PCA Manual

Contents

IBM Tealeaf CX Passive Capture Application Manual

The following content can be used to help you install, configure, and administer a CX Passive Capture Application Manual in your IBM Tealeaf environment.

Passive Capture Overview

Passive Capture from Tealeaf® captures and records the complete interaction between the visitor and the web application environment by using a network tap or network switch spanning port. The Passive Capture software features the following benefits:

- Introduces zero overhead, page latency, or CPU utilization to the web server
- Introduces zero risk of failure to the web application - monitored/captured traffic is not part of the active traffic
- Supports any web application environment: homogenous or mixed, packaged, or custom
- Supports encrypted (HTTPS) and non-encrypted (HTTP) traffic
- Supports deployment into the Amazon Web Services (AWS) cloud-based environment
- Reconstructs the HTTP traffic of the user experience for downstream processing of user sessions and events

To capture requests and responses of your website's traffic, the IBM® Tealeaf CX Passive Capture Application requires high-quality data source that is provided over a reliable network. See “Tealeaf PCA Network Capture Traffic Requirements” on page 12.

Enhanced International Character Support (EICS) for CX Passive Capture Application version 3730

Make sure that you are using the correct version of the CX Passive Capture Application to support IBM Tealeaf with Enhanced International Character Support (EICS).

The IBM Tealeaf PCA version 3730 supports capturing data that is encoded using enhanced international characters. PCA version 3730 is used to capture web traffic for processing by Tealeaf CX version 9.0.2A.

Security and Administration

The CX Passive Capture Application software is highly controlled and secured. It is bound to the capture host workstation and can operate without a public interface. All administration functions can be conducted by a Secure Shell (SSH) client program.

A secured web console interface is available to administer and managed your CX Passive Capture Application.

SSL Support

The CX Passive Capture Application software provides full support for SSL (HTTPS) transactions.

Note: To support SSL, a copy of the SSL private key(s) must be provided to the CX Passive Capture Application software. If there are multiple SSL Certificates, a copy of each private key is required. This enables the CX Passive Capture Application software to decrypt SSL traffic for HTTP hit content processing.

Integration with HSMs
n some environments, security restrictions at the operating system level are insufficient for management of encrypted private keys. In these environments, Tealeaf supports integrations with Hardware Security Modules.

IA® Hardware Security Module (HSM) provides both logical and physical protection of sensitive SSL private keys from non-authorized use and potential adversaries.

While the implementation of importing/exporting SSL private keys to the IBM Tealeaf CX Passive Capture Application server with the HSM varies from environment to environment, the design goal of these transfers is an automated process whereby the private keys are securely on the HSM. HSM vendors provide solutions that address the requirements of this transfer process, usually including several supported methods for installing keys on the HSMs. There are typically implementation-specific aspects to designing the automated installation process.

In an HSM environment, the keys that are used by the Tealeaf run time inherit the protective measures that are offered by the HSM. The key file is stored on the HSM and retains an additional layer of access control to prevent its movement.

- For more information about HSM integration, see Appendix - Integrating Tealeaf SSL Keys with HSM.
- Without an HSM, SSL private key are converted to an encrypted Tealeaf.ptl file format and stored in an operating system directory in a form that is usable on the same workstation only; the key is hashed in a machine-specific way. For more information about this method, see “Encrypted SSL Key Setup” on page 189.

Deployment architecture overview

Passive Capture consists of software that is running on a host, which directly connects to the collection device, a network tap, or switch spanning port. The data flow from the collection device to the host workstation is unidirectional; the host only receives data passively.

From the host, the Passive Capture software transports the data in real time to the Tealeaf CX Server environment. Data can be transported over TCP/IP or through a network crossover cable that is connected directly between the Passive Capture host and the receiver workstation in the Tealeaf CX environment. Passive Capture performs the following functions:

- Reconstruct the HTTP(S) request and response bodies from the captured TCP/IP packet data
- Decrypt SSL (if applicable)
- (optional) Sessionize (or sequence) the HTTP request and response pages by a session ID into visitor sessions
- (optional) Privacy blocking can be defined for sensitive data
- Transport the data to the Tealeaf CX Server environment

On-premises deployment
The on-premises deployment architecture represents a common IBM Tealeaf environment that is deployed within your local network infrastructure. In this scenario, the CX Passive Capture Application can be hosted on a physical server or it can be hosted from a compatible virtual server within the same network environment.

The capture device must have access to all traffic sent to the load balancing router or a network segment that is containing the group of application/web servers that are supported by the IBM Tealeaf CX solution.

Because the Tealeaf Passive Capture host is connected directly to the collection device, opening firewall ports is not required to collect data.

The following diagrams illustrate typical deployment architectures for switch spanning or network tap methods. From the Passive Capture host, data is transported (through TCP/IP or SSL) to the IBM Tealeaf CX Server environment where it is analyzed, aggregated, and archived.

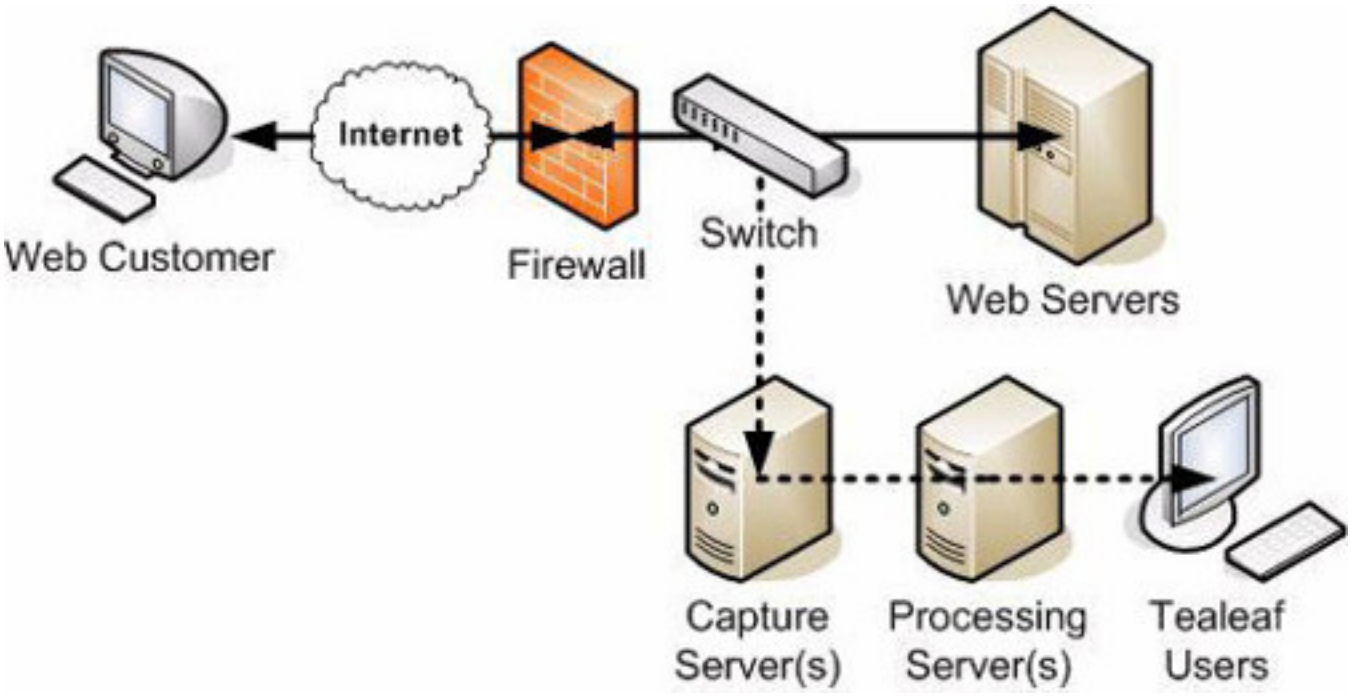


Figure 1. Deployment Architecture Scenario - Port Mirror from Switch (or Load Balancer)

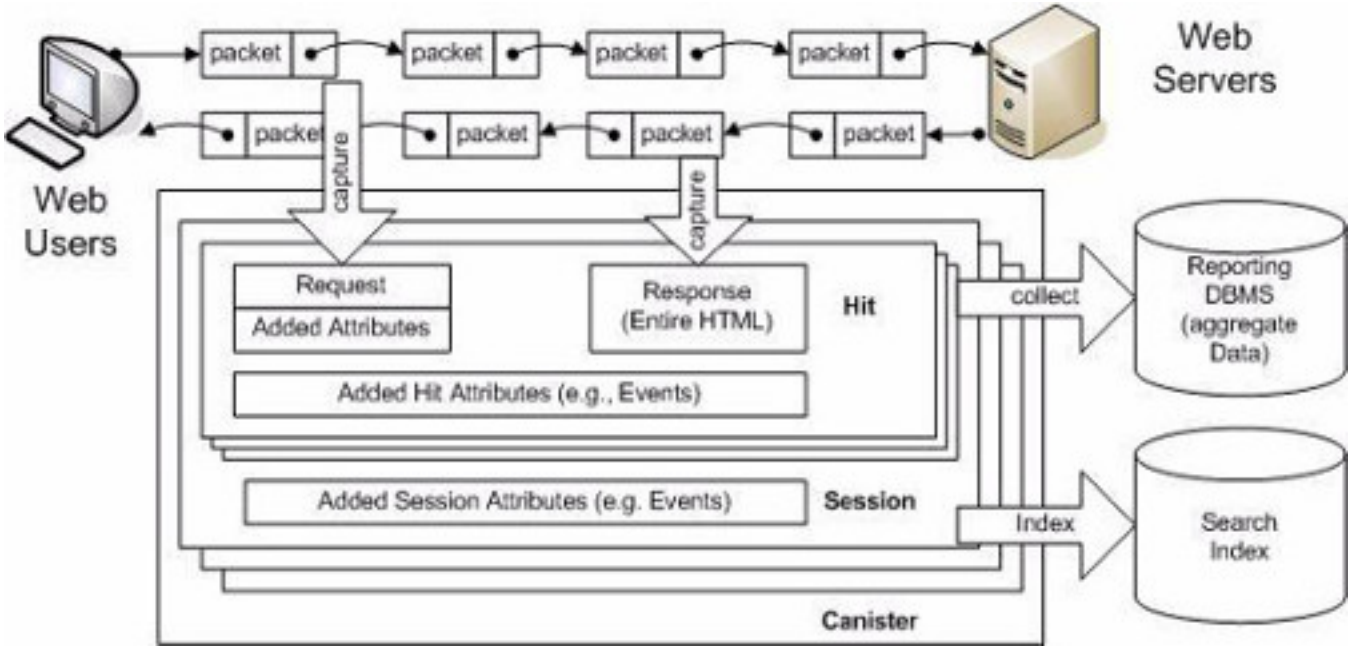


Figure 2. Deployment Architecture Scenario - Network Tap

Deployment in the Cloud

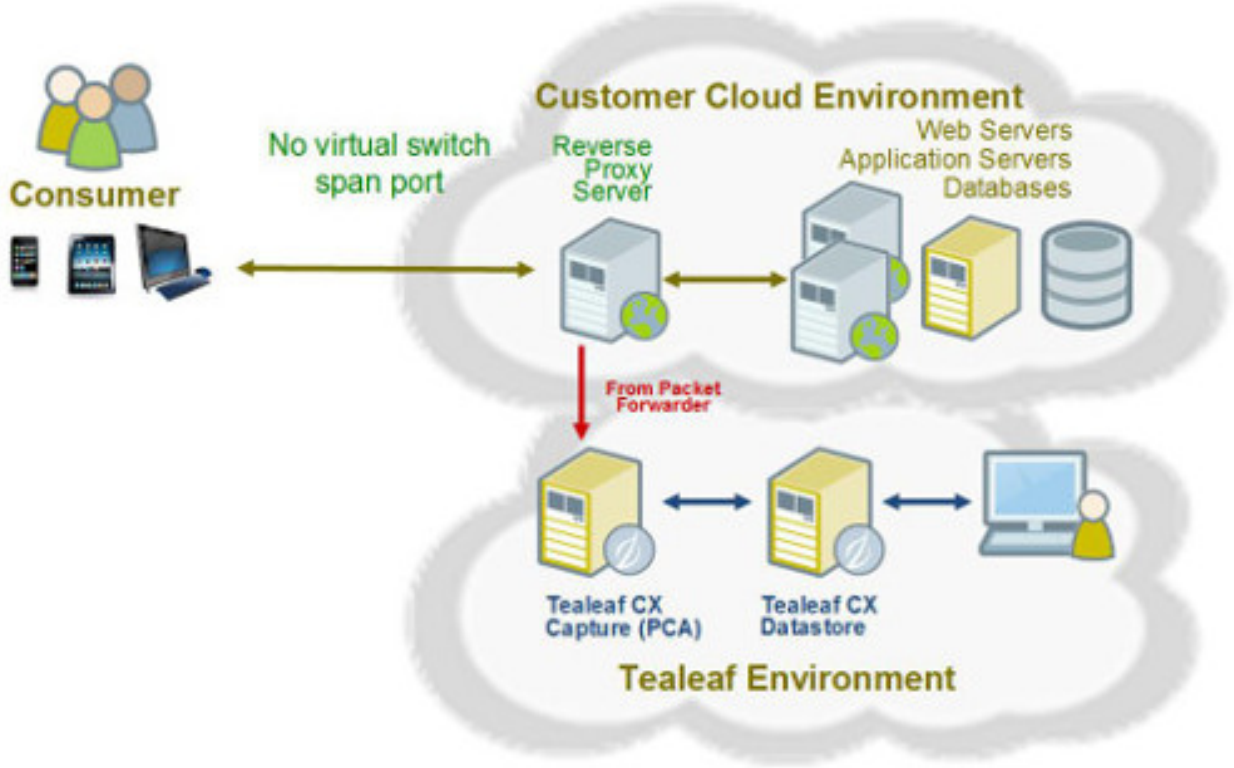
The cloud deployment architecture represents a common IBM Tealeaf environment that is deployed within a supported cloud-based infrastructure.

IBM Tealeaf can be deployed to one of the following cloud-based infrastructures:

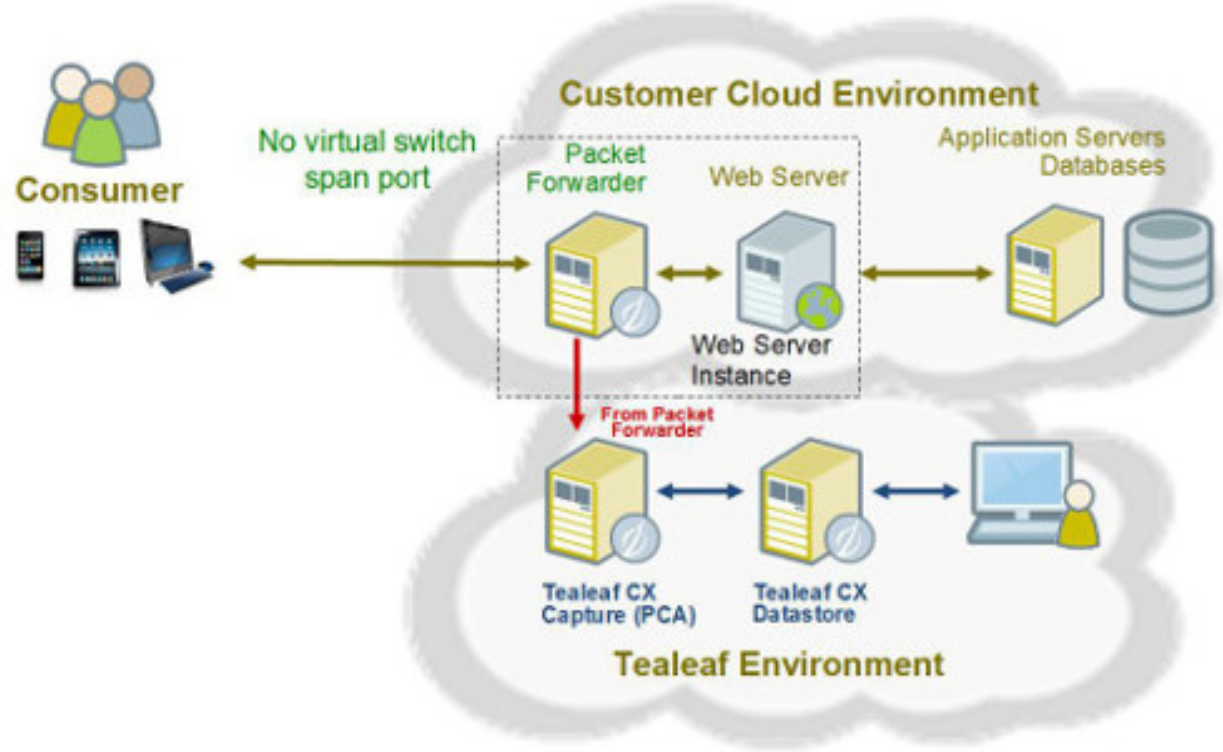
- IBM SoftLayer®
- Amazon Web Services (AWS)
- Microsoft Azure

The following diagram illustrates the deployment architecture for cloud-based installations using a reverse proxy server that also has a packet forwarder installed on it. In this deployment, the packet

forwarder captures web traffic from the virtual network to the reverse proxy server and sends the captured data to the PCA which is hosted on a separate virtual machine.



The following diagram illustrates the deployment architecture for cloud-based installations where the packet forwarder is deployed on the web server. In this scenario, each web server instance has a packet forwarder instance that is deployed to the web server. Each packet forwarder instance captures the web traffic between the web server and the client. The packet forwarder sends the captured web traffic to the packet forwarder which is hosted on a separate virtual machine.



For information about installing the IBM Tealeaf packet forwarder, see "Cloud Packet Capture Overview" on page 6.

PCA Throughput

The following components can affect how IBM TealeafCX Passive Capture Application processes hit data that is forwarded to the CX PCA.

Note: Review the recommended CX PCA requirements to optimize the performance of the CX PCA.

Table 1. CX PCA components and how each component affects performance

Component	**Affect on performance**
Network interface cards (NICs)	The network interface card represents the upper limit of what a specific instance of the CX PCA server can capture and process. For example, using NICs that are only capable of 100 megabits per second, limits the maximum throughput for a CX PCA server. If 1 gigabit per second NICs are used, you can achieve up to 10 times more throughput.
CPU cores	The CX PCA benefits when installed on a server with eight or more CPUs. With extra available cores, you can install more instances of the IBM TealeafCX Passive Capture Application.
RAM	More RAM on the CX PCA server enables more resources for processing of captured data.
SSL	Secure traffic is CPU-intensive and can have a large impact on overall throughput. For example, if a CX PCA can handle 700 megabits per second of non-SSL traffic throughput, processing the same traffic over SSL might result in achieving only 70 megabits per second throughput.

Table 1. CX PCA components and how each component affects performance (continued)	
Component	**Affect on performance**
Virtual environments	Your VMware virtual machine settings must be configured to meet the same operating system and hardware requirements as a physical server that is hosting IBM Tealeaf CX PCA. If the virtual machine does not meet the same requirements as a physical server, you might experience performance-related issues. Limit throughput to no more than 500 Mbps. The CX Passive Capture Application supports throughput for up to 500 Mbps. Environments with throughput rates greater than 500 Mbps can experience packet loss at the CX Passive Capture Application.

Related concepts

Tealeaf PCA Network Capture Traffic Requirements

The following requirements are needed for mirroring network traffic and forwarding it to the CX PCA for capture.

Cloud Packet Capture Overview

The Cloud Packet Capture is used to capture and forward hits to a cloud-based CX PCA that is operating on a virtual machine.

The CX PCA processes the hits that are forwarded by the Cloud Packet Capture.

The Cloud Packet Capture software is included with the CX PCA and consists of a transmitter and a receiver component. The transmitter captures TCP packets and forwards them to the designated receiver. The receiver can be configured to capture data that is submitted from a specified transmitter. You can configure multiple transmitter instances to send data to a centralized CX PCA. Each transmitter instance must connect to an individual receiver instance on the CX PCA.

Note: Transmitter instances and a receiver instances cannot share the same listening port.

The Cloud Packet Capture provides the following functionality:

- Replaces the default TCP packet sniffer component of the PCA with a network socket listener
- Directs traffic into an internal PCA instance. The transmitter points to a centralized PCA instance in the cloud and delivers packets to the receiver through a network connection.
- TCP packets are captured by sniffing the designated port.

The Cloud Packet Capture components can be deployed in a public or private cloud to manage capture and forwarding of TCP packets for processing by a cloud-based IBM Tealeaf installation.

Software architecture

The CX Passive Capture Application uses the following services to perform the capture process.

The core capture processes captures, reassembles, post-processes, and delivers the reassembled HTTP/HTTPS hits to the Tealeaf Transport Service, which is hosted on another server. The five core processes in order of processing during capture are named `captured`, `listend`, `reassd`, `pipelined`, and `deliverd`.

Table 2. CX PCA process descriptions

Process	Description
Captured	Captured is the top-level capture process. It is the parent of several children processes, which include listend, reassd, pipelined, and deliverd. Its two main roles are to create capture instances and create and manage its children processes. A capture instance is a pair of listend and reassd processes that capture and reassemble network traffic. Upon starting, Captured creates all configured capture instances as child processes. It then creates the pipelined and deliverd processes as child processes. Captured restarts their children processes when they terminate unexpectedly or when its maintenance script determines an unhealthy condition.
Listend	Captures network traffic packets from the configured primary and secondary interfaces and send them to the reassembly process, Reassd. Listend is essentially a packet sniffer. It uses the configured and ignored traffic to determine the packets to capture. Listend buffers the packets that it sends to Reassd in memory to accommodate small delays in the ability of Reassd to read the packets. Listend additionally provides packet archiving to record the captured packets to files on the local hard disk.
Reassd	Reassembles TCP packets, decrypt SSL traffic, and initially parse the resulting HTTP requests and responses. Reassd retrieves packets for reassembly from its communication pipe with the listend process. After it parses an HTTP request and response pair, reassd sends the reassembled hit to pipelined. Reassd is the core process of Passive Capture and is usually the most CPU-intensive process because of its HTTP and SSL processing.
Pipelined	Retrieves the reassembled HTTP request and response from reassd, format them into a Tealeaf hit, and perform any configured post processing. The post-processing can include dropping hits that are based on configurable options, data compression/decompression, privacy block and filtering, and instructing deliverd to send the hit to a workstation. The workstation runs the Tealeaf Transport Service, which is typically the IBM Tealeaf CX server. **Note:** The CX PCA supports the creation of multiple instances of the pipelined process.
Routerd	Transparently load balances (TLB) incoming network packets and connections to the multiple Reassd process instances. By distributing network traffic more evenly across all Reassd instances, it increases the efficiency of the system's cpu cores to improve overall performance. This process module is present only if TLB mode is enabled.

Table 2. CX PCA process descriptions (continued)	
Process	**Description**
`Tcld`	Provides TCL-based script processing to handle the management of the Tealeaf hits for specialized delivery with the `deliverd` process. This process can accept Tealeaf hits from one or more `pipelined` source processes.
`Deliverd`	Delivers the Tealeaf formatted hits to one or more Tealeaf Transport Services on remote workstations as instructed by `tcld`. `Tcld` is responsible for deciding whether a hit must be sent and to whom it must be sent. Establishes the network connection and sending the hits over the network to the Tealeaf Transport Service. It can optionally communicate with the Tealeaf Transport Service using an SSL connection to provide a secure channel.
`Failoverd`	This optional process is present if failover is enabled and running on an instance of the IBM Tealeaf CX Passive Capture Application. • This process sends heartbeat signals to the `failoverd` processes on other PCA instances in the environment. • This process runs independently of the other PCA processes.
`Memcached`	The `Memcached` process provides a global in-memory caching system to the CX PCA. `Memcached` is primarily used to store SSL session information for later access by all `Reassd` instances in processing SSL decryption (resumed SSL sessions). This process module is present only if TLB mode is enabled.

Related concepts

Multi-Instance Pipeline Processes

The `pipelined` process runs multiple CPU-intensive operations, such as privacy blocking activities, which can cause performance bottlenecks in single-threaded configurations.

CX PCA Transparent Load Balancing Overview

The CX PCA can be configured for transparent load balancing (TLB) which provides the ability to transparently segment and distribute network capture traffic.

Related reference

PCA Web Console - Failover Tab

Capture Process

The core capture processes capture, reassemble, post-process, and deliver the reassembled HTTP/HTTPS hits to the Tealeaf Transport Service running on another workstation. The five processes in order of processing during capture are named captured, listend, reassd, pipelined, and deliverd.

- The tcld process can or cannot present in your PCA.

Captured

Captured is the top-level capture process. It is the parent of several children processes: listend, reassd, pipelined, and deliverd. Its two main roles are to create capture instances and create and manage its children processes. A capture instance is a pair of listend and reassd processes that capture and reassemble network traffic. Upon starting, captured creates all configured capture instances as child processes. It then creates the pipelined and deliverd processes as child processes. Captured restarts

their children processes when they terminate unexpectedly or when its maintenance script determines an unhealthy condition.

Listend

The primary function of `Listend` is to capture network traffic packets from the configured primary and secondary interfaces and send them to the reassembly process, `Reassd`. `Listend` is essentially a packet sniffer. It uses the configured and ignored traffic to determine the packets to capture. `Listend` buffers the packets that it sends to `Reassd` in memory to accommodate small delays in the ability of `Reassd` to read the packets. `Listend` additionally provides packet archiving to record the captured packets to files on the local hard disk.

Reassd

Reassd's primary function is to reassemble TCP packets, decrypt SSL traffic, and initially parse the resulting HTTP requests and responses. Reassd retrieves packets for reassembly from its communication pipe with the listend process. After it parses an HTTP request and response pair, reassd sends the reassembled hit to pipelined. Reassd is the core process of Passive Capture and is usually the most CPU-intensive process because of its HTTP and SSL processing.

Pipelined

Pipelined's primary function is to retrieve the reassembled HTTP request and response from reassd, format them into a Tealeaf hit, and perform any configured post processing. The post-processing can include dropping hits that are based on configurable options, data compression/decompression, privacy block and filtering, and instructing deliverd to send the hit to a workstation. The workstation runs the Tealeaf Transport Service, which is typically the IBM Tealeaf CX server.

- PCA supports the creation of multiple instances of the pipelined process. See “Multi-Instance Pipeline Processes” on page 10.

Routerd

The primary function of `Routerd` is to transparently load balance (TLB) incoming network packets and connections to the multiple `Reassd` process instances. By distributing network traffic more evenly across all `Reassd` instances, it increases the efficiency of the system's cpu cores enabling better overall performance. This process module is present only if TLB mode is enabled. For more information, see “CX PCA Transparent Load Balancing Overview” on page 10.

Tcld

Tcld's primary function is to provide TCL-based script processing to handle the management of the Tealeaf hits for specialized delivery with the deliverd process. This process can accept Tealeaf hits from one or more pipelined source processes.

Deliverd

Deliverd's primary function is to deliver the Tealeaf formatted hits to one or more Tealeaf Transport Services on remote workstations as instructed by tcld. Tcld is responsible for deciding whether a hit must be sent and to whom it must be sent. Deliverd is responsible for establishing the network connection and sending the hits over the network to the Tealeaf Transport Service. It can optionally communicate with the Tealeaf Transport Service using an SSL connection to provide a secure channel.

Failoverd

This optional process is present if failover is enabled and running on an instance of the IBM Tealeaf CX Passive Capture Application.

- This process sends heartbeat signals to the failoverd processes on other PCA instances in the environment.
- This process runs independently of the other PCA processes.
- See “PCA Web Console - Failover Tab” on page 157.

Memcached

The Memcached process provides a global in-memory caching system to the CX PCA. Memcached is primarily used to store SSL session information for later access by all Reassd instances in processing SSL decryption (resumed SSL sessions). This process module is present only if TLB mode is enabled.

For more information, see “CX PCA Transparent Load Balancing Overview” on page 10.

Multiple Instances

In both TLB mode and non-TLB mode, the CX PCA can be configured to initiate multiple instances of `listend` and `reassd` processes to use multiple CPU cores to handle high capture traffic loads.

The instances can be configured to capture different TCP/IP addresses and ports to distribute the traffic load among the capture instances. The instances can share NICs for capturing packets or can capture packets by using multiple NICs available on the IBM Tealeaf CX Passive Capture Application server.

The CX PCA can also create multiple instances of pipelined process to distribute its processing load requirements.

In TLB mode, a single instance of `listend` is used to feed multiple `reassd` processes through the `routerd` process. Multiple instances are provided through the `reassd` processes where the effective work is needed and eliminates the manual workload of segmenting and distributing the capture traffic load.

For integration with load balanced web servers that use a single virtual IP (VIP), see “CX PCA Transparent Load Balancing Overview” on page 10.

Multi-Instance Pipeline Processes

The `pipelined` process runs multiple CPU-intensive operations, such as privacy blocking activities, which can cause performance bottlenecks in single-threaded configurations.

You can create additional instances of the `pipelined` process to distribute the processing load for all PCA instances across available CPU resources.

For example, suppose that a single PCA instance is generating 500 pageviews/second and is configured for intensive pipeline privacy processing, which is limiting its throughput to 200 page views per second. Adding two more pipeline instances (for a total of three pipelines) enables the handling of the overall page-view throughput.

One or more `reassd` processes (multi-PCA instances) can feed its resulting HTTP hits to a single, shared memory (SHM) queue, which manages distribution to the available instances of the `pipelined` processes in round-robin fashion.

In an example of multi-PCA instances, suppose that you have created four PCA instances, which are generating 1000 pageviews/second. If a single pipeline can process 400 page views per second in your environment, two more pipelines can be added to manage processing the entire volume.

PCA master and slave failover also supports multi-instance pipelines. See “PCA Web Console - Failover Tab” on page 157.

Related concepts

Pipeline Settings

CX PCA Transparent Load Balancing Overview

The CX PCA can be configured for transparent load balancing (TLB) which provides the ability to transparently segment and distribute network capture traffic.

New CX PCA installations come with TLB enabled by default. Prior to this feature (non-TLB mode), segmentation of the capture traffic required assigning blocks of traffic to specific CX PCA instances for load balanced processing.

By configuring the CX PCA for transparent load balancing, you can:

- Reduce customer support issues that are caused by uneven traffic loads or changes to the traffic profile across multiple CX PCA instances where a sudden increase in network traffic can overload a CX PCA instance. If a CX PCA instance is overloaded, it can cause the instance to restart and lose of captured traffic. By enabling transparent load balancing, network traffic is distributed to the CX PCA instances by using a round robin method of distribution. Distributing the network traffic to the CX PCA instances prevents an instance from overloading.
- Simplify your CX PCA installation and configuration. By enabling transparent load balancing, you do not need to provide extra configuration for each additional CX PCA instance. You can specify the number of instances that you want to use and Tealeaf automatically distributes network traffic to the instances.
- Capture traffic from a single virtual IP (VIP) for web servers that are configured to work under a single VIP.

Multiple `Listend-Routerd` Pairs

You can enable multiple `listend` instances using multiple `Listend-Routerd` pairs (MLRP).

MLRP provides the capability of using multiple NICs to capture data in a load-balanced environment. You can configure your CX PCA to use MLRP with multiple NICs to improve packet capturing performance and increase scalability to meet the demands of your network traffic. MLRP takes advantage of multiple NICs by creating multiple instances of the `routerd` process. Each `routerd` process requires one CPU core to operate. Each `routerd` process actively routes the flow of incoming network traffic from a `listend` process to the `reassd` processes. Each `listend` process is paired to one `routerd` process and can process 1 Gigabit per second of traffic. The ability to route the network traffic to multiple `reassd` processes removes the need to manually segment and distribute the captured traffic to prevent queuing. Balancing the network traffic to multiple `reassd` processors enables the CX PCA to take advantage of using multiple NICs to receive and process large amounts of network traffic.

For information on how to configure MLRP, see “Configuring Multiple Listend-Routerd Pairs” on page 180.

Maintenance program

The Passive Capture software includes a maintenance program that runs as the root user through the workstation's cron service.

The maintenance program performs various tasks, including checking the health of the passive capture processes, logging, statistics, sending diagnostic statistics to another workstation, and managing various log files created by the Passive Capture software programs.

3rd party software

The CX Passive Capture Application software installation packages include the following third-party packages:

```
Apache HTTPD 2.2.19
Expat 1.2
LibNet 1.1.1
LibPCAP 1.1.1
OpenSSL 1.0.0d
PHP 5.2.9
TCL 8.4.x
Tcpdump 4.1.1
Tcpslice 2004.05.10
```

Some of these packages are directly used by the Tealeaf software and some are provided as tools for managing the system.

Formatted commands for readability

Linux commands are formatted specially for display purposes. The following examples explain how some of the commands might be formatted to improve the readability of the content.

For example, the following is a command that is entered on the screen:

```
# tcpdump -Xnr tst1.dmp |more
```

For display purposes, the command can be displayed in manual in the following manner:

```
# tcpdump -Xnr \
tst1.dmp |more
```

Note the backslash, which is used as the line continuation indicator.

Commands that are displayed back on the screen can be formatted as follows:

```
# tcpdump -Xnr \
> tst1.dmp |more
```

Note the caret (>) at the beginning of the second line to indicate continuation.

Note: Be careful copying and pasting Linux commands from manual. Some commands can require modification.

Tealeaf PCA Network Capture Traffic Requirements

The following requirements are needed for mirroring network traffic and forwarding it to the CX PCA for capture.

Network devices such as switch span ports, network taps, and load balancers are just a few of the network traffic capture points that can provide a copy of live network traffic to the IBM Tealeaf CX Passive Capture Application. Typically, the mirrored traffic consists of the customer website's web server traffic.

- Mirrored network traffic is considered passive in nature, as the capture NIC(s) that are used by the CX PCA do not interact with the live network traffic.

Note: The IBM Tealeaf CX Passive Capture Application supports the capture of 128-bit SSL traffic. Encryption methods by using a fewer numbers of encryption bits are not supported.

Basic traffic requirements

For proper operation, the PCA requires that the mirrored network traffic is of high integrity and quality.

Any loss of critical network TCP packets can prevent the PCA from reassembling the TCP traffic into HTTP hits. Lost TCP packets can result in Tealeaf sessions with missing pages, partial pages, or both. In a worst-case scenario, the entire session can be unusable.

Confirm the following basic requirements with your network administrator:

- Traffic stream: The PCA requires bidirectional traffic stream or two unidirectional traffic streams containing all HTTP requests and responses traffic between your web application and the visitor browsers that are interacting with it.
- No errors or dropped packets: No errors, dropped packets, or overrun packets at operating system network interface card and network level.
  - An `ifconfig ethX` command on the capture NIC must display a constant number of dropped packets or errors.
  - If the number is increasing at a high rate, there can be problems with the fidelity of the traffic sent to the PCA. There can be inadequate sizing of your PCA hardware for your traffic volume, or both.

- Real visitor IPs: The capture point can see the real visitor IPs or host address of visitor's IP.

  Access to the real IP address of your visitors is a valuable resource for troubleshooting purposes. For customers who use load balancers, this requirement cannot be possible.
- Filtered traffic: Spanned traffic is filtered down to the essential traffic only.

  Tealeaf recommends filtering out as much unnecessary traffic as possible at the network level before it is delivered to the PCA. This filtering offloads processing resources that the PCA must use to filter out traffic.
- TCP persistent connections issues:

  To capture traffic, the PCA must see the start of all TCP connections.

Related concepts

TCP Connections

The IBM TealeafCX Passive Capture Application requires to monitor the start of all TCP connections. If TCP persistent connections are enabled, then the PCA is able to reassemble hits from in-progress connections.

Diffie-Hellman Cipher

Diffie-Hellman is a type of SSL encryption cipher.

It is designed so that third parties, which are systems other than the two parties at the two endpoints of a conversation, cannot decrypt the communications traffic. A user session that was established with a web server by using this cipher cannot be captured by using the IBM Tealeaf CX Passive Capture Application.

Note: IBM Tealeaf does not support the use of the Diffie-Hellman cryptographic protocol and recommends configuring your web servers to not use it.

Related concepts

How do I remove Diffie Hellman cipher from web server SSL cipher list

TLS SessionTicket Extension

This SSL protocol extension is used by some web servers to transmit encrypted traffic to the browsers that support it. In the OpenSSL modules of the latest Apache web servers and possibly other web servers, the new SSL TLS protocol extension (RFC-5077) for stateless session resumption, which is known as SessionTicket extension, encrypts the SSL state information, which is used only if both the client browser and the web server comply with the standard.

Note: The IBM Tealeaf CX Passive Capture Application supports the SSL Session Ticket extension in recent builds. If you enable this extension on your web server, verify that you installed or upgraded to build `TLSv1.x in Build 3327` or later. For more information on downloading IBM Tealeaf, see IBM Passport Advantage® Online.

See “Some SSL hits missing from Firefox browser sessions” on page 264.

TCP Connections

The IBM TealeafCX Passive Capture Application requires to monitor the start of all TCP connections. If TCP persistent connections are enabled, then the PCA is able to reassemble hits from in-progress connections.

Please check with your IT team to see whether TCP persistent connections is enabled in the IT infrastructure. Individual TCP persistent connections can be used by multiple visitors to your web application. It can also be deployed by a load balancer such as an F5 network device, a front-end proxy such as an Akamai server, or the web server itself.

For SSL sessions, pooling SSL transactions is considered an optimization. However, SSL pooling transactions to a set of TCP persistent connections can cause issues, which prevent these sessions from being decrypted. If a new SSL session is not seen to allow the PCA to cache the SSL session ID information, then any subsequent SSL sessions that reuse the session ID cannot be decrypted.

In such an environment, connections can persist up to 24 hours, which introduces a latency in the capture of sessions when the PCA is installed, upgraded, or rebooted. There can be possible workarounds or compromise configuration settings on the source network devices which can mitigate the latency period.

- For more information, contact your IT team.

Duplicate Data
Each instance of the IBM TealeafCX Passive Capture Application must feed data that is unique within Tealeaf.

Note: Duplicated data must not be intentionally passed to Tealeaf. While CX PCA is designed to filter out duplicated data, unnecessary duplicate packets in a high-volume environment can impede processing. Tealeaf supports passive failover across multiple instances of the IBM Tealeaf CX Passive Capture Application. See “PCA Web Console - Failover Tab” on page 157.

Sources of network traffic quality issues

If you are having network traffic issues, review the following issues to help isolate the problem.

Table 3. Sources of network traffic quality issues

Issue	Source
Dropped network TCP packets	Network TCP packets can be dropped in any of the following conditions occur: • **Over-subscribed span port:** Dropped network packets can be caused by an over-subscribed network switch span port. In this configuration, one or more selected network traffic streams are configured to a share a single port where the total of all selected traffic exceeds the port's bandwidth. For example, three 500 megabits/s traffic streams with aggregate bandwidth of 1.5 gigabits/second is mirrored to a switch span port that can handle only 1.0 gigabits/second. During peak traffic periods, this span port is unable to handle the load, and packets are dropped. • **Inadequate CPU resources on the switch:** The span port can be dependent on the switch's CPU for available cycles to aggregate and/or filter the required traffic for mirroring. Contemporary switches typically allocate available CPU cycles for span port mirroring where the CPU priority is to handle switching operations. If the CPU is busy with switching operations, there cannot be sufficient cycles to manage the mirroring, in which case span port operations "starve," and network packets are dropped in the mirrored traffic. **Note:** The mirrored traffic bandwidth cannot be close to the practical limits of the span port. A network switch's utilization curve becomes an important factor in providing high-integrity mirrored traffic. • **Other network devices:** In a more complex network infrastructure, more network devices can be used with a mirrored network traffic source, such as network traffic aggregators, and network port replicators. These types of devices can cause network packet loss, especially if any active devices are altering the network traffic as part of their processing.

Table 3. Sources of network traffic quality issues (continued)	
Issue	**Source**
Unidirectional traffic	A simple misconfiguration error can result in the CX PCA receiving network traffic for one direction only. In these instances, HTTP requests or responses are forwarded to the CX PCA, but not both. For the CX PCA to correctly reassemble HTTP hits, the TCP traffic must be provided for both directions. In most cases, this situation is a relatively easy to identify and usually is caused by misconfiguration of the source network device.

Measuring dropped packets

The PCA provides several metrics to help identify dropped network packet conditions. These metrics are only data points to help to assess likely causes for dropped packets.

Unfortunately, few network switch metrics can indicate when a switch has overrun its internal buffers, causing dropped network packets. Indirect metrics such as port bandwidth and CPU utilization can indicate a possible issue. These metrics samples the state of the network switch at some pre-determined time interval. If a peak condition occurs between sampling periods, however, no indication would be available at all.

The best indicator is to evaluate captured Tealeaf sessions for missing pages, partial pages, or both missing pages and partial pages. Static validation of test Tealeaf sessions can provide another data point in analyzing the cause of sessions with missing pages. Real time tracking of Tealeaf sessions with compound events that are trigger for missing pages can help to determine whether a solution resolves the issue.

Installing the CX Passive Capture Application

The following instructions can be used to assist the installation of your CX Passive Capture Application software.

The deployment architectures that are used represent common on-premises and cloud-based IBM Tealeaf environments that are supported.

Note: If you are upgrading from a previous version of CX PCA, see the upgrade considerations.

To begin installing the CX PCA software in your IBM Tealeaf environment:

1. Configure and install the hardware and operating system for your CX PCA server.
2. Perform the pre-installation check.
3. Install the CX PCA software to your designated CX PCA server.
4. Configure the CX PCA server.
5. If your IBM Tealeaf environment is cloud-based, deploy the packet forwarders for your CX PCA environment.
6. Perform the post-installation tasks .

CX PCA installation requirements

The following requirements must be met before you install the IBM Tealeaf CX Passive Capture Application and Packet Forwarder.

- IPv6 addresses must be captured. Processing of IPv6 addresses throughout the Tealeaf solution is available for Release 8.4 and later only.

- Your Apache servers are handling SSL compression traffic to and from Chrome browsers.
- For HTTP_X_FORWARDING support, you must use PCA 3502 or later.

For additional requirements, see:

- “Changes to the PCA server” on page 24
- Hardware requirements
- “Hard disk mount point recommendations” on page 18
- “Multiple instances of PCA” on page 23
- Network traffic requirements
- “Operating system requirements” on page 19
- “Supported Accelerator Cards” on page 18

Network traffic requirements

Network devices such as switch span ports, network taps, and load balancers are just a few of the network traffic capture points that can provide a copy of live network traffic to the IBM Tealeaf CX Passive Capture Application. Typically, the mirrored traffic consists of the customer website's web server traffic. Mirrored network traffic is considered passive in nature, as the PCA's capture NIC(s) do not interact with the live network traffic.

Note: The IBM Tealeaf CX Passive Capture Application supports the capture of 128-bit SSL traffic. Encryption methods by using a fewer numbers of encryption bits are not supported

Before you begin to capture network traffic, you must review the requirements for network traffic that PCA expects to receive. This information must be shared with the IT infrastructure team.

Note: Tealeaf does not support the use of the Diffie-Hellman cryptographic protocol and recommends configuring your web servers to not use it.

Note: The IBM Tealeaf CX Passive Capture Application supports the SSL Session Ticket extension. If you enable this extension on your web server, upgrade to one of the supporting builds:

- TLSv1.1 in Build 3611 or later
- TLSv1.2 in Build 3611 or later

For more information on downloading IBM Tealeaf, see IBM Passport Advantage Online.

Note: The IBM Tealeaf CX Passive Capture Application expects to see the start of all TCP connections. If TCP persistent connections are used by any server that is feeding data to the PCA, then latency can be introduced in the capture of sessions, and data can be lost.

CX PCA hardware requirements

The following table lists the minimum and the recommended hardware requirements to run the CX Passive Capture Application.

Table 4. CX PCA hardware requirements

Minimum requirements	Recommended requirements
Note: These are the minimum requirements for operation of the CX Passive Capture Application software. They cannot accurately support the volume of data and processing requirements for your environment. For more information about sizing for your environment, contact Tealeaf Professional Services. • Dual processor, dual core: Intel dual-core Xeon processor at 2.8 GHz or better for total of four cores minimum • 8 GB of RAM minimum • 3 NICs, 1 Gigabit each • 100 GB or better SAS or SCSI hard disk – 15-ms access time – 7200-rpm drive speed	• Dual processor, quad core: Intel quad-core Xeon processor at 2.8 GHz or better for total of eight cores minimum • 16 GB of RAM minimum • 3 NICs, 1 Gigabit each • 100 GB or better SAS or SCSI hard disk drive – 15-ms access time – 7200-rpm drive speed The following hardware is recommended for general software installation and machine recovery: • CD-ROM drive • 1.44-MB diskette drive • Secondary drive for capturing and storing network traffic to archives: 200 GB - 800 GB

Hard disk mount point recommendations
Following are the recommended mount points and sizes for a 100-GB drive for the Passive Capture software.

Table 5. Recommended PCA mount point sizes

Mount point	Size
/	4 GB
/archive	42 GB (Remaining disk)
/tmp	4 GB
/usr	40 GB
/var	8 GB
swap	2 GB

The /archive partition is used for storing raw packet archives, if enabled. By default, the feature is off and must be used for troubleshooting problems only.

The /usr partition contains the Passive Capture software. The Tealeaf Passive Capture software RPM installs files into /usr/local.

Supported Accelerator Cards

See Appendix - Supported Hardware Accelerator Cards.

Integration with Hardware Security Modules

Tealeaf PCA can be integrating with private keys retained on hardware security modules. See Appendix - Integrating Tealeaf SSL Keys with HSM.

VMware support
The IBM Tealeaf CX Passive Capture Application supports being installed to a VMware vSphere 5.5 virtual machine.

Your VMware virtual machine settings must be configured to meet the same operating system and hardware requirements as a physical server that is hosting IBM Tealeaf CX PCA. If the virtual machine does not meet the same requirements as a physical server, you might experience performance-related issues.

Note: The following limitations apply to IBM Tealeaf deployed within a VMware environment:

- Limit throughput for up to 500 Mbps. The CX Passive Capture Application supports throughput for up to 500 Mbps. Environments with throughput rates greater than 500 Mbps can experience packet loss at the CX Passive Capture Application.
- You must disable multi-queue support in the VMware virtual network driver. Multi-queue support is automatically enabled by default when VMware is installed. If multi-queue support is not disabled, the packets that are sent to the CX Passive Capture Application might become out of order and cause the packets to be dropped.

Operating system requirements
The following operating system requirements must be met before installing the IBM Tealeaf CX Passive Capture Application.

The IBM Tealeaf CX Passive Capture Application (PCA) is considered a network appliance software, like a network switch, that can be installed on a supported Linux platform. The software is designed to run in a dedicated environment to capture and process a high volume of network packets. As such, it is the only application software that must own the Linux server. It is not meant to be shared with any other general applications.

Red Hat Enterprise Linux or SUSE Linux Enterprise Server must be installed before you begin installing IBM Tealeaf CX Passive Capture Application.

Supported operating system distributions for CX PCA Builds

Note: If your CX PCA server is running a build that is earlier than build 3502, it is recommended to upgrade to build 3502 or later. Before you upgrade to CX PCA build 3502 or later, you must upgrade the operating system on your CX PCA server to a distribution of Linux that is supported by the CX PCA.

At the time of this publication, the following distributions of Red Hat Enterprise Linux and SUSE Linux Enterprise Server are compatible with the CX PCA.

- Red Hat Enterprise Linux (RHEL) versions 5, 6, and 7

  Note: Red Hat Enterprise Linux (RHEL) 7 uses the same installation package and process as Red Hat Enterprise Linux (RHEL) 6.
- SUSE Linux Enterprise Server (SLES) version 11

Depending on the type of operating system, more installation might be required. Review all of the following requirements.

Supported operating system distributions for Packet Forwarder

The Packet Forwarder software can be installed to systems with the following operating systems:

- Red Hat Enterprise Linux (RHEL) versions 6 and 7
- SUSE Linux Enterprise Server (SLES) version 11

Note: Red Hat Enterprise Linux (RHEL) 7 uses the same packet-forwarder installation package and process as Red Hat Enterprise Linux (RHEL) 6. In this scenario, use tealeaf-pca-<nnnn>-<rrr>.RHEL6.i386.rpm for the installation package.

Depending on the type of operating system, more installation might be required. Review all of the following requirements.

Disable SELinux

Before you begin, SELinux must be disabled through the operating system for all versions of Red Hat Linux. See "CX PCA installation requirements" on page 16.

Disable iptables

On the Linux server hosting the IBM Tealeaf CX Passive Capture Application, please disable use of `iptables`. For more information, see "Disable iptables" on page 20.

Hyperthreading

Note: If the CX PCA is hosted on a server that supports hyperthreading, do not disable it. It is enabled on most servers that support it and must be enabled for the IBM Tealeaf CX Passive Capture Application.

If you are using multiple instances of the CX PCA, do not count the hyperthreaded virtual processors as available CPU cores. To calculate the maximum number of CX PCA instances, count only the real CPU cores. See "Multiple instances of PCA" on page 23.

32-bit Multi-Core O/S

For a multi-core system with a 32-bit operating system, the installation process automatically detects the additional processors and installs an SMP kernel to enable multi-core support. Physical Address Extension (PAE) support is included as part of the SMP kernel and supports up to 16 GB of RAM on a 32-bit operating system.

64-bit Multi-Core O/S

In a multi-core system with a 64-bit operating system, the installation process requires no additional kernels.

Note: The 32-bit versions of the required libraries must be installed from the installation disk of your 64-bit version of Linux. See "Required Packages" on page 21.

Disable SELinux

The security enhancement features of Red Hat Linux are not compatible with the IBM TealeafCX Passive Capture Application. Multiple system settings are not allowed in SELinux mode, and the syslog system is not available, which prevents the PCA `capture.log` from working.

- If SELinux is enabled and the tealeaf script is used to start capture, a warning is printed.
- A warning message is also displayed in the PCA Web Console when SELinux is enabled.

Before you install the IBM Tealeaf CX Passive Capture Application, SELinux must be disabled through the operating system. For more information, see the documentation for your Linux distribution.

Disable iptables

You can disable the Linux firewall by disabling `iptables`.

About this task

On the Linux server that is hosting the IBM Tealeaf CX Passive Capture Application, disable use of `iptables`.

Note: If `iptables` are enabled and cannot be disabled, you can disable the firewall through Linux to access the PCA Web Console. For more information, review the documentation that came with your Linux release.

To disable `iptables`, run the following commands in the listed order.

Note: For more information about `iptables`, review the documentation that came with your Linux release.

Procedure

1. Commands:

```
service iptables save
service iptables stop
chkconfig iptables off
```

2. Restart the PCA.

Required Packages

The CX Passive Capture Application software RPM requires the following packages, which are included with a minimal installation of RHEL and SLES.

As part of a 32-bit operating system installation, these packages must be installed already.

- You must manually install them for 64-bit installations. While the 64-bit versions of these libraries are automatically installed, the 32-bit versions are required by PCA and must available on the installation media.

Note: A minimal installation of Red Hat Enterprise Linux is required for Tealeaf installation. If more configuration or software is required because of local policies that are concerning firewalls or monitoring software, those components must be installed and configured. It is done after the minimal Tealeaf installation is completed and Passive Capture is up and running.

Red hat Enterprise Linux Server release 5.6

Required Packages:

- bash-3.1-16.1
- coreutils-5.97-12.1.el5
- expat-1.95.8-8.2.1
- gawk-3.1.5-14.el5
- glibc-2.5-18
- libgcc-4.1.2-14.el5
- libgdbm-1.8.0-26.2.1
- libicudata.so.38
  - Provided with the Tealeaf rpm
- libicuuc.so.38
  - Provided with the Tealeaf rpm
- libstdc++-4.1.2-14.el5
- libxml2-2.6.26-2.1.2
- perl-5.8.8-10
- zlib-1.2.3-3

Red Hat Enterprise Linux Server release 6.1

Required Packages:

- bash-4.1.2-3.el6.i686
- coreutils-8.4-9.el6.i686
- gawk-3.1.7-6.el6.i686
- glibc-2.12-1.7.el6.i686
- libgcc-4.4.4-13.el6.i686
- libstdc++-4.4.4-13.el6.i686

- libxml2-2.7.6-1.el6.i686
- libicudata.so.38
  - Provided with the Tealeaf rpm
- libicuuc.so.38
  - Provided with the Tealeaf rpm
- openssl-1.0.0-4.el6.i686
- perl-5.10.1-115.el6.i686
- zlib-1.2.3-25.el6.i686

Red Hat Enterprise Linux Server release 6.5

Required Packages:

- glibc-2.12-1.132.el6_5.2.i686.rpm
- keyutils-libs-1.4-4.el6.i686.rpm
- krb5-libs-1.10.3-15.el6_5.1.i686.rpm
- libcom_err-1.41.12-18.el6.i686.rpm
- libgcc-4.4.7-4.el6.i686.rpm
- libselinux-2.0.94-5.3.el6_4.1.i686.rpm
- libstdc++-4.4.7-4.el6.i686.rpm
- libxml2-2.7.6-14.el6_5.2.i686.rpm
- nss-softokn-freebl-3.14.3-10.el6_5.i686.rpm
- openssl-1.0.1e-16.el6_5.14.i686.rpm
- zlib-1.2.3-29.el6.i686.rpm

Red Hat Enterprise Linux Server release 7

Required Packages:

- glibc-2.12-1.132.el6_5.2.i686.rpm
- keyutils-libs-1.4-4.el6.i686.rpm
- krb5-libs-1.10.3-15.el6_5.1.i686.rpm
- libcom_err-1.41.12-18.el6.i686.rpm
- libgcc-4.4.7-4.el6.i686.rpm
- libselinux-2.0.94-5.3.el6_4.1.i686.rpm
- libstdc++-4.4.7-4.el6.i686.rpm
- libxml2-2.7.6-14.el6_5.2.i686.rpm
- nss-softokn-freebl-3.14.3-10.el6_5.i686.rpm
- openssl-1.0.1e-16.el6_5.14.i686.rpm
- zlib-1.2.3-29.el6.i686.rpm

SUSE Linux Enterprise Server 11

Required Packages:

- bash-3.2-147.3
- coreutils-6.12-32.17
- gawk-3.1.6-1.22
- glibc-2.9-13.2

- libgcc43-4.3.3_20081022-11.18
- libstdc++6-4.7.2
- libxml2-2.7.1-10.8
- zlib-1.2.3-106.34

Installing required packages

The required packages must be installed for the tealeaf-pca rpm to install correctly.

Note: The installation must run as root.

To view the required packages for your specific machine, run the following:

```
rpm -q --requires -p tealeaf-pca-XXXX-1.YYYY.ZZZZ.rpm | fgrep -v rpmlib | \
sort -u | while read x; do rpm -q --whatprovides ${x}; done | sort -u
```

Where:

- XXXX is the PCA build number
- YYYY is the Linux distribution
- ZZZZ is the architecture

Note: Red Hat Enterprise Linux (RHEL) 7 uses the same PCA installation package and process as Red Hat Enterprise Linux (RHEL) 6.x. In this scenario, use tealeaf-pca-<xxxx>-1.RHEL6.<zzzz>.rpm for the installation package.

If the RPMs cannot be found on the installation disk/iso, contact your Linux administrator.

Note: Most versions of Linux include an automated RPM repository system that can find and update the missing RPMs. RHEL uses the YUM repository system. SUSE uses the YAST repository system. Tealeaf does not provide these RPMs.

Multiple instances of PCA

You can install multiple instances of the IBM TealeafCX Passive Capture Application.

Note: The following formula and associated notes must be used as a guideline when configuring multiple instances of the PCA. Use them to estimate your requirements and be prepared to make adjustments based on traffic patterns and CPU usage.

To compute the recommended maximum number of PCA instances in your Tealeaf environment, use the following formula:

```
# of PCA instances = # of physical cores - # of PCA pipelines - 1.
```

For example, if your environment has 16 physical cores, you can expect to have as many as 15 PCA instances to use.

Note: For each additional PCA pipeline within a PCA application instance, you must deduct one from the maximum number of PCA instances, as indicated in the previous formula.

Note: Do not count hyperthreaded virtual processors as available cores. Hyperthreaded processing provides little performance enhancement to highly CPU-intensive PCA processing and is not be counted in the expected usage.

The above limit assumes that each PCA core is using over 60% capacity. If the cores are using significantly less than this capacity, you can increase the number of PCA instances over this limit.

If you are using an accelerator card, you can increase this maximum number, as the impact is offloaded to the card's hardware.

Note: When offloading encryption to an SSL accelerator card, you can need a larger number of instances to effectively capture and process the traffic load.

Segmenting traffic across multiple PCA instances

You can add PCA instances through the PCA web console. The PCA supports multiple methods of traffic segmentation:

For non-TLB PCA instances:

- Web Server Host IP/Port Addresses Filtering: The typical and preferred method for segmenting traffic by PCA instance is to filter on web server host IP/Port addresses.
- TCP Client Port Segmentation Filtering: TCP client port segmentation can be used when the capture traffic is presented as a single virtual web IP address (VIP).

Note: PCA instances are IP/Port sensitive. Do not add PCA instances if you lack the IP addresses or ports to segregate your capture traffic.

Note: If you do not have IP/port segregation enabled in your environment with multiple CPUs, at least you can create two PCA instances. The first instance handles non-SSL traffic on port 80, while the second handles SSL transactions on port 443. This arrangement does not take much advantage of any SSL accelerator cards.

Some options:

- Move the point of capture after any load balancers.
- Use client-side IP addresses to segregate traffic in multiple instances. If you have a reasonable number of NAT IP addresses, you can group incoming addresses in netmask blocks or discretely based on IP addresses to deliver to the appropriate handler.

For TLB PCA instances:

When TLB mode is enabled, the process of determining how to segment the network capture traffic is no longer needed. Network capture traffic is automatically segmented and distributed to create a transparent load balanced environment. TLB mode does not require as much configuration to your network interface as non-TLB mode.

For more information about adding PCA instances, see “PCA Web Console - Interface Tab” on page 84.

Related concepts

Supported Accelerator Cards

Related reference

PCA Web Console - Interface Tab

Changes to the PCA server

When the rpm package is installed, by default the PCA is installed in `/usr/local/ctccap`. In addition to the installation directory, other changes are made to the system.

The package creates the log file directory in `/var/log/tealeaf` by default, if it does not exist.

- In earlier versions of the PCA, the log directory was `/usr/local/ctccap/logs`.
- When you upgrade from an old installation with a non-empty `/usr/local/ctccap/logs` directory, the package uses the existing directory instead of the newer `/var/log/tealeaf` directory. This behavior is intended to avoid surprising the user by leaving old log files in the old directory (`/usr/local/ctccap/logs`) and writing new log files to the new default (`/var/log/tealeaf`).

  Note: This check for `/usr/local/ctccap/logs` is independent of the installation prefix that is chosen for installation for upgrade. If you install Passive Capture into `/opt/tealeaf`, the package still looks for a non-empty directory `/usr/local/ctccap/logs`.

The tealeaf-pca files are currently unused and are reserved for future use. The tealeaf-web files are used by the default `httpd.conf` for the web console. The tealeaf-tts files are provided for convenience in configuring SSL connections with the TeaLeaf Transport Service. The `/usr/local/ctccap/etc` directory is normally writable by root and the capture user, `ctccap`.

- Install crontab file: `/etc/cron.d/tealeaf`. The crontab file schedules the execution of "tealeaf cron" as user root.

- Install the following initialization scripts in `/etc/init.d`:
  - `tealeaf-pca`
  - `tealeaf-startup`
- Create the `capture.log file` in the log file directory, if the file does not exist.

The package performs the following actions that modify directories and files outside of the installation prefix.

- Create group ctccap if it does not exist.
- Create user ctccap if it does not exist.
- Set `/usr/local/ctccap/bin/listend` and `/usr/local/ctccap/bin-debug/listend` as setuid root (required for listend to open eth devices for packet sniffing; drops down to user ctccap after you open the eth devices).
- Remove PHP session files in `/tmp`; they are assumed to be PHP session files for the Passive Capture web console.
- Update `/etc/syslog.conf` (if needed) to ensure that it contains an entry for facility local0 to file `capture.log` in the log file directory.
- Restart syslogd to force it to reload its configuration and use any changes that are made to `/etc/syslog.conf`.
- Add the file `/etc/ld.so.conf.d/tealeaf.conf` or modify `/etc/ld.so.conf` to point to `/usr/local/ctccap/lib` to ensure that shared libraries are linked correctly at runtime.

PCA and packet forwarder requirements for cloud-based deployments
The CX PCA Packet Forwarder captures web traffic between a customer and your web server and forwards the data to a centralized virtual PCA instance.

Each packet forwarder service that is running on the web server connects to a listener service that is running on the PCA server. For more information, see “Cloud Packet Capture Overview” on page 6.

The following requirements must be met to operate a PCA in a cloud-based web server environment that is hosted by Softlayer.

Each packet forwarder requires the following resources:

- One processor core that is dedicated to the service. The CPU core speed requires a minimum processor speed of 2.0 GHz.
- The packet forwarder requires a minimum version of Red Hat Linux (RHEL) 6.4 to operate.

  Note: If a packet forwarder is deployed to a 64-bit operating environment, you must install the 32-bit versions of the `yum install glibc.i686 yum` and `install zlib.i686` libraries.
- In environments that use a large amount of bandwidth, configure the packet forwarder probes for your web and application servers for dynamic instance spawning. Dynamic instance spawning gives the packet forwarder the ability to use a pool of network socket connections to locate an available packet listener.
- Each paired packet forwarder and packet listener instance require a dedicated port. The first packet forwarder and packet listener pair uses port 1888 to communicate. Each additional pair would use an incremental port number. For example, if you have 10 pairs of packet forwarders and packet listeners, you need to make sure that ports 1888 - 1898 are open in the firewall settings for the operating system and your network firewall settings.

Each packet listener service requires the following resources:

- A minimum of four processor cores with each core operating at a minimum speed of 2.0 GHz and a minimum of 8 GB of memory must be allocated to the processor core.
- A minimum version of Red Hat Linux (RHEL) 6.4 to operate.
- Each paired packet forwarder and packet listener instance require a dedicated port. The first packet forwarder and packet listener pair uses port 1888. Each additional pair would use an extra port. For

example, if you have 10 packet forwarders and packet listeners, you need to make sure that ports 1888 - 1898 are open in the firewall settings for the operating system and your network firewall settings.

Package Installation

The following information describes the IBM TealeafCX Passive Capture Application installation package.

The Tealeaf Passive Capture software package file name looks like:

```
tealeaf-pca-<nnnn>-<rrr>.<distro>.i386.rpm
```

Where:

- <nnnn> is the build version number; for example, 3650.
- <rrr> is the RPM revision number. This is usually a single digit number.
- <distro> is an identifier for the Linux distribution, such as "RHEL*n*" for Red Hat Enterprise Linux release *n*.

Note: Red Hat Enterprise Linux (RHEL) 7 uses the same PCA installation package and process as Red Hat Enterprise Linux (RHEL) 6.x. In this scenario, use tealeaf-pca-<nnnn>-<rrr>.RHEL6.i386.rpm for the installation package.

You can access the IBM TealeafCX Passive Capture Application installation package through IBM Passport Advantage Online.

Pre-installation steps

Before you begin the installation process, do the following steps:

Procedure

1. Plug one live network cable from your LAN into the LAN network port. Do not plug any other network cables into the other network ports.
2. Insert the bootable Red Hat Enterprise Linux Install CD-ROM disc 1 into the CD-ROM drive.
3. Turn on the power to the machine.
4. Enter the BIOS setup and set the CMOS clock to Greenwich Mean Time (GMT).
5. Exit the BIOS. The machine boots up and the Red Hat Enterprise Linux installation splash screen is displayed.
6. Press SPACEBAR to prevent automatic booting.
7. Proceed to the section Red Hat Enterprise Linux Installation.

   Note: The Passive Capture time zone is typically configured to the local time zone. Step 4 allows the Passive Capture time zone to be configured and modified without having to change the CMOS clock.

Operating system users

The PCA must be installed by using the `root` user account. During the installation process, the PCA user `ctccap` is created. During execution, the `ctccap` user runs the PCA processes, regardless of the user that started them.

Note: Do not use the sudo root user for installation. Although it can display that the installation was completed, several capture errors indicate that the installation failed. These errors can include "restarting too rapidly" errors, failures to start interfaces, permissions issues, and more. Please be sure to use a true root user login.

It is not required that you log in to the system by using the `root` user. However, the `ctccap` user must have the permissions to run the `tealeaf start` and `tealeaf stop` commands. It is necessary to run with limited `root` permissions as described.
As a passive network traffic that is capturing application running under a stock Linux operating system, the PCA requires specific system permissions to passively capture network packets. Through the operating system, the PCA must be able to place system network NICs into promiscuous capture mode. It

allows the PCA to passively listen to all network traffic presented to the designated NICs. It is necessary to run the specific application process as root permission.

To minimize security issues, only one specific PCA application module requires this permission for traffic that is capturing. All other PCA application modules are run with non-root user permissions.

The capturing module only listens to a copy of the supplied network traffic. The module cannot inject any traffic whatsoever between your web server and the client browser.

Copying the installation package from the CD-ROM disc
Use the following procedure to copy the installation package from the CD-ROM to the local drive.

Procedure

1. Insert the CD-ROM disc into the CD-ROM drive.
2. Enter the following commands, replacing <nnnn>, <rrr>, and <distro> with the appropriate numbers for the package file:

```
mount /mnt/cdrom
cp /mnt/cdrom/tealeaf-pca-<nnnn>-<rrr>.<distro>.i386.rpm /root
umount /mnt/cdrom
```

3. Eject the CD-ROM disc and remove it.

Installing the PCA software
Use the following information to install the PCA software to your physical server or virtual machine. If you are deploying your CX Passive Capture Application to a cloud-based environment, refer to the installation procedures for those environments.

Procedure

1. Log in to the server by using the root account.

   Note: The installation must be run as root.
2. Open a command prompt.
3. Enter `rpm -ivh tealeaf-pca-<nnnn>-<rrr>.<distro>.i386.rpm` to install the PCA software.

   Where:

   - *<nnnn>* is the build version number; for example, 3650.
   - *<rrr>* is the RPM revision number. The revision numbers is usually a single digit number.
   - *<distro>* is an identifier for the Linux distribution, such as "RHEL *n*" for Red Hat Enterprise Linux release *n*.

   Note: Red Hat Enterprise Linux (RHEL) 7 uses the same PCA installation package and process as Red Hat Enterprise Linux (RHEL) 6.x. In this scenario, use tealeaf-pca-<nnnn>-<rrr>.RHEL6.i386.rpm for the installation package.

   You can also use the Yum Package Manager to install the tealeaf-pca package by running the following command:

```
yum install tealeaf-pca-<nnnn>-<rrr>.<distro>.i386.rpm
```

   By default, the PCA software is installed in `/usr/local/ctccap`. You specify the alternate directory by using the rpm command's `--prefix` option along with the installation and upgrade commands.

   The following are some sample rpm invocations.

```
rpm -i --prefix=/opt/tealeaf tealeaf-pca-<nnnn>-<rrr>.<distro>.i386.rpm
rpm -U --prefix=/home/tealeaf tealeaf-pca-<nnnn>-<rrr>.<distro>.i386.rpm
```

   When you do not use the `--prefix` option during an install or upgrade, RPM uses the default installation directory that is specified in the PCA package file, which is `/usr/local/ctccap`. Once

you relocate a package, you must specify the alternate directory when you apply upgrades so that the package correctly checks for and updates previous installations.

Results

When the files are extracted from the rpm package, follow the post-installation checklist to validate the installation and begin the configuration process.

Related concepts

Post-installation checklist
Use the post-installation checklist to complete the PCA installation process.

Configuring the CX PCA
The IBM Tealeaf CX Passive Capture Application can be configured through a web-based console or through the configuration files that are stored on the PCA server. The following information guides you on how to configure the CX PCA.

Installing the Packet Forwarder

The Tealeaf packet forwarder is used to forward web traffic that is transmitted between a client and a cloud-based web server to a cloud-based PCA.

The Tealeaf packet forwarder is packaged with the Tealeaf PCA software and shares the same requirements as the Tealeaf PCA software.

Cloud-based installation with a reverse proxy server

If your cloud-based web solution includes a reverse proxy server, you can install the packet forwarder software to the reverse proxy server and to the PCA server. After the packet forwarder software is installed, you must configure packet forwarder transmitter instance on the reverse proxy server and the packet forwarder receiver instances on the PCA.

Cloud-based installation with no reverse proxy server

If your cloud-based web solution does not include a reverse proxy server, you can install the packet forwarder software to each web server in your cloud-based environment and to the PCA server. After the packet forwarder software is installed, you must configure the packet forwarder transmitter instances on your web servers and the packet forwarder receiver instances on the PCA. Each transmitter instance requires a dedicated receiver instance.

Run the following command to install the `tealeaf-pktfwdr` package.

- If you are using Red Hat Package Manager, enter the following:

```
rpm -ivh tealeaf-pktfwdr-<nnnn>-<rrr>.<distro>.i686.rpm
rpm -ivh --prefix=/opt/tealeaf tealeaf-pktfwdr-<nnnn>-<rrr>.<distro>.i686.rpm
```

  Where:

  – <nnnn> is the build version number; for example, 3650.
  – <rrr> is the RPM revision number. This is usually a single digit number.
  – <distro> is an identifier for the Linux distribution, such as "RHEL*n*" for Red Hat Enterprise Linux release *n*.

  Note: Red Hat Enterprise Linux (RHEL) 7 uses the same packet-forwarder installation package and process as Red Hat Enterprise Linux (RHEL) 6.x. In this scenario, use tealeaf-pca-<nnnn>-<rrr>.RHEL6.i386.rpm for the installation package.

- If you are using Yellowdog Updater Modified (Yum), enter the following:

```
yum install tealeaf-pktfwdr-<nnnn>-<rrr>.<distro>.i686.rpm
yum install --prefix=/opt/tealeaf tealeaf-pktfwdr-<nnnn>-<rrr>.<distro>.i686.rpm
```

  Where:

  – <nnnn> is the build version number; for example, 3650.

- <rrr> is the RPM revision number. This is usually a single digit number.
- <distro> is an identifier for the Linux distribution, such as "RHEL*n*" for Red Hat Enterprise Linux release *n*.

By default, the PCA software is installed in /usr/local/ctccap.

You can relocate the package to a directory other than the default /usr/local/ctccap. You specify the alternate directory by using the rpm command's --prefix option along with the installation and upgrade commands.

The following are some sample rpm invocations.

```
rpm -i --prefix=/opt/tealeaf tealeaf-pktfwdr-<nnnn>-<rrr>.<distro>.i686.rpm
rpm -U --prefix=/home/tealeaf tealeaf-pktfwdr-<nnnn>-<rrr>.<distro>.i686.rpm
```

Where:

- <nnnn> is the build version number; for example, 3650.
- <rrr> is the RPM revision number. This is usually a single digit number.
- <distro> is an identifier for the Linux distribution, such as "RHEL*n*" for Red Hat Enterprise Linux release *n*.

When you do not use the --prefix option during an install or upgrade, RPM uses the default installation directory that is specified in the package file, which is /usr/local/ctccap. If you relocate a package, you must make sure that you always specify the alternative directory so that the package can accurately check for and update any previous installations.

If a custom installation directory is not used, the following directory structure is created.

```
/opt/tealeaf/
        /bin/pktfwdr
        /bin/ctcstats
        /etc/fwdr-conf.xml
        /etc/fwdr-conf-defaults.xml
        /sbin/
```

The following core files are installed:

Note: This is not a complete list of every file that the installer copies to the disk.

Table 6. Installed file components

File name	Description
pktfwdr	Packet forwarder daemon To start a packet forwarder instance, run /user/local/ctccap/bin/pktfwdr -t as a root user.
ctcstats	Operational statistics/metrics
fwdr-conf.xml	Packet forwarder configuration file
fwdr-conf-defaults.xml	Default configuration file

Note: If you are using a 64-bit version of Red Hat Enterprise Linux, run one of the following commands to install the required 32-bit compatibility libraries:

```
yum install glibc.i686
yum install zlib.i686
```

or

```
yum install rpm -ivh --prefix=/opt/tealeaf  tealeaf-pktfwdr-<nnnn>-
<rrr>.<distro>.i686_24thApr14.rpm
```

After the installation is complete, you must configure the packet forwarder instances.

Packet Forwarder Commands
You can run the Packet Forwarder utility with command options.

The Packet Forwarder can be run with options to start an instance, stop an instance, and more. For example, to start the Packet Forwarder, run `/user/local/ctccap/bin/pktfwdr -t` where `-t` is the option that tells the Packet Forwarder to start the service.

The following options are available when you run the Packet Forwarder.

Table 7. Packet Forwarder commands

Option	Description
`-c <configuration file>`	Overrides the default configuration file and gives you the ability to use of a custom configuration file, where *<configuration file>* is the name of the configuration file.
`-D`	Delete transmitter SHM.
`-d`	Debug option.
`-e`	Encapsulate packet mode.
`-f <filter rule>`	Override the filter rules that are specified in the configuration file.
`-h`	Version and option list.
`-i <NIC interface>`	Override the NIC settings that are specified in the configuration file.
`-I <instances#>`	Specifies the number of transmitter instances to load, where *<instances#>* is the number of instances that you want to run.
`-k`	Stop the service and its instances.
`-l`	Reports if the service is running.
`-n`	Debugging option for a stand-alone environment.
`-t`	Start the service.

Failover installation with Packet Forwarders
For failover, there are multiple packet forwarders on different web servers in the cloud. There are Primary and Standby PCAs in the cloud but on separate host servers. The PCAs should be on separate servers because if both PCAs were on the same server the failover won't work.

The packet forwarders forward their traffic to the Primary PCA via a port replicator or port mirror component ensuring that the traffic also gets forwarded to the Standby PCA. The Standby PCA has a heart beat mechanism with the Primary along with heartbeats to the packet forwarders. If the Primary PCA goes down, the Standby PCA tells the packet forwarders (through the heartbeat) to forward the packets to the Standby PCA directly.

Installing PCAs and Packet Forwarders for Failover on-cloud
For failover, you must have two PCAs, one SPR (Software Packet Replicator), and at least two packet forwarders.

Procedure

1. Install the PCAs.
   a) Log in to the PCA server by using root account.
   b) Install the PCA by using one of these commands:

```
rpm -ivh tealeaf-pca-<build>-<release>.<distro>.<arch>.rpm
```

   or

```
yum install tealeaf-pca-<build>-<release>.<distro>.<arch>.rpm
```

Where:

1) <build> is the build version number
2) <release> is the release version number
3) <distro> is the linux distribution such as RHEL6 or SUSE11
4) <arch> is the architecture such as i386, i686, i586

2. Install the packet forwarders.
   a) Log in to the packet forwarder by using root account.
   b) Install the packet forwarder by using one of these commands:

```
rpm -ivh tealeaf-pktfwdr-<build>-<release>.<distro>.<arch>.rpm
```

or

```
yum install tealeaf-pktfwdr-<build>-<release>.<distro>.<arch>.rpm
```

Where:

1) <build> is the build version number
2) <release> is the release version number
3) <distro> is the linux distribution such as RHEL6 or SUSE11
4) <arch> is the architecture such as i386, i686, i586

Installing the SPR (Software Packet Replicator)

The SPR handles switching the packet forwarders to a different PCA during failover.

Procedure

1. Log in to the packet forwarder by using root account.
2. Install the SPR by using one of these commands:

```
rpm -ivh tealeaf-spr-<build>-<release>.<distro>.<arch>.rpm
```

or

```
yum install tealeaf-spr-<build>-<release>.<distro>.<arch>.rpm
```

Where:

a. <build> is the build version number
b. <release> is the release version number
c. <distro> is the linux distribution such as RHEL6 or SUSE11
d. <arch> is the architecture such as i386, i686, i586

Configuring the Packet Forwarder for failover on cloud

You configure the packet forwarder primary interfaces and listening ports.

Procedure

1. Using a text editor, open the `/etc/fwdr-conf.xml` file.
2. Edit the `PrimaryInterface` tag to add the virtual NIC device name that the packet forwarder uses to capture the web server's traffic. In most installations, the NIC device name is `eth0`.
3. Locate the `ListenTos` tag and add any additional ports that you want to capture traffic from the configuration file. Ports 80 and 443 are listed by default.

4. Locate the `Delivery` tag and edit the `Address` and `Port` tags with the IP address and port number of the virtual machine that is hosting the SPR.

   Note: Each packet forwarder and listener pair uses one port. The default port number is 1888. When multiple pairs are used, the port address defines the first port number that is used to define a block of port numbers. For example, if you are capturing traffic from five web servers, then five packet forwarder and packet listener pairs are used to capture the traffic. In this scenario, ports 1888 - 1892 are used.
5. Edit the `Port` tag to define the port number for the network connection. Each packet forwarder requires a unique port number to identify a unique network connection to the SPR VM instance. The port numbers must be assigned in sequential order. This is required by the SPR's socket receiver when configuring it for the packet forwarders' network connections. If you decide to start with port number 1888 for the first packet forwarder, then defining five of them would be ports 1888 - 1892 explicitly.
6. Edit the `MaxRotatePeers` tag to define the maximum number of web server instances that are dynamically provisioned. The default value is 1. If you are capturing traffic from five web servers, then set this value to 5.

   Note: If you are statically assigning a fixed number of web server instances with associated packet forwarders, then the `MaxRotatePeers` would remain set to the default value of 1. Each packet forwarder would need to configured with a unique Port number to identify a unique network connection to the SPR VM instance. The port numbers must be assigned in sequential order. This is required by the SPR's socket receiver when configuring it for the packet forwarders' network connections. If you decide to start with port number 1888 for the first packet forwarder, then defining five of them should be 1888 - 1892 explicitly.
7. Save you changes to the `/etc/fwdr-conf.xml` file.

Configuring the PCAs for failover on cloud.
You configure the delivery and pipeline settings for the PCA in failover.

Procedure

1. Log on to the PCA web console.
2. Go to the **Delivery** tab and edit the delivery settings for your environment.
3. Go to the **Pipeline** tab and edit the **Pipeline Instances** setting to configure the number of pipeline instances for your configuration.
4. Select **Save Changes** to save your updated configuration settings.

   DO NOT restart the PCA server.
5. Edit the PCA configuration file by opening `/usr/local/ctccap/etc/ctcconf.xml` in a text editor.
6. Go to the Capture tag settings and edit these settings:
   a. Set `ListenerSocketEnabled` to `true`.
   b. Set `TransparentLoadBalancingEnabled` to `false`.
   c. Set `SslSessionInfoOnMemcachedServer` to `false`. If the PCA Server is configured to decrypt SSL traffic from the packet forwarders, set this to `false`.
7. Go to the Listener tag settings and edit these settings:
   a. Set `BasePort` to match the port number that is defined in the Delivery settings of the packet forwarder configuration file. The packet forwarder configuration file can be accessed by opening `/etc/fwdr-conf.xml` on a web server instance.
   b. Set `Instances` to equal the number of packet forwarders that the PCA connects to.
8. Save your changes to `/usr/local/ctccap/etc/ctc-conf.xml`.
9. Run `tealeaf restart` to restart the PCA services.

Configuring the SPR for Failover on cloud
You configure the SPR to identify the primary and secondary PCAs.

Procedure

1. Log in to the SPR server.
2. Under Delivery -> Peers, there are two peers. The first is the primary PCA and the second is the secondary PCA.
   a) Configure the Primary Peer's NIC tag with an available NIC (eth0, eth1, etc.).
   b) Configure the Primary Peer's address with the IP address of the Primary PCA.
   c) Configure the Secondary Peer's NIC tag with an available NIC (eth0, eth1, etc.).
   d) Configure the Secondary Peer's address with the IP address of the Secondary PCA.
3. Optional: If you are using a port other than 1888 or if you are using more than one port, edit the `spr-instances` file and change 1888 to the port that you are using. If you are using more than one port, enter each port number on a new line.

Starting the Services for PCA and Packet Forwarder failover on cloud
After you install and configure the PCAs, packet forwarders, and SPR, you start the services on the PCA server.

Procedure

1. On the PCA server, make sure that the PCA is running by entering `tealeaf ps`. If the PCA is not running, start the PCA by entering `tealeaf start`.
2. Verify that the PCA is listening to the correct ports by entering `netstat -an | grep <port number>.`
3. On the SPR server, if you haven't already done so, start the SPR instance for each Packet Forwarder or Port number with the command `service spr start`.
4. On the packet forwarder server, verify that the Packet Forwarder is running entering `service pktfwdr status`. IF the packet forwarder is not running, enter `service pktfwdr start`.

Installing the PCA in the Softlayer Cloud
The following instructions are used to deploy the PCA into a Softlayer cloud-based environment.

It is also recommended to verify that your virtual machines can communicate with each other. Contact your network administrator to make sure that all of the necessary network ports are open for the PCA software, packet forwarders, and packet listeners.

Common website installations in the cloud use a virtual load balancer to distribute web traffic to a dynamically provisioned web server tier that consists of multiple web server instances. Each web server instance requires a packet forwarder to be installed to forward the captured web traffic to a centralized PCA that is running on a virtual machine for processing.

The installation process consists of installing the packet forwarders to your web instances and installing the centralized PCA on your hosted virtual machine.

PCA requirements for a Softlayer virtual machine

Before you install the PCA into a Softlayer virtual machine, make sure that the virtual machine meets the hardware and software requirements for the PCA software. The hardware and software requirements are identified in a pre-installation checklist. For more information, see Pre-installation Checklist.

The following items are also required:

- Softlayer provisions both dedicated physical machines or virtual servers to provide maximum network infrastructure flexibility. The servers can be configured with dynamic or static network settings. It may be necessary to provide static internal IP addresses to allow for instance-to-instance intra-communication where the assigned IP addresses are maintained if instances are stopped or spun up or

down. This is necessary to re-establish network connections between the PCA listener instance and its packet forwarder probe instances.

- Each server that hosts a web server instance, must have one CPU core that is dedicated to running the packet forwarder service. Minimum core speed is 2.0 GHz.
- If the web server application and packet forwarder instances are installed on Linux Red Hat, a minimum version of RHEL 6.4 is required.
- It is recommended to disable SELinux. If it is enabled, configure the firewall settings to allow communication on the ports that are used by the packet forwarders and packet listeners.
- If the web server instance is using a 64-bit version of Linux Red Hat, 32-bit versions of `glibc` and `zlib` must be deployed during the installation process.
- On the PCA server, each packet listener service requires four CPU cores. Each CPU core must be 2.0 GHz or higher and have 8 GB of dedicated memory.
- Configure your firewall settings to allow communication on port 1888. The communication ports incrementally increase by one for each additional packet forwarder that is deployed. If five packet forwarders are deployed, then ports 1888-1892 must be open. The ports are used by the packet forwarders to send information to the packet listeners, which process the data at the PCA.

Installing the packet forwarder

Note: The maximum number of web server instances must be known before the installation process. The number of web server instances is used in the configuration of the packet forwarder to determine the maximum number of active TCP connections that can connect to the destination PCA socket receiver.

Note: You must be logged in as a root user to perform all PCA-related installations. Performing an installation using another account may prevent the necessary permissions that are required to successfully install the software.

Use the installation rpm to install the packet forward on each web instance. The default installation directory is `/usr/local/ctccap`. You can use the `--prefix` option when performing the installation command to install the software to another directory.

To install the software, run `rpm -ivh --prefix=/opt/tealeaf tealeaf-pktfwdr-`*`xxxx`*`-1.RHEL6.i686.rpm` where *xxxx* is the version number of the PCA software.

The packet forwarder requires some additional 32-bit libraries if you are installing the packet forwarder to a 64-bit version of Linux. To install all of the dependent libraries, run the following command:

```
yum -y install tealeaf-pktfwdr-3650-1.RHEL6.i686.rpm
```

Note: If you are not installing the packet forwarder into the default directory, you must install the `glibc` and `zlib` libraries manually using the following commands:

1. `yum install glibc.i686`
2. `yum install zlib.i686`

Use the `--prefix` option to specify the installation path.

The following files are used to configure and run the packet forwarder.

Table 8. Required packet forwarder operational and configuration files

File name	Description
`/bin/pktfwdr`	Packet forwarder daemon
`/bin/ctcstats`	Operational statistics and metrics
`/etc/fwdr-conf.xml`	Packet forwarder configuration file
`/etc/fwdr-conf-defaults.xml`	Default configuration file

Configure the packet forwarder by editing the `/etc/fwdr-conf.xml` configuration file.

1. Edit the `PrimaryInterface` tag to add the virtual NIC device name that the packet forwarder uses to capture the web server's traffic. In most installations, the NIC device name is `eth0`.
2. Locate the `ListenTos` tag and add any additional ports that you want to capture traffic from to the configuration file. Port 80 and 443 are listed by default.
3. Locate the `Delivery` tag and edit the `Address` and `Port` tags with the IP address and port number of the virtual machine that is hosting the centralized PCA server.

   Note: Each packet forwarder and listener pair uses one port. The default port number is 1888. When multiple pairs are used, the port address defines the first port number that is used to define a block of port numbers. For example, if you are capturing traffic from five web servers, then five packet forwarder and packet listener pairs are used to capture the traffic. In this scenario, ports 1888 - 1892 are used.
4. Edit the `Port` tag to define the port number for the network connection. Each packet forwarder requires a unique port number to identify a unique network connection to the centralized PCA VM instance. The port numbers must be assigned in sequential order. This is required by the PCA's socket receiver when configuring it for the packet forwarders' network connections. If you decide to start with port number 1888 for the first packet forwarder, then defining five of them would be ports 1888 - 1892 explicitly.
5. Edit the `MaxRotatePeers` tag to define the maximum number of web server instances that are dynamically provisioned. The default value is 1. If you are capturing traffic from five web servers, then set this value to 5.

   Note: If you are statically assigning a fixed number of web server instances with associated packet forwarders, then the `MaxRotatePeers` would remain set to the default value of 1. Each packet forwarder would need to configured with a unique Port number to identify a unique network connection to the centralized PCA VM instance. The port numbers must be assigned in sequential order. This is required by the PCA's socket receiver when configuring it for the packet forwarders' network connections. If you decide to start with port number 1888 for the first packet forwarder, then defining five of them should be 1888 through 1892 explicitly.
6. Save you changes to the `/etc/fwdr-conf.xml` file.

Installing a centralized PCA in a Softlayer virtual machine

A centralized PCA is used to receive communication from the packet forwarders that are deployed to the web server instances in your cloud environment. Installing the PCA software to a virtual machine is similar to the installation process on a physical server. Use the following process to install the PCA software to a virtual machine.

1. Install the PCA software to your virtual machine. For more information, see “Package Installation” on page 26 and “Post-installation checklist” on page 40.

   Note: You have already installed the packet forwarders to your web server instances using the instructions in “Installing the packet forwarder” on page 34. “Installing the Packet Forwarder” on page 28 does not apply to this installation procedure.
2. Log on to the PCA web console.
3. Go to the **Delivery** tab and edit the delivery settings for your environment. For more information, see “PCA Web Console - Delivery Tab” on page 101.
4. Go to the **Pipeline** tab and edit the **Pipeline Instances** setting to configure the number of pipeline instances for your configuration. For more information about pipeline instances, see “Pipeline instances” on page 109.
5. Select **Save Changes** to save your updated configuration settings.

   Note: Do not restart the PCA server.
6. Edit the PCA configuration file by opening `/usr/local/ctccap/etc/ctc-conf.xml` in a text editor.
7. Go to the `Capture` tag settings and edit the following settings.

- Set `ListenerSocketEnabled` to `true`
- Set `TransparentLoadBalancingEnabled` to `false`
- Set `SslSessionInfoOnMemcachedServer` to `false`

  Note: If the PCA server is configured to decrypt SSL traffic from the packet forwarders, set `SslSessionInfoOnMemcachedServer` to `true`.

8. Go to the `Listener` tag settings and edit the following settings.
   - Set `BasePort` to match the port number that is defined in the `ListenTos` settings of the packet forward configuration file. The packet forwarder configuration file can be accessed by opening `/etc/fwdr-conf.xml` on a web server instance.
   - Set `Instances` to equal the number of packet forwarders that the PCA connects to.
9. Save your changes to `/usr/local/ctccap/etc/ctc-conf.xml`.
10. Run `tealeaf restart` to restart the PCA services.

Starting the PCA server and packet forwarders

It is recommended to start the central PCA server before you start the packet forwarders. If the packet forwarders are started before the PCA server is running, they can experience network timeout conditions that and cause a delay in the time it takes to connect with the PCA server.

To start the PCA server, run `tealeaf start all` from the virtual machine that is hosting the PCA server.

To start a packet forwarder instance, run `service pktfwdr start` from each web server instance.

To stop a packet forwarder, run `service pktfwdr stop` from each web server instance.

To check the operational status of a packet forwarder, run `service pktfwdr status` from each web server instance.

To view the available metrics of a packet forwarder, run `/opt/tealeaf/bin/ctcstats -p` from each web server instance.

To test that a packet forwarder is connecting to the PCA server, use the `netstat` utility. If the port connection is configured for port 1888, run `netstat -an|grep 1888`. The output returns a status of ESTABLISHED if the packet forwarder is connected to the PCA server. If a connection is not established, the firewall rules for your network might not be configured to allow communication between the packet forwarders and the PCA server. Check your network configuration settings for the packet forwarders and your PCA server, then make sure that your firewall settings allow communication on those network settings.

Installing the PCA in the Microsoft Azure Cloud

The following instructions are used to deploy the PCA into a Microsoft Azure cloud-based environment.

It is also recommended to verify that your virtual machines can communicate with each other. Contact your network administrator to make sure that all of the necessary network ports are open for the PCA software, packet forwarders, and packet listeners.

Common website installations in the cloud use a virtual load balancer to distribute web traffic to a dynamically provisioned web server tier that consists of multiple web server instances. Each web server instance requires a packet forwarder to be installed to forward the captured web traffic to a centralized PCA that is running on a virtual machine for processing.

The installation process consists of installing the packet forwarders to your web instances and installing the centralized PCA on your hosted virtual machine.

PCA requirements for a Microsoft Azure virtual machine

Before you install the PCA into a Microsoft Azure virtual machine, make sure that the virtual machine meets the hardware and software requirements for the PCA software. The hardware and software

requirements are identified in a pre-installation checklist. For more information, see Pre-installation Checklist.

The following items are also required:

- Each server that hosts a web server instance, must have one CPU core that is dedicated to running the packet forwarder service. Minimum core speed is 2.0 GHz.
- If the web server application and packet forwarder instances are installed on Linux Red Hat, a minimum version of RHEL 6.4 is required.
- It is recommended to disable SELinux. If it is enabled, configure the firewall settings to allow communication on the ports that are used by the packet forwarders and packet listeners.
- If the web server instance is using a 64-bit version of Linux Red Hat, 32-bit versions of `glibc` and `zlib` must be deployed during the installation process.
- On the PCA server, each packet listener service requires four CPU cores. Each CPU core must be 2.0 GHz or higher and have 8 GB of dedicated memory.
- Configure your firewall settings to allow communication on port 1888. The communication ports incrementally increase by one for each additional packet forwarder that is deployed. If five packet forwarders are deployed, then ports 1888-1892 must be open. The ports are used by the packet forwarders to send information to the packet listeners, which process the data at the PCA.

Installing the packet forwarder

Note: The maximum number of web server instances must be known before the installation process. The number of web server instances is used in the configuration of the packet forwarder to determine the maximum number of active TCP connections that can connect to the destination PCA socket receiver.

Note: You must be logged in as a root user to perform all PCA-related installations. Performing an installation using another account may prevent the necessary permissions that are required to successfully install the software.

Use the installation rpm to install the packet forward on each web instance. The default installation directory is `/usr/local/ctccap`. You can use the `--prefix` option when performing the installation command to install the software to another directory.

To install the software, run `rpm -ivh --prefix=/opt/tealeaf tealeaf-pktfwdr-`*`xxxx`*`-1.SUSE11.i586.rpm` where *xxxx* is the version number of the PCA software.

The packet forwarder requires an extra 32-bit library if you are installing the packet forwarder to a 64-bit version of Linux. To install all of the dependent libraries, run the following command:

```
zypper install zlib-32bit-1.2.7-0.10.128
```

Run `zypper clean -a` to clear the local rpm cache.

The following files are used to configure and run the packet forwarder.

Table 9. Required packet forwarder operational and configuration files

File name	Description
`/bin/pktfwdr`	Packet forwarder daemon
`/bin/ctcstats`	Operational statistics and metrics
`/etc/fwdr-conf.xml`	Packet forwarder configuration file
`/etc/fwdr-conf-defaults.xml`	Default configuration file

Configure the packet forwarder by editing the `/etc/fwdr-conf.xml` configuration file.

1. Edit the `PrimaryInterface` tag to add the virtual NIC device name that the packet forwarder uses to capture the web server's traffic. In most installations, the NIC device name is `eth0`.

2. Locate the `ListenTos` tag and add any additional ports that you want to capture traffic from to the configuration file. Port 80 and 443 are listed by default.
3. Locate the `Delivery` tag and edit the `Address` and `Port` tags with the IP address and port number of the virtual machine that is hosting the centralized PCA server.

   Note: Each packet forwarder and listener pair uses one port. The default port number is 1888. When multiple pairs are used, the port address defines the first port number that is used to define a block of port numbers. For example, if you are capturing traffic from five web servers, then five packet forwarder and packet listener pairs are used to capture the traffic. In this scenario, ports 1888 - 1892 are used.
4. Edit the `Address` tag to define the IP address or host name of the PCA. This the IP address of the virtual machine.
5. Edit the `Port` tag to define the port number for the network connection. Each packet forwarder requires a unique port number to identify a unique network connection to the centralized PCA VM instance. The port numbers must be assigned in sequential order. This is required by the PCA's socket receiver when configuring it for the packet forwarders' network connections. If you decide to start with port number 1888 for the first packet forwarder, then defining five of them would be ports 1888 - 1892 explicitly.
6. Edit the `MaxRotatePeers` tag to define the maximum number of web server instances that are dynamically provisioned. The default value is 1. If you are capturing traffic from five web servers, then set this value to 5.

   Note: If you are statically assigning a fixed number of web server instances with associated packet forwarders, then the `MaxRotatePeers` would remain set to the default value of 1. Each packet forwarder would needs to be configured with a unique Port number to identify a unique network connection to the centralized PCA VM instance. The port numbers must be assigned in sequential order. This is required by the PCA's socket receiver when configuring it for the packet forwarders' network connections. If you decide to start with port number 1888 for the first packet forwarder, then defining five of them should be 1888 - 1892 explicitly.
7. Save you changes to the `/etc/fwdr-conf.xml` file.

Installing a centralized PCA in a Microsoft Azure virtual machine

A centralized PCA is used to receive communication from the packet forwarders that are deployed to the web server instances in your cloud environment. Installing the PCA software to a virtual machine is similar to the installation process on a physical server. Use the following process to install the PCA software to a virtual machine.

1. Install the PCA software to your virtual machine. For more information, see “Package Installation” on page 26 and “Post-installation checklist” on page 40.

   In the native Azure image for Suse 11 SP3 (64 bit), the following 32-bit dependent libraries are needed:

   - libgcc_s1-32bit-4.7.2_20130108-0.17.2.x86_64.rpm
   - libuuid1-32bit-2.19.1-6.54.1.x86_64.rpm
   - libxml2-32bit-2.7.6-0.25.1.x86_64.rpm
   - libstdc++6-32bit-4.7.2_20130108-0.17.2.x86_64.rpm
   - zlib-32bit-1.2.7-0.10.128.x86_64.rpm

   To install the 32-bit libraries, run `zypper install zlib-32bit-1.2.7-0.10.128`.

   After the libraries are extracted to the disk, run `zypper clean -a` to clear the local rpm cache.

   Note: You have already installed the packet forwarders to your web server instances using the instructions in “Installing the packet forwarder” on page 37. “Installing the Packet Forwarder” on page 28 does not apply to this installation procedure.
2. Log on to the PCA web console.

3. Go to the **Delivery** tab and edit the delivery settings for your environment. For more information, see "PCA Web Console - Delivery Tab" on page 101.
4. Go to the **Pipeline** tab and edit the **Pipeline Instances** setting to configure the number of pipeline instances for your configuration. For more information about pipeline instances, see "Pipeline instances" on page 109.
5. Select **Save Changes** to save your updated configuration settings.

   Note: Do not restart the PCA server.
6. Edit the PCA configuration file by opening `/usr/local/ctccap/etc/ctc-conf.xml` in a text editor.
7. Go to the `Capture` tag settings and edit the following settings.
   - Set `ListenerSocketEnabled` to `true`
   - Set `TransparentLoadBalancingEnabled` to `false`
   - Set `SslSessionInfoOnMemcachedServer` to `false`

     Note: If the PCA server is configured to decrypt SSL traffic from the packet forwarders, set `SslSessionInfoOnMemcachedServer` to `true`.
8. Go to the `Listener` tag settings and edit the following settings.
   - Set `BasePort` to match the port number that is defined in the `ListenTos` settings of the packet forward configuration file. The packet forwarder configuration file can be accessed by opening `/etc/fwdr-conf.xml` on a web server instance.
   - Set `Instances` to equal the number of packet forwarders that the PCA connects to.
9. Save your changes to `/usr/local/ctccap/etc/ctc-conf.xml`.
10. Run `tealeaf restart` to restart the PCA services.

Starting the PCA server and packet forwarders

It is recommended to start the central PCA server before you start the packet forwarders. If the packet forwarders are started before the PCA server is running, they can experience network timeout conditions that and cause a delay in the time it takes to connect with the PCA server.

To start the PCA server, run `/usr/local/bin/tealeaf start all` from the virtual machine that is hosting the PCA server.

To start a packet forwarder instance, run `service pktfwdr start` from each web server instance.

To stop a packet forwarder, run `service pktfwdr stop` from each web server instance.

To check the operational status of a packet forwarder, run `service pktfwdr status` from each web server instance.

To view the available metrics of a packet forwarder, run `/opt/tealeaf/bin/ctcstats -p` from each web server instance.

To test that a packet forwarder is connecting to the PCA server, use the `netstat` utility. If the port connection is configured for port 1888, run `netstat -an|grep 1888`. The output returns a status of `ESTABLISHED` if the packet forwarder is connected to the PCA server. If a connection is not established, the firewall rules for your network might not be configured to allow communication between the packet forwarders and the PCA server. Check your network configuration settings for the packet forwarders and your PCA server, then make sure that your firewall settings allow communication on those network settings.

Installing the PCA to a VMware virtual machine

You can install and run the CX Passive Capture Application in a VMware virtual machine.

Before you begin

Before you install the PCA to a VMware virtual machine, make sure that the virtual machine meets the same hardware and software requirements that are defined for a physical server. The virtual machine requires virtual hardware that is defined for a deployment to a physical server.

Procedure

1. Review the hardware and software requirements.

   The virtual machine requires the same software and hardware resources as a physical server.
2. Perform the installation.

   The installation process for a virtual machine is the same as if you are installing to a physical server.
3. Disable multi-queue support for the VMware virtual network driver.

   Note: You must disable multi-queue support in the VMware virtual network driver. If multi-queue support is not disabled, the packets that are sent to the PCA might become out of order and result in the CX PCA dropping the packets.
4. Review the post installation checklist.
5. Configure the PCA for your environment.

What to do next

After completing the installation steps and configuring the PCA, you can start capturing network traffic from your VMware virtual machine.

Related concepts

Installing the CX Passive Capture Application
The following instructions can be used to assist the installation of your CX Passive Capture Application software.

CX PCA installation requirements
The following requirements must be met before you install the IBM Tealeaf CX Passive Capture Application and Packet Forwarder.

Configuring the CX PCA
The IBM Tealeaf CX Passive Capture Application can be configured through a web-based console or through the configuration files that are stored on the PCA server. The following information guides you on how to configure the CX PCA.

Post-installation checklist

Use the post-installation checklist to complete the PCA installation process.

Related concepts

Validate PCA Install
After you complete the Tealeaf installation, you can validate the installation.

Generate SSL Keys
For secure transport, you can apply a signed or self-signed certificate for PCA use.

Initial PCA Configuration

Check permitted connections settings
At installation time, the PCA sets the maximum permitted connections for each PCA instance.

Configure PCA for Capture of Rich Internet Applications
If your deployed rich internet application (RIA) is submitting data for capture, you must verify that the PCA is configured to capture all submitted data types.

Tealeaf passive capture software service

Once the Tealeaf passive capture software package is installed, you can use the service command to restart, start, and stop the Tealeaf passive capture software.

CX PCA Patches
Patches are released to improve performance and reliability of the CX PCA software.

Related tasks
Start PCA

Validate PCA Install
After you complete the Tealeaf installation, you can validate the installation.

The following command reads a list of files with the expected user, group, and permission settings and compares the list to what was installed. If the matching fails, an error message is printed with the actual and expected values.

```
tealeaf ps
```

If the validation is successful, output similar to the following is displayed:

```
[root@venus ~]# tealeaf ps
  PID TTY          TIME CMD
29939 ?        00:00:00 captured
29940 ?        00:00:00 listend
29941 ?        00:00:00 reassd
29942 ?        00:00:00 tcld
29943 ?        00:00:00 deliverd
29945 ?        00:00:00 pipelined
29964 ?        00:00:00 httpd
29969 ?        00:00:00 httpd
29970 ?        00:00:00 httpd
29971 ?        00:00:00 httpd
29972 ?        00:00:00 httpd
29973 ?        00:00:00 httpd
```

Generate SSL Keys
For secure transport, you can apply a signed or self-signed certificate for PCA use.
Related tasks
Generating a Self-Signed Certificate
To generate a self-signed certificate, you must use the `openssl` utility to generate a private key and a self-signed certificate for that key.

Start PCA

About this task

After the PCA rpm installation is completed, the first start of the PCA must be completed as `root` user. Using this user allows the PCA to set several system kernel variables by using the `sysctl` cmd, which is available as `root` only.

Note: The `ctccap` user is created without a password that is assigned to it, so you cannot log in with that account by default. Security risks are minimal; the `ctccap` user can start and own the Tealeaf processes. Depending on your enterprise security requirements, you can assign a password to the `ctccap` user from the `root` user.

`sysctl` cmd is run in the main `tealeaf` script. After you log in as `root` user, the following command starts the IBM Tealeaf CX Passive Capture Application:

```
tealeaf start
```

After the PCA is started for the first time, you can then run the script as a non-root user `ctccap` each successive time. To run as `ctccap` user:

Procedure

1. Stop the PCA, run cmd:

```
tealeaf stop
```

2. Change to `ctccap` user:

```
su ctccap
```

3. Start the PCA as `ctccap` user:

```
tealeaf start
```

Results

Note: After you start the PCA as `root`, you can also restart the PCA machineto run as `ctccap` user.

Initial PCA Configuration

Note: This section provides a framework for performing the initial configuration of one component of the IBM Tealeaf CX system in a simplified deployment model. Depending on your Tealeaf solution's deployment, more configuration can be required. If you have any questions about configuration, contact http://support.tealeaf.com.

After you complete installation of the PCA software, you can follow the steps to configure the PCA to capture web application traffic and forward to one or more the Processing Servers.

Check permitted connections settings
At installation time, the PCA sets the maximum permitted connections for each PCA instance.

By default, these values are set as:

- Current connections max: `5000`
- SYN/WAIT connections max: `1000`

Note: The settings define the maximum permitted connections for each PCA instance. If the actual number of connections exceeds these values, data can be lost. Any analysis of PCA performance that is based on the current state can be skewed depending on the volume of the non-captured data. You must review these settings as soon as possible.

You can check the current state of these settings in the Statistics tab of the PCA web console. For each PCA instance, the statistics to compare are:

Current
Maximum

`Current connections`
`Current connections max`

`SYN/WAIT connections`
`SYN/WAIT connections max`

If either of the current metrics is near the corresponding maximum, you must consider raising the maximum for all affected PCA instances. It ensures that data is effectively captured.

Configure PCA for Capture of Rich Internet Applications
If your deployed rich internet application (RIA) is submitting data for capture, you must verify that the PCA is configured to capture all submitted data types.

Note: If the PCA is not configured to capture POST and Mimetypes that are submitted by your rich internet application (RIA), those hits are not captured and data in them is lost to Tealeaf. Verify that you

have a list of all required types that must be captured by PCA for RIA replay and reporting. It includes includes any custom types that are deployed.

Capturing JavaScripts

By default, the PCA excludes the capture of JavaScript files. Capture of static JavaScript by the PCA is rarely required for accurate replay of rich internet applications. In most situations, these files can be stored in a static database or re-referenced through replay rules.

Note: If your web application generates dynamic JavaScript, the PCA must be manually configured to capture these files.

Capturing XML

By default, the PCA captures the following content types without any additional configuration.

- `application/xml`
- `text/xml`

Contents of these types submitted to the web server are inserted into the request buffer in the `[xml1]` section for processing by the Tealeaf system.

Typical RIA capture types

The following capture types must be added to PCA capture types, depending on the monitored application. These types can be specified in the XML post types list.

- See "To configure" on page 43.
- `application/json`
- `application/x-json`
- `text/json`
- `text/x-json`

In the following sections, you can review example sets of types for various kinds of rich internet applications.

Example RIA: Ajax

Default captured types:

- `application/xml`
- `text/xml`
- `application/json`
- `text/json`

The following custom types can be present and must be configured:

- `ajax/xml`
- Dynamically generated JavaScripts

To configure

If you are submitting other XML post types that Tealeaf must capture, more configuration is required, depending on the build number of your IBM Tealeaf CX Passive Capture Application:

- Build 3326 or later: You must add the XML post type to the whitelist in the Pipeline tab of the PCA Web Console. See "Pipeline Settings" on page 109.
- Build 3325 or earlier: Contact http://support.tealeaf.com.

Tealeaf passive capture software service
Once the Tealeaf passive capture software package is installed, you can use the service command to restart, start, and stop the Tealeaf passive capture software.

The following commands can be used to restart, start, and stop the Tealeaf passive capture software.

```
tealeaf restart
tealeaf start
tealeaf stop
```

If some components of Passive Capture do not stop in a timely manner, the `tealeaf restart` command cannot successfully start them after you attempt to stop them. Instead, use the `tealeaf stop` command to confirm Tealeaf Passive Capture software was terminated.

Use the following command to determine whether any Tealeaf processes are still running: `ps Uctccap`

CX PCA Patches
Patches are released to improve performance and reliability of the CX PCA software.

After your CX PCA server is installed and configured, you can apply any patches that might be available for your version of the CX PCA software. Patches for the CX PCA can be downloaded from IBM Fix Central at http://www.ibm.com/support/fixcentral/. To locate patches from the Fix Central page:

1. Using your web browser, go to http://www.ibm.com/support/fixcentral/.
2. Locate **Product Group**; then, select **Enterprise Marketing Management**.
3. Locate **Select from Enterprise Marketing Management**; then, select **Tealeaf Customer Experience**.
4. Click **Continue**.
5. From the "**Identify fixes**" menu, select **Browse for fixes**, and click **Continue** to display all of the available Tealeaf fixes. You can use the "**Filter your content**" section to filter the list of available fixes.

Make sure that you download the correct patch for your operating system.

Troubleshooting tips

Use the following troubleshooting tips to diagnose problems with your PCA installation.

Table 10. Troubleshooting tips

Troubleshooting tip	Description
Core files	The presence of `core.*` files in the `/usr/local/ctccap` directory is a sign that the capture failed and wrote a core dump file.
Bootup delays	You can notice delays during the bootup procedure and when running various network-related commands if the `/etc/resolv.conf` file contains the wrong information for the local network. The delays can take the form of a long SSH login attempt when the SSH daemon on the Passive Capture host workstation times out while you use the incorrect DNS resolution information from the `/etc/resolv.conf` file. This file can contain incorrect information if it was left over from a static IP configuration on a different network. It can also be left over from when the workstation was shut down while using DHCP, although booting up with DHCP normally creates `/etc/resolv.conf` file. Fixing the file depends on whether the host workstation is configured for DHCP or static IP information.

Table 10. Troubleshooting tips (continued)

Troubleshooting tip	Description
DHCP	If the Passive Capture software is configured for DHCP, then do the following steps: 1. Log in as user root. 2. Delete the file `/etc/resolv.conf`. 3. Run `shutdown now` to enter single-user mode. 4. Use the `exit` command to leave single-user mode and allow the system to generate a new `/etc/resolv.conf` file.
Static IP	If the Passive Capture software is configured with a static IP address, then do the following steps: 1. Log in as user root. 2. Delete the file `/etc/resolv.conf`. 3. Run `tealeaf ipconfig` to reenter the DNS information and exit. 4. The program generates a new `/etc/resolv.conf` file, which takes effect immediately.
Single-user mode	If you just rebooted the Passive Capture host machine or powered it on and you must enter single-user mode, then do the following while you use use the GRUB boot loader: 1. When the **GRUB** boot menu is displayed, press SPACEBAR to prevent any automatic boot. 2. Use the arrow keys to select the Red Hat Enterprise Linux kernel and version you want to boot. 3. Press the A key to append kernel options. 4. At the `grub append` prompt, append the word `single`. Press SPACEBAR and then enter `single`. 5. Press ENTER to accept the new value and boot. 6. For more information, see Basic System Recovery chapter of the Red Hat Enterprise Linux System Administration Guide.

Table 10. Troubleshooting tips (continued)

Troubleshooting tip	Description

Total large packets exceeded	The TCP packet size has exceeded the configured limit.
	
	The CX PCA and Packet Forwarder are configured to limit packet size. When a captured packet exceeds the configured limit, the CX PCA reports the `The TCP packet size has exceeded the configured limit` error message. Additionally, this scenario causes missing events during session replay
	
	To enable the PCA and Packet Forwarder to accept larger packet sizes:
	
	1. Edit the CX PCA tuning parameters and enter a new value for the **Max large capture packet size**. For more information, see "Tuning Parameters" on page 98.
	2. Edit the packet forwarder configuration file and add the following entry to increase the maximum captured packet size:
	
	`<Capture>`
	`<MaxLargeCapturePktSize>`*X*`</MaxLargeCapturePktSize>`
	`</Capture>`
	
	Replace *X* with a numeric value for the maximum capture packet size. The value is represented in kilobytes (KB). By default, the maximum-captured-packet size for the packet forwarder is configured for 40 KB.
	
	The following example shows an entry that increases the maximum captured packet size to 45 KB.
	
	`<Capture>`
	`<MaxLargeCapturePktSize>45</MaxLargeCapturePktSize>`
	`</Capture>`

Viewing capture logs	Examining the passive capture logs can help you locate a possible problem. If Capture is not starting, `capture.log` typically shows the reason for failing to start, such as bad entry syntax or invalid entry in the configuration file. Another troubleshooting log, `maintenance_200xxxxx.log`, shows unhealthy conditions that are forcing the restart/shutdown of the Passive Capture software. Both of these logs can be viewed by the web console or by a Linux text editor in the Passive Capture default logs directory. Depending on the version of the Passive Capture software, they are located in `/usr/local/ctccap/logs` or `/var/log/tealeaf`.

Uninstall or Rollback of the CX Passive Capture Application

Complete the following instructions to uninstall the PCA software.

Uninstall the CX Passive Capture Application

To uninstall:

Stop the Tealeaf PCA. At the command line, enter:

```
tealeaf stop
```

From the UNIX command prompt, check for any running processes. While logged in to root, enter the following command:

```
PS Tealeaf
```

If any process is running, enter the following command:

```
killall <processname>
```

where <processname> is the name of the running process.

Back up the existing ctccap/etc folder. This folder contains your custom configuration files such as ctc-conf.xml, stored PTL keys, and more.To uninstall the software, run the following command:

Note: The following command removes the PCA software from the Linux server.

```
rpm -e tealeaf-pca
```

The PCA software is uninstalled. To complete a clean uninstall, delete the /usr/local/ctccap folder.

Rollback the CX Passive Capture Application

To roll back to a previous version:

1. Complete the uninstall steps.

   Note: Verify that the /usr/local/ctccap folder does not exist before the installation.
2. Install the rpm package for the older version. See “Installing the PCA software” on page 27.
3. Restore your backup version of saved configuration files to the ctccap/etc folder.

Uninstall the Packet Forwarder

If needed, you can complete the following instructions to uninstall the Packet Forwarder software.

You can use Red Hat Package Manager (RPM) to uninstall the Packet Forwarder. To uninstall the Packet Forwarder, enter the following from a command line:

```
rpm -ev tealeaf-pktfwdr-<nnnn>-<rrr>.<distro>.i686
```

where:

- <nnnn> is the build version number; for example, 3650
- <rrr> is the RPM revision number; for exmaple, 1
- <distro> is the an identifier for the Linux distribution, such as "RHEL6" for Red Hat Enterprise Linux 6

Upgrading the CX PCA Software

You can learn about various considerations that are necessary to know before you upgrade the version.

Before you upgrade

In this section, you can learn about things you must do before upgrade.

If upgrading to 64-bit operating system

If you are upgrading from a 32-bit to 64-bit version of a supported operating system, you must install a set of 32-bit libraries to support the PCA, a 32-bit application.

- See “Required Packages” on page 21.

Before enabling Transparent Load Balancing (TLB) mode

The transparent load balancing feature is available in PCA Build 3620 or later. If you are upgrading from a PCA build before 3620, you can enable TLB on your PCA.

Note: If you enable TLB for your network communication, the previous network interface settings are overwritten. Before you enable TLB, make sure that you copy the existing network interface settings if you disable TLB mode.

For more information about transparent load balancing, see “CX PCA Transparent Load Balancing Overview” on page 10.

Validate current SSL keys

Before you upgrade, you want to test to see whether your current SSL keys are still valid in the new PCA build. The following steps show how to extract the reassd process from the new PCA distribution and how the appropriate command to run it.

Procedure

1. Acquire the latest PCA build. For more information on downloading IBM Tealeaf, see IBM Passport Advantage Online.
2. Copy the rpm over to the PCA to `/tmp`.
3. Run the following command to extract the reassd process from the provided rpm and place it in the current directory:

   ```
   rpm2cpio tealeaf-pca-<nnnn>-<rrr>.<distro>.i686.rpm | cpio \
     -ivd./usr/local/ctccap/bin-debug/reassd ; \
     mv usr/local/ctccap/bin-debug/reassd .
   ```

   Where:

   - <nnnn> is the build version number; for example, 3650.
   - <rrr> is the RPM revision number. This is usually a single digit number.
   - <distro> is an identifier for the Linux distribution, such as "RHEL*n*" for Red Hat Enterprise Linux release *n*.
4. reassd must be in the `/tmp` directory.
5. To test your current SSL keys, run the following command from the `/tmp` directory:

   ```
   ./reassd -j
   ```

   a) If the current SSL keys are successfully loaded, the following message is displayed:

   ```
   Success loading configuration and SSL keys.
   ```

   b) If the current SSL keys cannot be loaded, the following message is displayed:

   ```
   Failed loading configuration (1), likely due to:
       * Loading bad SSL keys
   ```

```
    * Error in configuration file
    * Other unknown error
```

Results

If the load fails, the PCA `capture.log` also reports the following error message for loading bad SSL keys:

```
Couldn't create reveal object: 1
```

For more information about the process for re-creating the SSL keys, see "Troubleshooting - Capture" in the *IBM Tealeaf Troubleshooting Guide*.

Move the file `httpd.conf` to another location

Before you begin the upgrade, move the file `httpd.conf` to another location.

About this task

This procedure explains how to move the file `httpd.conf` to another location before you run the upgrade.

Procedure

1. Back up your existing `httpd.conf` by entering the following command.

   ```
   mv <$installed_path>/etc/httpd.conf /root/backup
   ```

2. Install the PCA software by entering the following command:

   ```
   rpm -Uvh TLVersion-tealeaf-pca-PCAVersion.Platform.Architecture.rpm
   ```

   Where:

   - **`TLVersion`** = the version of Tealeaf
   - **`PCAVersion`** = the PCA build that you are upgrading to. For example, `3682-24`
   - **`Platform`** = RHEL5, RHEL6, RHEL7, or SLES11
   - **`Architecture`** = i386, i686, i586
   -

3. Edit `httpd.conf` to customize the settings for your PCA installation.

What to do next

After you finish the upgrade process, edit the new `httpd.conf` file and apply any custom settings from the old `httpd.conf` file.

Basic upgrade

Use the following information to perform a basic upgrade.

About this task

Note: The upgrade must be executed as root.

You can use a single Linux command to execute the upgrade if your PCA installation meets the following requirements:

- PCA Configuration settings are stored in the default directory: `/usr/local/ctccap/etc`.
- If you are upgrading from Release 31xx and user authentication is in use, see “Upgrading PCA with user authentication” on page 50. Otherwise, proceed with the following steps.

If your installation meets the above requirements, to upgrade

Procedure

1. Make a backup copy of `/usr/local/ctccap/etc`:

```
mkdir /root/tmp
cp -r /usr/local/ctccap/etc /root/tmp
```

2. A basic upgrade can be executed by using the following command:

```
rpm -Uvh tealeaf-pca-XXXX-1.RHEL6.i686.rpm
```

where *XXXX* equals the CX PCA version number. For example, if you are upgrading to CX PCA version 3620, run

```
rpm -Uvh tealeaf-pca-3620-1.RHEL6.i686.rpm
```

.

Upgrading PCA with user authentication

If your PCA is operating in a Tealeaf environment where user authentication is enabled, more steps in the upgrade process might be required.

About this task

Before PCA version 3200, major changes were implemented to the way user authentication is configured. Upgrading from PCA 31xx to a 32xx or 33xx build is more complex if user authentication is enabled. The following steps are required to upgrade:

Procedure

1. Make a copy of `/usr/local/ctccap/etc`:

```
mkdir /root/tmp
cp -r /usr/local/ctccap/etc /root/tmp
```

2. Remove the existing `tealeaf-pca` package. Remove the remaining files in `/usr/local/ctccap`:

```
rpm -e tealeaf-pca
cd /usr/local/ctccap
rm -rf *
```

Note: Verify that you are in the correct directory before you run the `rm` command.

3. Install the new PCA package:

```
rpm -ivh tealeaf-pca-3315.rpm
```

4. Copy the original `ctc-conf.xml`, `privacy.cfg` and any `*.ptl` files to `/usr/local/ctccap/etc`. If prompted, overwrite the current files:

```
cd /root/tmp/etc
cp ctc-conf.xml privacy.cfg *.ptl /usr/local/ctccap/etc
```

5. Copy `httpd.users` file to `/usr/local/ctccap/etc` and to `tealeaf-web.users`:

```
cp httpd.users /usr/local/ctccap/etc
cd /usr/local/ctccap/etc
cp httpd.users tealeaf-web.users
```

6. Edit `/usr/local/ctccap/etc/runtime.conf`, and add the following lines to the end of the file:

```
httpd_userauth_enable="YES"
httpd_userauth_realm="Tealeaf PCAv2"
httpd_userauth_require="valid-user"
httpd_userauth_type="Basic"
```

7. Start `httpd`.

```
tealeaf start all
```

8. Verify that the web console is running and that user authentication is still enabled. Verify that capture is running.
9. The upgrade is complete.

Configuring new data types

If you upgraded from a build before PCA Build 3324, you must review and configure the data types that are captured by the IBM TealeafCX Passive Capture Application to verify that the required types are being captured.

Before Build 3324, some of these types were not available for capture or were not configured for capture by default.

Note: If you upgrade your PCA and are including a Rich Internet Application, you must configure the XML post types. See “Configure PCA for Capture of Rich Internet Applications” on page 42.

For more information about configuring XML post types, see “Pipeline Settings” on page 109.

Configuring the CX PCA

The IBM Tealeaf CX Passive Capture Application can be configured through a web-based console or through the configuration files that are stored on the PCA server. The following information guides you on how to configure the CX PCA.

You can configure the CX Passive Capture Application through one of the following methods:

- CX PCA web console
- Editing CX PCA configuration files `ctc-conf.xml` and `runtime.conf` with the `vi` editor.

Note: For most activities, the web console is the primary location for configuring the CX PCA. You can edit the configuration files when a parameter needs to be changed and is not available through the web console.

Configuration via Web Console

The PCA web console provides a convenient graphical interface for monitoring and configuring the IBM Tealeaf CX Passive Capture Application and its connections.

Note: All configuration settings that are required to initialize the IBM Tealeaf CX Passive Capture Application are available through the Web Console.

Note: The CX Passive Capture Application web console does not support entering multibyte characters into a field. If you want to configure a setting with multibyte characters, you must edit the configuration. For more information about editing the configuration file, see “Configuration via ctc-conf.xml” on page 52.

- See “Supported Browsers for PCA Web Console” on page 65.

CX PCA configuration files

Configuration settings that are related to the IBM TealeafCX Passive Capture Application are available through the PCA Web Console or, if needed you can use the **vi** editor to edit the configuration files that are located in `/usr/local/ctccap/etc/`.

About this task

- `ctc-conf.xml`: This configuration file contains passive capture configuration settings.
- `runtime.conf`: This configuration file contains custom settings and values for operating system-level configuration. This file can be used to override any of the default setting values that are listed in the `tealeaf.conf` file.
- `tealeaf.conf`: This configuration file contains the default settings and values for operating system-level configuration.

  Note: `tealeaf.conf` must be assigned read-only permissions for all users. It must never be edited.

Note: When you make configuration changes to your Linux installation, apply the changes to the `runtime.conf` file. `runtime.conf` supersedes the default `tealeaf.conf` file. `tealeaf.conf` can be used to revert changes to the default settings if necessary, and it must be configured to be a read-only file.

To change a runtime setting:

Procedure

1. Copy the entry from `tealeaf.conf`.
2. Paste it into `runtime.conf` and edit the setting value.
3. Save `runtime.conf` and restart the PCA.

Configuration via `ctc-conf.xml`

While all required configuration options are available through the web console, vi must be used to view and edit the complete set of configuration fields, if wanted.

- See "Passive Capture Configuration File ctc-conf.xml" on page 165.

Configuration using `runtime.conf`

Configuration settings that are related to the IBM TealeafCX Passive Capture Application are available through the PCA Web Console or, if needed, the `ctc-conf.xml`.

About this task

Configuration settings that apply to how the PCA interacts with the operating system are specified in two files. These files are located in the following directory:

```
/usr/local/ctccap/etc/
```

Files

About this task

- `tealeaf.conf` - This file contains the default settings and values for operating system-level configuration.

  Note: `tealeaf.conf` must be assigned read-only permissions for all users. It must never be edited.
- `runtime.conf` - This file must be used to override any of the setting values listed in the `tealeaf.conf`.

To change a runtime setting:

Procedure

1. Copy the entry from `tealeaf.conf`.
2. Paste it into `runtime.conf` and edit the setting value.
3. Save `runtime.conf` and restart the PCA.

SSL Decryption

If SSL decryption of your web data is required, load it by using the Web UI or through the command line.

A. Web UI:

Procedure

1. Go to `https://<machineIP>:8443/` and click **SSL Keys**.
2. Click **Loaded** at the top of the page to view the loaded SSL keys and add new SSL keys.
3. Click **Save** when done.
   - For more information about using the Passive Capture software web console, "Supported Browsers for PCA Web Console" on page 65.

B. Command Line:

Procedure

1. Edit the file `/usr/local/ctccap/etc/ctc-conf.xml`.
2. Edit the XML node CaptureKeys.
3. Modify any remaining options by using either the web UI or by editing the `/usr/local/ctccap/etc/ctc-conf.xml` file.

C. Restart Services:

- If any changes are made by using the web console, services are automatically restarted to apply the changes.
- If you edited the `ctc-conf.xml` file, restart the capture services manually by using the following commands:

```
tealeaf stop capture
tealeaf start capture
```

- If you are not using the Tealeaf Cookie Injector for sessionization, sessionization parameters must be configured in the TLSessioning session agent in the `TealeafCaptureSocket.cfg` file on the IBM Tealeaf CX Server. See "Sessioning Session Agent" in the *IBM Tealeaf CX Configuration Manual*.

PCA Tealeaf Command Line Reference

This section contains a reference of commands, actions, and options that can be run by using the `tealeaf` script command. This command is used primarily for post-installation of following tasks :

- Some administration and maintenance functions
- Some access to web console functions when the interface is not available
- Debugging operations

Basic Command

```
tealeaf [options] action [service ...]
```

See

Options

Option
Description

-h
Show this help.

-n
Show the commands without running them.

-v
Show more messages (verbose mode).

Options are passed along to the service except when you specify service `all`. See “Services” on page 55.

Actions

Action
Description

allselfsignedcerts
Generate all self-signed certificates if missing.

bwmon
Run the bwMon utility.

capturekeys2ptl
Convert all PEM files in the capturekeys directory.

clearstats
Clear statistics for all instances.

configdiffs
Show differences for current and default configuration files.

deletestats
Delete statistics for all instances.

disable
Prevent one or all services from starting.

enable
Allow one or all services to start.

env
Display the "tealeaf environment".

genselfsignedcert
Generate a self-signed certificate.

ifdetails
Show detailed information about the specified network device.

ifstat
Show statistics about the specified network device.

ifsummary
Show summary information about network devices.

ifup
Start all network devices.

ipconfig
Configure network devices.

maint
Run maintenance script.

man
Show provided manual pages.

no
Set a runtime configuration variable to "NO".

openssl
Run provided OpenSSL.

pem2ptl
Encrypt PEM files into PTL format.

ps
Show capture processes by using /bin/ps.

restart
Stop and then start the specified service.

rolllog
Roll all log files or the specified one.

showstats
Show capture statistics.

showstatsxml
Show capture statistics in XML.

start
Start all or the specified service.

stats
Run statistics utility.

status
Show status of capture and HTTPd.

stop
Stop all or the specified service.

tcpdump
Run provided tcpdump.

testconn
Run TeaLeaf Transport Service connection test program.

top
Show capture processes using /usr/bin/top.

tzconfig
Configure time zone.

Note: Time zone settings must comply with the time zones that are supported by PHP. For a list of supported time zones, see http://www.php.net/manual/en/timezones.php.

userauthpw
Add or update a web console user password.

validate
Validate the user, owner, and permissions of PCA files.

yes
Set a runtime configuration variable to "YES".

Services

For the actions `disable`, `enable`, `start`, `status`, and `stop`, the following Services can be specified:

- `all`
- `capture` - through `captured`

- `httpd` - through `httpd`

Example commands

```
tealeaf ifdetails em0
tealeaf showstats
tealeaf start
```

- Using `start` as root causes this script to bring up the primary and secondary capture interfaces.

```
tealeaf start all
```

- Using `start` as root causes this script to bring up the primary and secondary capture interfaces.

```
tealeaf stop
tealeaf start capture
tealeaf start capture -r
```

Initial PCA Configuration

Note: This section provides a framework for performing the initial configuration of one component of the IBM Tealeaf CX system in a simplified deployment model. Depending on your Tealeaf solution's deployment, more configuration can be required. If you have any questions about configuration, contact http://support.tealeaf.com.

After you complete installation of the PCA software, you can follow the steps to configure the PCA to capture web application traffic and forward to one or more the Processing Servers.

Pre-Requisites

About this task

Before you begin configuring the PCA, verify that you meet the following requirements and acquired the following information:

Procedure

1. The operating system for the PCA server is installed with the Tealeaf-recommended packages. See Hardware Setup and Operating System Installation.
2. The operating system is properly configured. See “Configuring Passive Capture on Red Hat Enterprise Linux (RHEL)” on page 238.
3. The PCA software is installed in a directory on the PCA hardware. See “Installing the CX Passive Capture Application” on page 16.
4. To complete the steps in this configuration, you must acquire the following information:
   a) The IP address of the PCA hardware
   b) The Network Interface Cards that is connected to the PCA device that are providing the traffic source
   c) The host name or IP address and port number of the Processing Server
      - If you are using Health-Based Routing (HBR), you need the host name or IP address and port number for the HBR machine. See "Health-Based Routing (HBR) Session Agent" in the *IBM Tealeaf CX Configuration Manual*.

Results

Note: The ctccap user is created without a password that is assigned to it, so you cannot log in with that account by default. Security risks are minimal; the ctccap user can only start and own the Tealeaf processes. Depending on your enterprise security requirements, you must assign a password to the ctccap user from the root user.

Example Configuration

Configuration of the PCA is dependent on the server environment where it resides. This section provides an example configuration for a simple system:

- 1 PCA server
- 1 PCA instance
- 1 Processing Server

Complicating Factors

About this task

To capture more complicated web applications, there are many possible PCA deployment architectures. They can include the use of multiple PCAs, multiple PCA instances, and various filtering mechanisms. Below, you can review example scenarios in which you can need assistance in configuring the PCA.

Note: If your web application environment meets one or more of the following criteria, it is recommended that you contact http://support.tealeaf.com or Tealeaf Professional Services before you begin configuration.

Procedure

1. High-volume web applications. If you are delivering over 200 hits/s over SSL or over 400 hits/s over clear-text HTTP:
   - You must split the traffic across multiple PCA instances.
   - You must filter out the IP addresses of web servers from which you want to capture. You can filter at the PCA level or the network level. Tealeaf recommends performing filtering at the network level, which lowers the processing overhead on the PCA.

     Note: IP filtering is possible only if the IPs are not NAT'd internally. For more information, contact your network administrator.
2. Capturing a range of IP addresses. If you are capturing a range of 25 IPs or more on the PCA:
   - You must create IP filters to drop content.
   - You must use netmasks to limit the number of entries in your configuration.
   - You must split the traffic across multiple PCA instances.

Results

For more information, contact http://support.tealeaf.com.

Configuration Steps

Following section contains configuration steps.

Start Apache

About this task

To begin your configuration, do the following steps:

Procedure

1. Log in as `root`.
2. Run the Tealeaf script to start the Apache process:

```
tealeaf start httpd
```

3. To verify that the process is successfully started, use the following to return the Apache processes that are currently running.

```
tealeaf ps
tealeaf status
```

Results

The output of the command must indicate that at least one process is running.

- If any process failed to start, review the `/var/log/tealeaf/capture.log` for any startup error messages to determine the issue.
- If any configuration changes are preventing the PCA web console (HTTPd process) from starting, you can manually edit the `/usr/local/ctccap/etc/ctc-conf.xml` file to correct the configuration. See “Passive Capture Configuration File ctc-conf.xml” on page 165.

Open PCA Web Console

About this task

After the Apache processes are started, you can open the PCA Web Console to review the configuration.

- See “Supported Browsers for PCA Web Console” on page 65.

Procedure

1. Open the PCA web console:
   a) HTTP Secure:

```
https://<servername>:8443
```

   b) HTTP:

```
http://<servername>:8080
```

2. If the previous URLs do not work, review the server name and the port number with your network administrator.

   Note: The PCA web console can require authentication.

Setting the PCA language and locale
You can set the PCA user interface to display in one of the supported globalization languages. You can set your locale at the same time.

About this task

Date and times are not translated as they are set based on the locale selected for the PCA.

The PCA language and locale are based on this priority order:

1. User preference for session selected with a control in the user interface
2. User preference expressed in a user profile.
3. User preference from HTTP Accept-Language header.
4. Default from PCA process locale.

Procedure

1. Go to the PCA Console.
2. In the **Language** section, select the locale to use for the main PCA from the **Locale** drop-down.
3. In the **Language** section, select the language to use from the **Language** drop-down.

Changing the language in your current session

During initial configuration, your language is set to the language in your locale. If you want to change to a different language in a session, you can change the language for the session to one of the supported languages. Setting the language in a session affects only the current session. The next time that you log in, the language will be the language for the locale of your main server.

About this task

The supported languages are:

- German
- Spanish
- French
- Italian
- Japanese
- Korean
- Brazilian Portuguese
- Russian
- Simplified Chinese
- Traditional Chinese

Procedure

1. In your current session, enter the command `locale -a` to see a list of supported locales.
2. Enter the command `LANG=<lang locale>`, where <lang locale> is the language locale for the language you want to use in your session.

Configuring the CX PCA Interface

When the PCA software is installed and started, it is not yet ready to capture bidirectional traffic. After installing the IBM Tealeaf CX PCA software, you need to configure the network interface to capture bidirectional traffic.

If there is a load balancer deployed between the CX PCA and the web server or you have multiple web servers operating under a single virtual IP (VIP), configure your CX PCA network interface for transparent load balancing. For more information, see “Configuring the CX PCA Interface with Transparent Load Balancing” on page 60.

If your web server deployment does not use a load balancer and does not operate under a single virtual IP (VIP), you can configure your CX PCA network interface without transparent load balancing. For more information, see “Configuring the CX PCA Interface without Transparent Load Balancing” on page 60.

Configuring the CX PCA Interface with Transparent Load Balancing

About this task

You can configure the network interface of your CX Passive Capture Application with transparent load balancing. For more information on the benefits of enabling transparent load balancing, see "CX PCA Transparent Load Balancing Overview" on page 10.

To configure the PCA interface with transparent load balancing:

Procedure

1. Open the CX PCA web console.
   See "Configuration via Web Console" on page 51.
2. Click the **Interface** tab.
3. Select **Enable Transparent Load Balancing**.
4. Enter the number of `Reassd` instances that you want to run.
   Increasing the `Reassd` instances increases the number of PCA instances that can process TCP packets.

   Note: You can enable up to *N*-1 packets where *N* is the total number of processor cores on your server. For example, if you have a total of 8 processor cores on your server, you can run up to 7 instances.
5. If you want to flush the SSL session information from `memcache` when the CX PCA service restarts, select **Restart Memcached server on Capture restart**.
6. If you want to disable TCP packet checksum, select Disable Packet checksum validation.

   Note: If your network interface card has packet checksum enabled, then it is recommended to disable the packet checksum.
7. **Multi-instance Capture** should not be selected unless you want to return to a non-transparent load balancing mode.
8. If you want to enter a filter rule, locate **Filter Rules** and enter the information for your filter; then, click **Create Filter**.
9. Click **Save Changes** to save your changes to the CX PCA configuration.
   If you want to cancel your changes, click **Revert Changes**.

Configuring the CX PCA Interface without Transparent Load Balancing

About this task

To configure the CX PCA interface in a non-load balanced environment:

Procedure

1. Open the CX PCA web console.
   See "Configuration via Web Console" on page 51.
2. Click the **Interface** tab.
3. If **Enable Transparent Load Balancing** is selected, deselect **Enable Transparent Load Balancing**.
   For more information on the benefits of enabling transparent load balancing, see "CX PCA Transparent Load Balancing Overview" on page 10.
4. Add a CX PCA instance by clicking **Add Instance**.
   You can add additional CX PCA instances to capture network traffic. Each CX PCA instances requires the use of an additional processor core. You can add up to *N*-1 instances, where *N* is the total number of processor cores in your CX PCA server. For example, if your system has eight processor cores, you can enable seven CX PCA instances.
5. You can use default port numbers to define the port numbers in the filter rules by clicking **Populate Ports**.

The default port numbers are 1024 through 65535. If you want to filter different port numbers for a CX PCA instance, you can add a filter rule or edit the instance.

6. If you want to change the settings for an instance, locate **Instance List** and click **Edit** next to the instance to begin making your changes.

   You can also delete and instance by clicking **Delete** or remove the filter rules for an instance by clicking **Clear Filters**.

   a) If you are installing the CX PCA for the first time, edit the filters for each CX PCA instance.

      See "Edit Filters" on page 96.

   b) From the Primary Interface drop-down, select the network device on which you want this instance to listen.

      - In most cases, you should not listen to a device whose IP address is listed in the drop-down and is listed with a down status. If you see a down status message for a device, then the operating system for the device is not configured to be active.
      - For a simple configuration, you can leave the other configuration options with their default values.
      - For more information about specifying PCA instances, see "PCA Web Console - Interface Tab" on page 84.

   c) Click **Update** to save your changes.

7. Click **Save Changes** to apply your changes to the CX PCA.

   If you want to cancel your changes, click **Revert Changes**.

Results

The CX PCA is now configured to capture traffic on the selected NIC.

Configure Hit Delivery

Following section explains how to configure hit delivery.

Deliver Hits to Processing Server

About this task

Now, you can specify the Processing Server or HBR server to which the PCA is to deliver hit data.

- The destination port number on the receiving Processing Server is defined for individual Windows pipelines. See "TMS Pipeline Editor" in the *IBM Tealeaf cxImpact Administration Manual*.

Procedure

1. Click the "PCA Web Console - Delivery Tab" on page 101.
2. Click **Add**.
3. Enter the host name or IP address of the Processing Server.
   - If you are using HBR, you can enter the host name or IP address for the HBR machine. See "Health-Based Routing (HBR) Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
4. Enter the port number. By default, this value is 1966.
5. Click **OK**.
6. Click **Save Changes**.
7. To test your delivery connection, click the **Ping** and Speed links for your newly added host in the **Delivery** tab.
   - If the tests fail or your Speed tests results in low throughput, review your network and PCA configuration.

Results

Note: If you have more than one Delivery Target Recipient, it is important that select the correct Delivery Mode. See “PCA Web Console - Delivery Tab” on page 101.

The configuration is set to deliver traffic to the referenced Processing Server.

- See “PCA Web Console - Delivery Tab” on page 101.

PCA Time Source

About this task

If needed, you can configure the IBM Tealeaf CX Passive Capture Application to rely on the Tealeaf Transport Service as the local time source. When enabled, the PCA queries the Transport Service at periodic intervals for the current time. To resolve discrepancies, the PCA speeds up or slows down its time incrementing to "drift" toward the value of the local time source.

Note: Unless you are synchronizing time through another mechanism, you must configure the PCA to synchronize by using one of the delivery peers as the source. Complete the following steps to do so.

Procedure

1. Click the “PCA Web Console - Delivery Tab” on page 101.
2. In the **Use Tealeaf Transport Service as Time Source** panel, enter the Host or Address name and port number of the Tealeaf Transport Service that is the master time source.
   - These values must be set to one of the delivery peers that are previously configured.
   - If it is not provided, the port number defaults to 1966.

Results

- See “PCA Web Console - Delivery Tab” on page 101.

Deliver Statistics Hits

About this task

Optionally, the PCA can be configured to deliver statistical information to the Processing Server for insertion into the TL_STATISTICS database for reporting through the Portal.

- Along with statistics from the Canister and the Extended Decoupler session agent, the PCA statistics hits are reported in the **System Statistics** page. See "System Statistics" in the *IBM Tealeaf cxImpact Administration Manual*.

Procedure

1. Click the “PCA Web Console - Delivery Tab” on page 101.
2. In the Deliver Statistics to Tealeaf Transport Service area, configure the following options:
   a) To enable delivery, click the **Enabled** check box.
   b) Enter the host name or Address of the delivery peer that is to receive the statistics hits.

      Note: Typically, statistics hits are sent to the same delivery peer that receives captured hits, as defined.
   c) Specify an interval in seconds at which to send hits.
   d) Enter a Port number to which the delivery peer listens. By default, this value is 1966.
   e) To use secure transport, click the **Use SSL** check box.

Results

- See “PCA Web Console - Delivery Tab” on page 101.

Configure the PCA Pipeline

In this section, you can step through the basic configuration options for the IBM Tealeaf CX Passive Capture Application processing pipeline.

- The PCA pipeline is configured through the Pipeline tab in the PCA web console. See “Pipeline Settings” on page 109.

  Note: The PCA pipeline has a different configuration from the session agent-based configuration for the Windows pipeline. For more information about the Windows pipeline configuration, see "Initial Pipeline Configuration" in the *IBM Tealeaf CX Configuration Manual*.

Data Sessioning

If cookies are being inserted into the request to uniquely identify visitors, the PCA can be configured to sessionize based on these cookies. Tealeaf supports multiple mechanisms for sessioning Tealeaf sessions.

- The preferred method for sessioning is to use the Tealeaf Cookie Injector, a lightweight server-side method for injecting unique identifiers as cookies in the request data. See "Installing and Configuring the Tealeaf Cookie Injector" in the *IBM Tealeaf Cookie Injector Manual*.
- For a general overview of the supported methods of sessionization, see "Managing Data Sessionization in Tealeaf CX" in the *IBM Tealeaf CX Installation Manual*.
- See “Pipeline Settings” on page 109.

Capture Mode

The IBM Tealeaf CX Passive Capture Application can be configured to capture the recommended text-based types of request and response data (Business mode), or you can configure the Business mode data and binary types, such as images (BusinessIT mode).

- BusinessIT mode requires more system storage.
- See “Pipeline Settings” on page 109.

Capture Request Methods

You can specify the request methods that are captured to be any of the following combination:

- GET
- POST
- PUT
- See “Pipeline Settings” on page 109.

Time Grading

Grades can be assigned to times measured by the PCA based upon interpolating between timestamps observed in network packets. You can assign threshold values and grades for Web Server Page Generation, Network Transit, and Round Trip times.

- For more information about time grading in general, see “Performance Measurement” on page 231.
- For more information about the reporting of time grades, see "Analyzing Performance" in the *IBM Tealeaf Reporting Guide*.
- For more information about configuring time grading, see “Pipeline Settings” on page 109.

Hit Processing

You must review all available options for how hits are processed by the PCA before you forward it to the delivery peer. These settings can affect storage requirements and PCA performance.

- See “Pipeline Settings” on page 109.

Other capture inclusions and exclusions

You can also configure the PCA to capture or drop from capture specified file types, Mimetypes, and all POST types.

- See “Pipeline Settings” on page 109.

Configure Privacy

About this task

Note: Before you enable capture, you must configure privacy rules to prevent the unwanted capture of sensitive information, such as customer credit card numbers. If capture is enabled without appropriate privacy rules, unfiltered customer data can be forwarded to the Windows pipeline and stored in the Tealeaf databases, where it can be searched by any Tealeaf user with the appropriate permissions.

Tealeaf privacy enables the manipulation, masking, or removal of sensitive information in the request or response traffic. Based upon privacy rules that you configure, this data can be hidden in the traffic that is stored in the Tealeaf database.

Procedure

1. Getting started with Tealeaf Privacy: See "Managing Data Privacy in Tealeaf CX" in the *IBM Tealeaf CX Installation Manual*.
2. Privacy in the PCA: Privacy can be deployed in the PCA through the PCA Web Console. See “Downloading Privacy Configuration” on page 123.

Enable Capture

About this task

Note: The following steps enable the PCA to begin capturing network traffic that is provided through the specified NIC and forwarding the captured data to the selected Processing Server. If the Processing Server is not yet configured to capture and process the forwarded data, then data is lost when the PCA is unable to establish a connection. However, you can use these steps and the subsequent ones to verify PCA operations.

When capture is enabled, the Processing Server must also be capturing in order for the hits to be captured.

Procedure

1. Click the “PCA web Console - Console Tab” on page 83.
2. Click **Start**.

Results

The PCA begins capturing and forwarding to the specified Processing Server.

- See “PCA web Console - Console Tab” on page 83.

Testing Your Configuration

About this task

After you complete initial configuration, you can perform the following steps to verify the configuration.

The output of the IBM Tealeaf CX Passive Capture Application is not easily reviewable until the remainder of the IBM Tealeaf CX system is configured. If you only configure the PCA, you can review the following steps to verify that the PCA is functioning properly.

Procedure

1. Enable capture through the PCA Web Console, if not done already. Verify that capture is on. See “Enable Capture” on page 64.
2. When capture is running, check the Machine Health section of the Summary tab to verify that all processes are running.
   - In the Peers section, you must have the delivery peers listed. The value of the Status column must be `connected`. If you do not configure a Tealeaf Processing Server to receive data from the PCA, errors can be reported here.
   - In the Peers section, the `Hits Delivered` statistics must be non-zero and increasing, which indicates that the PCA is delivering hits to the targets specified in the Delivery tab.
   - See “PCA Web Console - Summary Tab” on page 71.
3. Check the log files for any errors. See “PCA Web Console - Backup-Logs Tab” on page 155.
   - In the log files, you can notice errors that the PCA is unable to contact a peer if you do not configured a Tealeaf Processing Server to receive data from the PCA.

Results

When all Tealeaf components are configured, you must complete an end-to-end test.

Supported Browsers for PCA Web Console

The following browsers are supported for accessing the PCA web console:

- Microsoft Internet Explorer 7, 8, and 9
- Firefox 4 or later

Note: The browsers supported for accessing the web console differ from the ones that are supported for accessing the Tealeaf Portal. Using an unsupported browser can result in unexpected behaviors.

- See "Logging in to the Tealeaf Portal" in the *IBM Tealeaf cxImpact User Manual*.

PCA Web Console Login

To monitor and configure the IBM Tealeaf CX Passive Capture Application server, you can use the web Console, a web-based administration tool.

To open the web Console, enter the following address into your browser's **Address** field.
HTTP Secure:

```
https://<servername>:<portnumber>
```

HTTP

```
http://<servername>:<portnumber>
```

where:

- `<servername>` corresponds to the host name of the PCA server.
- `<portnumber>` corresponds to the port number used to communicate with the web Console.
  - For HTTP, the default port number is `8080`.
  - For HTTPS, the default port number is 8443.

The ports to which the PCA web Console listens can be configured. See “Changing Web Console Listening Ports” on page 68.

Note: If you enable Windows Enhanced Security features, you can experience issues when you use Internet Explorer to access the PCA web Console. See "Troubleshooting - Portal" in the *IBM Tealeaf Troubleshooting Guide*.

PCA Web Console Logout

To log out of the PCA, close the browser window.

Note: Beginning in PCA Build 3500, the web console enforces a default timeout setting of 30 minutes. If the PCA causes your session to time out, you must log in, whether authentication is enabled or not.

- If you are timed out of your session, reenter your authentication credentials to log in again.
- If authentication is disabled, leave the textboxes empty and click **Login**.
- For more information about configuring the timeout setting, see “PCA web Console - Console Tab” on page 83.

Web Console Tabs

At the top of the web console, you can review status information. It includes the Tealeaf build number, host and port information, and current version of Linux, as well as the time at which the page was last loaded.

- In the upper-right corner of the console, you can access the **SysInfo** page. See “SysInfo Page” on page 69.
- When the page is loaded, the web console checks the available disk space in the partition that is containing the PCA software. If there is insufficient free disk space, a red status message is displayed, and steps must be taken immediately to free up space in the partition (`/usr/local/ctccap` by default).

The following configuration pages are available in the web console:

Tab Label
Used for...

“PCA Web Console - Summary Tab” on page 71
Status of running Capture processes; Viewing hits, rejected hits; TCP connections/packets/errors; SSL connections/handshakes; and listener bytes read and written. Viewing status and configuration information for the primary and secondary network interfaces

“PCA web Console - Console Tab” on page 83
Starting/stopping capture of live packets from the network, Enable/disable capture at startup

“PCA Web Console - Interface Tab” on page 84
Defining network interfaces (NICs), configuring Passive Capture for a network tap or spanned switch port, configuring capture instances, defining web servers to monitor and ignore, defining traffic filters, and defining capture tuning parameters

“PCA Web Console - Delivery Tab” on page 101
Specifying Tealeaf servers to receive packaged hits from Passive Capture, setting delivery parameters, synchronizing time

“PCA Web Console - SSL Keys Tab” on page 105
Loading, editing, and deleting private keys for web servers that are monitored; obtaining more information about, ignoring, or deleting missing private keys

“Pipeline Settings” on page 109
Editing configuration parameters that control hit processing; time-grading, capture mode, sessionization, include/exclude extensions.

“Downloading Privacy Configuration” on page 123
Enabling/disabling privacy, creating and editing privacy rules

“Stats per Instance” on page 138
Viewing Passive Capture activity metrics

“PCA Web Console - Backup-Logs Tab” on page 155
Backing up and uploading the configuration file; viewing various log files; enabling/disabling packet archiving.

“PCA Web Console - Failover Tab” on page 157
Managing failover settings

“PCA Web Console - Utilities Tab” on page 159
Access various utilities for PCA administrators

“PCA Web Console - Debug Page” on page 162
Managing PCA core dumps

Configuration

The following sections contain some basic configuration steps for setting up the PCA Web Console.

Enabling Web Console Authentication

Access to the PCA web console can be restricted.

Toggling HTTP/HTTPS Access

About this task

By default, the PCA web console is accessible in HTTP mode over port 8080 or in HTTPS mode over port 8443.

Optionally, you can configure the PCA to not be accessible in one of these modes.

Steps:
To toggle access, complete the following steps.

Procedure

1. Edit the `/usr/local/ctccap/etc/runtime.conf` file.
2. Add or edit the following lines:

```
httpd_port_enable="NO"
httpd_portssl_enable="YES"
```

Mode
Settings

HTTP only

```
httpd_port_enable="YES"
httpd_portssl_enable="NO"
```

HTTPS only

```
httpd_port_enable="NO"
httpd_portssl_enable="YES"
```

both HTTP and HTTPS

```
httpd_port_enable="YES"
httpd_portssl_enable="YES"
```

3. Save the file.
4. Restart the PCA.

Results

If needed, you can change the ports to which the PCA web console listens. See “Changing Web Console Listening Ports” on page 68.
For more information about logging in, see “PCA Web Console Login” on page 65.

Deploying an SSL Certificate for the Web Console

You can deploy a custom SSL certificate. See “Generating a Self-Signed Certificate” on page 202.

Changing Web Console Listening Ports

About this task

By default, the PCA web console listens to the ports listed at the top of this section. Optionally, you can change the listening ports by adding the following lines to the `runtime.conf` file.

The `runtime.conf` file is used to override the default settings that are stored in the `tealeaf.conf` file.

Note: `tealeaf.conf` must be configured to be read-only and must never be edited.

Procedure

1. Edit `runtime.conf`, which is stored in the following location:

```
/usr/local/ctccap/etc/runtime.conf
```

2. HTTP port (unencrypted): Add the following lines:

```
httpd_listen="X"
httpd_port="X"
```

   where X is the port number to which the web Console must listen for unencrypted traffic.
3. HTTPS port (encrypted): Add the following lines:

```
httpd_listenssl="X"
httpd_portssl="X"
```

   where X is the port number to which the web Console must listen for encrypted traffic.
4. Save the file.
5. Restart the PCA.

IPv6 Support in the PCA Web Console

For new installs of PCA Build 3600, the web Console is configured to accept IP addresses in IPv6 format by default.

- Before PCA Build 3502, IPv6 addresses cannot be entered through the PCA web Console.

If you are upgrading from a previous version, you must manually insert the following attribute in the `Conf` section of `ctc-conf.xml` file:

```
<IPv6ConsoleEnabled>1</IPv6ConsoleEnabled>
```

The previous change can also be applied to PCA Build 3502 to configure the PCA web Console to accept IPv6 addresses by default.

- See "Passive Capture Configuration File ctc-conf.xml" on page 165.

When the value is set to 1, the PCA web console validates data entry assuming that IP addresses are entered in IPv6 format.

- This change primarily affects the addresses that you can enter in the Interface tab. See "PCA Web Console - Interface Tab" on page 84.

SysInfo Page

When you click the sysinfo link above the **PCA Console** menu bar, the **SysInfo** page is displayed. This page is generated by running a set of Linux commands at the command line and displaying the results in a single page.

You can review the individual commands that generate the **SysInfo** page and example outputs of each command.

System

The following command can be used for either SLES and RHEL distributions, which have different filenames.

Command

```
cat /etc/*-release
```

Output

```
System
release info                 : LSB_VERSION="1.3"
Red Hat Enterprise Linux ES release 3 (Taroon Update 5)
```

Command

```
uname-a
```

Output

```
kernel info                  : Linux venus.tealeaf.com 2.4.21-32.EL #1 Fri \
> Apr 15 21:29:19 EDT 2005 i686 i686 i386 GNU/Linux
```

Command

```
cat /proc/cpuinfo
```

Output

```
processor                    : 0
vendor_id                   : GenuineIntel
cpu family                   : 6
model                          : 8
model name               : Pentium III (Coppermine)
stepping   : 3
cpu MHz                      : 664.526
cache size                   : 256 KB
fdiv_bug  : no
hlt_bug                        : no
f00f_bug  : no
coma_bug                  : no
fpu                                : yes
fpu_exception           : yes
cpuid level                  : 2
wp                                 : yes
flags                              : fpu vme de pse tsc msr pae mce cx8 sep \
> mtrr pge mca cmov pat pse36 mmx fxsr sse
bogomips                    : 1327.10
```

Command

```
cat /proc/meminfo
```

Output

```
total:    used:    free:  shared: buffers:  cached:
Mem:  258945024 250028032  8916992        0 110923776 90759168
Swap: 534601728  5242880 529358848
MemTotal:       252876 kB
MemFree:          8708 kB
MemShared:           0 kB
Buffers:        108324 kB
Cached:          85572 kB
SwapCached:       3060 kB
Active:         183328 kB
ActiveAnon:      37496 kB
ActiveCache:    145832 kB
Inact_dirty:     35704 kB
Inact_laundry:    7588 kB
Inact_clean:      3436 kB
Inact_target:    46008 kB
HighTotal:           0 kB
HighFree:            0 kB
```

```
LowTotal:       252876 kB
LowFree:          8708 kB
SwapTotal:      522072 kB
SwapFree:       516952 kB
CommitLimit:    648508 kB
Committed_AS:   285972 kB
HugePages_Total:     0
HugePages_Free:      0
Hugepagesize:     4096 kB
```

dmesg

Command

```
dmesg
```

Output

```
dmesg
device eth2 entered promiscuous mode
device eth0 left promiscuous mode
device eth4 left promiscuous mode
device eth1 left promiscuous mode
device eth2 left promiscuous mode
device eth0 entered promiscuous mode
eth4: Promiscuous mode enabled.
device eth4 entered promiscuous mode
device eth1 entered promiscuous mode
eth2: Setting promiscuous mode.
device eth2 entered promiscuous mode
```

PCA Web Console - Summary Tab

When you connect to the Web Console, the **Summary** tab is displayed. The Summary tab provides a quick snapshot of the system's state. Statistics displayed on this page include device health, connections, current TCP and SSL stats, HTTP connections, and partition metrics.

- Compound statistics are also provided to provide an easy-to-understand overview of the health of the PCA. See “Instance Compound Statistics” on page 75.
- If a core dump is generated by the PCA, a link to the **Debug** page is provided in the **Summary** tab. See “PCA Web Console - Debug Page” on page 162.
- Additional operating system information is available through the Utilities Tab. See “PCA Web Console - Utilities Tab” on page 159.

Web console security
The following topics describe how to secure the web console.
Related tasks
Disabling web server for the web console
You can disable the web server for the PCA web console. Disabling the web server prevents users from accessing the PCA web console.

Disabling web console access through port 8080
You can configure the PCA to disable the port for the PCA web console. By disabling the port, remote users cannot access the web console.

Enabling web console access through a single IP address

You can specify a single IP address which can access the web console. Limiting access to a single IP address helps to prevent unauthorized access through an unknown system.

Applying authentication when accessing the web console
You can improve security by enabling authentication to the web console.

Applying configuration changes immediately
You can apply configuration changes to your PCA by restarting the service.

Disabling web server for the web console
You can disable the web server for the PCA web console. Disabling the web server prevents users from accessing the PCA web console.

About this task

To disable the web Server for the web Console:

Procedure

1. Run the following command.

   ```
   tealeaf disable httpd
   ```

2. If the web console is running, stop it using the following command.

   ```
   tealeaf stop httpd
   ```

   - If the previous command does not stop the HTTPd process, verify that no user has the web console open in a browser window.
   - If you run the previous command without success, you can use the following command to stop any orphaned HTTPd processes:

     a. Log in as root.

     b. Run the following command:

     ```
     killall httpd
     ```

3. `PortalStatus` needs the web server to retrieve status information. If you disable the web server, `PortalStatus` is no longer able to retrieve the status information for the PCA.

Disabling web console access through port 8080
You can configure the PCA to disable the port for the PCA web console. By disabling the port, remote users cannot access the web console.

About this task

To turn off web console access via port 8080:

Procedure

1. Edit file `/usr/local/ctccap/etc/runtime.conf`.
2. Search for the following line:

   ```
   httpd_port_enable=
   ```

3. If the line does not exist, add it.
4. Set the value after the equals sign to `"NO"`.
   For example:

   ```
   httpd_port_enable="NO"
   ```

5. Save the file.

6. The updated configuration file takes effect the next time the web server starts.

Enabling web console access through a single IP address
You can specify a single IP address which can access the web console. Limiting access to a single IP address helps to prevent unauthorized access through an unknown system.

About this task

To allow access to the web Console from one IP address:

Procedure

1. Edit the file `/usr/local/ctccap/etc/runtime.conf`.
2. Search for the following line:

```
httpd_console_allow_from=
```

3. If the line does not exist, add it.
4. Set the value after the equals sign to the IP address from which you would to access the web console. For example:

```
httpd_console_allow_from=1.2.3.4
```

5. The updated configuration file takes effect the next time the web server starts.

Applying authentication when accessing the web console
You can improve security by enabling authentication to the web console.

About this task

When you use the following procedure to restrict access to the Web Console, you must use the file name `index.php` when you access the web console's default page. For example, after you apply the following steps, the following URL is not displayed as the default web console page for the PCA *1.2.3.4*.

```
http://1.2.3.4:8080/
```

You must specify the `index.php` page as follows.

```
http://1.2.3.4:8080/index.php
```

This restriction also applies to following HTTPS access:

```
https://1.2.3.4:8443/index.php
```

To require username/password when you access the web console:

Create the Web Server user database file by using the following commands:

Procedure

1. Edit the file `/usr/local/ctccap/etc/runtime.conf`.
2. Search the file for:

```
httpd_userauth_
```

3. If the string is not present, add the following parameters to the end of the file. If these entries exist, edit them to the following values:

   Note: Prior to Fix Pack 7, PCA supported Basic Authentication only. Starting with fix pack 7, PCA supports Digest Authentication.

   a) For Basic Authentication:

```
httpd_userauth_enable="YES"
httpd_userauth_realm="PCAv2"
httpd_userauth_require="valid-user"
httpd_userauth_type="Basic"
```

Note: Values for `httpd_userauth_enable` must be in all capital letters, as in the previous example (YES).

b) For Digest Authentication:

```
httpd_userauth_enable='YES'
httpd_userauth_realm="PCAv2"
httpd_userauth_require="valid-user"
httpd_userauth_type="Digest"
```

To generate password:

```
/usr/local/ctccap/bin/htdigest
/usr/local/ctccap/etc/tealeaf-web.usersdigest "realm" "UserName"
```

In the case where you are upgrading:

1) Compare

```
/usr/local/ctccap/httpd.conf.default
```

with

```
/usr/local/ctccap/httpd.conf
```

2) copy **`LoadModule auth_digest_module libexec/mod_auth_digest.so`** to /usr/local/ctccap/httpd.conf.

3) Restart PCA.

4. To add a user or change their password, use one of the following commands, replacing `johndoe` with the name of the new or existing user:

   With the following command, you are prompted to enter the new password when the command is run:

   Note: Tealeaf recommends using this method for creating passwords. If this method is not used, passwords cannot be longer than 8 characters.

   For Basic Authority:

   ```
   /usr/local/ctccap/bin/htpasswd -m \
   /usr/local/ctccap/etc/tealeaf-web.users johndoe
   ```

   When the `-b` option is added, the password (`mypassword`) can be specified as part of the command:

   ```
   /usr/local/ctccap/bin/htpasswd -mb \
   /usr/local/ctccap/etc/tealeaf-web.users johndoe mypassword
   ```

   For Digest Authority:

   ```
   /usr/local/ctccap/bin/htdigest \
   /usr/local/ctccap/etc/tealeaf-web.usersdigest "realm" "UserName"
   ```

5. The changes mentioned in the previous command do not affect PortalStatus's use of the web server to retrieve status information.
6. The updated configuration file takes effect the next time the Web Server starts.

Applying configuration changes immediately
You can apply configuration changes to your PCA by restarting the service.

About this task

To apply changes to the configuration file `/usr/local/ctccap/etc/runtime.conf` immediately, run the following commands to stop the web server and then start it.

Procedure

1. Run `tealeaf stop httpd` to stop the service.
2. Run `tealeaf start httpd` to start the service.

Instance Compound Statistics

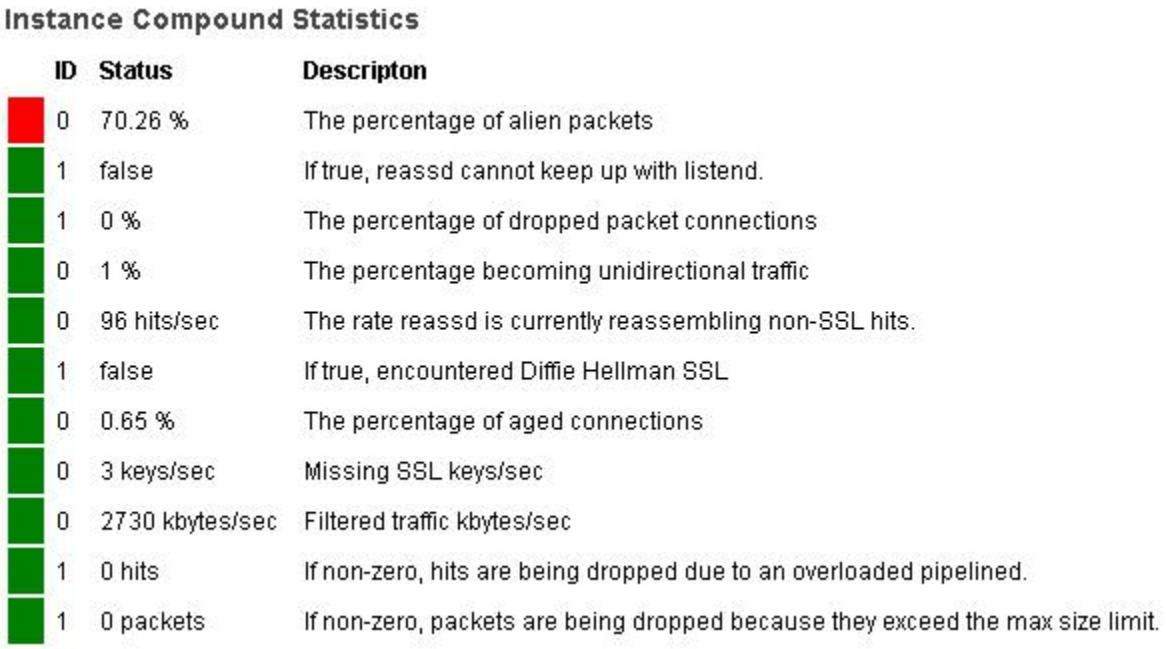


Figure 3. Summary tab - Instance Compound Statistics

By default, the **Summary** page refreshes automatically about once every 20 seconds.

- To disable the auto-refresh function, click **Disable auto-refresh** in the upper right corner of the page. When disabled, the page does not auto-refresh until a user leaves the page and then returns to it or auto-refresh is enabled again.
- To manually refresh the data, click **Refresh**.

When the PCA is experiencing issues with capture or processing of hit data, a message can be displayed on the **Summary** tab with some information about the issue.

- Items that are listed in red must be addressed immediately.
- For more information about evaluating these messages, see “Additional PCA Web Console Debugging Information” on page 83.

The percentage of alien packets

About this task

The percentage of packets that are encountered in the capture stream that the PCA cannot associate with an existing connection. When capture is first started, this number is expected to be a high percentage. But as capture continues to associate and process hits, this figure must drop.

Analysis:
If this metric is marked in red, the quality of the data that is sent to the PCA or the TCP connections must be improved. Here are some suggested approaches.

Procedure

1. Apply traffic filters: If you not done already, you can apply filters to remove unwanted traffic that is being forwarded to the PCA. Traffic filters can be applied to port ranges or IP addresses.
   - See “PCA Web Console - Interface Tab” on page 84.
2. Capture Mode: If the PCA is configured to be in BusinessIT mode, more data is captured, which cannot be important. Alien packet counts can drop if you switch the PCA to capture in Business mode. See “Pipeline Settings” on page 109.
3. After you make changes to the above, you must restart the PCA. See “Installing the CX Passive Capture Application” on page 16.
4. Check hardware: The SPAN port that is used to deliver hits to the PCA can be dropping some, due to oversubscription. Verify with your IT department that data is not being lost by the SPAN port.
   - High alien packet counts and missing pages can be associated with improperly functioning NIC card on the machine hosting the PCA. You must also review and update, if needed, the driver for the NIC card.
5. Bad checksums: If there are a significant number of bad checksums, you must check with your IT staff to verify that the source of the traffic that is forwarded to the PCA is generating valid checksums.
   - To test the validity of the checksums in the packet data, you can enable checksum validation through the Interface tab. Validation is enabled by default. See “PCA Web Console - Interface Tab” on page 84.
6. Additional information can be available in the statistics log, which you can download from the PCA web console. See “PCA Web Console - Backup-Logs Tab” on page 155.
7. You can enable archiving in the PCA, which delivers raw network packets to the designated archive and can be useful for debugging issues in session data.

   Note: Use of the PCA archiving features must be conducted under the guidance of Tealeaf personnel. For more information, contact Tealeaf Customer Support.
   - See “PCA Web Console - Backup-Logs Tab” on page 155.

If true, reassd cannot keep up with listend

About this task

The listening (listend) process in the PCA instance is sending more hits to the reassembly (reassd) process than it can evaluate. As a result, hits are being dropped.

- For more information about processing flow in the PCA, see “Passive Capture Overview” on page 1.

Analysis:
If this metric is marked in red, you must configure the PCA to send fewer hits through the individual instance of the PCA. Some suggestions:

Procedure

1. Add PCA Instances: Adding instances of the IBM Tealeaf CX Passive Capture Application to the hosting server can alleviate the traffic volume to individual processes.
   - For more information about the maximum number of instances on the server, see “Installing the CX Passive Capture Application” on page 16.
   - For more information about adding instances, see “PCA Web Console - Interface Tab” on page 84.
2. Listen on more ports: Adding listen ports to the PCA can reduce bottlenecks in the processing over any individual port. See “PCA Web Console - Interface Tab” on page 84.

The percentage of dropped packet connections

This metric identifies completed connections that the PCA suspects dropped packet conditions.

Analysis:
This problem is caused by the connection between the PCA and the device that is feeding it. Review the listen configuration for the PCA, the output configuration for the sending device, and the network topology in between.

- For more information about configuring the network interfaces to which the PCA listens, see “PCA Web Console - Utilities Tab” on page 159.

The percentage becoming unidirectional traffic

This metric indicates the percentage of traffic that is passed to the PCA that moves in one direction. To reassemble a hit, the PCA matches requests (traffic moving between client browser and web server) to responses (messages that are sent back to client browser based on requests). To capture a visitor's experience, the PCA must receive all bidirectional traffic.

Analysis:
Typically, this issue is a configuration problem with the device that is responsible for forwarding data to the PCA. Consult with your IT department to verify that the SPAN port or switch is forwarding bidirectional traffic across all Tealeaf ports.

- When the PCA detects unidirectional hits, those hits can be dropped. For request-type hits, can result in a request cancelled hit, with no corresponding response present in the capture stream.

The rate reassd is currently reassembling non-SSL hits

About this task

This metric indicates the core processing rate of the PCA. Typically, an instance of the PCA must be able to process between 400®-600 hits per second.

- For SSL traffic, the process rate is typically 200-300 hits per second.

Analysis:
If this rate drops too low, then the reassd process is overburdened. The following items can be investigated to try to improve processing rates:

Procedure

Check privacy rules: Privacy rules that are applied in the PCA can be expensive in terms of processing, especially if you are using regular expressions to assess the data. Wherever possible, avoid by using regular expressions.

- Use privacy rules to block or encrypt only the most sensitive data. For more information about privacy rules, see “Downloading Privacy Configuration” on page 123.
- Privacy evaluation can be moved from the PCA to the Windows pipeline, as needed. While applying privacy in the PCA ensures that sensitive data never displayed in the Tealeaf system, non-critical privacy processing can be applied through the Windows pipeline, by using identical rules configuration. See "Privacy Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
- For more information about how Tealeaf deploys privacy, see "Managing Data Privacy in Tealeaf CX" in the *IBM Tealeaf CX Installation Manual*.

If true, encountered Diffie Hellman SSL

If this metric is marked in red, the PCA encountered the Diffie Hellman SSL cryptographic algorithm, which is not supported by the PCA.

Analysis:

The IBM Tealeaf CX Passive Capture Application is unable to capture traffic in the presence of Diffie Hellman. It is recommended that you reconfigure your web servers to not use this protocol. For more information, see the documentation that came with your web server product.

The percentage of aged connections

This value indicates the percentage of TCP connections that are captured by the PCA that timed out.

- Aged connections can result in abnormally terminated sessions in the Tealeaf data.

Analysis:
High percentages of aged connections can indicate a network configuration issue. It happens as the connection timeout indicates that the PCA is waiting for data that is never delivered.

- By default, the PCA is configured with a timeout setting of 60 minutes.
- PCA connection timeouts can be configured through the `ctc-conf.xml` file. The setting is `<AgedTcpConnectionsTimeout>` in the capture section. See “Passive Capture Configuration File ctc-conf.xml” on page 165.

Missing SSL keys/sec

This metric indicates the number of missing SSL keys that are detected in the traffic each second.

Analysis:
When this metric is marked in red, the SSL keys are updated on the web server, yet the PCA is not provided with the new keys.

- Without the proper SSL keys, the PCA cannot decrypt SSL-based traffic, and those hits are dropped.

You must acquire the new SSL keys from the web server. Contact the IT team responsible for your web servers.

- For more information about installing SSL keys for PCA, see “SSL Keys” on page 188.
- If your environment is using a Hardware Security Module to manage keys, more configuration can be required. See Appendix - Integrating Tealeaf SSL Keys with HSM.

Filtered traffic kbytes/sec

This value indicates the kilobytes per second of traffic that is being captured by the PCA after any configured filter rules are applied.

Analysis:
If this value is too low, then you can have a problem with the data filters that you apply through the PCA. You must review the filters that you applied.

- See “PCA Web Console - Interface Tab” on page 84.

To assess the quality of your filtering, you must review the quality of the data that is captured. Through replay, you can quickly identify whether meaningful hits are being dropped.

- For more information about using replay through the Tealeaf Portal, see "CX Browser Based Replay" in the *IBM Tealeaf cxImpact User Manual*.
- For more information about using the IBM Tealeaf CX RealiTea Viewer desktop application, see "RealiTea Viewer - Replay View" in the *IBM Tealeaf RealiTea Viewer User Manual*.

If non-zero, hits are being dropped due to an overloaded pipelined.
When this value is not zero, the indicated number of TCP packets were dropped from the pipelined process due to overloaded conditions.

Analysis:
This value must not be zero. You can specify the maximum permitted size for individual TCP packets through the Tuning Parameters in the Interface tab.

- See “PCA Web Console - Interface Tab” on page 84.

If some hits are being dropped, the overload condition can be caused by too many privacy rules or too much complexity in them.

- See “Downloading Privacy Configuration” on page 123.

In PCA Build 3403 or later, you can add more instances of the pipelined process, which can help to distribute the processing load.

- See “Pipeline Settings” on page 109.

When this statistic is summed across all PCA instances, the result indicates that the total number of hits lost due to exceeding the specified TCP packet size. To calculate the % of total, divide this value by sum of the `Captured before hit processing` statistics for all PCA instances, which is the total hits count for delivery to the pipeline queue.

- See “Stats per Instance” on page 138.

Increasing the number of pipelines under the pipeline tab can help alleviate this issue.

- See “Pipeline Settings” on page 109.

If non-zero, packets are being dropped because they exceed the max size limit.

Whenever a packet is received with a size larger than the maximum large capture packet size limit, this metric is incremented by one.

Note: If you are using one or more 10-gigabit fiber network interface cards and are experiencing capture traffic quality issues, it can be caused by the fiber interface card and driver issues. If the PCA is not using Intel chipset-based NIC interface cards, Tealeaf highly recommends that you switch to NICs by using Intel chipsets.

Under the Interface tab in the Tuning Parameters view, the `Max large capture packet size` field defines the maximum large capture packet size limit.

- By default, this setting is set to 8 KB.
- As needed, this setting can be increased to accommodate systems that have features such as large receive offload (LRO) enabled.

Increasing the `Max large capture packet size` must stop metric on the Summary tab from increasing.

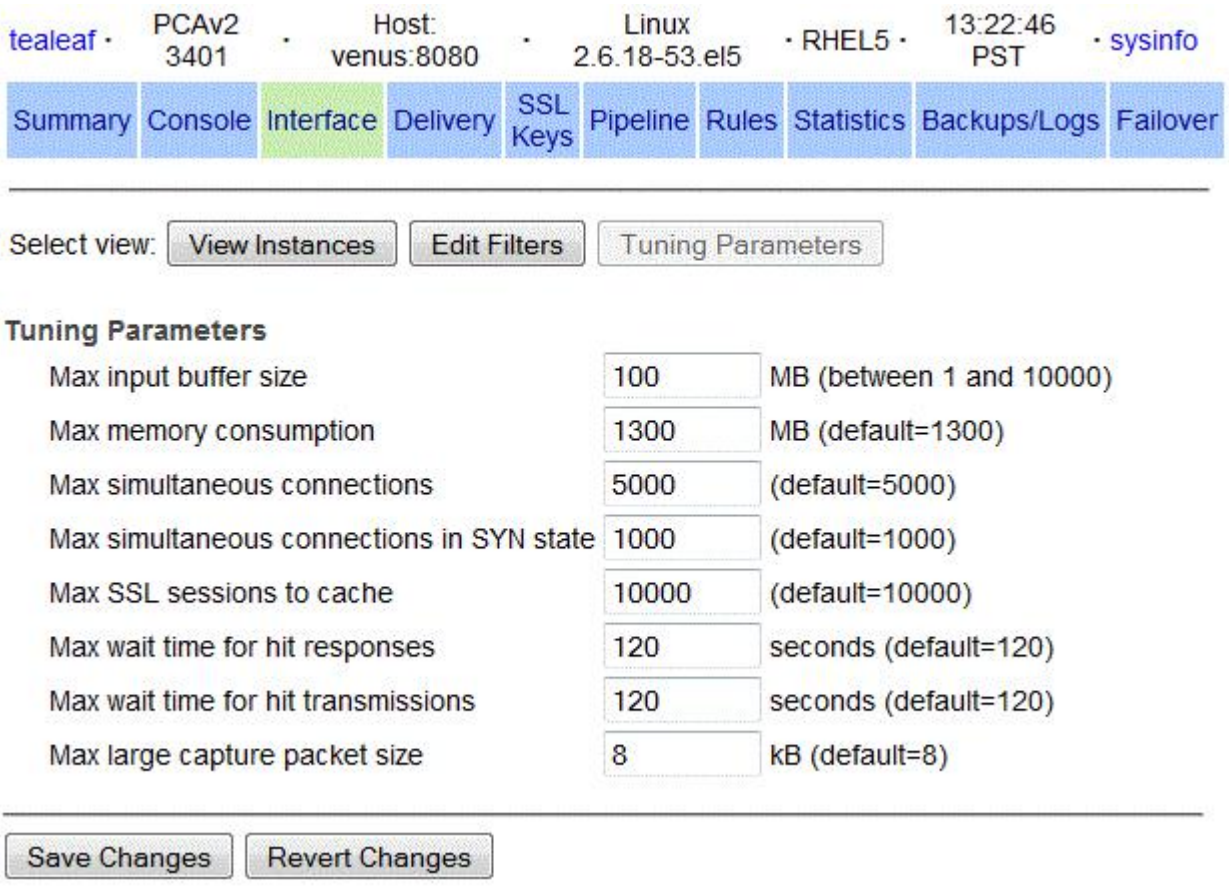


Figure 4. Max Large Packet Size

See "PCA Web Console - Interface Tab" on page 84.

TCP Connections

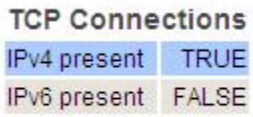


Figure 5. Summary tab - TCP Connections

Note: The TCP Connections table is displayed in PCA Build 3500 or later, in which IPv6 traffic can be detected. Capture and processing of IPv6 is not supported as of PCA Build 3500.

In the TCP Connections table, you can review the types of IP addresses that are detected by the IBM Tealeaf CX Passive Capture Application. An entry of TRUE indicates that the connection type is detected.

Machine Health

The **Machine Health** panel indicates current metrics on the counts and general health of each process that is running on the PCA server.

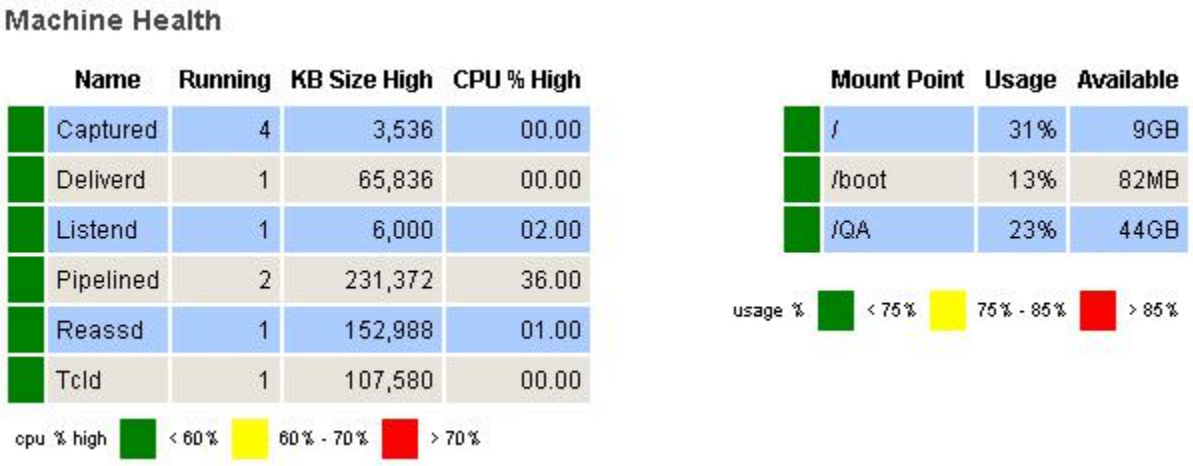


Figure 6. Summary tab - Machine Health

Setting
Description

Name
Name of PCA pipeline process

Running
Count of processes running on the PCA server

KB Size High
Maximum size in kilobytes used by all instances of the process since the PCA last restarted.

CPU % High
Maximum RAM consumption as a percentage of the available memory on the CPU since the PCA last restarted.

Mount Stats

You can review stats on the configured mount points on the PCA server.

Setting
Description

Mount Point
Path from root of the specified mount point

Usage
Percent of available RAM used by the mount point

Available
Available RAM used by the mount point

Peers

The **Peers** panel indicates the connectivity between the PCA server and the Transport Service servers, which process data captured by the PCA.

Figure 7. Summary tab - Peers

Setting
Description

`Delivery Host or Address`
Host name or static IP address of the peer

`Port`
Port that is used to communicate with the Transport Service peer

- Typically, port 1966 or 1967 is used.

`Status`
Current status: `disconnected` or `connected`

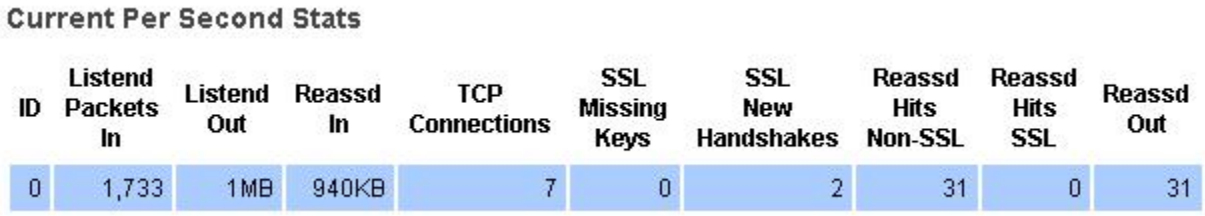
`Hits Delivered`
Count of hits that are sent from delivered to the peer since the PCA last restarted

`Hits Dropped`
Count of hits since the PCA last restarted that were not acknowledged by the peer and therefore dropped.

Note: Non-zero values must be investigated with the administrators of the Transport Service server, as they can be indicative of connectivity issues or issues in the processing of hits in the Windows pipeline.

Current Per Second Stats

For each instance of the PCA, this panel indicates the flow of hits through each process of the application on a per-second basis. This refreshes every 20 seconds by default



Current Per Second Stats

ID	Listend Packets In	Listend Out	Reassd In	TCP Connections	SSL Missing Keys	SSL New Handshakes	Reassd Hits Non-SSL	Reassd Hits SSL	Reassd Out
0	1,733	1MB	940KB	7	0	2	31	0	31

Figure 8. Summary tab - Current Per Second Stats

Setting
Description

`ID`
Identifier of the instance

`Listend Packets In`
Count of packets that are entering the listend process. This metric indicates the rate of packets that are received by the PCA from the network.

`Listend Out`
Volume of data that is leaving the listend process per second.

`Reassd In`
Volume of data that is expected to enter the reassd process per second. This metric must match the volume leaving the listend process.

- Differences between the values of `Listend Out` and `Reassd In` can indicate problems with the PCA processing hits fast enough to match the current flow of traffic.

`TCP Connections`
Count of TCP connections between the PCA and the switch or span submitting data to it

`SSL Missing Keys`
Count of missing SSL keys per second.

Note: This value must be zero. Non-zero values can indicate issues to investigate. See “PCA Web Console - SSL Keys Tab” on page 105.

SSL New Handshakes
Count of new SSL handshakes detected in the capture stream per second. Typically, this metric indicates the count of new sessions.

Note: Consistently abnormal values can indicate that the web server is initializing new SSL handshakes when it must not, which can indicate a server-side configuration issue.

Reassd Hits Non-SSL
Count of non-SSL hits that are entering the reassd process per second

Reassd Hits SSL
Count of SSL hits that are entering the reassd process per second

Reassd Out
Count of hits that are leaving the reassd process per second

Additional PCA Web Console Debugging Information

- Get tcpdumps of the network traffic that is delivered to the PCA. This data can be useful in assessing whether issues are occurring within the PCA or elsewhere in the enterprise network infrastructure.
- Statistical information can be downloaded in the Statistics log. See “Stats per Instance” on page 138.
- If the PCA has generated a core dump due to a major error, you can download the core dump and other data through the **Debug** page, which is accessible from a link on the Summary tab. See “PCA Web Console - Debug Page” on page 162.
- More information is available in the PCA logs. See “PCA Web Console - Backup-Logs Tab” on page 155.

PCA web Console - Console Tab

The following figure displays the functions available in the **Console** tab, including the default settings of the four configuration options:

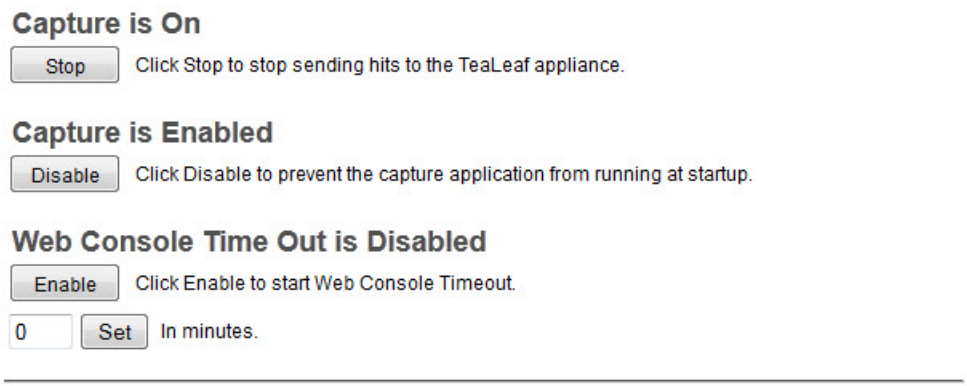


Figure 9. Console tab

The options available in the Console tab include the following options.

Setting
Description

Start/Stop Capture
This button controls whether the Passive Capture device captures packets from the network. When started, it captures packets. When stopped, it does not capture packets. Capture cannot be started if it is disabled.

When you **Stop Capture**, the **Reset all statistics before starting capture** checkbox is displayed.

Note: If PCA master/slave machine failover is enabled, do not check the **Reset all statistics before starting capture** checkbox to clear statistics. Clearing or resetting statistics prevents failover from

working correctly. If clearing statistics is needed, first stop failover in the Failover tab. Restarting the PCA correctly sets machine failover state with statistics cleared.

Enable/Disable Capture
This button controls the behavior of the main capture application when the service is started at boot time, from the command line, or from the web console. When enabled, the main capture application is allowed to start. When disabled, the main capture application is not allowed to start.

Enable/Disable Web Console Time Out
By default, the PCA web Console is configured to time out sessions if no activity is detected in 30 minutes.

- To disable the console timeout, click **Disable**.
  - If user authentication for the web Console is disabled, a console timeout is not applicable.
- To enable a console timeout, click **Enable**. Enter a non-zero value for the number of minutes to set for the timeout. Then, click **Set**.
  - Console tabs that auto-refresh, such as the Summary tab and the Console tab do not reset the timeout.

    Note: The console timeout can be enabled or disabled in PCA Build 3600 or later.

    - You can configure the length of the console timeout in PCA Build 3500 or later. Before PCA Build 3600, however, the console timeout cannot be disabled.

PCA Web Console - Interface Tab

In the **Interface** tab, you can configure the number of instances of the IBM Tealeaf CX Passive Capture Application and the trafficking rules for sending data to each instance.

Note: You can configure the PCA Web Console to accept IPv6 addresses by default. See "Supported Browsers for PCA Web Console" on page 65.

Note: After you save changes in the **Interface** tab, a manual restart of the PCA is required. See "PCA web Console - Console Tab" on page 83.

The CX Passive Capture Application can be configured to support transparent load balancing or you can disable load balancing and use the legacy method of capturing network traffic. For more information about the benefits of transparent load balancing, see "CX PCA Transparent Load Balancing Overview" on page 10. If you want to configure your CX PCA to use transparent load balancing, see "Configuring the PCA Interface with Transparent Load Balancing" on page 85. If you do not want to enable transparent load balancing on your CX PCA, see "Configuring the PCA Interface without Transparent Load Balancing" on page 84.

Configuring the PCA Interface without Transparent Load Balancing

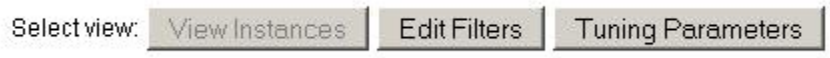


Figure 10. Select View

From the top of the page, you can select the view for the page.

- To configure individual instances of the IBM Tealeaf CX Passive Capture Application, click **View Instances**. See "View Instances" on page 85.
- To edit data filters for each instance, click **Edit Filters**. See "Edit Filters" on page 96.
- To review and edit the interface that is tuning parameters, click **Tuning Parameters**. See "Tuning Parameters" on page 98.

Traffic Segmentation: Through the Interface tab, you can segment the traffic to multiple instances of the IBM Tealeaf CX Passive Capture Application. The following two methods are available for segmenting traffic to distribute traffic load:

- “Web Server Host IP/Port Addresses Filtering” on page 87

  Note: Wherever possible, IP address segmentation is the preferred method over port segmentation.
- “TCP Client Port Segmentation Filtering” on page 88
  - See “Traffic Segmentation” on page 86.

Configuring the PCA Interface with Transparent Load Balancing

You can configure the network interface of your CX Passive Capture Application with transparent load balancing. For more information on the benefits of enabling transparent load balancing, see “CX PCA Transparent Load Balancing Overview” on page 10.

To configure

In the **Interface** tab, you can configure the number of instances of the IBM Tealeaf CX Passive Capture Application and a traffic rule for sending data to each instance.

Note: You can configure the PCA Web Console to accept IPv6 addresses by default. See “Supported Browsers for PCA Web Console” on page 65.

Note: After you save changes in the **Interface** tab, a manual restart of the PCA is required. See “PCA web Console - Console Tab” on page 83.

Figure 11. Select View

From the top of the page, you can select the view for the page.

- To configure individual instances of the IBM Tealeaf CX Passive Capture Application, click **View Instances**. See “View Instances” on page 85.
- To edit data filters for each instance, click **Edit Filters**. See “Edit Filters” on page 96.
- To review and edit the interface that is tuning parameters, click **Tuning Parameters**. See “Tuning Parameters” on page 98.

Traffic Segmentation: Through the Interface tab, you can segment the traffic to multiple instances of the IBM Tealeaf CX Passive Capture Application. The following two methods are available for segmenting traffic to distribute traffic load:

- “Web Server Host IP/Port Addresses Filtering” on page 87

  Note: Wherever possible, IP address segmentation is the preferred method over port segmentation.
- “TCP Client Port Segmentation Filtering” on page 88
  - See “Traffic Segmentation” on page 86.

View Instances

Multiple interface instances allow the PCA to take advantage of multi-core multi-CPU hardware by allowing multiple processes to concurrently capture network traffic for HTTP hit reassembly and SSL decryption.

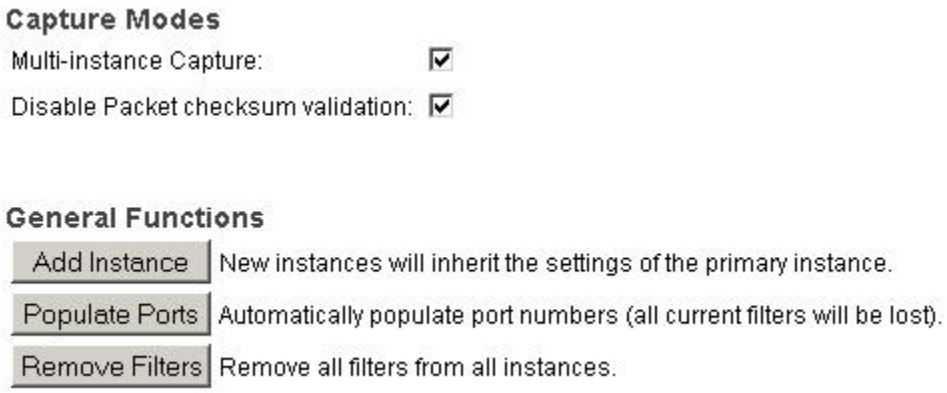


Figure 12. Instances

Note: The number of PCA instances must not exceed:
`(the number of available cores) - 1`
See "Installing the CX Passive Capture Application" on page 16.

- To enable multi-instance capture, click the check box.
- To disable the checksum validation of captured packets, click the check box. See "Disabling Packet Checksum Validation" on page 86.
- To add an instance of the PCA, click **Add Instance**. Another instance is added to the Instance List. See "Instance List" on page 94.
- To automatically populate port numbers across all current instances of the PCA, click **Populate Ports**. See "Populating Ports" on page 88.
- To remove all current filters from all instances, click **Remove Filters**.

Disabling Packet Checksum Validation

By default, the PCA performs a checksum validation for each packet that is forwarded to it. In environments with network interface cards (NICs) that use large receive option (LRO) or checksum offloading (rx-checksumming) or both, checksum validation of captured network packets is managed in the hardware of the card. Since the checksum validation is performed on individual packets in the hardware, there is no reasonable must perform another checksum of the aggregated, larger packets.

When either or both of these options are enabled, the resulting packets that are forwarded to the PCA do not contain a recomputed packet checksum, which causes the PCA checksum to fail and the packet to be discarded. Other effects:

- The counts of missing or partial pages rise in session data.
- The PCA stats must show a significant increase in `Total checksum errors`. See "Stats per Instance" on page 138.

Note: If the NIC used by the IBM Tealeaf CX Passive Capture Application uses large receive option and/or checksum offloading, you must disable checksum validation in the PCA Web Console. To disable, select the `Disable Packet checksum validation` check box in the Interface tab.

As an alternative, you can enable packet checksum validation for the IBM Tealeaf CX Passive Capture Application if you disable checksum offloading through the operating system driver level. However, this option adds a processing usage to the operating system.

- The command to disable checksum offloading to the NIC must be placed in the bootup configuration script.

Traffic Segmentation

Captured packets are trafficked to individual instances of the PCA based upon the specified Desired Traffic for each instance and the global Ignored Traffic settings.

Passive Capture examines every network packet and determines how to traffic it based upon the filter rules. With the help of filter rules, you can specify where you want the required traffic to go, help balancing the load between multiple PCA instances, and define the types of traffic that PCA can ignore.

Note: The PCA automatically configures its listen filters to allow 802.1q VLAN packets in for capture. See "VLAN Filters" on page 101.

- To remove all filters from all instances, select **Remove Filters** in the General Functions section.

Either of the following two methods can be configured in the Interface tab to segment traffic loads to multiple instances of the PCA:

- Web Server Host IP/Port Addresses Filtering: The typical and preferred method for segmenting traffic by PCA instance is to filter on web server host IP/Port addresses. See "Web Server Host IP/Port Addresses Filtering" on page 87.
- TCP Client Port Segmentation Filtering: The alternate method, TCP client port segmentation, is used when the capture traffic is presented as a single virtual web IP address (VIP). See "TCP Client Port Segmentation Filtering" on page 88.

Web Server Host IP/Port Addresses Filtering

If the capture traffic presented to the PCA is served by multiple web servers via their respective host IP/Port addresses, then each PCA instance can filter for a subset of those host IP addresses. This method provides the means to distribute traffic loads across the multiple instances.

Note: IP filters are listed in the order in which you enter them, and the order cannot be dynamically changed. However, when the filters are compiled into binary format, they can be collated by address and netmask for optimal processing, though unlikely. Periodically, the list of filters must be reviewed to verify that all active filters contain traffic. Filters without traffic must be removed from the list.

Figure 13. Filter Rules (PCA Build 35xx or later)

For each instance of the PCA, the Instance List and Ignored Traffic sections identify the network packets to include and exclude. If the packet matches the required traffic and does not match the traffic to ignore, then capture it for further processing.

- See "Ignored traffic filter rules" on page 92.

In the Filter Rules section, you can specify the IP addresses/ports that are submitted data to the PCA. You can add and delete specific IP addresses or a range of IP addresses. You can also specify specific hosts whose traffic you do not want the device to capture.

- For more information about best practices in managing IP addresses, see "Best practices for filter rules" on page 93.
- For more information about creating rules for this method of traffic segmentation, see "Filter rules for a host" on page 90.
- For more information about creating rules to ignore traffic, see "Ignored traffic filter rules" on page 92.

TCP Client Port Segmentation Filtering

When traffic is served from a single virtual web IP (VIP) address, you can use the TCP client port segmentation method to segment the traffic based on TCP client port ranges.

Note: Wherever possible, IP address segmentation is the preferred method over port segmentation. See "Web Server Host IP/Port Addresses Filtering" on page 87.

Since there are not multiple web server host IP addresses to distribute, the segmentation is done by TCP client port ranges. Each PCA instance filters on a range of client TCP ports. The aggregate of all port ranges across all PCA instances spans the entire spectrum of client TCP ports and thus ensures complete capture.

The following are the requirements to use this method:

- The virtual IP address (VIP) traffic must contain reqiured capture traffic only. All traffic on this VIP is used.

  Note: Verify that the VIP does not have any undesired traffic. Only one VIP can be specified for this type of filtering.
- Web servers host TCP port numbers must be less than 1024. For example, host ports 8443, 4443, and 1443 are not valid.
- Ignored filter rules cannot be used.
- For more information about creating filter rules for this method of traffic segmentation, see "Filter rules for a port range" on page 90.
- For more information about custom filter support, contact Tealeaf http://support.tealeaf.com.

Populating Ports

About this task

Note: The use of port ranges to segment your captured traffic is considered an advanced feature and must be specified only during initial configuration of the IBM Tealeaf CX Passive Capture Application. If you have any questions, contact Tealeaf http://support.tealeaf.com.

To begin, you can auto-populate the port ranges that are directed to each instance of the PCA. All port ranges from 1024 and above are evenly split between the PCA instances. For example, if you have three PCA instances, each PCA receives traffic from an equal number of ports, which equates to the following ports:

```
(65,536 - 1024) / 3 = 21,504 ports/instance
```

Note: Valid port numbers range from 1024 to 65,535. Port numbers below 1024 are reserved.

- For more information, see `http://www.iana.org/assignments/port-numbers`.

Note: Populating the ports removes all other listen filters from each instance of the PCA.

Procedure

1. To populate the port ranges, click **Populate Ports**.
2. Port ranges are populated across all available instances of the PCA. Save your changes.
3. A restart of the PCA is required.

Results

After you populated the ports, you must monitor the traffic loading that is sent to each instance. For example, suppose your web server is delivering HTTP responses on port 8080. Then the PCA instance that is receiving this traffic can be running hot, while others are lightly used.

Current Hits Per Second statistics are reported on the Summary tab, with each PCA instance reported under a separate ID value.

- SSL Hits/sec rate is reported in the Reassd Hits SSL column.
- Non-SSL Hits/sec rate is reported in the Reassd Hits Non-SSL column.

See "PCA Web Console - Summary Tab" on page 71.

Adjustments

About this task

- If you see imbalances, you must consider applying more filter rules.
- On multi-core IBM Tealeaf CX Passive Capture Application servers, you can create multiple instances of the PCA and distribute the load across configurable port ranges. See "Load balancing between PCA instances using port ranges" on page 89.
- After auto-populating ports, you can configure a virtual IP address. See "Editing existing port range filter rules" on page 92.

Load balancing between PCA instances using port ranges

About this task

When you populate the port ranges across all available PCA instances, the PCA assigns the same number of ports to each available PCA instance. Typically, however, the enterprise network infrastructure does not evenly distribute the traffic load across the entire range of available ports. After you populate port ranges, you can discover that the traffic load is not evenly distributed between the instances. For example, PCA Instance 0 can be processing 75% of the forwarded data, while PCA Instance 1 is processing only 25%, even though each instance is listening on the same number of ports.

Using the steps below, you can adjust the port ranges assigned to each PCA instance to balance the load between available instances. This process can require iterative tuning and tweaking and should factor peak traffic periods.

Procedure

1. Instantiate the required number of PCA instances. See "View Instances" on page 85.
2. In the Interface tab, click **Populate Ports**.
3. Save your changes.
4. The previous step distributes the load traffic evenly across all ports. The following steps must be repeated until the data load is distributed evenly across all available ports to the PCA instances:
   a) Check the number of SSL hits/sec processed by each instance. SSL hit processing is the most CPU-intensive operation and a good indicator for load balancing. If SSL hits are not the primary traffic volume, then use the non-SSL hits/sec rates to gauge the load. You can use a combination of the two, if required.
      - Current Hits Per Second statistics are reported on the Summary tab, with each PCA instance reported under a separate ID value.
      - SSL Hits/sec rate is reported in the Reassd Hits SSL column.
      - Non-SSL Hits/sec rate is reported in the Reassd Hits Non-SSL column.
      - See "PCA Web Console - Summary Tab" on page 71.
   b) Using the specific hit rates per second on each PCA instance, you must review and tweak the port ranges, expanding or contracting as needed, to more closely approximate even load distribution.
   c) Adjust and then review the results in the Summary tab.

Note: The PCA Web Console does not validate the specified port ranges. With each adjustment, verify that no gaps or overlaps are created in the port ranges and that the entire range of available ports is not specified.

d) It is unlikely that any set of adjustments produces a even distribution. Getting the hits/sec rates for each range to within 25% of each other must suffice, as load rates can vary over time.

e) Save your changes. The PCA is automatically restarted, and the changes are applied.

f) Repeat the preceding steps until the load is balanced to your satisfaction.

5. When your adjustments are complete, verify that the entire range of available ports (1024 - 65535) is covered by your set of port ranges. Gaps and overlaps must be eliminated.

Filter Rules

You can use filter rules to filter the incoming data packets and traffic them to specific PCA instances. Rules can be defined to filter based on the host name, netmask, and port range of incoming traffic.

Note: The **Filter Rules** pane is useful for adding a single filter rule to be applied to multiple hosts across multiple PCA instances. For initial creation and debugging, the Edit Filters view provides easier methods of verifying that all ports are covered by your filter rules for all instances. See "Edit Filters" on page 96.

Filter rules for a host

About this task

Host-based filter rules can be used to traffic wanted or ignored traffic according to the host that is sending the traffic.

- To specify trafficking that is based on ports, use a port range filter. See "Filter rules for a port range" on page 90.

To specify a filter rule for a host:

Note: Do not mix filter rules from the two traffic segmentation methods. You can only use the specified filter rules for the chosen method.

Procedure

1. Enter the IP address of the host.
   - If this value is left blank, all host IPs are captured based on the specified port number. However, the netmask size setting cannot be used without a valid host value.
   - To add a host, click the **Add More**.
     - In PCA Build 34xx and earlier, click the **Add a Host** link.
2. If host traffic is coming from a specific netmask, enter the value here.
3. If the Port1 and Port2 check box are unspecified, all traffic from the host/netmask is filtered based on the rule. For a host-based rule, do not specify specific ports.
4. From the Add to drop down, select the PCA instance to which to apply the rule.
5. Then, you can select the type of filter rule:
   - `Desired` - Specified traffic is directed to the selected instance.
   - `Ignored` - Specified traffic is ignored and dropped from further processing. See "Ignored traffic filter rules" on page 92.
6. Click **Add**.
7. The filter rule is added to the specified instance and is immediately applied to incoming traffic.

Filter rules for a port range

A port range filter rule can be used to direct required traffic across a specific set of ports to a PCA instance. The following methods for specifying port range filters are supported:

Note: Valid port numbers range from 1024 to 65,535.

Note: Do not mix filter rules from the two traffic segmentation methods. You can only use the specified filter rules for the chosen method.

- Automatic: The preferred method for specifying port range filters is to populate the ports automatically. It creates the correct port range filter rule for each instance for you. Populating ports assumes that all required instances are already created. See "Populating Ports" on page 88.
  - After auto-populating port ranges, you can edit them if needed. See "Editing existing port range filter rules" on page 92.
- Manual: If you are manually entering port ranges (not auto-populated), only one IP address entry is allowed for VIP (Virtual IP) filtering. Any additional IP addresses added to the port ranges are ignored.
  - The workaround is to use a subnet mask with a single IP address.
  - The following steps enable manual specification of a port range filter rule for the specified instance.
  - If you must edit existing rules, click **Edit Filters** in the Interface tab.

Port range filter rules can filter on a required VIP address, which allows filtering out other unwanted traffic with the VIP address traffic.

- If the capture traffic only contains required traffic, then an IP address is not needed here.

Manually adding or specifying a filter rule for a range of ports

About this task

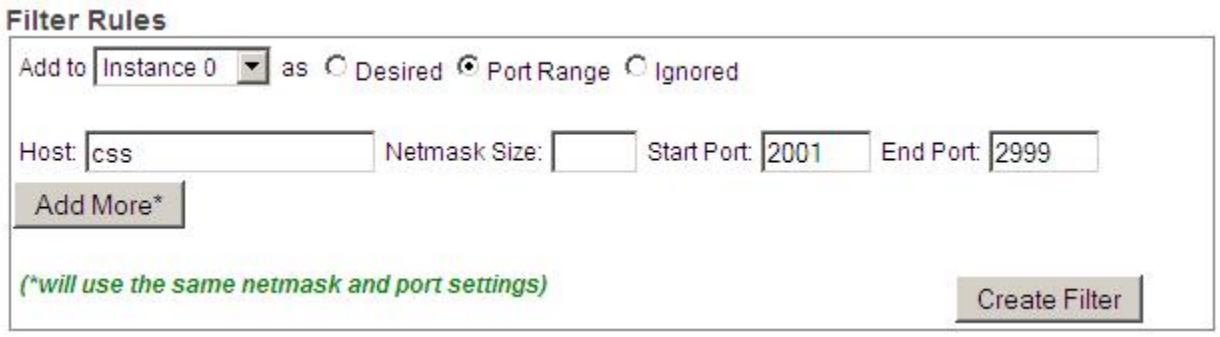


Figure 14. Manually adding port range filter rules (PCA Build 35xx or later)

Procedure

1. If needed, under the Filter Rules enter the IP address of the VIP in the `Host` field.
2. For the type of filter rule, select `Port Range`, which sends the specified traffic to the selected instance.
3. Use the same IP address for each port range filter rule.
   - If multiple IP addresses are needed and are grouped into a subnet, then a subnet mask can be applied to the base IP address. For example, an entry of `66.211.169.0/24` matches the first 24 bits of the IP address (the first three octets) and allows wildcard matching on any value in the fourth octet, which is specified as `0`. Any port range that is specified for this virtual IP matches across all 254 IP addresses of the VIP.
4. If VIP traffic is coming from a specific netmask, enter the mask value here.
5. Enter the start port value in the `Start Port` field and the end port value in the `End Port` field.
6. From the Instance drop-down, select the PCA instance to which to apply the rule.
7. Click **Create Filter**.
   - In PCA 34xx and earlier, click **Add**.
8. The filter rule is added to the specified instance and is immediately applied to incoming traffic.

Note: Only one port range filter rule should be added to each instance. Any additional port range rules for the instance are ignored.

Note: After you save changes in the Interface tab, a manual restart of the PCA is required. See "PCA web Console - Console Tab" on page 83.

Editing existing port range filter rules

About this task

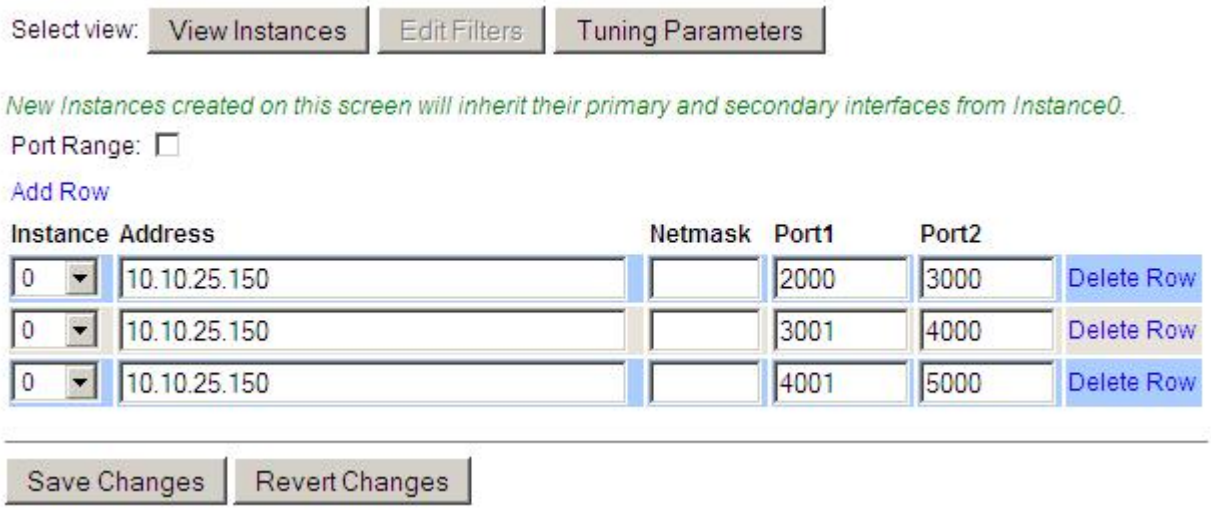


Figure 15. Editing existing port range filter rules with a VIP address

Note: This mode can be used to add a VIP address if the Auto-populate ports option was done (Populate Ports button).

Procedure

1. If needed, in the **Edit Filters** screen, click the **Port Range** check box.
2. Enter the IP address of the VIP under the `Address` field.
3. Use and apply the same IP address for each port range filter rule.
4. Change any of the filter rule fields as needed.
5. To apply your changes, click **Save Changes**.

   Note: After you save changes in the **Interface** tab, a manual restart of the PCA is required. See "PCA web Console - Console Tab" on page 83.
6. The configuration changes are applied to incoming traffic.

Ignored traffic filter rules

About this task

You can specify filter rules for ignoring traffic. These rules are applied to across all instances of the PCA.

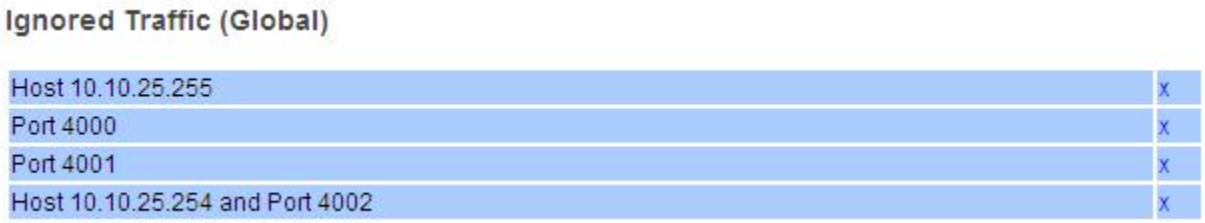


Figure 16. Specifying an ignored traffic filter rule

Procedure

1. Specify the rule in the Filter Rules box.
   a) Enter the host the traffic from which you want to ignore. To ignore all traffic from a specific port value, leave this value blank.
   b) Specify the port to ignore, if required. To ignore all traffic from the host, leave netmask and port values empty.

      Note: You cannot specify port ranges for ignored traffic rules.
2. Click the **Ignored** check box.
3. Click **Create Filter**.
   - In PCA 34xx and earlier, click **Add**.
4. The rule is populated in the Ignored Traffic (Global) box at the bottom of the screen.

Results

Figure 17. Ignored Traffic (Global)

All traffic that is submitted from addresses that are matching the ignored traffic rules is dropped from the PCA.

Best practices for filter rules

It is recommended that you limit the number of filter rules to no more than 20 for each instance of the PCA.

Note: Performance of the IP filters is known to degrade as more entries are added. It is a best practice to avoid having more than 20 entries in an instance.

To address this issue, you can:

- Reduce the number of filter rules by using subnet masks. For example, if you are using individual filter rules for each port in a range of ports, you can use a subnet mask to create a single filter rule for all ports in the range.
- Create multiple instances of the PCA application. See "Installing the CX Passive Capture Application" on page 16.

Mixing filters for specific IP addresses and port ranges

It is possible to use combinations of specific IP addresses and port ranges to filter traffic.

Note: Filter configuration method is for advanced PCA users only. It is not supported in the PCA web Console interface and can be implemented only by manually editing the configuration file. After this method is implemented, you can no longer use the web console to edit your filters.

Note: If these methods are mixed, you are likely to generate duplicate traffic if manually implementing this change.

To mix filtering modes in the same configuration, you must insert entries similar to the following in `ctc-conf.xml`:

Note: Manually edited entries can be lost if the PCA web console is used and causes a rewrite of its configuration.

```
<Instance>
                <ListenTos>
                    <ListenTo>
                        <Address>10.10.100.200</Address>
                        <PortRange>33280-65535</PortRange>
                    </ListenTo>
                </ListenTos>
            </Instance>
```

See "Passive Capture Configuration File ctc-conf.xml" on page 165.

Instance List

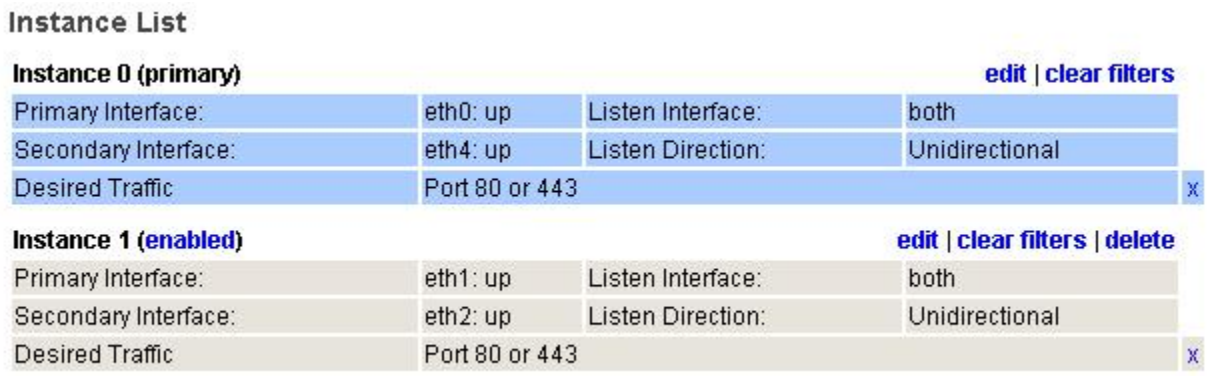


Figure 18. Instances

In the Instance List, you can configure, enable, disable, and delete instances of the IBM Tealeaf CX Passive Capture Application on the server.

- To delete a created instance, click the delete link next to the listing in the Instance List.
  - The primary instance cannot be deleted.
- To toggle use of a secondary instance, click the Enabled or Disabled link next to its name
- To remove all filters for a specific instance, click **clear filters**.
- To edit an instance, click the edit link next to its listing. See "Capture Network Interfaces" on page 94.

Capture Network Interfaces

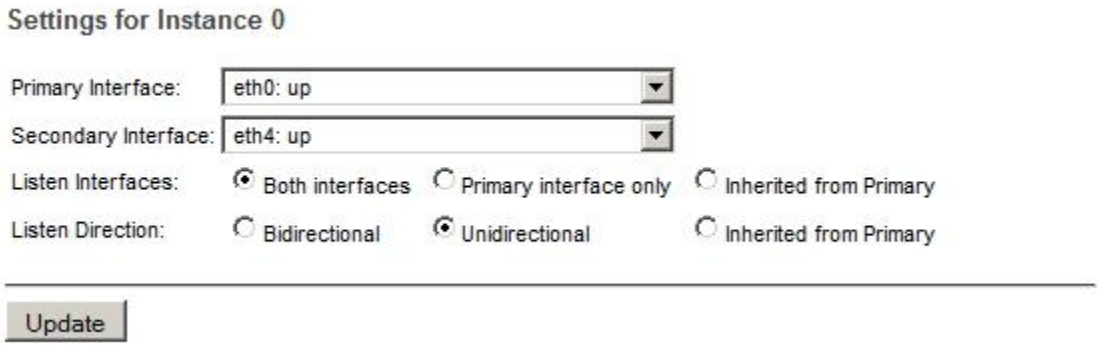


Figure 19. Capture Network Interfaces

The options that are displayed in the figure include the following descriptions.

Note: If you are using multiple instances, all instances must be set within the primary instance listing. Else, the PCA fails to start.

Setting
Description

`Primary Interface`
This drop-down designates a particular hardware network interface as the primary interface for capture. The drop-down menu is a dynamically built list of the important interfaces.

`Secondary Interface`
This drop-down designates a particular hardware network interface as the secondary interface for capture. The drop-down menu is a dynamically built list of the important interfaces.

`Listen Interfaces`
Selects the interfaces on which the selected instance listens:

- `Both Interfaces` - Both interfaces listen to traffic.
- `Primary Interface only` - Only the primary interface listens to traffic.
- `Inherited from Primary` - Listen interfaces are inherited from the primary instance.

`Listen Direction`
Selects the directions in which the selected interfaces listen to traffic:

- `Bidirectional` - Selected interfaces listen for both incoming and outgoing packets.
- `Unidirectional` - The primary interface listens for incoming packets, and the secondary interface listens for outgoing packets.
- `Inherited from Primary` - Listen directions are inherited from the primary instance.

Examples

Following are some examples of interfaces.

Primary Interface only Bidirectional

This option listens on the primary interface for both incoming and outgoing packets. Use it when connected to a single network segment through a switch with port mirroring or a hub.

Primary and Secondary Interface Bidirectional

This option listens on both interfaces for both incoming and outgoing packets. Use it when connected to two separate network segments through switches with port mirroring or hubs.

Primary and Secondary Interface Unidirectional

This option listens on the primary interface for incoming packets and the secondary interface for outgoing packets. Use it when connected to a single network segment through a tap.

Traffic to Ignore

This section specifies traffic that the device must explicitly ignore. Even if a host-port pair in this list meets the criterion in the Desired Traffic section, the device does not capture it. To ignore all traffic for a host, enter `*` or `All` as the port.

When you specify host and port combinations to ignore, you are adding restrictions that matched packets must not be one of the host and port combinations. For example, suppose you wanted to capture all traffic to and from hosts that are communicating on ports 1, 2, and 3 except for the following host and port combinations:

Host
Port

1.2.3.4
4

5.6.7.8
5

The description of that traffic is the same as running the following single command:

```
tcpdump -n -i eth0 "((port 1) or (port 2) or (port 3)) and not \
((host 1.2.3.4 and port 4) or (host 5.6.7.8 and port 5))"
```

In the `ctc-conf.xml`, the example translates into the following XML:

```
<Ignores>
    <Ignore>
        <Address>1.2.3.4</Address>
        <Port>4</Port>
    </Ignore>
    <Ignore>
        <Address>5.6.7.8</Address>
        <Port>5</Port>
    </Ignore>
</Ignores>
<ListenTos>
    <ListenTo>
        <Port>1</Port>
    </ListenTo>
    <ListenTo>
        <Port>2</Port>
    </ListenTo>
    <ListenTo>
        <Port>3</Port>
    </ListenTo>
</ListenTos>
```

Edit Filters

About this task

In Edit Filters view, you can edit ports and port ranges to filter the data sent to each instance of the PCA. You can use this view to verify that all required port ranges are properly specified across all instances of the IBM Tealeaf CX Passive Capture Application.

- You can also specify data filters in the View Instances view. See “Filter Rules” on page 90.

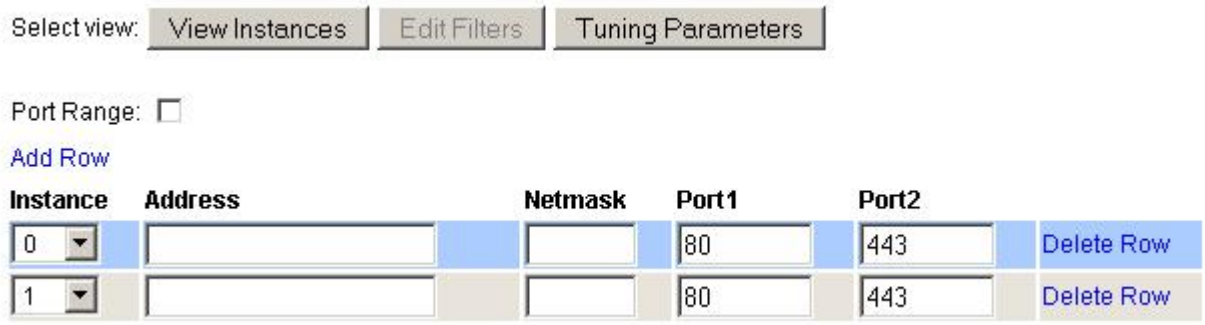


Figure 20. Edit Filters

By default, the Edit Filters view enables specification of up to two individual ports for which to send data to an individual PCA.

- To specify a range of ports, click the **Port Range** check box. The data that is displayed in the port check box becomes a starting and ending range for capture and forwarding.

- To add a row, click the **Add Row** link. The new row is inserted.
- To remove a data filter row, click the **Delete Row** link.

To specify a data filter:

Procedure

1. From the Instance column, select the PCA instance identifier to which the filter applies. All data that is captured from the specified server and ports is forwarded to the selected instance.
   - See "Instance List" on page 94.
2. In the Address column, enter the IP address of the server that is providing the data.

   Note: Host names are not accepted.
3. In the Netmask column, you can enter a netmask, if applicable.
4. Enter the ports to capture:
   - If Port Range is not selected, you can specify up to two ports to capture from the specified address.
   - If Port Range is selected, you can specify a Start Port and End Port in the two textboxes. These entries indicate a range of ports, inclusive, that are forwarded to the selected PCA instance for capture.

CIDR Format

To configure a block of allowable IP addresses, use the CIDR format. CIDR specifies an IP address range by the combination of an IP address and its associated network mask. CIDR notation uses the following format:

```
192.30.250.00/18
```

- The `192.30.250.00` in this example is the network address itself. The 18 indicates that the first 18 bits are the network part of the address, leaving the last 14 bits for specific host addresses.

The following table contains more examples:

CIDR Format
Equivalent Netmask

`10.10.0.0/16`
`255.255.0.0`

`10.10.10.0/24`
`255.255.255.0`

`10.10.10.0/28`
`255.255.255.240`

SPAN Port Traffic

If you are capturing a subnet from a SPAN port, you must determine if the SPAN port is sending you only that subnet or other traffic.

If you are receiving just that subnet, then select **Specific Ports on All Hosts** to capture specific ports. For example, to capture all port 80 and 443 traffic on all hosts, select **Specific Ports on All Hosts** and enter ports 80 and 443.

If your SPAN port is mirroring additional traffic, then select **Specific Host-Port Combinations**. For the hosts, use CIDR syntax to match the subnet. In our port 80 and 443 example, if you wanted all the traffic for network 1.2.3.0 netmask 255.255.255.0, then specify the following Specific Host-Port Combinations:

Host
Port

1.2.3.0/24
80

1.2.3.0/24
443

Tuning Parameters

The Tuning Parameters section specifies the performance characteristics of the system.

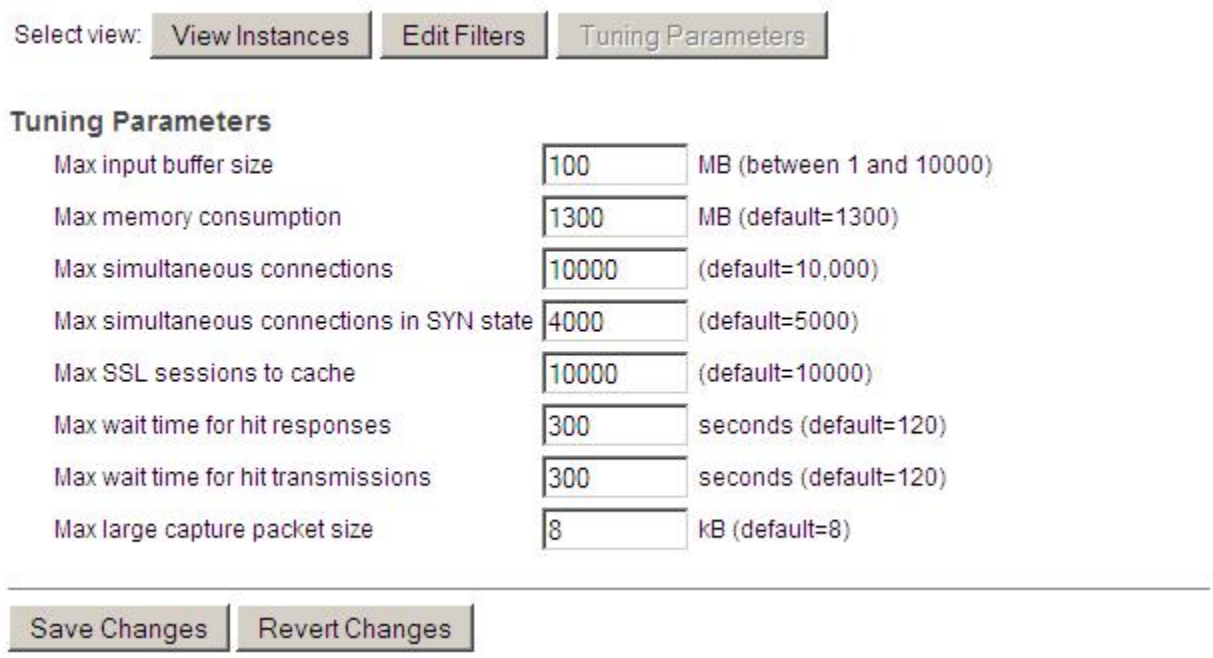


Figure 21. Tuning Parameters (Capture Settings)

The options that are displayed in the previous figure include the following options:

Setting
Description

`Max input buffer size`
Defines the size of the buffer between the packet sniffer and the hit assembler. If the hit assembler becomes too slow, packets are queued in this buffer for processing. When the hit assembler has available resources, it begins pulling packets from the queue and processing them.

- When the buffer fills, the PCA begins dropping hits. By enforcing a limit on the buffer, the system prevents a crash. However, data is dropped.

  Note: Tealeaf recommends that you keep this setting at the default value. It is used for debugging issues that are related to spiking traffic conditions that are overwhelming the buffer. Do not change this setting without guidance from Tealeaf.

`Max memory consumption`
Defines the maximum amount of system memory (in MB) allocated to the capture process. The default value is `1300` (about 1.3 GB).

- The IBM Tealeaf CX Passive Capture Application is a 32-bit application, which means each PCA process can address a maximum of 2 GB of RAM.

  Note: Tealeaf recommends that you keep this setting at the default value. It is used for debugging issues that are related to increased traffic volumes that are overwhelming the PCA. Do not change this setting without guidance from Tealeaf.

Max simultaneous connections
Sets the maximum number of TCP connections over which the system can simultaneously capture. If there are more connections than this number of connections, the capture system replaces the oldest connections with the new ones. After an old one closes, the system begins capturing the next new connection. By enforcing this limit, the system prevents a spike in the number of connections overloading system resources from causing a crash.

Note: This setting is applied per PCA instance. As part of an initial installation or upgrade of the PCA, this setting must be reviewed against current traffic volume. See "Installing the CX Passive Capture Application" on page 16.

Max simultaneous connections in SYN State
Sets the maximum number of TCP connections that can be in the SYN state at one time. If there are more than this number of connections in this state, the system replaces the oldest connections with the new ones. Once an old one closes or transitions from this state, the system begins capturing the next new connection. By enforcing this limit, the system prevents SYN flood attacks from causing a crash.

Note: This setting is applied per PCA instance. As part of an initial installation or upgrade of the PCA, this setting must be reviewed against current traffic volume. See "Installing the CX Passive Capture Application" on page 16.

Max SSL sessions to cache
Sets the maximum number of SSL sessions the system can cache concurrently. After the system reaches this limit, it discards old entries first. If a session corresponding to a discarded entry resumes, the system cannot decode it. By enforcing this limit, the system prevents a spike of improperly terminated sessions from causing a crash.

- This setting can be raised with some constraints. For more information, see "Troubleshooting - Capture" in the *IBM Tealeaf Troubleshooting Guide*.

Max wait time for hit responses
Sets the duration of the timer that is used to determine whether a server is stalled on an HTTP request. After the system receives the last packet for a request, it starts this timer. If the timer expires before receiving the first packet of the response, the system identifies the request as stalled and packages it up as a stalled hit. If the response eventually arrives, the system ignores it. By enforcing this timer, the system prevents stalled requests from using resources.

Max wait time for hit transmissions
Sets the duration of the timer that is used to determine whether a TCP connection is hanging. After the system receives a packet for a connection, it starts this timer. If the timer expires before receiving another packet, the system identifies the connection as hanging and discards it. If the connection corresponds to an HTTP request, the system ignores it completely. If the connection corresponds to an HTTP response, the system packages the partial response data in a hit. By enforcing this timer, the system prevents hanging connections from using resources.

Max large capture packet size
Specifies the maximum TCP packet capture size. The default value is 8 KB.

Manual Changes to Interface Configuration

In most cases, you can specify any interface configuration in the PCA Web Console. IN rare cases, you must make manual changes to interface configuration through the `ctc-conf.xml` file.

Setting
Description

All Traffic
This option captures all packets to or from any host on the network segment. When you select to capture all required traffic, the description is an empty statement that matches all possible TCP/IP packets. It is the same as running the command:

```
tcpdump -n -i eth0
```

In the `ctc-conf.xml` file, the choice to capture all traffic translates into the following XML:

```
<ListenTos>
    <ListenTo>*</ListenTo>
</ListenTos>
```

Specific Ports on All Hosts
This option captures packets to or from any host but only on specific ports. When selected, you must specify one or more TCP/IP port numbers. The resulting description matches any packet that is destined for or sent to at least one of the ports you specify. For example, suppose you specified ports 99, 199, and 200. The resulting description of the packets to match would be the same as running the following command:

```
tcpdump -n -i eth0 "((port 99) or (port 199) or (port 200))"
```

In the `ctc-conf.xml` file, the previous example would translate into the following XML:

```
<ListenTos>
    <ListenTo>
        <Port>99</Port>
    </ListenTo>
    <ListenTo>
        <Port>199</Port>
    </ListenTo>
    <ListenTo>
        <Port>200</Port>
    </ListenTo>
</ListenTos>
```

Specific Host-Port Combinations
This option captures only those packets to or from specific host-port combinations. When selected, you can specify the host and corresponding ports for that host that must be captured. The resulting description matches at least one of the combinations where the source or destination host matches the host that is specified, and the source or destination port matches the specified port.

Suppose you specified the following host and port combinations.

Host
Port

127.0.0.1
80

172.16.0.1
1

172.16.0.2
2

The corresponding command to record the same traffic would be the following single command:

```
tcpdump -n -i eth0 "((host 127.0.0.1 and port 80) or \
(host 172.16.0.1 and port 1) or (host 172.16.0.2 and port 2))"
```

In the `ctc-conf.xml` file, the previous example would translate into the following XML:

```
<ListenTos>
    <ListenTo>
        <Address>127.0.0.1</Address>
        <Port>80</Port>
    </ListenTo>
    <ListenTo>
        <Address>172.16.0.1</Address>
        <Port>1</Port>
    </ListenTo>
    <ListenTo>
        <Address>172.16.0.2</Address>
        <Port>2</Port>
    </ListenTo>
</ListenTos>
```

VLAN Filters

The PCA automatically configures its listen filters to allow 802.1q VLAN packets to be captured without explicit configuration.

Note: Exception: When you use port range filters, VLAN traffic is not captured.

If you are using `tcpdump` for traffic analysis, you must manually apply the VLAN filter tags at the command line to see VLAN packets. In the previous section, the command to start `tcpdump` must be augmented to enable VLAN packet capture in the following manner:

Note: Remove the slashes at the end of each line, which indicate line continuation.

```
tcpdump -n -i eth0 "((host 127.0.0.1 and port 80) or \
(host 172.16.0.1 and port 1) or (host 172.16.0.2 and port 2) or \
(vlan and host 127.0.0.1 and port 80) or \
(vlan and host 172.16.0.1 and port 1) or (vlan and host 172.16.0.2 and \
port 2))"
```

PCA Web Console - Delivery Tab

The **Delivery** tab lets you specify target recipients and tuning parameters. The following figures display the configuration options available through the **Delivery** tab of the web console.

- The Network interfaces are now displayed in the **Utilities** tab. See “PCA Web Console - Utilities Tab” on page 159.

Target Recipients

This list specifies the Tealeaf servers to which the device must send packaged hits. Adding a recipient initiates a series of screens for configuring the address and delivery security.

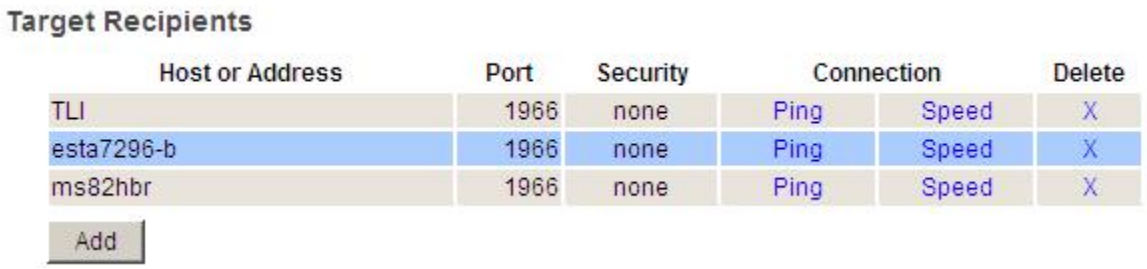


Figure 22. Target Recipients

For each peer, the links in the Connection column (Ping and Speed) test the connection by pinging the peer or testing connection speed, respectively.

- To remove a peer, click the **X** icon in the Delete column.

Figure 23. Add Recipient

Setting
Description

`Host Address`
Host name or IP address of the target recipient.

`Host Port`
Port number on which the target recipient listens.

`Enable Secure Delivery`
Determines whether to use secure delivery or not.

- When this option is enabled, you must import an SSL certificate for use by the PCA. See "Generating a Self-Signed Certificate" on page 202.

Maximum Number of Recipients

Depending on your PCA build, you can add up to the following number of recipients:

- PCA Build 34xx and earlier: `20`
- PCA Build 35xx and later: `40`

Note: Avoid using many peer connections, if possible. The default delivery queue buffer for each peer (`Max Queue Length`) is 50 MB. Based on the default setting, to enable 20 peers, 20 * 50 MB = 1 GB of process memory for delivery buffers is required. If you use 40 peers, 2 GB of process memory is required, exceeding the 32-bit process memory limit.

If you want to use that many peers, then you must reduce the default delivery queue memory to 25 MB, keeping the total queue memory usage to 1 GB. For more information, see the `Max Queue Length` setting in "Tuning Parameters" on page 103.

Example: Add Recipient

About this task

To add a recipient, perform the following steps:

Procedure

1. Click **Add**. The **Add Recipient for Hit Delivery** page starts
2. Enter the domain or IP address of the target recipient in the **Host Address** field.

   Note: If the operating system on the IBM Tealeaf CX Passive Capture Application server is configured to connect to a DNS server, you can enter the domain name. Otherwise, enter the IP address. Tealeaf recommends using a static IP address to eliminate potential DNS issues in the future.
3. In the **Host Port** field, enter the port on which the target recipient listens for packaged hits.
4. The Enable Secure Delivery option determines whether to use secure delivery or not.
5. To use secure delivery, select the **Secure** check box, then click **OK**. The **Add Certificate for Secure Delivery** page launches. Enter the certificate to use when authenticating the target recipient for delivery by pasting the target recipient's certificate into the Certificate for New Recipient textbox on this screen. Click **OK**.
6. If secure delivery is not used, leave the **Secure** check box cleared, then click **OK**.

Tuning Parameters

With the Tuning Parameters you can set maximum delivery characteristics.

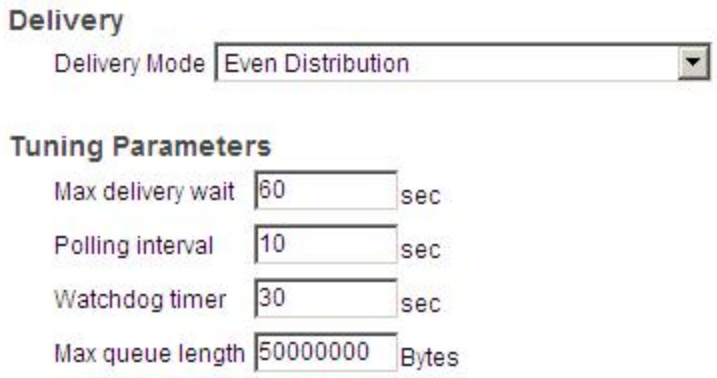


Figure 24. Tuning parameters(Delivery)

Setting
Description

`Delivery Mode`
The delivery mode feature allows the IBM Tealeaf CX Passive Capture Application to deliver traffic through different methods to its delivery peers (css boxes). Traffic can be delivered by the following methods:

- `Even Distribution` - Traffic is distributed evenly among peers. For example, if four peers are configured, then each receives approximately 25% of total traffic.

  Note: In PCA Build 3500 or later, when one or more delivery peers become available, traffic is automatically redistributed to the remaining active peers. If an inactive peer becomes available, traffic fails back to the peer and is rebalanced to ensure even distribution. This method guarantees delivery traffic to always evenly distribute 100% of its traffic to all active delivery peers.

- `Failover` - This method requires two peers, a primary and secondary. Primary receives 100% of the total traffic while the secondary idles. If connection to the primary peer is lost or too many hits are being dropped, the PCA closes the connection to the primary peer and fails over to the secondary. If the secondary peer fails, the PCA attempts to fail back to the primary peer. If the PCA is unable to establish a healthy connection to both the primary and secondary peer, it switches between the two until a healthy connection can be established.

  Note: This delivery mode is likely to be deprecated in a future release.
- `Clone` - This option was the previous default behavior. Every peer gets 100% of the total traffic.
- None - This option replaces the 'deliver to null' option. If this option is selected, traffic is dropped before being sent to any delivery peers, which are useful for debugging purposes only.

`Max Delivery Wait`
Sets the duration of the timer that is used to send packaged hits. When this timer expires, the device attempts to send all packaged hits to the target recipients.

`Polling Interval`
This setting is not currently used.

`Watchdog Timer`
The maximum time (in seconds) allowed to make a connection to the IBM Tealeaf CX Server. If the timeout is exceeded, the connection is marked as disconnected. The default value is 30 seconds.

`Max Queue Length`
Sets the maximum length of the delivery queue. If the queue reaches this length, the system begins discarding newly packaged hits until the queue shortens. By enforcing this limit, the system prevents the backlog from causing a crash.

Saving Changes

Note: After you save changes through the web console's **Interface** tab, a manual restart of the PCA is required. Changes that are made in other tabs of the web console do not require manual restarts.

- For changes made through the ctc-conf.xml file, a restart is required.

See "PCA web Console - Console Tab" on page 83.

Use Tealeaf Transport Service as Time Source

You can learn how to configure a host that is running the Tealeaf Transport Service as a time source in this section. When enabled, the specified Tealeaf Transport Service is contacted every 15 minutes and queried for its current time. The system clock is then drifted to the time of the Transport Service. "Drifting" means that the local time of the Passive Capture software is not forced to the exact remote time of the Transport Service machine. Instead, if the local time is behind the remote time, the system clock increments by a small amount. If the local time is ahead of the remote time, the system clock advances more slowly so that it eventually slows down to match the remote time.

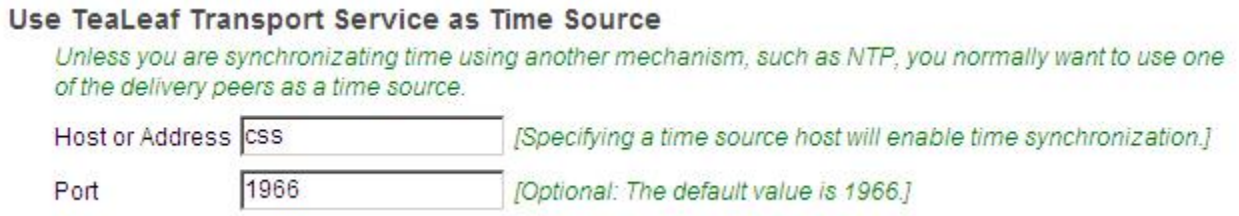


Figure 25. Use Tealeaf Transport Service as Time Source

Setting
Description

`Host or Address`
Designates the domain name or IP address of the host that is running the Tealeaf Transport Service to be used as a time source. If you do not want to synchronize to a time source, leave this field empty.

Port
Designates the port on which the time source host listens for time source queries. If you do not want to synchronize to a time source, leave this field empty.

Deliver Statistics to Tealeaf Transport Service

This section enables configuration of the statistics hit. You can control the following five settings for the statistics hit:

Figure 26. Deliver Statistics to Tealeaf Transport Service

Setting
Description

Enabled
If this check box is selected, then statistics hits are enabled as a feature. If cleared, the feature is disabled.

Host or Address
This field contains either the host name or IP address of the machine that is running the Tealeaf Transport Service that must receive statistics hits.

Interval
This setting, a positive number, is the minimum number of seconds to lapse between attempts to send statistics hits. If zero, statistics hits are not sent.

Port
Enter the TCP/IP port number to use when you connect to the Tealeaf Transport Service on the host.

Use SSL
Indicates whether the connection to the Tealeaf Transport Service must use SSL.

PCA Web Console - SSL Keys Tab

You can use this tab to review and edit the Loaded keys list and Missing keys list. To toggle between the lists, use the appropriate radio button:

- The Loaded private keys view lets you add, edit, and delete private keys for secure servers.
- The Missing private keys view lets you see information about, ignore, or clear missing private keys.
- You can also upload SSL certificates in multiple formats. See "Capture Keys" on page 109.

Loaded Keys
In the **SSL** tab, you can review the loaded private keys and the missing private keys.

Loaded keys can be displayed in IPv6 format. See "How does the PCA manage the capture of IPv6 addresses" on page 279. For more information about Missing Keys view, see "Missing Keys" on page 107.

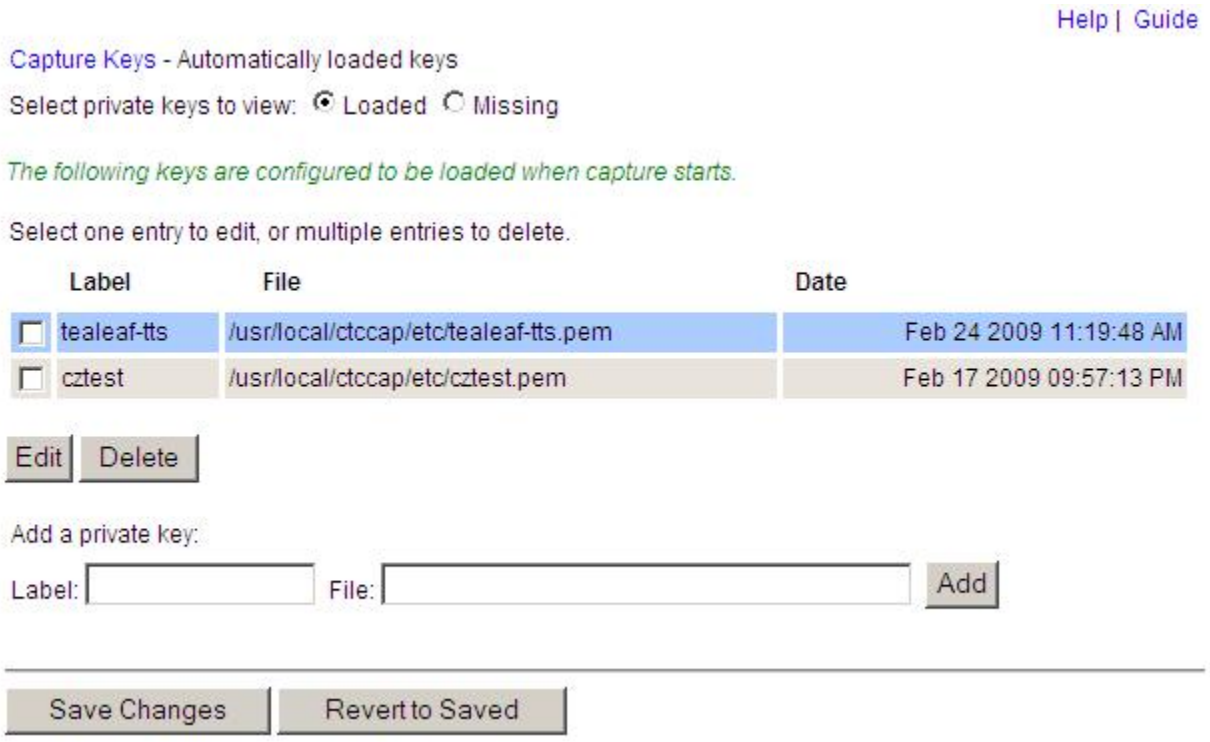


Figure 27. SSL Keys Tab - Loaded Keys view

Column
Description

checkbox
Click the check box to select a certificate.

`Label`
Display label for the certificate.

- For more information about changing the display label, see "Editing a Private Key" on page 106.

`File`
Path and file name of the `.pem` file.

- For more information about changing the display file name, see "Editing a Private Key" on page 106.

`Date`
Timestamp for first occurrence when the PCA encountered a packet by using the key.

- For more information about loading a private key, see "Adding a Private Key" on page 107.
- To edit a loaded key, click the check box next to it. Then, click **Edit**. See "Editing a Private Key" on page 106.
- To delete a loaded key, click the check box next to it. Then, click **Delete**.
- To save your changes, click **Save Changes**.
- To revert unsaved changes to the saved version, click **Revert to Saved**. The previously saved set of keys is reloaded.

Editing a Private Key

You can edit a private key to load a key, assign it a more meaningful label name, and enter the fully qualified path to the key file.

- To save changes, click **OK**.

Adding a Private Key

About this task

Figure 28. Add Private Key To add a private key, perform the following steps:

Note: Only private keys (`.pem` and `.pfx`) converted to **`.ptl`** formats are supported.

Procedure

1. Select the **Loaded** radio button.
2. Enter the domain name or IP address of the recipient in the **Label** field. The value entered in this field designates the label used to identify the key for display.
3. In the **File** field, enter the name of the file that is containing the private key that the device must attempt to use to decode SSL sessions. This field must contain an absolute, fully qualified file name.
4. Click **Add**.
5. Click **Save Changes** at the bottom of the page.
6. You can then edit, view, or delete the key by clicking the corresponding buttons.

Missing Keys

To review and edit the list of missing private keys, click the **Missing** radio button at the top of the SSL Keys tab.

- Beginning in PCA Build 3500, missing keys can be displayed in IPv6 format. See "How does the PCA manage the capture of IPv6 addresses" on page 279.

Figure 29. SSL Keys Tab - Missing Keys view

Column
Description

checkbox
Click the check box to select a key.

Host:Port
Host IP address and port number for the SSL certificate.

Date
Timestamp for the first occurrence since last PCA restart when an SSL packet was detected for which a unique SSL key is missing.

- Each subsequent SSL packet for the same missing key does not update the **Date** field.
- To clear the date, select the check box and click **Clear Selected**. When the next packet instance that is missing the cleared SSL key is detected, the timestamp is updated.

To select an SSL key, click the check box next to the host and port for the certificate.

- To select all missing certificates, select **Select All**.
- To ignore the selected certificates, select **Ignore Selected**.

- To delete the selected certificates, select **Clear Selected**.
- To save any changes, click **Save Changes**.

Capture Keys
Through the **SSL** tab, you can upload SSL certificates in clear text `.pem` format or password-protected `.pfx` format for conversion to `.ptl` for PCA use.

If you have access to the PCA software on the Linux server, you can drop SSL certificates into a specified directory for automatic conversion to `.ptl` format.

- See "Exporting the SSL private key" on page 194.
- See "Exporting the SSL private key" on page 194.

Pipeline Settings

The Pipeline tab allows users to edit configuration parameters such as capture, limits, and cookie IDs.

- If the fields are left blank, the device attempts to read default values from the `ctc-conf-defaults.xml` file.

You can select either of the two views to display pipeline settings:

- Pipeline Settings - Define data sessioning, time grading, capture mode, and more. See Pipeline Settings.
- Edit Type List - Specify the data types and file extensions to include or exclude from capture. See "Capture Type Lists" on page 118.

  Note: PCA capture types must be reviewed during any installation of the IBM Tealeaf CX Passive Capture Application or if the monitored web application is updated. See "Capture Type Lists" on page 118.

For more information about the Pipeline settings, see:

- "Pipeline instances" on page 109
- "Data Sessioning" on page 110
- "X-Forwarding" on page 111
- "Session Sampling" on page 112
- "Capture Mode" on page 112
- "Capture Request Methods" on page 113
- "Time Grading" on page 113
- "Hit processing" on page 113

Pipeline instances
By default, the PCA is configured to create a single instance of the PCA pipelined process for use by all instances of the PCA application. If needed, more instances of the pipelined process can be created to more efficiently distribute the work across available resources.

Note: Multiple instances of the PCA pipeline are available in PCA Build 3403 or later.

When multiple instances of the pipelined process are created, each instance of the PCA application submits the TCP packets. These packets are assembled by its reassd process to the pipeline queue. This queue then distributes the packets for processing to the configured pipelined instances in a round-robin fashion.

- The PCA pipelined process takes the individual HTTP hits and performs processing on them, such as dropping hits, applying privacy, data compression, and more. See "Passive Capture Overview" on page 1.

The effectiveness of multiple pipelines depends on the number of available CPU cores. The general rule of thumb is to allocate one available CPU core for each pipeline instance. If four idle CPU cores are available, you must configure no more than four pipeline instances if you expect a full CPU load.

Note: You must always leave at least one CPU core in the machine for system-based processes.

- The theoretical maximum limit on the number of pipelines is 128. It is not likely you must approach this limit.

Note: All pipelines operate on the same set of configuration rules. There must be no differences between privacy rules or other configuration options between multiple pipelines.

Setting
Description

`Instances`
Number of instances of the pipelined process.

- To create a different number of instances, enter a value in the textbox and click **Save Changes**.

  Note: Be conservative when creating new instances of the pipelined. Increment instances by one and then assess the results and impact on available resources on the PCA server.

To retrieve statistics on an individual pipeline instance, run the following commands.
Instance #0 stats:

```
ctcstats instdata
```

Instance #N stats

```
ctcstats -I<#N> instdata
```

where

- <#N> is the instance identifier.

Data Sessioning

The PCA can be configured to create a session id for each hit that is based on cookies injected into the request. When enabled, you can configure the request section and field information that is containing the session identifier.

- The cookie on which to session must be unique and persist for each hit in a session.

When data sessioning is enabled, the session id/cookie specified by the `Field Name` value is hashed to create the Tealeaf session identifier (`TLTSID`). If the Tealeaf Cookie Injector is in use, it creates this value.

Note: If you are using the Tealeaf Cookie Injector, do not enable this feature. The Tealeaf Cookie Injector provides guaranteed unique identifiers for session data that is captured by Tealeaf. See "Installing and Configuring theTealeaf Cookie Injector" in the *IBM Tealeaf Cookie Injector Manual*. If there is no session cookie, you can be able to sessionize off other hit data by deploying the Sessioning session agent in the Windows pipeline on the Processing Server. See "Sessioning Session Agent" in the *IBM Tealeaf CX Configuration Manual*.

Property
Description

`Field Name`
The name of the cookie on which you want to sessionize. Accepted values include `jsessionid` and `aspsessionid`.

- To sessionize on multiple cookies, you can insert multiple delimited values in this field. Accepted delimiters are comma (`,`) or semi-colon (`;`)

`Field Section`
You can use this field to specify the section of the request in which to look for the `Field Name`. If this value is not specified, then the entire request is searched for the field, and the first occurrence is used.

Field Offsets

You to sessionize on a specific part of the session cookie, as specified by `Field Name`. For example, if your cookie value is 32 characters long, setting the value to `0 15` sessionizes on the first 16 characters.

This feature is useful if the session cookie is appended with a static string:

```
. jsessionid=<unique keystuff here>mycookie;
```

X-Forwarding

About this task

A common standard, X-forwarding enables the tracking of the originating IP address of a client that is connecting to a server through multiple servers, such as proxy servers or load balancers.

- When enabled, the `HTTP_X_FORWARDING` field can be populated with the IP addresses of each server that is reviewed and forwarded the request.
- When content is returned from the origin web server, it is passed through each server that is listed in the `HTTP_X_FORWARDING` field. Each server removes the reference to it in the field and then passes it to the next server in the chain.
- In this manner, content can be passed through multiple servers between the requesting client and the supplying origin server.
- Use of port numbers in the IP address (for example, `<ip_address>:XXXX`) is not supported.

  Note: This feature is available in PCA Build 3501 or later.
- If a `CLIENT_IP` header is available, it can be preferable to use this for the X-Forwarding source, as it typically contains only one IP address.

Depending on how your web application is configured, you can define through the PCA the header field that is used to specify the `HTTP_X_FORWARDING` field. This field then points to the field that is the source of the IP address, in either IPv4 or IPv6 format.

Note: Although not required, the X-forwarding feature can be used to manage forwarding for both IPv4 and IPv6 addresses.

Beginning in PCA Build 3501, you can configure the source of the `REMOTE_ADDR` address value that is inserted into the PCA.

Procedure

1. To enable X-forwarding, click the **Enable** check box.
2. Enter the field Name value the HTTP request header variable name that contains the X-Forwarding IP address.
   - For PCA Builds 3501 and 3502, you must insert the actual, formatted name of the HTTP header, which is not easily available. The values that are inserted into the `[env]` section of the request do not work.
   - Beginning in PCA Build 3600, you can use underscores, dashes, and the `HTTP_` prefix in the field value entry, as well as the entries supported in Builds 3501 and 3502. For example, for the field value `X-FORWARDED-FOR`, the following variants are accepted:

     ```
     HTTP_X_FORWARDED_FOR
     X_FORWARDED_FOR
     X-FORWARDED-FOR
     ```

     Note: The field name is case-sensitive.

     Note: If the X-forwarding source field can contain multiple IP addresses, each IP address must be separated by a comma. Semi-colon or other field delimiters are not supported; in a multi-entry line,

the first address is used if it is properly demarcated. Otherwise, the entire line is used and is not processed properly.

3. Click **Save Changes**.

Results

When X-forwarding is enabled through the Pipeline tab, the specified header field is scanned for the name of the field in the request to use for REMOTE_ADDR. This field is then scanned for the value to insert into REMOTE_ADDR.

- The search is case-sensitive.
- The identified field is scanned for correct formatting. If no matching value is found, no action is taken, and REMOTE_ADDR is populated normally.

  Note: Before PCA Build 3501, HTTP_X_FORWARDING identification was managed through Privacy rules in the PCA pipeline. Before you deploy this new method, which is processed before content is passed into the PCA pipeline, verify that any PCA privacy rules to manage HTTP_X_FORWARDING is disabled. See "Downloading Privacy Configuration" on page 123.

If a match is found, the value is inserted into REMOTE_ADDR, and the previous value is inserted into the request variable REMOTE_ADDR_ORIG.

Example (IPv4)

About this task

```
REMOTE_ADDR=10.20.30.40
IPV6_REMOTE_ADDR=0000:0000:0000:0000:0000:FFFF:0A14:1E28
REMOTE_ADDR_ORIG=10.10.28.82
```

Example (IPv6)

About this task

```
REMOTE_ADDR=abcd::100:B200:CD10:10
IPV6_REMOTE_ADDR=ABCD:0000:0000:0000:0100:B200:CD10:0010
REMOTE_ADDR_ORIG=10.10.28.82
```

Beginning in Release 8.4, the values that are detected in REMOTE_ADDR after X-forwarding are converted to IPv6 format and inserted into the IPV6_REMOTE_ADDR variable. These values are indexed for search. See "How does the PCA manage the capture of IPv6 addresses" on page 279.

Session Sampling

If enabled, session sampling specifies a percentage of sessions to forward to the delivery peer. The remaining sessions are deleted from the capture. Session sampling allows for statistically significant volumes of data capture without burdening the system with production volumes.

Note: This feature eliminates session data from the capture stream and is intended as a debugging feature. Enabling it is not recommended.

Capture Mode

The Capture Mode setting specified the types of data that the PCA captures and drops from the capture stream. The following settings are available:

Capture Mode
Description

Business
Configures the Passive Capture software to capture only HTTP(S) request and response objects for .business. page requests (for example, HTML, ASP, JSP). Static objects such as style sheets, JavaScript, and image files are not captured by the PCA.

- Tealeaf replay clients can acquire and load these items on an as-needed basis during replay.

Note: Business capture mode is the default setting. Tealeaf recommends using Business mode.

BusinessIT
Configures Passive Capture to capture HTTP(S) requests and responses, as well as file objects associated with each hit. These static objects, such as image files, are captured by the PCA and passed to the Windows pipeline for further evaluation.

Note: In BusinessIT mode, the response object payload body is not saved. Only the image file and the request are captured and processed.

Note: Changing the capture mode from Business to BusinessIT significantly increases the volume of traffic that is captured, processed, and stored by Tealeaf. Before you change, review your entire Tealeaf solution to verify that you have the system resources to manage the payload increase. For more information, please contact Tealeaf Professional Services.

Capture Request Methods

When you are viewing the Capture Request Methods in the Pipeline editor, you can select the HTTP methods that you want to capture from the list that is provided.

Note: Requests of HEAD type are not supported for capture.

Time Grading

If enabled, Time Grading can assign a grade to a hit in one of the following three areas:

Area
Description

`Web Server Page Gen`
How long it takes the web server to serve up the page.

`Network Transit`
Measures network speed based on how much time a packet spent on the network.

`Round Trip`
How long it takes an arbitrary packet to travel from the client to the Web server.

Based on the three criteria, Time Grading assigns the hit a numerical grade. The default grade descriptions (Excellent, Normal, HighNormal, High) can be edited, along with their corresponding maximum values.

Hit processing

The following table describes the hit processing settings.

Table 11. Hit processing settings

Setting	Description
`Include Raw Request`	Determines whether RawRequest is on. RawRequest is an aid in debugging. The default value is `False` (disabled). If enabled (`True`), the HTTP Request headers are added to the hit. **Note:** Tealeaf highly recommends that this value can set to `False`; otherwise data is added to each hit.

Table 11. Hit processing settings (continued)	
Setting	**Description**
`Include Response Headers`	Determines whether ResponseHeaders are on. ResponseHeaders are aids in debugging. The default value is `False` (disabled). If enabled (`True`), the HTTP Response headers (in Tealeaf format, not necessarily the exact HTTP representation) are added to the hit. **Note:** Tealeaf highly recommends that this value stay set to `False`; otherwise data is added to each hit.
`Decode URL fields`	This option determines whether to URL-decode URL fields.
`Cookie Parser`	If this option is selected, a cookies section is added to the request.
`Enable UnReq Cancelled`	If enabled, this option checks the last 100 bytes of the response body for `</html` when `capturetype=1` and marked as canceled.
`Inflate compressed response`	When this option is selected, responses are automatically inflated in the PCA pipeline. If a response has a content-encoding header whose value is `deflate`, `gzip`, or `x-gzip`, then it is a candidate for having the body that is inflated from its compressed state. If this option is selected, then an attempt is made to inflate the response. **Note:** This setting must be set to `false`. Enabling this feature can significantly increase the data volume that is transmitted between the IBM Tealeaf CX Passive Capture Application server and the Transport Service. • If the inflate fails, a message is logged at the `notice` log level. • If the inflate succeeds, the value of the content-encoding header is overwritten with X's; for example, Content-Encoding: XXXX. • In PCA Build 3502 or later, compressed POSTs are automatically inflated for the content-encoding types, regardless of the content type, to support capture of data from Tealeaf client frameworks. – In PCA Build 3501 or earlier, this option was `Inflate compressed requests and responses`.
`Preserve responses when inflate fails`	When a hit response is inflated and the inflate process fails, the response is replaced with HTML reporting that an inflate error is occurred. Select this option to disable the replacement HTML, which preserves the original response.
`Deflate hits sent to target recipients`	Select this option to deflate hit responses before they are sent to a target recipient. The hit responses are compressed by using the HTTP deflate method. Enable this option to reduce the amount of network bandwidth that is used to deliver Tealeaf hits to the Tealeaf Transport Service.

Table 11. Hit processing settings (continued)	
Setting	**Description**
`Enable I18N`	When selected, internationalization support is enabled on the PCA. The request urlfields are encoded to UTF-8, and an attempt is made to detect the response body encoding. **Note:** There is a known issue in which special characters submitted in JSON data from a Tealeaf client framework are mangled. **Note:** This setting can only be enabled in PCAs connected to IBM Tealeaf CX Release 7.0 or later systems.
`Delete Images on PCA side`	When enabled, this option deletes image hits in the capture stream that meet specific criteria. See "Delete Images on PCA Side" on page 115.
`Enable TLI`	If you deploy a TLI server in your Tealeaf environment, you can enable the capture of image content for purposes of storing it in the TLI server downstream. See "Enabling Image Capture for TLI" on page 117.
`Max Response Size`	The largest acceptable response size (in bytes). The default value is 1572864 (1.5 MB).
`Default Response Encoding`	If the PCA is not able to detect the encoding type of a response, this value is used. **Note:** The following information applies to IBM Tealeaf version 9.0A only. CX PCA Build 3700 through 37xx contains additional selections to support Enhanced International Character Support (EICS) from what is available in CX PCA Build 3650 through 36xx.
`Default Request Encoding`	If the PCA is not able to detect the encoding type of a request, this value is used. **Note:** The following information applies to IBM Tealeaf version 9.0A only. CX PCA Build 3700 through 37xx contains additional selections to support Enhanced International Character Support (EICS) from what is available in CX PCA Build 3650 through 36xx.
`Total dropped due to ICU encoding errors`	This statistic reports each time a hit (either Request or Response) cannot be encoded to UTF-8 which causes the complete hit to be dropped. This scenario also generates an error (ERR) in the log.

Delete Images on PCA Side

Before PCA Build 3502, the PCA used configuration options and embedded logic to manage the automatic dropping of image content from captured hits, which significantly reduced the space that is required to store sessions. When the PCA was configured to be in BusinessIT mode, some image content types can be captured and passed to the Windows pipeline.In the pipeline, they were typically dropped by using the DelImages session agent.

- For more information about BusinessIT mode, see "Capture Mode" on page 112.

- For more information about the DelImages feature for the Windows pipeline, see "Data Drop Session Agent" in the *IBM Tealeaf CX Configuration Manual*.

Beginning in PCA Build 3502, the PCA now provides the DelImages functionality in the PCA pipeline. When DelImages is enabled in the PCA, the volume of data that is captured, processed, and transferred to the Windows server is reduced.

Note: To ensure the capture of image content throughout your Tealeaf environment, this setting must be consistently applied through the Pipeline tabs across all PCA instances.

If a hit meets the following criteria, then the hit is identified as an image hit and is dropped:

- `Delete Images on PCA side` is enabled.
- The file extension for the response is listed on the Excluded File Extensions list. See "Excluded File Extensions" on page 121.
- Either of the following criteria is met:
  1. PCA `CaptureType=3` and (`StatusCode = 200` or `StatusCode = 304`)
     - The previous criterion determines if the PCA is in BusinessIT mode (CaptureType=3) and an image request is returned with an "okay" status or a Not Modified status (StatusCode =304).
  2. `HTTP_USER_AGENT contains "RealiTeaViewer"` or `HTTP_USER_AGENT contains "TeaLeafFileGetter"`
     - The previous criterion determines if the request is being made by Tealeaf's IBM Tealeaf CX RealiTea Viewer desktop application for image content from the origin server during replay. These requests should not be captured.

If the previous criteria are met, then the image hit is dropped.

- When this feature is enabled, if `CaptureType=1` and the response content type is listed in the Include Extension list, then both the request and the response are captured.

In the Statistics tab, the total count of dropped image hits is displayed in the `Total dropped due to businessIT mode and DelImages feature set` metric. See "Stats per Instance" on page 138.

Workaround for mangled JSON characters

About this task

In some situations, special characters that are submitted in JSON data (UTF-8) from one of the Tealeaf client frameworks can be mangled during processing by Tealeaf. Through the PCA, you can configure settings to ensure that these characters are properly consumed.
If you have enable I18N translation in the **Pipeline** tab, complete the following steps.

Procedure

1. In the **Pipeline** tab of the PCA Web Console, set the `Default request encoding` to `UTF-8`. The request urlfields are defined as being encoded in UTF-8. The PCA uses UTF-8 encoding if it is not able to detect an encoding type.

   Note: The previous change to flag the request urlfields as encoded in UTF-8 can cause translation issues if the fields are not encoded in ISO 8859 or UTF-8.
2. Click **Save Changes**.

Results

Based on the previous configuration changes, the submitted JSON data in UTF-8 is not translated to a different encoding. Since the JSON is submitted in the `[RequestBody]` section, which is included in the `[urlfield]` section, setting the default encoding to UTF-8 results in no translation of the data. As a result, it is properly represented inside Tealeaf.

Enabling Image Capture for TLI

In Tealeaf, a TLI server can be deployed to capture static content, including images, JavaScripts, and Style sheets, to permanent archives. During replay, requests for this static content reference the static archives, which prevents unnecessary and sometimes forbidden requests to the origin server. Through a TLI server, you can retain a copy of the static content of each session, as it was experienced by the original visitor, for replay and auditing purposes.

- For more information about TLI servers, see "Managing Static Archives" in the *IBM Tealeaf cxImpact Administration Manual*.

When this option is enabled, the PCA captures image hits with the following content type associated with them:

```
Content-Type=image
```

Note:

- Other static content, such as Style sheets and JavaScripts, are in text formats that are automatically captured by the IBM Tealeaf CX Passive Capture Application.
  - When a TLI server is deployed, these objects are forwarded from the PCA to the Windows pipeline. In Windows pipeline, TLI session agent forwards them to the TLI server for appropriate storage. See "TLI Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
- If `Enable TLI` and `Delete Images on PCA Side` options are both enabled, then `Enable TLI` overrides and determines the capture behavior of the PCA. See “Delete Images on PCA Side” on page 115.
- To ensure the capture of image content throughout your Tealeaf environment, this setting must be consistently applied through the Pipeline tabs across all PCA instances.

When the hit is received by the Windows server, it examines the `TLIHit` value and, since it is set to `True`, forwards the hit to the TLI server for storage in the appropriate archive.

- Timestamp information is retained with the hit. It enables the TLI server to later serve the version of the image that was experienced by a visitor and recorded to match the visitor's session.
- Hits sent to the TLI server are not stored in the Canister. The session data is altered to reference the TLI server-based content, from which a single stored entity can be queried by multiple sessions. This method provides a significant storage cost savings.

This feature must be reviewed with the include and exclude file extensions list. If the feature is enabled AND:

- If the file extension is on the Included File Extensions list, then the PCA treats the hit as a standard capture type accepted by the PCA. The application captures the request and response and marks the image object with the following values for the TLI server:

  ```
  CaptureType=1
  TLIHit=False
  ```

- If the file extension is not on the Included File Extensions list, then the PCA captures the image object only. PCA marks it with the following properties for the TLI server:

  ```
  CaptureType=3
  TLIHit=True
  ```

- If the file extension is on the Excluded File Extensions list, then the PCA captures the image object only and marks it as mentioned in previous section..

  Note: When this feature is enabled, image objects are always captured, regardless of whether the object is included or excluded on the file extensions list.

- If the file extension is displayed on the Included File Extensions list, the hit is treated normally by the PCA. See “Included File Extensions” on page 121.
- See “Excluded File Extensions” on page 121.

Capture Type Lists

By default, the PCA is configured to capture data types that are interesting for most web applications. Particularly for rich internet applications, custom data types and file extensions can be present in the capture stream.

- Additionally, the PCA automatically inflates POSTs with some content encoding types and can be configured to inflate other types. See “Capture All Content-Encoding Types” on page 122.

  Note: Whenever you upgrade your PCA, you must review the all capture type lists to verify that all required data types are being captured and processed appropriately.

Note: For all web applications, the set of PCA capture types must be reviewed so that all meaningful data is captured and processed by Tealeaf. Data that is not defined to be captured by the IBM Tealeaf CX Passive Capture Application is dropped in and results dropped hits that are displayed in session data.

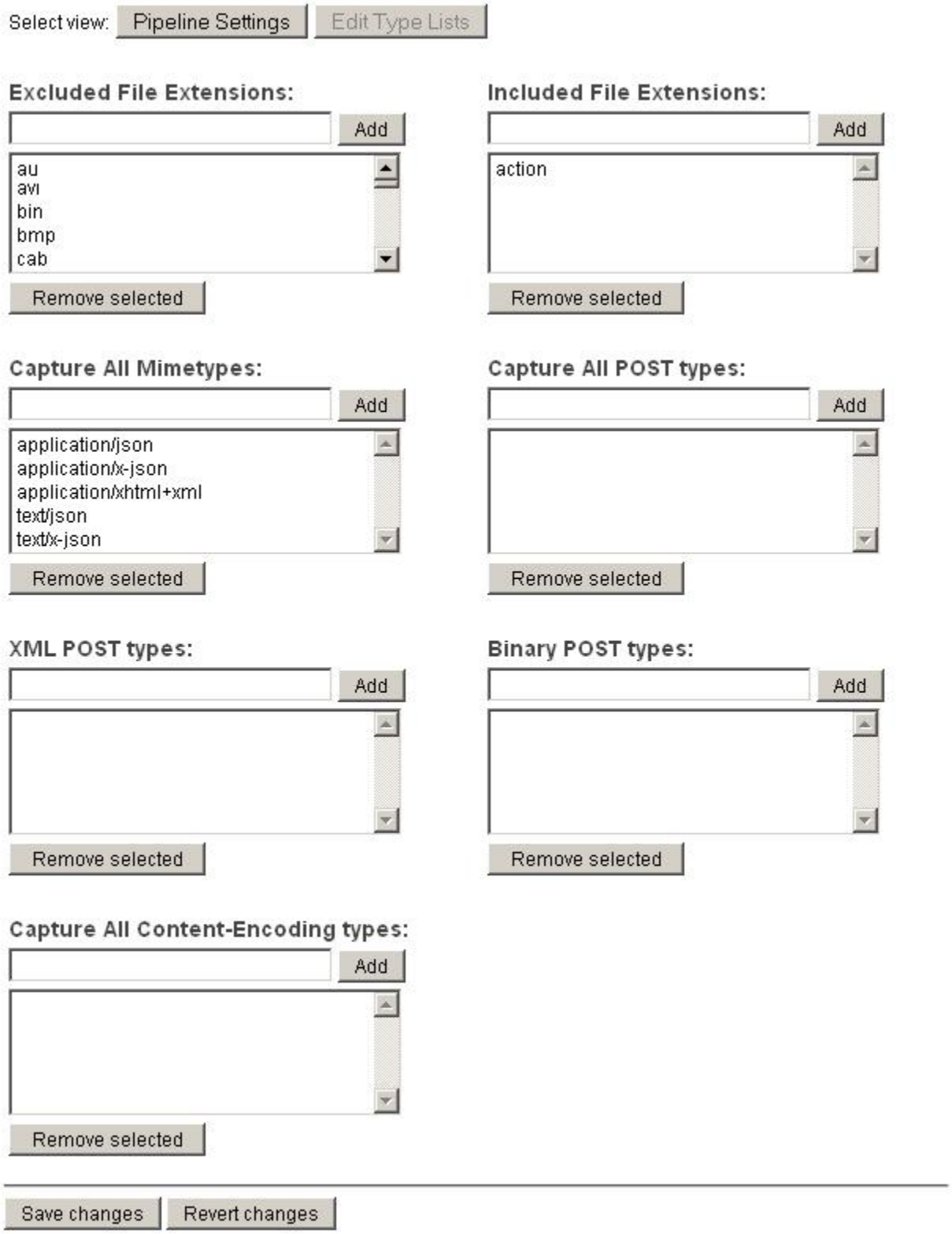


Figure 30. Capture Type Lists

In the Capture Type Lists sections, you can configure inclusions and exclusions that are applied to requests and responses. For example, if you remove the `text/json` content type from the XML POST panel, the content type is still captured as part of the internal default captured content types, but the content is no longer inserted into the `[xml1]` section. See "JSON Examples" on page 120.

Note: After you add new content types for capture, you must also add them through TMS if you want to index the HTTPS responses of the captured type. See "Configuring CX Indexing" in the *IBM Tealeaf CX Configuration Manual*.

How the PCA evaluates capture types

About this task

When hits are identified in the **Pipeline** tab, the PCA performs the evaluation of the hit in the following order to determine if it must be captured:

Procedure

1. Request:
   a) Checks Request for content encoding type. If the type matches the specified set of types to inflate, the request is inflated for processing. See "Capture All Content-Encoding Types" on page 122.
   b) Checks Request for the following internally known content types. See "Default Captured Content Types" on page 121.
   c) Set the request content and body types:
      1) Checks the XML POST Type list for POSTs of XML type to capture. See "XML POST Types" on page 122.
      2) Checks the Binary POST Type list for POSTs of binary type to capture. See "Binary POST Types" on page 122.
   d) Check file extension types list for included and excluded types:
      - See "Included File Extensions" on page 121.
      - See "Excluded File Extensions" on page 121.
2. Response:
   a) Check the following content types lists for values:
      - "Capture All POST Types" on page 122
      - "Binary POST Types" on page 122
      - "Capture All Mimetypes" on page 121
   b) If no values are found in the lists, the PCA checks its internal default list for response types. See "Internal default response types" on page 121.
   c) If there are values in the lists, check the following lists in the order that is mentioned .
3. Request Body: If the Request and Response pass the previous tests to be included, then the Request body is processed.
   a) If Request content type is defined in one of the previous, then the PCA processes its type accordingly.
   b) If the content type for the request body is still unknown after the previous checks, it checks the Capture All Post Types list.
      1) If the content type is found in list, the PCA then processes the body as text in `[RequestBody]` section of the generated request.
      2) See "Capture All POST Types" on page 122.

JSON Examples

JSON is an emerging standard in use in many web applications. Some Tealeaf modules, such as the Tealeaf Logging Frameworks of IBM Tealeaf CX Mobile, use JSON POSTs for submitting data from the client to Tealeaf for capture. The following example content types can be displayed in Tealeaf- or application-sourced data.

Request Type
PCA Content Type Evaluation

`text/json`
Request is considered a known text content type. When the request body processing is complete, it is a known content type and is processed accordingly.

`application/json`
If the request content type is `application/json` and is not defined in the Capture All POST types list, then it is an unknown type for the PCA. No processing of the request body is performed, and the hit is dropped.

`application/json`
If the request content type is `application/json` and is defined in the Capture All POST types list, then it is a known type for the PCA. If it is not listed on the XML or Binary type lists, it is considered a text type and is processed as text.

For more information about the Tealeaf JSON schema, which is used to capture content from Tealeaf client frameworks, see "Tealeaf JSON Object Schema Reference" in the *IBM Tealeaf Client Framework Data Integration Guide*.

Default Captured Content Types

By default, PCA captures the following content types.

Note: These content types are internal defaults of the PCA and require no configuration to capture.

Internal default request types

- `application/x-www-form-urlencoded`
- `application/xml`
- `multipart/form-data`
- `text/*`
- `text/xml`

Internal default response types

Note: This list applies to response content types. Request content types are evaluated as per the order defined. See “How the PCA evaluates capture types” on page 120.

- `text/*`
- `application/text/*`

Excluded File Extensions

Specifies the files extensions to exclude from the captured DataStream. This setting can be used to refine the behavior that is specified by CaptureMode.

Note: By default, the PCA does not capture JavaScript files. If your web application is generating dynamic JavaScript files, those files must be manually added to the set of captured types, if you want to capture them.

Included File Extensions

Specifies files extensions that are fully captured. Binary files such as PDFs can be included in capture.

Note: If you deploy a TLI server to capture static content, you must insert the file extensions of the static content types in this area to capture them for insertion into the TLI server. See "Managing Static Archives" in the *IBM Tealeaf cxImpact Administration Manual*.

Capture All Mimetypes

Specifies response content types (MIME types) for which to capture a full hit.

Capture All POST Types

Specifies content types in the request data that is not part of the standard XML or form data.

XML POST Types

In this section, you can specify the types of XML posts to add to the request. When specified XML content type is matched, the `[xml1]` section is added to the request buffer, and the content is inserted in it.

Note: New installations of the PCA from Build 3324 are automatically configured to capture the XML post types that are listed. These XML post types were added in PCA Build 3324. If you are using an earlier build or upgraded from an earlier build, you must manually configure these capture types.

By default, some content types are automatically checked and captured. They do not must be added. See “Default Captured Content Types” on page 121.

Depending on the type of JSON toolkit, the following content types can be displayed in the capture stream. If present, these types must be added.

- `application/x-javascript`
- `text/javascript`
- `text/x-javascript`
- `text/x-json`

Binary POST Types

The PCA can be configured to capture binary POST types. For example, AMF-based applications submit binary requests to the web server. To capture AMF-based request data, add the type `application/x-amf` to this list.

- By default, the PCA does not capture binary responses.
- Decoding of AMF data must be enabled in the Windows pipeline. See "Inflate Session Agent" in the *IBM Tealeaf CX Configuration Manual*.

When the `application/x-tlt-ld` is enabled for capture, the requests of all captured hits of this type have the following request variable that is inserted into the `[env]` section:

```
PostRequestBodyEncoding=Base64
```

For other hits, this value is set to `None`.

Note: In Release 8.4 or later, capture of the `application/x-tlt-d` binary post type can be deprecated. See .

Capture All Content-Encoding Types

In PCA Build 3502 and later, you can specify the content encoding types through text box whose requests are inflated during the capture process.

Note: In PCA Build 3502 and later, the following content encoding types are automatically inflated and do not must be specified here:

- `*/deflate`
- `*/gzip`
- `*/x-gzip`

When a request received by the PCA matches one of the specified encoding types, the PCA automatically inflates or extracts the request.

The following table describes behaviors:

Table 12. Capture All Content-Encoding Types				
In other capture type lists for capture?	**In Capture All Content-Encoding Types?**	**Captured?**	**Inflated?**	**Notes**
Y	Y	Y	Y	`*/deflate`, `*/gzip`, and `*/x-gzip` are automatically inflated.
N	Y	N	N	dropped
Y	N	Y	N*	captured; not inflated (* unless one of the content-encoding types that are inflated by default)
N	N	N	N	dropped

Content Types and Indexing

After PCA captures content, the request and response of each hit is forwarded to a Canister for more processing, including indexing the content for search.

- Request: Specific sections of the request are automatically indexed for search. See "Configuring CX Indexing" in the *IBM Tealeaf CX Configuration Manual*.
  - You can configure privacy rules to move content from one section of the request to another section that is automatically indexed. It is recommended that you apply these privacy rules in the Canister. See "Privacy Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
- Response: Optionally, you can add individual HTTP response types for indexing. See "Configuring CX Indexing" in the *IBM Tealeaf CX Configuration Manual*.

Downloading Privacy Configuration

If needed, you can download the privacy configuration file `privacy.cfg` for offline editing and archiving from the Backups/Logs tab.

Note: `privacy.cfg` must be formatted in a UTF-8 compatible format.

In the **Backups/Logs** tab, there are two locations:

Note: The PCA Web Console does retain up to five previous versions of `privacy.cfg`. See “Privacy changes” on page 138.

- In the **Privacy Configuration File** section, click **Download Selected**.
- In the**Logs** section, click the **configuration files** link.
- See “PCA Web Console - Backup-Logs Tab” on page 155.

Rule Manipulation

Command
Description

`Insert Rule 1`
Inserts a new rule that is applied first and loads the Edit rule page.

`Enable/Disable`
Toggles the rule in that row to either enabled (active) or disabled.

Delete
Deletes the rule in that row from the session. Changes must be saved for the `privacy.cfg` file to be changed.

Edit
Loads the **Edit** page for that rule.

Insert Below
Inserts a new rule below this row and loads the **Edit Rule** page.

arrows
Moves the rule up or down, depending on the arrow clicked. Rules are applied in order and must be changed. Changes that are made by clicking the arrows are made in the session. To save any changes, click **Save Changes**.

Test Manipulation

Command
Description

Add
Loads the **Add Test** page.

Edit
Loads the **Edit** page for that test.

Action Manipulation

Command
Description

Add
Loads the **Add Action** page.

Delete/In Use
If the action can be deleted, a Delete link is available in the Actions to Take column.

- If the action is flagged as in use, then a rule is referencing the action and it cannot be deleted. To delete an in-use action, all references to it must be removed from all rules. You can see which actions are being used in the Actions to Take column in the Rules table.

Edit
Loads the **Edit** page for that Action.

Key Manipulation

Command
Description

Add
Loads the **Add Key** page.

Delete
Deletes the key.

Edit
Loads the **Edit** page for that Key.

Adding a key is optional and can be used to explicitly define privacy keys along with their (encrypted) value. This is normally only used when the Privacy Filter is running on a machine other than the IBM Tealeaf CX server (on a Web server, for example) where the defined privacy keys are not directly accessible. Entries in this section should be in the following format:

```
keyID=keydata
```

where:

- keyID is the name (ID) of the key
- keydata is the encrypted key value string

Add/Edit Rules

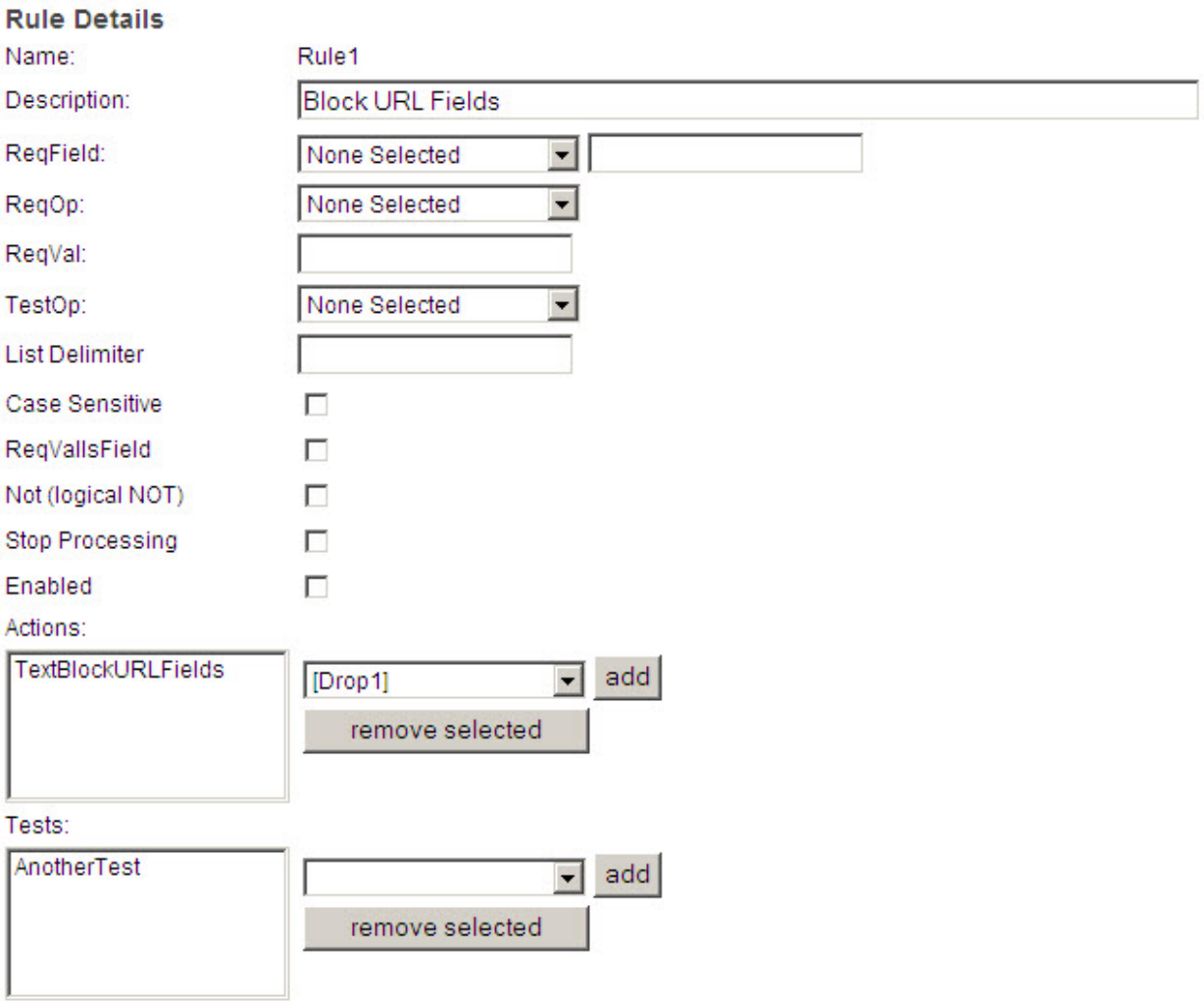


Figure 31. Add/Edit Rules page

To define a single condition (test), you can specify ReqField, ReqOp, and ReqVal in a Rule. For more complex conditions, use the Tests option and define the test conditions separately.

Setting
Description

Name
Name of the rule

Description
User-readable description of the rule, which also displayed in `privacy.cfg`.

ReqField
This option specifies the name of a field, the name portion of a name-value pair, in the request file. The value of this field is used for comparison. You can also apply one of following special field names:

- TL_URLEXT - The file extension portion of the URL
- TL_URLTAIL - The tail of the URL, which includes the last / in the URL and everything that is following it
- TL_VIRTUALDIR - The virtual directory portion of the URL

ReqOp

ReqOp defines the comparison operation that is performed by this rule between ReqField and ReqVal. Following are the valid values for this option:

- EQ or = - True if the field value equals ReqVal. String comparison is case-insensitive
- NE or != - True if the field value does not equal ReqVal. String comparison is case-insensitive
- GT or > - True if the field value is greater than ReqVal
- LT or < - True if the field value is less than ReqVal
- CONTAINS - True if ReqVal is contained in the field value
- PARTOF - True if the field value is part of (contained in) ReqVal
- PARTOFLIST - True if the field value matches one of the values in ReqVal.
  - The list of values in ReqVal can be delimited by semicolons or other delimiter specified by the ListDelimiter property.

ReqVal

Literal value or field name (set ReqValIsField=True for field name). When ReqOp=PARTOFLIST, this setting must specify a list of values that are separated either by a semicolon or another delimiter (specified by using ListDelimiter).

- If ReqField is set to TL_URLEXT, this field contains the extensions that are including periods.

TestOp

Logical operator to use when multiple tests are specified. Possible values are AND and OR. If no value is specified, AND is applied as the default value.

- When TestOp=AND, all tests must return True for the actions to be processed.
- If TestOp=OR, the actions are processed if any of the tests return True.

List Delimiter

The character used to separate list items in ReqVal when using the ReqOp=PARTOFLIST. The default is a semicolon (;).

Case Sensitive

True or False value that is indicating whether the searches for field names must be case-sensitive. Default is False. Setting this to True speeds up searches.

ReqValIsField

True or False indicating whether ReqVal contains a field name.

Not

True or False value. If True, then the result of the test evaluation is inverted (logical NOT).

Stop Processing

True or False value that is indicating whether to stop processing further rules if this rule evaluates to True.

Enabled

True or False Value which specifies whether this rule is active.

Actions

One or more action names which correspond to the names of action sections to process if this rule returns True.

Tests

One or more test names which correspond to the names of test sections. The specified tests are evaluated to determine whether the actions is ran for the rule. If no test is specified (and no embedded test specified as described below), then the actions are run for every hit.

Add/Edit Tests

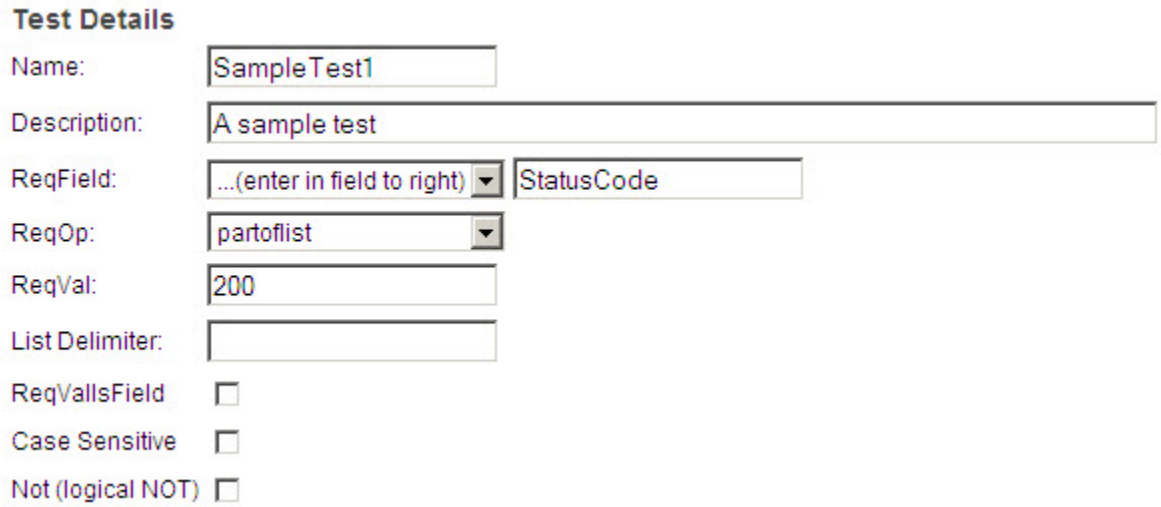


Figure 32. Add/Edit Test page

Setting
Description

`Name`
The name of the test.

`Description`
User-readable description of the test, which also appears in `privacy.cfg`.

`ReqField`
Name portion of a name/value pair. This may also be one of the following reserved names:

- `TL_URLEXT`
- `TL_URLTAIL`
- `TL_VIRTUALDIR`

`ReqOp`
Operation to perform - options are:

- `EQ` or =
- `NE` or != or <>
- `GT` or >
- `LT` or <
- `CONTAINS`
- `PARTOF`
- `PARTOFLIST`

`ReqVal`
Literal value or field name (set `ReqValIsField=True` for field name). When `ReqOp=PARTOFLIST`, this value should specify a list of values separated either by a semicolon or another delimiter (specified using `ListDelimiter`).

`ListDelimiter`
The character used to separate list items in `ReqVal` when using `ReqOp=PARTOFLIST`. The default is a semicolon (`;`).

`ReqValIsField`
`True` or `False` indicating whether `ReqVal` contains a field name.

CaseSensitive
`True` or `False` value indicating whether the searches for field names should be case-sensitive. Default is `False`. Setting this to `True` speeds up searches.

Not
`True` or `False` value. If `True`, then the result of the test evaluation is inverted (logical NOT).

Add/Edit Actions

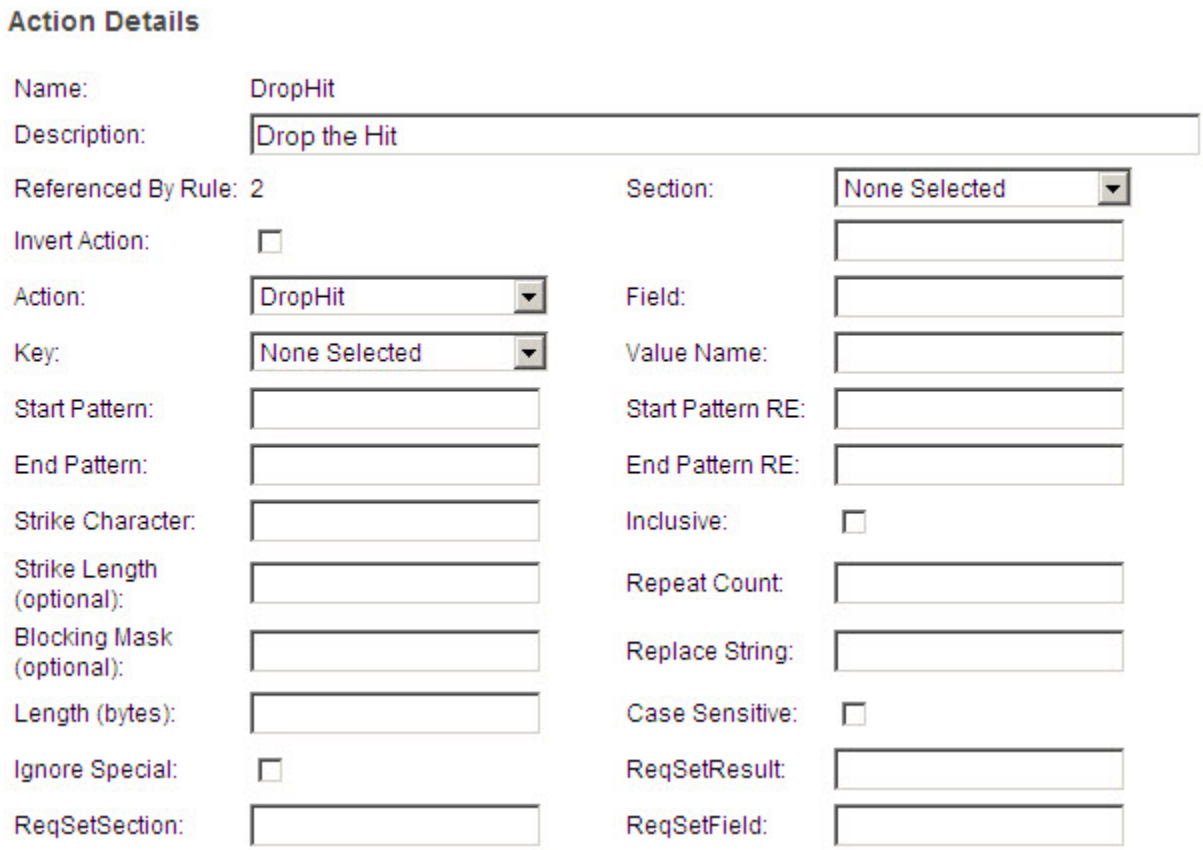


Figure 33. Add/Edit Action page

At the top of the **Action Details** page, you can review the name of the action and the rules in which it is referenced, as well as the currently configured properties.

Setting
Description

Name
The name of the action.

Description
User-readable description of the action, which also displayed in `privacy.cfg`.

Invert Action
`True` or `False` value that is indicating whether to invert the action (perform the action on all fields or Value Names EXCEPT the ones specified).

- If Value Name is specified, then all except the name(s) specified in Value Name are processed.
- If Value Name is not specified, then the name(s) specified for Field is/are excepted from the action.

  Note: This can only be used with `Block`, `Encrypt`, and `Replace` actions.
  `Start Pattern` and `Start Pattern RE` cannot be used with an Invert action.

Action
The action to take. This can be one of the following value:

- `Block` - Blocks the matched data using the specified strike character.
- `Encrypt` - Encrypts the matched data and masks it with the specified strike character.
- `Replace` - Replaces the matched data with a specified text string.
- `DropHit` - Drops the current hit (no further action is taken).
- `DropResponse` - Drops the response from the current hit.
- `ReqSet` - Sets or replaces the value for the specified name/value pair in the request. Creates the name/value pair if it doesn't exist. Also creates the specified section if is doesn't exist.
- ReqAppend - Appends to the value of the specified name/value pair in the request. Creates the name/value pair if it doesn't exist. Also creates the specified section if it doesn't exist.
- `ReqDelete` - Removes the specified name/value pair completely from the request. This does not remove the section, even if empty.

Key
key ID to use for encryption if `Action=Encrypt`.

Section
The section name of the data to act upon. If this is set to `response`, then the response is processed. This can also be one of the following reserved names:

- `urlfield` - Performs the action for the specified Value Name(s) (or all if Value Name is omitted) for values in the urlfield section, QUERY_STRING, query string in RawRequest (if present) and the query string in HTTP_REFERER and the Referer request header and request body in RawRequest (if present).
- `cookies` - Performs the action for the specified Value Name(s) (or all if Value Name is omitted) for values in the `[cookies]` section, HTTP_COOKIE and HTTP_SET_COOKIE name-value pairs, Set-Cookies headers in the ResponseHeader section (if present), Set-Cookie headers in the response, and the `[cookies]` header in the RawRequest section (if present).

  Note: If a Section is not specified in an action, then the entire request buffer (REQ) is used.

Field
One or more optional field names (name portion of the name-value pair). If both `Field` and `Value Name` are omitted, then the entire section is blocked/encrypted. This can also be one of the following reserved names:

- body - If `Section=response`. then this specifies the response body as the target. If `Section=RawRequest`. then the request body (if present) is processed.

Value Name
One or more names of values (in multi-value name-value pairs, such as HTTP_COOKIE) or the names of items when `Section=urlfield` or `Section=cookies`.

Start Pattern
The starting string pattern to search for within the specified data. The data immediately following the matching pattern is processed. If `Start Pattern` is used, then you must also specify either `End Pattern` or `Strike Length`, unless you set `Inclusive=True`. If set, then the `Start Pattern` and optional `End Pattern` are blocked/encrypted as well. This is useful for blocking or encrypting a constant data string.

Start Pattern RE
Regular expression version of `Start Pattern`. This can be used to specify a standard regular expression to define the starting pattern to find. You can use either `Start Pattern` or `Start Pattern RE`, but not both.

End Pattern
The string pattern which signals the end of the data that is matched by a `Start Pattern`. The data up to, but not including, the `End Pattern` is processed (unless `Inclusive=True`).

End Pattern RE
Regular expression version of End Pattern. This can be used to specify a standard regular expression to define the ending pattern to find. You can use either End Pattern or End Pattern RE, but not both.

Strike Character
The character that is used to replace the original data that is blocked or encrypted. This can be any alphanumeric character or symbol not included in the following list:

- . (period)
- , (comma)
- / (forward slash)
- \ (backslash)
- [(left square bracket)
-] (right square bracket)
- | (pipe)
- ' (single quote)
- " (double quote)

Strike Length
Optional length (in bytes) of strike data. This is the number of Strike Character characters that are used to replace the original data (if Action=Block or Action=Encrypt).

- If Strike Length is longer than the original data length, then more strike characters are added.
- If Strike Length is shorter than the original data length, then Strike Length characters are replaced with the Strike Character and the remaining data is removed.
- If Strike Length is a negative number, then the number of characters represented by the absolute value of Strike Length is left as-is. For example, to leave the last four characters or a value untouched, set Strike Length=-4. (see Blocking Mask for more flexible blocking options.)

Inclusive
True or False value that is indicating whether the Start Pattern (or Start Pattern RE) and (optional) End Pattern (or End Pattern RE) are blocked or encrypted. Default is False.

Repeat Count
This can be used for actions that have a Start Pattern or Start Pattern RE to specify how many instances of data that is matching the pattern are processed.

Blocking Mask
An optional regular expression that specifies which characters in the found data are replaced with the strike character (does not apply to Replace action). All character within a group (defined by parentheses) in the regular expression is replaced with the strike character.

- Characters that match part of the pattern outside of a group are not replaced. For example, the following mask would block just the numbers in a Social Security Number, leaving the dashes visible:

```
BlockingMask=([0-9]{3})-([0-9]{2})-([0-9]{4})
```

This example would leave the first four digits of a credit card number visible:

```
BlockingMask=[0-9]{4}([0-9]*)
```

Blocking Mask is used in lieu of Strike Length. You can use one or the other, but not both.

Note: Be careful when you use Blocking Mask. If the data does not match the regular expression that is specified for Blocking Mask, then the data is not blocked or encrypted.

Replace String
The string that is used to replace the original data when Action=Replace.

Length (bytes)
Used in lieu of an End Pattern or End Pattern RE, this value specifies the length of the data (in bytes) to process following a matched Start Pattern (or Start Pattern RE).

Case Sensitive
True or False value that is indicating whether the searches for field names and/or patterns must be case-sensitive. Default is False. Setting this to True speeds up searches.

Ignore Special
True or False value that is indicating whether to ignore special handling when urlfield or cookies is specified for the Section. Setting to True allows Start Pattern or Start Pattern RE to be used in the urlfield or cookies sections. Default is False.

ReqSetSection
Specifies the section for the name-value pair for a ReqSet, ReqAppend, or ReqDelete action. ReqSetSection is required for these three actions.

ReqSetField
Specifies the name of a name-value pair for a ReqSet, ReqAppend, or ReqDelete action. ReqSetField is required for these three actions.

ReqSetResult
This option is used with Start Pattern RE to produce a formatted value for a ReqSet or ReqAppend action. The Start Pattern RE expression must contain one or more "groups", defined by parentheses within the regular expression. ReqSetResult is a string that is containing literal text and placeholders for the data that is captured by Start Pattern RE. For example:

```
StartPatternRE=name="(.*?)" value="(.*?)"
ReqSetResult=Field
{g1} value: {g2}
```

The code might give following result:

```
Field name value: Bob
```

The first placeholder, {g1}, is replaced with the value from the first group in the regular expression. {g2} gets the second value, and so on. The result string is then used as the value for the ReqSet or ReqAppend action.

Add/Edit Keys

Privacy keys can be generated within Tealeaf for use in the encryption and decryption of sensitive data as needed throughout the system. Encryption and decryption is managed by the Privacy Filter, which is available in the PCA and in the Windows pipeline.

- For more information about pipeline privacy, see "Extended Privacy Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
- For more information about pipeline rules creation, see "Privacy Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
- For a general overview of how Tealeaf manages privacy, see "Managing Data Privacy in Tealeaf CX" in the *IBM Tealeaf CX Installation Manual*.

Privacy keys that are used for encryption and decryption of sensitive data for use throughout Tealeaf must be added to the PCA Web Console.

Note: Any encryption key that is used by the PCA to encrypt and by Search Server to decrypt must be defined in Search Server configuration and provided to the PCA. For more information about defining these keys, see "Configuring the Search Server" in the *IBM Tealeaf CX Configuration Manual*.

You can add privacy keys for the PCA to use during encryption operations by the Privacy filter in the PCA. To make a privacy key available for PCA use, enter the key name and the generated key in this section.

- You can copy a key value that is generated from Search Server configuration and paste it into the listed **Key Details** fields.

Setting
Description

Name
Name of the key.

Key
The key itself.

Privacy.cfg Reference

About this task

This section provides a reference overview of the Privacy.cfg file, which is used to configure privacy rules that are applied to the capture stream in the IBM Tealeaf CX Passive Capture Application.

Note: Avoid making direct changes to this configuration file. It is recommended that you change your privacy configuration through the **Rules** tab in the web console, which provides a user interface onto this configuration file. For more information, see "Supported Browsers for PCA Web Console" on page 65.

Privacy enables the removal or encryption of sensitive information in the capture stream. Privacy can be applied at the following points during the capture and processing of session data.

Procedure

1. UI Capture
2. PCA
3. Windows Pipeline
   see "Managing Data Privacy in Tealeaf CX" in the *IBM Tealeaf CX Installation Manual*.

Results

You can use the Windows-based privacy tester utility to develop and test your privacy rules. Tested rules can then be pasted back into this configuration file for application to the PCA.

- See "Privacy Tester Utility" in the *IBM Tealeaf CX Configuration Manual*.

Additional documentation is provided in the notes in the Privacy.cfg configuration file. This file is in the /usr/local/ctccap/etc directory. It can be edited with the vi editor.

Rules

Property
Description

Enabled
True or False value which specifies whether this rule is active.

Tests
One or more test names which correspond to the names of test sections. The specified tests are evaluated to determine whether the actions is run for the rule. If no test is specified (and no embedded test specified as described below), then the actions are run for every hit.

TestOp
Logical operator to use when multiple tests are specified. Possible values are AND and OR.

- If TestOp=AND, then all tests must return True for the actions to be processed.
- If TestOp=OR, then the actions are processed if any of the tests return True.

Not
True or False value. If True, then the result of the test evaluation is inverted (logical NOT).

StopProcessing
True or False value that is indicating whether to stop processing further rules if this rule evaluates to True.

Actions
One or more action names which correspond to the names of action sections to process if this rule returns True.

ReqField
Name portion of a name-value pair. This can also be one of the following reserved names:

- TL_URLEXT
- TL_URLTAIL
- TL_VIRTUALDIR

ReqOp
Operation to perform - options are:

- EQ or =
- NE or != or <>
- GT or >
- LT or <
- CONTAINS
- PARTOF
- PARTOFLIST

ReqVal
Literal value or field name (set ReqValIsField=True for field name). When ReqOp=PARTOFLIST, this value must specify a list of values separated either by a semicolon or another delimiter (specified using ListDelimiter).

ReqValIsField
True or False indicating whether ReqVal contains a fieldname.

ListDelimiter
The character that is used to separate list items in ReqVal when you use ReqOp=PARTOFLIST. The default is a semicolon, ;.

CaseSensitive
True or False value indicating whether the searches for field names must be case-sensitive. Default is False. Setting this to True speeds up searches.

Tests

Property
Description

ReqField
Name portion of a name-value pair. This can also be one of the following reserved names:

- TL_URLEXT
- TL_URLTAIL
- TL_VIRTUALDIR

ReqOp
Operation to perform - options are:

- EQ or =
- NE or != or <>

- GT or >
- LT or <
- CONTAINS
- PARTOF
- PARTOFLIST

ReqVal
Literal value or field name (set ReqValIsField=True for field name). If ReqOp=PARTOFLIST, this value must specify a list of values that are separated either by a semicolon or another delimiter (specified by using ListDelimiter).

ReqValIsField
True or False indicating whether ReqVal contains a field name.

ListDelimiter
The character that is used to separate list items in ReqVal when ReqOp=PARTOFLIST. The default is a semicolon, ;.

CaseSensitive
True or False value that is indicating whether the searches for field names must be case-sensitive. Default is False. Setting this to True speeds up searches.

Not
True or False value. If set to True, then the result of the test evaluation is inverted (logical NOT).

Actions

Property
Description

Action
The action to take. Following are the values :

- Block - Blocks the matched data using the specified strike character.
- Encrypt - Encrypts the matched data and masks it with the specified strike character.
- Replace - Replaces the matched data with a specified text string.
- DropHit - Drops the current hit (no further action is taken). Any rule may have a drop hit action.
- DropResponse - Drops the response from the current hit.
- ReqSet - Sets or replaces the value for the specified name/value pair in the request. Creates the name/value pair if it doesn't exist. Also creates the specified section if is doesn't exist.
- ReqAppend - Appends to the value of the specified name/value pair in the request. Creates the name/value pair if it doesn't exist. Also creates the specified section if it doesn't exist.
- ReqDelete - Removes the specified name/value pair completely from the request. This does not remove the section, even if empty.

Key
key ID to use for encryption if Action=Encrypt.

Group
Group name (in the format domain\groupname) to use for encryption if Action=Encrypt.

Note: Use either Key or Group to specify the encryption key, not both.

Section
The section name of the data to act upon. If this is value that is set to response, then the response is processed. This can also be one of the following reserved names:

- urlfield - Performs the action for the specified ValueName (or all if ValueName is omitted) for values in the urlfield section, QUERY_STRING, query string in RawRequest (if present) and the query string in HTTP_REFERER and the Referer request header and request body in RawRequest (if present).

- `cookies` - Performs the action for the specified ValueName (or all if ValueName is omitted) for values in the `[cookies]` section, HTTP_COOKIE and HTTP_SET_COOKIE name-value pairs, Set-Cookies headers in the ResponseHeader section (if present), Set-Cookie headers in the response, and the `[cookies]` header in the RawRequest section (if present).

  Note: If a Section is not specified in an action, then the entire request buffer (REQ) is used.

`IgnoreSpecial`
`True` or `False` value that is indicating whether to ignore special handling when `urlfield` or `cookies` is specified for the Section. Setting this to `True` allows `StartPattern` or `StartPatternRE` to be used in the `urlfield` or `cookies` sections. Default is `False`.

`Field`
One or more optional field names (name portion of the name-value pair). If both Field and ValueName are omitted, then the entire section is blocked/encrypted. This can also be one of the following reserved names:

- body - If `Section=response` then, this value specifies the response body as the target. If `Section=RawRequest`, then the request body (if present) is processed.

`ValueName`
One or more names of values (in multi-value name-value pairs, such as HTTP_COOKIE) or the names of items when `Section=urlfield` or `Section=cookies`.

`Invert`
`True` or `False` value that is indicating whether to invert the action (perform on all fields or ValueNames EXCEPT the ones specified).

- If `ValueName` is specified, then all except the name(s) specified in `ValueName` are processed.
- If `ValueName` is not specified, then the name(s) specified for `Field` is/are excepted from the action.

  Note: This can only be used with `Block`, `Encrypt`, and `Replace` actions. `StartPattern` and `StartPatternRE` cannot be used with an invert action.

`StartPattern`
The starting string pattern to search for within the specified data. The data immediately following the matching pattern is processed. If `StartPattern` is used, then you must also specify either `EndPattern` or Length, unless you set Inclusive to `True`. When `Inclusive=True`, the `StartPattern` (and optional `EndPattern`) are blocked/encrypted as well. This is useful for blocking or encrypting a constant data string.

`StartPatternRE`
Regular expression version of StartPattern. This can be used to specify a standard regular expression to define the starting pattern to find. You can use either `StartPattern` or `StartPatternRE`, but not both.

`EndPattern`
The string pattern which signals the end of the data that is matched by a StartPattern. The data up to, but not including, the `EndPattern` is processed (unless `Inclusive=True`).

`EndPatternRE`
Regular expression version of `EndPattern`. This can be used to specify a standard regular expression to define the ending pattern to find. You can use either `EndPattern` or `EndPatternRE`, but not both.

`Length`
Used in lieu of an `EndPattern` or `EndPatternRE`, this value specifies the length of the data (in bytes) to process following a matched `StartPattern` (or `StartPatternRE`).

`Inclusive`
`True` or `False` value that is indicating whether the `StartPattern` (or `StartPatternRE`) and (optional) `EndPattern` (or `EndPatternRE`) are blocked or encrypted. Default is `False`.

`RepeatCount`
This can be used for actions that have a `StartPattern` or `StartPatternRE` to specify how many instances of data that is matching the pattern is processed.

ReplaceString
The string that is used to replace the original data when `Action=Replace`.

CaseSensitive
`True` or `False` value that is indicating whether the searches for field names and/or patterns must be case-sensitive. Default is `False`. Setting this to `True` speeds up searches.

StrikeChar
The character that is used to replace the original data that is blocked or encrypted. This can be any alphanumeric character or symbol not included in the following list:

- . (period)
- , (comma)
- / (forward slash)
- \ (backslash)
- [(left square bracket)
-] (right square bracket)
- | (pipe)
- '(single quotation mark)
- " (double quotation mark)

StrikeLen
Optional length (in bytes) of strike data. This is the number of StrikeChar characters that are used to replace the original data (if `Action=Block` or `Action=Encrypt`).

- If `StrikeLen` is longer than the original data length, then more strike characters are added.
- If `StrikeLen` is shorter than the original data length, then `StrikeLen` characters are replaced with the `StrikeChar` and the remaining data is removed.
- If `StrikeLen` is a negative number, then the number of characters represented by the absolute value of `StrikeLen` is left as-is. For example, to leave the last four characters or a value untouched, set `StrikeLen=-4`.
- For more flexible options, see BlockingMask.

BlockingMask
An optional regular expression that specifies which characters in the found data are replaced with the strike character (does not apply to Replace action). All characters within a group (defined by parentheses) in the regular expression are replaced with the strike character. Characters that match part of the pattern outside of a group are not replaced. Examples:
The following mask would block just the numbers in a Social Security Number, leaving the dashes visible:

```
BlockingMask=([0-9]{3})-([0-9]{2})-([0-9]{4})
```

This example would leave the first four digits of a credit card number visible:

```
BlockingMask=[0-9]{4}([0-9]*)
```

BlockingMask is used in lieu of StrikeLen. You can use one or the other, but not both.

Note: Be careful when you use BlockingMask. If the data does not match the regular expression that is specified for BlockingMask, then the data is not blocked or encrypted.

ReqSetSection
Specifies the section for the name-value pair for a `ReqSet`, `ReqAppend`, or `ReqDelete` action. `ReqSetSection` is required for these three actions.

ReqSetField
Specifies the name of a name-value pair for a ReqSet, ReqAppend, or ReqDelete action. ReqSetField is required for these three actions.

ReqSetResult
This option is used in conjunction with StartPatternRE to produce a formatted value for a ReqSet or ReqAppend action. The StartPatternRE expression should contain one or more "groups", defined by parentheses within the regular expression. ReqSetResult is a string containing literal text and placeholders for the data captured by StartPatternRE. Examples:

```
StartPatternRE=name="(.*?)" value="(.*?)"
ReqSetResult=Field
{g1} value: {g2}
```

Would result in a following value like:

```
Field name value: Bob
```

The first placeholder, {g1}, is replaced with the value from the first group in the regular expression. {g2} gets the second value, and so on. The result string is then used as the value for the ReqSet or ReqAppend action.

Action notes

- For ReqSet and ReqAppend the value to set or append can be specified a couple different ways. You can either use a literal string by setting ReplaceString to the required text, or you can pull data from the request or response by using Section, Field, ValueName, StartPattern, StartPatternRE, EndPattern and/or EndPatternRE.
- When you useg StartPattern or StartPatternRE with one of these actions the RepeatCount is always set to 1 (the first match is always used).
- IgnoreSpecial is always True for these actions when Section is specified. There is no special handling for the urlfield or cookies sections with these actions.
- The value for a field (name/value pair) can be cleared without removing the entire field by using ReplaceString with no value:

```
ReplaceString=
```

- All carriage-returns and linefeeds in the value string are replaced with \r and \n.
- Privacy changes are queued and applied after all actions are complete. This means that actions normally see the original data. ReqSet, ReqAppend and ReqDelete keep track of field additions, changes, and deletions, so multiple changes to a single field (such adding a field then concatenating addition data to the value) can be done safely. Since the Replace action can affect any arbitrary piece of data in the request or response, it is not included in this change tracking. Changes that are made to field values are best done by using ReqSet and ReqAppend.
- When you use use Field or ValueName with ReqSet or ReqAppend you must specify a single field or value name. If there are multiple names the value for the last item that found is used.
- Similar to the note above, you must avoid specifying only a section to retrieve the value for a ReqSet or ReqAppend. Doing so results in the value from the last field (name/value pair) in the section that is used for the ReqSet or ReqAppend.

Logging Changes

Following section contains information about logging changes.

Privacy changes

When changes are made in the **Rules** tab that apply to `privacy.cfg`, a backup version of the old file is saved in the following format: `privacy.cfg.X`, where X is a version number.

- By default, a maximum of five versions are retained at any time.

Diff logging

In addition to logging privacy changes, differences in all web console changes are logged in the `conf_changelog.cfg` file.

Reference

- For general information about Tealeaf privacy, see "Managing Data Privacy in Tealeaf CX" in the *IBM Tealeaf CX Installation Manual*.
- For more information about privacy configuration, see "Privacy Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
  - Tealeaf provides a number of pre-configured privacy filters, which can be enabled and modified to meet the requirements of your web application. See "Pre-configured Filters" in the *IBM Tealeaf CX Configuration Manual*.
  - For more information about the enhanced version of the Windows session agent, see "Extended Privacy Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
- For more information about the privacy tester utility, see "Privacy Tester Utility" in the *IBM Tealeaf CX Configuration Manual*.

Stats per Instance

When you select a view that displays statistics across multiple instances, the data for each instance is displayed in a separate column: `ID#0`, `ID#1`, and so on.

- The number of displayed data columns indicates the number of configured instances of the IBM Tealeaf CX Passive Capture Application and the number of configured additional instances of the pipelined process.

Example

If you have three PCA instances and five pipeline instances, five data columns are displayed, which is the larger of the two sets of instances.

- The first three instances contain all specific information for both PCA and pipeline instances.
- The last two instances only contain information specific to the remaining two pipeline instances.

Example:
If you have six PCA instances and three pipeline instances, six data columns are displayed, of which only the first three instances contain pipeline-specific information, since there are only three pipelines.

Note: Multiple instances of the PCA pipeline process can be configured in PCA Build 3403 or later.

- For metrics about the performance of individual pipelines, see “Hits section” on page 147.
- For more information about configuring additional instances of the pipeline, see “PCA Web Console - Interface Tab” on page 84.

Checking on System Health through `stats.xml`

You can use the `stats.xml` output to monitor whether traffic is being received by the PCA and then delivered to the target recipients.

Table 13. Traffic:	
Setting	**Description and Expected Value**
<CaptureCurrentFilteredKbytesPerSec>	This value indicates the number of kilobytes per second of filtered data that is captured by the PCA. • If capture is working, this value must be positive.
<SslTotalDhCipherConnections>	This value indicates the total number of Diffie-Hellman SSL connections in use. **Note:** The IBM Tealeaf CX Passive Capture Application does not support the use of the Diffie-Hellman cipher. This value must be zero (0).

Table 14. Delivery:	
Setting	**Description and Expected Value**
<StateText>	This value indicates the state of the connection between the PCA and the target Windows server. • This value must be connected.
<TotalHitsQueued>	Total count of hits queued for delivery to IBM Tealeaf CX server. • This value must be equal to <TotalHitsDelivered>.

For more information about the available options for ctcstats at the command line, run the following as the ctccap user:

```
./ctcstats -h
```

Capture Software Processes

For more information about the processes of the PCA, see “Passive Capture Overview” on page 1.

Passive Capture Statistics

The following sections describe the Passive Capture statistics definitions.

Legend

- XML - XML node in stats.xml
- Console Display - Display value that is displayed in the Statistics tab of the PCA Web Console
  - In this column, a value of not available indicates that the statistic is not reported by default in the PCA Web Console.
- Description - A text description of the statistic.

General section

Table 15. General section		
XML	**Console Display**	**Description**
<CaptureVersion>	Capture version	The Passive Capture software build version number.
<CapturedPctCpu>	Captured CPU usage percent (high)	The current CPU usage for the process.
<CoreDumpCount>	Number of coredumps	Number of coredumps that occurred from any of the Passive Capture processes. This is a count of coredump files in the /usr/local/ctccap subdirectory.
<CpuLoadPct>	CPU load percentage	The total CPU load percentage reported by the system.
<InstanceCount>	Number of instances	Number of instances that arerunning (listend and reassd pairs).
<PeerCount>	Number of delivery peers	Number of Deliverd socket connections to Tealeaf processing servers.
<ProcessCount>	Number of processes	Total number of processes that make up the Passive Capture software, Apache server processes, and so on.
<ProcessClassCount	Number of process classes	Total number of Tealeaf specific processes that are grouped in classes.
<ReassdPctCpu>	Reassd CPU usage percent (high)	The highest CPU percentage usage as reported by the system within all Reassd processes. There can be multiple Reassd processes, but typically only one.

Time Section

Table 16. Time Section		
XML	**Console Display**	**Description**
<LastReset>	Last time statistics were reset	The time and date of when the statistics were cleared.
<LastResetSecondsUtc>	Last time statistics were reset in UTC seconds	The UTC seconds since the statistics were last cleared.
<LastResetUtc>	Last time statistics were reset in UTC	The time and date of when the statistics were cleared in Coordinated Universal Time.
<LastRestart>	Last time capture entered main loop	The time and date of when Captured restarted its child processes.
<LastRestartSecondsUtc>	Last time capture entered main loop in UTC seconds	The UTC seconds since Captured restarted its child processes.

Table 16. Time Section (continued)		
XML	**Console Display**	**Description**
<LastRestartUtc>	Last time capture entered main loop in UTC	The time and date of when Captured restarted its child processes in UTC.
<LocalTime>	Local time	The local time of the system.
<LocalTimeSecondsUtc>	Local time in UTC seconds	The local time of the system in UTC seconds.
<LocalTimeUtc>	Local time in UTC	The local time of the system in Coordinated Universal Time.
<NumSystemRestarts>	Number of times capture entered main loop	Total number of times Captured restarted its child processes since the Passive Capture software was started.
<TimeCpuUptime>	Time since last OS reboot (days, hours, minutes, seconds)	Elapsed time since the system OS rebooted.
<TimeCpuUptimeSeconds>	Seconds since last OS reboot	Elapsed number of seconds since the system OS rebooted.

Memory section

The following memory statistics are all interrelated and track each other.

Table 17. Memory section		
XML	**Console Display**	**Description**
<MemoryListendSize>	Listend size	The process current memory footprint as reported by the OS, in bytes. Typically this value must be under 20 MB.
<MemoryListendMaxSize>	Listend max size	The process max memory footprint size as reported by the OS, in bytes. This value fluctuates depending on various internal requirements. Typically, it tracks the current size with little deviation and is the high water mark indicator for it.
<MemoryListendMemoryIn_use>	Listend memory in use	The process current memory usage size, in bytes, based on its dynamically allocated memory requirements. This value grows, depending on its needs, to as much as 100 MB for internal packet buffers.
<MemoryListendMaxMemoryIn_use>	Listend max memory in use	The high water mark indicator for the above in use value.

Table 17. Memory section (continued)		
XML	**Console Display**	**Description**
<MemoryReassdSize>	Reassd size	The process current memory footprint size, in bytes, as reported by the OS. This value is the current memory that is allocated to it, including its footprint. It typically can range from a few megabytes to 1 GB or more.
<MemoryReassdMaxSize>	Reassd max size	The high water mark for the current memory size above.
<MemoryReassdMemoryIn_use>	Reassd memory in use	The process current memory usage size that is based on dynamically allocated memory demands from it. This value can also vary from a few megabytes to over 1 GB depending on its processing requirements for the current network traffic activity. There is no typical value, but it is usually less than 500 MB.
<MemoryReassdMaxMemoryIn_use>	Reassd max memory in use	The high water mark for the current memory size above.
<MemoryListendOutputBuffers>	Listend output buffers	Current memory used in output buffer, in bytes, for the listend process filtered packet traffic. This memory buffer is used to buffer traffic that is flowing from listend to reassdthrough its pipe. Reassd process pulls traffic packets as it is able to process them. The default size of this buffer is 100 MB.
<MemoryListendOutputBuffersMax>	Listend output buffers max	The high water mark for the above buffers size value.
<MemoryDeliveryQueue>	Delivery queue	Current hit delivery buffer size that is used, in bytes, to send hits through the socket to the IBM Tealeaf CX server.
<MemoryDeliveryQueueMax>	Delivery queue max	The high water mark for above queue size value.

Table 17. Memory section (continued)		
XML	**Console Display**	**Description**
<MemorySslSessionCacheEntries>	SSL session cache entries	The current number of SSL session entries that are stored in the cache table. The conf config setting determines what the max limit of entries that can be stored at a time. Typical default is 10,000 entries. • For more information on tuning the max limit setting, see SSL Total session cache misses stat below.
<CpuUsagePctHigh>	not available	CPU usage percent (high)
<CpuUsagePctTotal>	not available	CPU usage percent (total)
<Id>	not available	process ID in the context of PCA processes
<MemUsagePctHigh>	not available	Memory usage percent (high)
<MemUsagePctTotal>	not available	Memory usage percent (total)
<Name>	not available	name of the process
<ProcessCount>	not available	ProcessCount
<VirtualMemorySizeKbytesHigh>	not available	Virtual memory size (kbytes) high
<VirtualMemorySizeKbytesTotal>	not available	Virtual memory size (kbytes) total

TCP section

Table 18. TCP section		
XML	**Console Display**	**Description**
<TcpTotalPacketsRcvd>	Total packets rcvd	The count of TCP packets received by the TCP reassembler.
<TcpTotalPacketsRcvdPerSec>	Total packets rcvd per second	Rate of TCP packets received per second
<TcpTotalConnections>	Total connections	The count of new TCP connections that are formed by the TCP reassembler.
<TcpTotalConnectionsPerSec>	Total connections per second	Rate of new TCP connections that are formed per second
<TcpTotalClosedConnections>	Total closed connections	The count of TCP connections closed by the TCP reassembler
<TcpTotalRstConnections>	Total reset connections	The count of TCP connections that are reset. A high number of reset connections can indicate a connection issue.
<TcpSyn_waitConnections>	SYN/WAIT connections	Current® count of TCP connections that only received the first SYN handshake packet. This number must track with the "Current connections" value, under 50 percent, depending on network traffic activity. If the value consistently exceeds it by a large margin, there can be a problem with the span port traffic.
<TcpSyn_waitConnectionsMax>	SYN/WAIT connections max	The high water mark for above.
<TcpTotalSyn_waitConnectionsAged>	Total SYN/WAIT connections aged	Shows how many SYN/WAIT connections are deleted due to aging.

Table 18. TCP section (continued)

XML	Console Display	Description
<TcpTotalSyn_waitConnectionsDestroyed>	Total SYN/WAIT connections destroyed	Count of SYN/WAIT connections destroyed due to the max limit that is being reached. This occurs to allow room for new connections to be created. If this count rises rapidly within a short period (5 minutes), it can indicate that the default max limits are set too low for the volume of network traffic captured. Adjust the max limit to a higher value to minimize loss. A rapidly rising count can also indicate a problem with the network infrastructure not providing relatively complete network traffic.
<TcpTotalOutsyncSyn_waitConnections>	Total out-of-sync SYN/WAIT connections	Total count of connections where the SYN handshake packets, SYN1 and SYN2, are reversed. Received the SYN packet from server to client before the client to server SYN packet.
<TcpCurrentConnections>	Current connections	Current count of completed SYN handshake connections (connections established).
<TcpCurrentConnectionsMax>	Current connections max	The high water mark for above.
<TcpTotalCurrentConnectionsAged>	Total Current connections aged	Shows how many current connections are deleted because of aging.
<TcpTotalCurrentConnectionsDestroyed>	Total Current connections destroyed	Count of connections destroyed because of the max limit being reached. This occurs to allow room for new connections to be created. If this count rises rapidly within a short time (5 minutes), it can indicate that the default max limits are set too low for the volume of network traffic captured. Adjust the max limit to a higher value to minimize loss. A rapidly rising count can also indicate a problem with the network infrastructure not providing relatively complete network traffic.
<TcpTotalConnectionsReaped>	Total Connections reaped	Connections per second that cannot be decrypted because of a missing key
<TcpTime_waitConnections>	TIME_WAIT connections	Current count of connections that is in a closed/wait state but not closed, received the FIN packets.
<TcpTime_waitConnectionsMax>	TIME_WAIT connections max	The high water mark for above.
<TcpTotalOooConnectionsDeleted>	Total out-of-order connections deleted	Indicates how many out-of-order connection deletions are occurred. The count value of this statistic automatically resets when it exceeds 5,000,000.
<TcpTotalOooConnections>	Total out-of-order connections	Indicates how many total out of order packet connections are occurring. If this number is high or approaching the "Total connections" number, then the network infrastructure that is providing traffic to the Capture ports cannot be clean, and some hits cannot properly reassemble because of excessive packet reordering required. This can be CPU-intensive for the Capture process.
<TcpTotalRolloverConnections>	Total rollover connections	Total connections where the TCP sequence number is rolled over to 0
<TcpTotalMissingPktConnections>	Total missing packet connections	Total connections where a missing packet condition are detected
<TcpCurrentStreamingConnections>	Current streaming connections	Not implemented or used
<TcpTotalStreamingConnections>	Total streaming connections	Not implemented or used
<TcpTotalAckedButUnseenPackets>	Total ACKed but unseen packets	A count of TCP ACK packets that were received but did not have a corresponding TCP data packet that it ACKed for the TCP connection.
<TcpTotalAckRollbacks>	Total ACK rollbacks	A count of ACK packet sequence numbers that are less than the expected ACK packet sequence number in the TCP reassembler.
<TcpAlienPacketsRcvd>	Alien packets rcvd	A count of any TCP packet where a corresponding TCP connection is not found in the TCP reassembler's table of current known TCP connections. The alien packet count must be measured against the `Total packets captured` value. Expect to see this count below 10 percent.
<TcpTotalChecksumErrors>	Total checksum errors	Count of bad TCP packet checksum errors. If you are getting error counts for this value, then your network infrastructure is spanning traffic to the Passive Capture host machine with bad packet checksum values. **Note:** If you are encountering a high number of checksum errors, the problem can be caused by a number of factors. It includs checksum offloading that are performed at the NIC. To verify, you must contact your network IT department to identify if this feature is enabled and, if so, to disable it and then recheck the value of this statistic.
<TcpErrors>	Errors	Not implemented or used.

Table 18. TCP section (continued)

XML	Console Display	Description
<TcpErrorsperSec>	TCP Errors per Second	Not implemented or used.
<TcpTotalDuplicatePackets>	Total back-to-back duplicate packets	Indicates how many back-to-back duplicate packets are occurring in the filtered capture traffic. A high number indicates that the network switch span ports are not properly configured and are providing duplicate traffic. In this case, the stat approaches one half the value that is specified in the Total packets rcvd value. While the Capture processes can handle duplicate traffic packets, it is an unnecessary usage that can impact performance when the system is already close to its maximum level. This also is an issue where available bandwidth for the Capture NICs is needlessly wasted. • See "How does the PCA handle duplicate TCP packets" on page 272.

SSL section

Table 19. SSL section

XML	Console Display	Description
<SslTotalTIs11Sessions>	Total TLS1.1 sessions	This is a total count of SSL sessions that use the TLS1.1 protocol.
<SslTotalTIs11SessionsDecrypted>	Total TLS1.1 sessions decrypted	This is a total count of SSL sessions that use the TLS1.1 protocol and were successfully decrypted.
SslTotalTls12Sessions	Total TLS1.2 sessions	This is a total count of SSL sessions that use the TLS1.2 protocol.
SslTotalTls12SessionsDecrypted	Total TLS1.2 sessions decrypted	This is a total count of SSL sessions that use the TLS2.1 protocol and were successfully decrypted.
<SslTotalNewHandshakes>	Total new handshakes	This is a count of new SSL handshake sessions that occurred. New indicates that the SSL session wasn't found in the SSL session cache table.
<SslTotalResumedHandshakes>	Total resumed handshakes	Provides a running total of SSL resumed handshakes that occurred. This statistic shows how well websites are taking advantage of SSL performance by its use. If the count is zero, this indicates that high overhead SSL new handshakes are being transacted on sites that may have performance issues.
<SslRecordsRcvd>	Records rcvd	This is a count of captured SSL records that could span multiple packets.
<SslTotalHandshakes>	Total handshakes	A count of properly negotiated SSL handshake sessions. This count is reflective of successful decryption of SSL traffic.
<SslHangingConnections>	Hanging connections	Not implemented or used.
<SslCurrentConnections>	Current connections	Not implemented or used.
<SslHitCount>	Hit Count	Not implemented or used.
<SslCurrentHitsPerSec>	Current hits per second	This statistic is an important indicator of system performance and availability. It shows the current number of SSL hits-per-second rate that the Capture processes are generating. The expected number of new handshake SSL hits is approximately 150 without SSL hardware acceleration. SSL decryption is a CPU-intensive operation that uses a lot of Capture system capacity. These stats are updated every 5 seconds.
<SslMaxHitsPerSec>	Maximum hits per second	Shows the maximum number of SSL hits-per-second rate that the Capture processes are generating.

Table 19. SSL section (continued)

XML	Console Display	Description
<SslAvgHitsPerSec>	Average hits per second	Provides a running average of the number of SSL hits per second being processed. This statistic gives an overall indicator of SSL operations over a long running period instead of just snapshot rates.
<SslNewHandshakesPerSec>	New handshake hits per second	Provides a snapshot of the rate of SSL new handshakes that are occurring.
<SslNewHandshakesPerSecMax>	Maximum new handshake hits per second	Maximum rate of new SSL handshakes per second
<SslResumedHandshakesPerSec>	Resumed handshake hits per second	Maxiumum rate of resumed SSL handshakes per second
<SslResumedHandshakesPerSecMax>	Maximum resumed handshake hits per second	Maxiumum rate of resumed SSL handshakes per second
<SslConnectionDataLen>	Connection data length	The average data length in bytes of a SSL connection over a 5-second period (sampling). This statistic is used to compute the average length of an SSL hit.
<SslHitDataLen>	Hit data length	The computed value of the average SSL hit data length in bytes.
<SslTotalNewSessionTicketSessions>	Total new SessionTicket sessions	This value provides a count of new SSL sessions using the TLS SessionTicket extension. Both client and server must support the extension for a valid count. For example, if a client requests using the SessionTicket extension and the server rejects it due to non-support, the session is not counted.
<SslTotalResumedSessionTicketSessions>	Total resumed SessionTicket sessions	This value is the count of the number of TLS SessionTicket sessions that were resumed after they had been stopped.
<SslTotalDecryptedSessionTicketSessions>	Total decrypted SessionTicket sessions	This value is the count of new and resumed SSL sessions that the PCA decrypted.
<SslTotalSessionTicketSessionCacheMisses>	Total SessionTicket session cache misses	This value is the count of the resumed SSL sessions that the PCA was unable to decrypt, usually due to failing to see the initial, new SSL session.
<SslTotalEphemeralRsaConnections>	Total ephemeral RSA connections	Shows the number of SSL connections that used "transient" ciphers, such as 40-bit weak RSA encryption. These typically are used by browsers internationally that aren't allowed to use 128-bit strong encryption browsers. **Note:** Pheromonal ciphers cannot be decrypted at a later time. An error log message is also generated to provide client IP information.
<SslTotalDhCipherConnections>	Total Diffie-Hellman cipher connections	Counts the number of SSL connections using the Diffie-Hellman cipher. • This ephemeral cipher cannot be decrypted at a later time. It can only be initiated by the Web server, not by the client browser. Having a non-zero count value indicates that one or more Web server has set up its SSL cipher suite preferences to use this particular cipher. • To allow post decryption, the Web server needs to change its SSL cipher preferences to remove this cipher and replace it with another, such as 256bit AES RSA cipher.

Table 19. SSL section (continued)

XML	Console Display	Description
<SslTotalNullCipherConnections>	Total Null Cipher Connections	Count of SSL connections that do not contain a cipher.
<SslTotalHsmKeysLoaded>	Total HSM keys loaded	Reports the number of SSL keys loaded from the Sun HSM keystore by the PCA at startup for each PCA instance.
<SslMissingKeys>	Missing keys	Count of SSL keys used that didn't have a corresponding SSL key pem file.
<SslMissingKeysPerSec>	Missing keys per second	Connections per second that cannot be decrypted because of a missing key
<SslTotalBadHandshakeSeqErrors>	Total Bad Handshake Sequence Errors	Not implemented or used.
<SslTotalUnknownCipherErrors>	Total Unknown Cipher Errors	Not implemented or used.
<SslErrors>	Errors	Not implemented or used.
<SslTotalSessionCacheMisses>	Total session cache misses	When an SSL session record comes in for decryption, it is checked to see if decryption cipher info for that session is in the cache. If not, it is counted as a cache miss. Because this is a record, it's assumed that the SSL handshake occurred and its decryption cipher info is sitting in the cache. This can happen if Passive Capture was restarted and began capturing in-progress SSL sessions or it has exceeded the default 10,000 concurrent SSL session cache entries and the LRU entries were deleted.
<SslSessionCacheMissesPerSec>	Session cache misses per second	Rate of session cache misses per second.
<SslOldestSessionCacheEntry>	Oldest session cache entry	Provides the oldest residing SSL cache entry in minutes from the current time. This statistic is helpful in gauging whether there is sufficient cache entries in sizing its table to handle a large volume site with minimal performance impact.
SslHitCount>	SSL hit count	Count of SSL hits.
<SslTotalCaptureType1>	SSL Total Capture Type 1	Count capture type 1 ssl hits (pages).
<SslPageViewPct>	Percent of ssl page views to page views	The percentage page views that are over ssl.

Hits section

Table 20. Hits section

XML	Console Display	Description
<HitsCaptured>	Captured	Count of hits where the HTTP parser was able to form a complete request and response hit.
<HitsCapturedPerSec>	Captured before hit processing per second	Provide current rate of captured hits (above). This statistic provides an indicator of the number of hits before hit processing, rejection, etc.
<HitsRejectedResponse>	Rejected response	Not implemented or used.
<HitsRejectedResponseBody>	Rejected response body	Not implemented or used.

Table 20. Hits section (continued)

XML	Console Display	Description
<HitsRejectedHits>	Rejected hits	When in Tealeaf's capture mode type BusinessIT, the count of hits that had their response rejected where their URL extension matches the extension exclusion list. The hit is still formed and delivered but the response is missing, i.e. just the request record. For example, URL extensions excluded, GIF, BMP, CSS, JS, etc.
<HitsUndeliveredHitsWhilePassive>	Undelivered hits while passive	Displays hits dropped while Passive Capture is passive node.
<HitsCurrentNonSslHitsPerSec>	Current non-SSL hits per second	Provide current rates of non-SSL hits per second being processed. This statistic provides an indicator of the amount of hits processed that are not SSL decrypted by Passive Capture. Some sites may have all their SSL traffic terminated before Passive Capture receiving it.
<HitsMaxNonSslHitsPerSec>	Maximum non-SSL hits per second	Provide maximum rates of non-SSL hits per second being processed. This statistic provides an indicator of the amount of hits processed that are not SSL decrypted by Passive Capture. Some sites may have all their SSL traffic terminated before Passive Capture receiving it.
<HitsAvgNonSslHitsPerSec>	Average non-SSL hits per second	Provide average rates of non-SSL hits per second being processed. This statistic provides an indicator of the amount of hits processed that are not SSL decrypted by Passive Capture. Some sites may have all their SSL traffic terminated before Passive Capture receiving it.
<HitsCurrentToDeliveryHitspersec>	Current to delivery hits per second	Provide current rates of hits sent to the Passive Capture delivery system. The delivery system may be overwhelmed due to various network socket issues, such as saturating the NIC bandwidth, which could cause it to drop hits.
<HitsMaxToDeliveryHitspersec>	Maximum to delivery hits per second	Provide maximum rates of hits sent to the Passive Capture delivery system. The delivery system may be overwhelmed due to various network socket issues, such as saturating the NIC bandwidth, which could cause it to drop hits.
<HitsTotalCaptureType1>	Total Capture Type 1 Hits	Counts of hits of Capture Type 1 that have been captured.
<HitsTotalCaptureType2>	Total Capture Type 2 Hits	Counts of hits of Capture Type 2 that have been captured.
<HitsTotalCaptureType3>	Total Capture Type 3 Hits	Counts of hits of Capture Type 3 that have been captured.
<HitsTotalCaptureTypeOther>	Total Capture Type Other Hits	Counts of hits of unidentified capture type that have been captured.
<HitsTotalLargeHits>	Total Hits Identified as Too Large	Counts of hits that have been identified as too large to capture.
<HitsTotalStreamingHits>	Total Streaming Hits	Counts of total streaming hits that have been captured.
<HitsTotalNonHttpTypeErrors>	Total non-Http type errors	Counts the number of hits that fail to have the "HTTP" protocol string in its header. The hit is dropped when this occurs.

Table 20. Hits section (continued)

XML	Console Display	Description
<HitsTotalBogusHttpErrors>	Total invalid HTTP errors	Counts hits that don't follow specific HTTP protocol format requirements for the headers, such as missing header chars, extraneous CR or LF chars, etc. The hit is dropped when this occurs.
<HitsTotalClientSpeaksFirstErrors>	Total responses before requests errors	Indicates that an HTTP hit was reassembled with a response before a request.
<HitsTotalMoreRespThanReqErrors>	Total more responses than requests errors	Indicates within a TCP connection where multiple hits are being formed that there were more responses than requests. This means that there were insufficient requests to match up with hit responses. After this condition is detected within the TCP connection, all following hits are dropped.
<HitsTotalUnansweredReqErrors>	Total unanswered requests errors	Indicates within a TCP connection that there were missing responses for the number of requests present for multiple hits.
<HitsTotalUnfinishedReqErrors>	Total unfinished request errors	Total count of HTTP requests that finished before its reported size indicated. These errors can occur if the request header for content length was incorrectly computed for the actual request body data. For example, stated length is greater than actual data. **Note:** This statistic is available in PCA Build 3500 or later.
<HitsTotalUnfinishedRespErrors>	Total unfinished response errors	Total count of HTTP responses that finished before its reported size indicated. These errors can occur if the response header for content length was incorrectly computed for the actual response data. For example, stated length is greater than actual data.
<HitsTotalRespTimerExpiredErrors>	Total response timer expired errors	Indicates within a TCP connection that a response did not occur after a request within this TCP transmission timeout configuration setting. The default value is 120 seconds.
<HitsTotalXmitTimerExpiredErrors>	Total packet transmission timer expired errors	Indicates within a TCP connection that packets must occur within this TCP transmission timeout configuration setting. The default value is 120 seconds.
<HitsTotalTlapiReparseRespNullErrors>	Total TLAPI invalid response errors	Counts hits in TLapi where no response is present.
<HitsTotalTlapiReqStartExtraBytes>	Total TLAPI request start extra bytes	Flags hits in TLapi that have extraneous CR, LF, or Null chars at the start of the request. This is just a warning condition count. Though it's not conforming, the extra chars are ignored, and checking continues if the rest of the request is valid.
<HitsTotalTlapiInvalidReqErrors>	Total TLAPI invalid request errors	Counts hits in TLapi where no request is present. The hit is dropped when this occurs.

Table 20. Hits section (continued)

XML	Console Display	Description
<HitsTotalTlapiReqCorruptErrors>	Total TLAPI request corrupt errors	Counts hits in TLapi if the request unexpectedly ends. Typically, there can be some extraneous chars that are filtered out leaving nothing left for a request. Or if after a request method, GET, POST, etc., nothing follows in the line. The hit is dropped when this occurs.
<HitsTotalTlapiReparseRespCorruptErrors>	Total TLAPI response corrupt errors	Counts hits in TLapi that were found without a response. This can occur when a TCP connection closes unexpectedly before a hit response was captured. The incomplete hit is still sent to TLapi to confirm if a complete hit does exist or not.
<HitsTotalInflateRequestCandidates>	Total candidates for inflate request	Total number of hits with a compressed request body (POST data) where decompression is attempted.
<HitsTotalInflateRequestsCompleted>	Total requests inflated	Total number of hits where a compressed request body is successfully decompressed.
<HitsTotalInflateRequestsFailed>	Total failed attempts to inflate the request	Total number of hits where decompression of a compressed request body failed.
<HitsTotalInflateResponseCandidates>	Total candidates for inflate response	Total number of hits with a compressed response where decompression is attempted.
<HitsTotalInflateResponsesCompleted>	Total responses inflated	Total number of hits where a compressed response is successfully decompressed.
<HitsTotalInflateResponsesFailed>	Total failed attempts to inflate the response	Total number of hits where decompression of a compressed response failed.
<HitsTotalDeflateResponseCandidates	Total candidates for deflate response	Total candidates for deflate response
<HitsTotalDeflateResponsesCompleted>	Total responses deflated	Total responses deflated
<HitsTotalDeflateResponsesFailed>	Total failed attempts to deflate the response	Total failed attempts to deflate the response
<HitsTotalDroppedBusinessModeExtension>	Total dropped due to business mode and extension	Total dropped due to business mode and extension
<HitsTotalDroppedBusinessModeResponse>	Total dropped due to business mode and response	Total dropped due to business mode and response
<HitsTotalDroppedByDelimagesFeature>	Total dropped due to businessIT mode and DelImages feature set	Total image hits meeting specified criteria dropped due to DelImages being enabled in the PCA • See "Pipeline Settings" on page 109.
<HitsTotalDroppedInvalidMethod>	Total dropped due to invalid HTTP method	Total hits dropped because of an invalid http method
<HitsTotalDroppedByParseRequest>	Total dropped due to HTTP request parsing errors	Total hits dropped by parserequest function

Table 20. Hits section (continued)

XML	Console Display	Description
<HitsTotalDroppedByParseResponse>	Total dropped due to HTTP response parsing errors	Total hits dropped by parse response function
<HitsTotalDroppedByPrivacy>	Total dropped by privacy rules	Total hits dropped by privacy
<HitsTotalDroppedBySampling>	Total dropped by sampling	Total hits dropped by sampling
<HitsTotalDroppedHitArrivedTooLate>	Total dropped because hit arrived too late	Total dropped because hit arrived too late • If the difference between the timestamp of the first request packet and the arrival timestamp when the entire hit is submitted to the PCA pipeline is more than one hour, then the hit is marked as "too late" for normal processing. These hits are dropped from further processing by the PCA. – The one hour limit is hard-coded and cannot be modified. – All hits entering the PCA pipeline have an arrival timestamp (TLapiArrivalTimeEx) inserted into the request record in the [timestamp] section. • Delays in the arrival of the entire hit into the PCA pipeline can be caused by many different issues, most of which are sourced outside of the PCA.
<HitsTotalDroppedMaxDataSize>	Total dropped because hit exceeds max data size	Total hits dropped due to the hit exceeding the max size
<HitsTotalDroppedReqHeaderExceedsMaxReqSize>	Total dropped due to HTTP request hdr too large	Total hits dropped due to the request header exceeding the max size
<HitsTotalDroppedTcldHitError>	Total dropped tcld hits error	Total hits dropped for the tcld process due to some error condition **Note:** This item is available in PCA Build 3403 or later.
<HitsAssembledHitsProcessedPerSecAvg>	Average assembled hits processed per second	Average number of hits processed/sec
<HitsAssembledHitsProcessedPerSecCurrent>	Current assembled hits processed per second	Current number of hits processed/sec
<HitsAssembledHitsProcessedPerSecMax>	Maximum assembled hits processed per second	Max number of hits processed/sec
<HitsAssembledHitQueueBlocksUsedAvg>	Average assembled-hit queue blocks used	Average assembled-hit queue blocks used
<HitsAssembledHitQueueBlocksUsedCurrent>	Current assembled-hit queue blocks used	Current assembled-hit queue blocks used
<HitsAssembledHitQueueBlocksUsedMax>	Maximum assembled-hit queue blocks used	Maximum assembled-hit queue blocks used

Table 20. Hits section (continued)

XML	Console Display	Description
<HitsAssembledHitQueueCurrentBlocksUsedPct>	Current assembled-hit queue blocks used percent	Current assembled-hit queue blocks used percent
<HitsAssembledHitQueueCurrentEntriesUsedPct>	Current assembled-hit queue entries used percent	Current assembled-hit queue entries used percent
<HitsAssembledHitQueueEntriesUsedAvg>	Average assembled-hit queue entries used	Average assembled-hit queue entries used
<HitsAssembledHitQueueEntriesUsedCurrent>	Current assembled-hit queue entries used	Current assembled-hit queue entries used
<HitsAssembledHitQueueEntriesUsedMax>	Maximum assembled-hit queue entries used	Maximum assembled-hit queue entries used
<HitsAssembledHitQueueTotalAllocation Failures>	Total assembled-hit queue allocation failures	Total assembled-hit queue allocation failures • This statistic is displayed as the If non-zero, hits are being lost due to pipelined being overloaded value in the Summary tab. See "PCA Web Console - Summary Tab" on page 71.
<HitsAssembledHitQueueTotalMisses>	Total assembled-hit queue misses	Total assembled-hit queue misses
<HitsAssembledHitQueueTotalPushFailures>	Total assembled-hit queue push failures	Total assembled-hit queue push failures
<HitsAssembledHitQueue2TotalAllocationFailures>	Total assembled-hit queue2 allocation failures	Total count of hits that were unable to allocate space on the queue between pipeline(s) and the tcld process. Normal values are zero or a non-increasing count. You can use metric to determine whether the tcld process is being overloaded. • Available in PCA Build 3403 or later. • This statistic is displayed as the If non-zero, hits are being lost due to pipelined being overloaded value in the Summary tab. See "PCA Web Console - Summary Tab" on page 71.
<HitsAssembledHitQueue2TotalPushFailures>	Total assembled-hit queue 2 push failures	Total count of hits that failed to queue up on the queue between pipeline(s) and tcld process. Normal values are zero or a non-increasing count. You can use this metric to determine if the tcld process is being overloaded. **Note:** This item is available in PCA Build 3403 or later.
<AveragePageSize>	Average page size	Average page size (capture type 1) in bytes.
<TotalPageSize>	Total page size	Used to calculate page views per second
<PageViewsPerSecMax>	Max page views per second	Maximum page views per second.
<PageViewsPerSecCur>	Current page views per second	Current page views per second.

Table 20. Hits section (continued)		
XML	**Console Display**	**Description**
<PageViewsPerSecAvg>	Average page views per second	Average page views per second.
<PageViewPct>	Page view percentage of hits	The percentage of hits that is page views.
<HitsTotalTlapiReqNullErrors>	Total TLAPI request null errors	Total TLAPI request null errors
<HitsTotalTlapiRespCorruptErrors>	Total TLAPI response corrupt errors	Total TLAPI response corrupted errors
<HitsTotalTlapiRespNullErrors>	Total TLAPI response null errors	Total TLAPI response null errors

Capture section

Table 21. Capture section		
XML	**Console Display**	**Description**
<CaptureBytesWrittenByListener>	Bytes written by listener	Total number of packet bytes written to reassd's pipe by listend.
<CaptureBytesWrittenByListenerPerSec>	Bytes written by listener per second	Rate of packet bytes written to reassd's pipe by listend per second.
<CaptureBytesReadFromListener>	Bytes read from listener	Total number of packet bytes read by reassd from reassd's pipe. This number should match with the above written by listener value, indicating that listend and reassd are in sync and keeping up with the incoming traffic rate.
<CaptureBytesReadFromListenerPerSec>	Bytes read from listener per second	Rate of packet bytes read by reassd from reassd's pipe per second.
<CaptureFilteredKbytesFromPrimaryInterface>	Current filtered KB from primary interface	Total filtered kbytes from primary interface
<CaptureFilteredKbytesFromPrimaryInterfacePerSec>	Current filtered KB/sec from primary interface	Curent filtered kbytes/sec from primary interface
<CaptureFilteredKbytesFromPrimaryInterfacePerSecMax>	Maximum filtered KB/sec from primary interface	Maximum filtered kbytes/sec from primary interface
<CaptureFilteredKbytesFromSecondaryInterface>	Current filtered KB from secondary interface	Total filtered kbytes from secondary interface
<CaptureFilteredKbytesFromSecondaryInterfacePerSec>	Current filtered KB/sec from secondary interface	Current filtered kbytes/sec from secondary interface
<CaptureFilteredKbytesFromSecondaryInterfacePerSecMax>	Maximum filtered KB/sec from secondary interface	Maximum filtered kbytes/sec from secondary interface
<CaptureTotalPacketsRcvd>	Total packets rcvd	Total packet count received by pcap as reported by its stats.
<CapturePacketsDroppedByPcap>	Total packets dropped by pcap	Total packet count dropped by pcap as reported by its stats. This value should be zero, indicating that the OS is keeping up with the NIC interface receiving network traffic.
<CapturePacketsDroppedInOutput>	Packets dropped in output	Total packets dropped by listend due to its output buffer being full. This value should be zero, indicating listend is keeping up with the filtered network traffic and reassd is able to pull packets from the listend output buffer without overrunning it.
<CaptureTotalPacketsCaptured>	Total packets captured	Total packet count on filtered packets received from pcap to listend.
<CaptureTotalPacketsCapturedPerSec>	Total packets captured per second	Rate of filtered packets received from pcap by listend per second.
<CaptureTotalIpChecksumErrors>	Total IP checksum errors	Total error count of IP header checksum errors.

Table 21. Capture section (continued)		
XML	**Console Display**	**Description**
<CaptureTotalLargePacketsExceeded>	Total large packets exceeded	Total number of TCP packets whose size exceeded the configured limit. • The TCP packet size limit for the PCA is configured in the Tuning Parameters section of the Interface tab. See "PCA Web Console - Interface Tab" on page 84. • The TCP packet size limit for the packet forwarder is configured in the `fwdr-conf.xml` configuration file. For more information on how to configure these settings, see "Troubleshooting tips" on page 44.
<CaptureCurrentFilteredKbytesPerSec>	Current filtered kbytes per second	Shows the current kilobytes per second traffic rate based on the filtered capture traffic from the span ports. This statistic provides an indication of any traffic after filtering is present and how much traffic is being processed by the Capture processes. If the span port's NIC setting is 100 mbits per second, then the maximum traffic rate that can be filtered through is about 10,000 KB per second. These stats are updated every 5 seconds.
<CaptureMaxFilteredKbytesPerSec>	Maximum filtered kbytes per second	Shows the maximum kilobytes per second traffic rate based on the filtered capture traffic from the span ports. This statistic provides an indication of any traffic after filtering is present and how much traffic is being processed by the Capture processes. If the span port's NIC setting is 100 mbits per second, then the maximum traffic rate that can be filtered through is about 10,000 KB per second. These stats are updated every 5 seconds.
<DeliveryMode>	Delivery Mode	Current delivery mode
<CoreDumps Count="0" /?>	not available	Number of core dumps

Target Recipients section

Table 22. Target Recipients section		
XML	**Console Display**	**Description**
<TotalHitsQueued>	Total hits queued	Total count of hits queued for delivery to IBM Tealeaf CX server.
<TotalHitsDelivered>	Total hits delivered	Total count of hits delivered to the IBM Tealeaf CX server. This number should match the hits queued, indicating that the hit delivery is keeping up.
<TotalBytesDelivered>	Total bytes delivered	The total number of bytes successfully sent to the recipient Tealeaf Transport Service.
<TotalHitsDropped>	Total hits dropped	The total number of hits dropped due to the per-recipient delivery queue being full, which occurs when Passive Capture cannot deliver hits to the recipient Tealeaf Transport Service. These failures may be due to network errors (such as network configuration on the Passive Capture or the recipient machine) or other software-related conditions, such as when the Tealeaf Transport Service is not running for an extended period of time. The hits counted by this value were not sent to the Tealeaf Transport Service.

Table 22. Target Recipients section (continued)		
XML	**Console Display**	**Description**
<UseSslText>	Use SSL	The delivery connection state whether SSL or not. • Yes - delivery connection is using a SSL connection • No - delivery connection is non-SSL

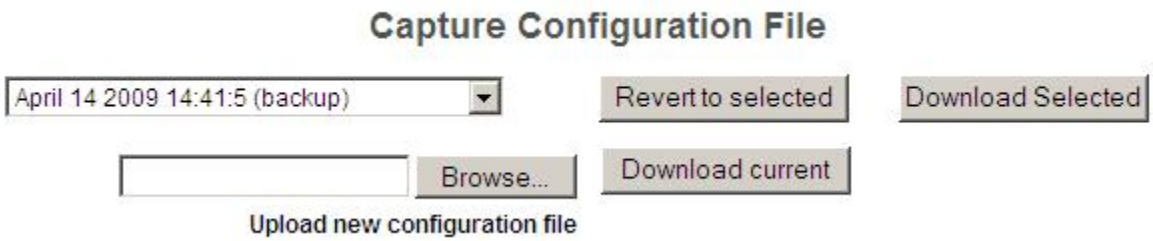
Failover section

Table 23. Failover section		
XML	**Console Display**	**Description**
<FailoverNodeRole>	Node role	Either master or slave.
<FailoverNodeState>	Node state	The state the node is currently in. • Active - Has control and is capturing hits and sending them downstream. • Ready - Capturing but not sending hits. It is ready to assume control as needed. • Down - Cannot assume control.
<FailoverCaptureState>	Capture state	Identifies whether the capture services are running on the node. • Running - Indicates that the capture services are running. • Stopped - The capture services are not running when the state is stopped. • Restarting - Indicates that the capture services are in the process of restarting.
<FailoverActive>	Failover active	Indicates whether a failover has taken place and the slave node currently has control.

PCA Web Console - Backup-Logs Tab

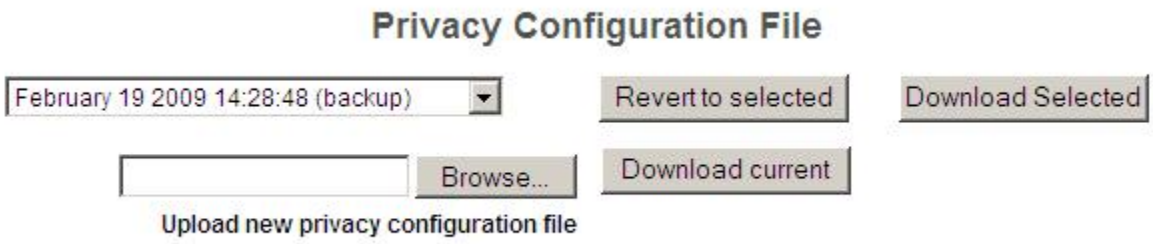
Through the **Backup/Logs** tab, you can perform configuration modifications, manage logs, and enable archiving of raw packet data captured by the PCA. When you save changes to a configuration file, a copy of the old one is written to a backup file. An error message displays in the event that the copy did not complete successfully.

Capture Configuration File



The Capture Configuration File section provides a way to edit the configuration file (`ctc-conf.xml`) via a Web interface rather than using a text editor. Users can restore, download the current, or upload a new configuration file by clicking the corresponding buttons in the Capture Configuration File section of the page.

Privacy Configuration File

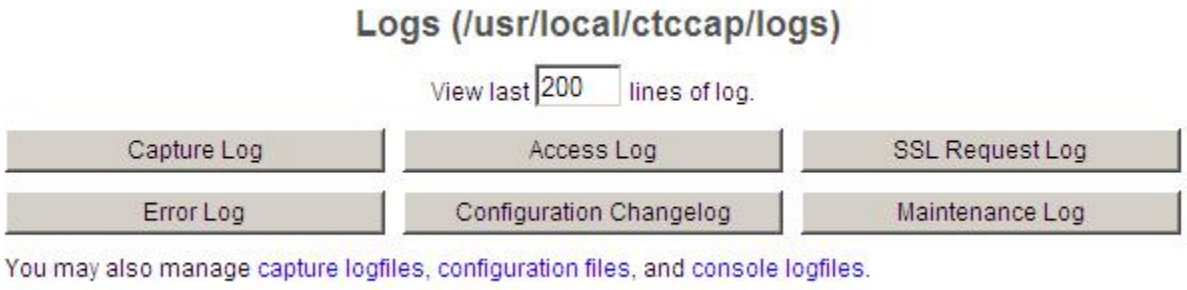


This section enables direct editing of the `privacy.cfg` file, which is used to specify the rules, tests, and actions for making sensitive data private before it is processed by Tealeaf. You can review previous versions of the file, as well as upload new versions for use by the PCA.

This version of the `privacy.cfg` file is a copy of the version used by the Windows pipeline session agent. For more information on its content and format, see "Privacy Session Agent" in the *IBM Tealeaf CX Configuration Manual*.

For more information on how Tealeaf manages privacy, see "Managing Data Privacy" in the *IBM Tealeaf CX Configuration Manual*.

Logs



You can access the following PCA logs through the **Backup/Logs** tab:

- Capture Log
- Access Log
- SSL Request Log

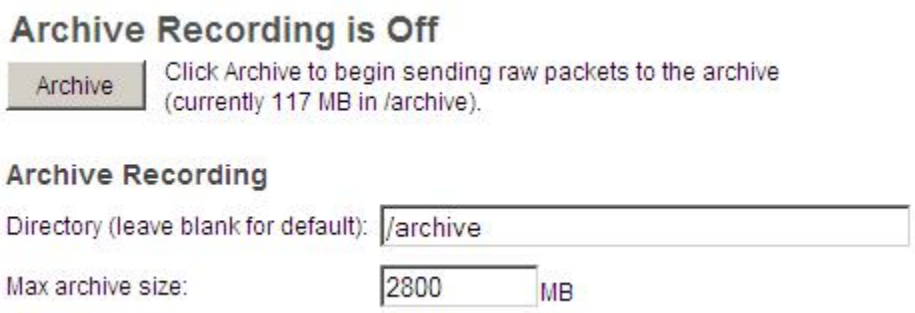
- Error Log
- Configuration Changelog
- Maintenance logs

At the bottom of the **Logs** section, you can also access and download the following types of files:

- Capture log files
- Configuration files
- Console log files

Archive Recording

In the Archive Recording section, you can enable archive recording, which delivers raw captured packets that have been forwarded to the PCA Server into the specified directory.



Note: This feature is intended for debugging purposes. Enable only if you are detecting problems with basic capture functionality.

Table 24. Archive settings

Setting	Description
`Directory`	If this field is left blank, it defaults to `/usr/local/ctccap/archive`. The `<RecordingDirectory>` and `</RecordingDirectory>` tags are removed from `ctc-conf.xml`.
`Max archive size`	Specifies the maximum cumulative size of the `tcpdump` archive files. The default value is 500 MB. When the disk usage reaches this value, older archive files are removed to make room for new ones.

To enable archive recording, click **Archive**.

PCA Web Console - Failover Tab

In the **Failover** tab, you can enable and configure failover between multiple IBM Tealeaf CX Passive Capture Application servers.

- When enabled, PCA failover is managed by the failoverd process in the IBM Tealeaf CX Passive Capture Application.
- For more information about troubleshooting PCA failover, see "Troubleshooting - Capture" in the *IBM Tealeaf Troubleshooting Guide*.

Heartbeat

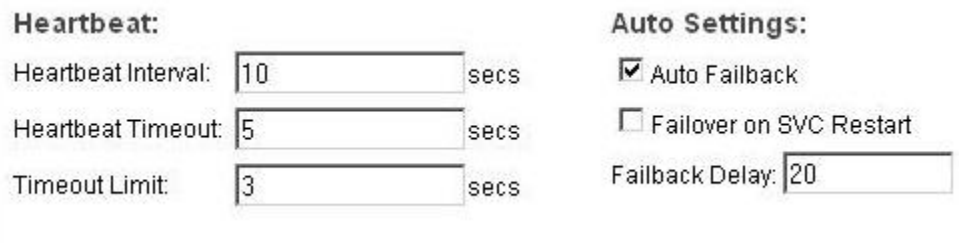


Figure 34. Failover Heartbeat

The subordinate checks the health of the Master by sending heartbeats to the Master. Technically these health checks are requests to the Master for its current state.

The heartbeat is a request that is sent through a UDP socket. When the Master sees the heartbeat, it responds to the sender with its current state. The Master also sends heartbeats to the subordinate Passive Capture host machine to keep track of its state to determine whether it can failover to the subordinate.

Setting
Description

Heartbeat Interval
How long to wait between heartbeats

Heartbeat Timeout
The amount of time Passive Capture waits for a response to a heartbeat before you call it a timeout

Timeout Limit
The number of consecutive heartbeat timeouts that are allowed before a failover is forced

Auto Settings

Setting
Description

`Auto Failback`
This option passes control (active state) from the Slave Passive Capture host machine back to the Master Passive Capture host machine once the Master machine indicates that it is ready to take control again.

`Failover on SVC Restart`
This option determines whether a failover is triggered when the capture services are restarted on the active PCA server.

`Failback Delay`
The minimum number of seconds to wait before you do automatic failback

Remote Monitors

In the Remote Monitor configuration, you can specify a list of authorized servers that are permitted PCA access to monitor failover state information, control the failover mode, or both.

Figure 35. Remote Monitors

A Remote Monitor is a Linux computer that is identified by host name or IP address that is allowed to receive failover state information and/or control a Passive Capture host machine that is configured for failover.

Note: This remote workstation must not be a PCA server.

A Remote Monitor may also optionally be allowed to control failover on a Passive Capture host machine, including forcing failover and failback. A IBM Tealeaf CX Passive Capture Application configured for failover responds to heartbeats or control requests from a machine that is properly configured as a Remote Monitor.

- After a host is authorized, the failstat utility that is installed on the host can be used to help debug failover issues.

PCA Web Console - Utilities Tab

The **Utilities** tab provides access to operating system diagnostic information, which is useful if you do not have access to PUTTY. When a command button is clicked, the output is generated and displayed on the screen.

- When verbose mode is enabled, some additional information can be included in the generated output.

Network Interfaces

The Network Interfaces section of the Utilities tab displays the network interfaces, flags, status, and IP addresses.

Network Interfaces

Interface	Flags	Status	IP Addresses
sit0 (details)	up	none	::127.0.0.1/96
eth0 (details)	up	none	fe80::20c:29ff:fe32:7981/64
eth1 (details)	up	none	fe80::20c:29ff:fe32:798b/64
lo (details)	up	none	::1/128
sit0 (details)	up	none	none
eth0 (details)	up	none	10.10.39.172/0xFFFF0000
eth1 (details)	up	none	192.168.96.128/0xFFFFFF00
lo (details)	up	none	127.0.0.1/0xFF000000

Figure 36. Web Console - Utilities Tab - Network Interfaces

This section lists all important network interfaces that includes the primary and secondary interface and the LAN interface that is used to connect to the Tealeaf Transport Service on the IBM Tealeaf CX server.

- In earlier builds, this section was displayed on the **Summary** tab or **Delivery** tab.

This section also displays information about the NICs, such as supported media and packet statistics.

- To reveal these statistics, click **(details)** next to the interface name. See “Details Page” on page 160.

Setting
Description

`Interface`
Interface identifier

`Flags`
Any specific issues are listed here.

- up indicates that the interface is functioning properly.

Status
Status as reported from the interface.

IP Address
IP address for the interface

Details Page

In the **Details** page, you can run Linux command-line and Tealeaf commands against individual interfaces to retrieve diagnostic information.

Note: Depending on the interface and your traffic load, these commands can require some time to execute.

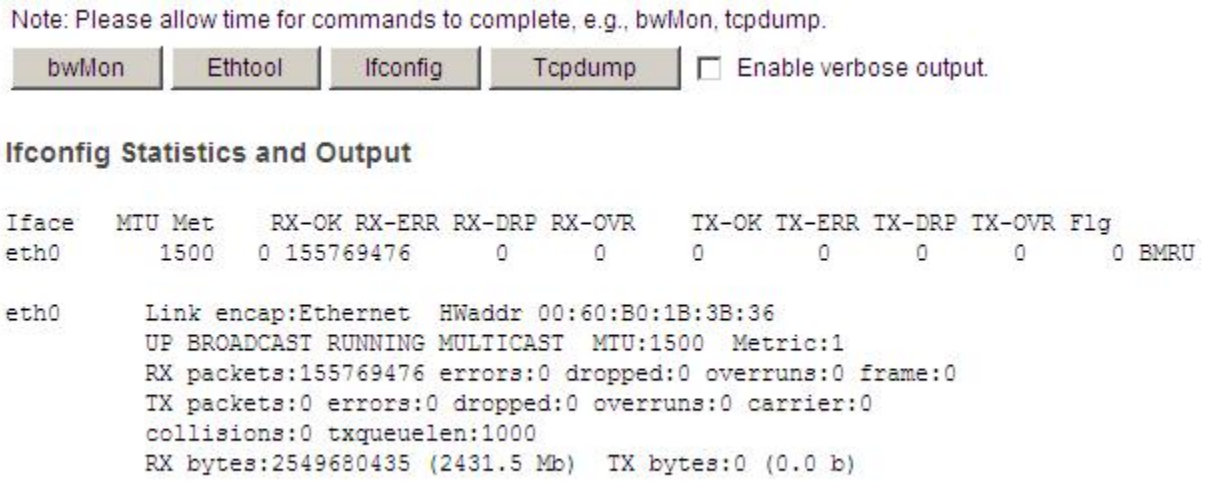


Figure 37. Utilities Tab - Details page

In the previous image, you can see the results of an `Ifconfig` command. To run one of the available Linux commands, click the appropriate button.

- To generate a more verbose output, select the check box.

The following buttons run Linux commands against the selected interface:

- Ethtool
- Ifconfig
- Tcpdump

For more information about the commands, use `man` at the Linux command line to display the available documentation.

- You can also search Tealeaf Online Help for other documented uses of these commands regarding the IBM Tealeaf CX Passive Capture Application.

bwMon

Provided by Tealeaf, the bwMon tool generates a set of monitoring statistics for the selected interface. This command queries the interface over a period of 10-seconds and returns results for 1-second intervals from the interface.

This tool can be used with activities that you initiate on the monitored web application for diagnosing connection and transfer issues. For example, you can perform actions on the web application and then verify whether the action resulted in activities through the appropriate interface.

- The Enable verbose output check box generates the same set of statistics.

An example output is displayed. Each row corresponds to a 1-second interval during the 10-second query period.

- If no traffic is being passed to the instance, then the output contains only the list of field names.

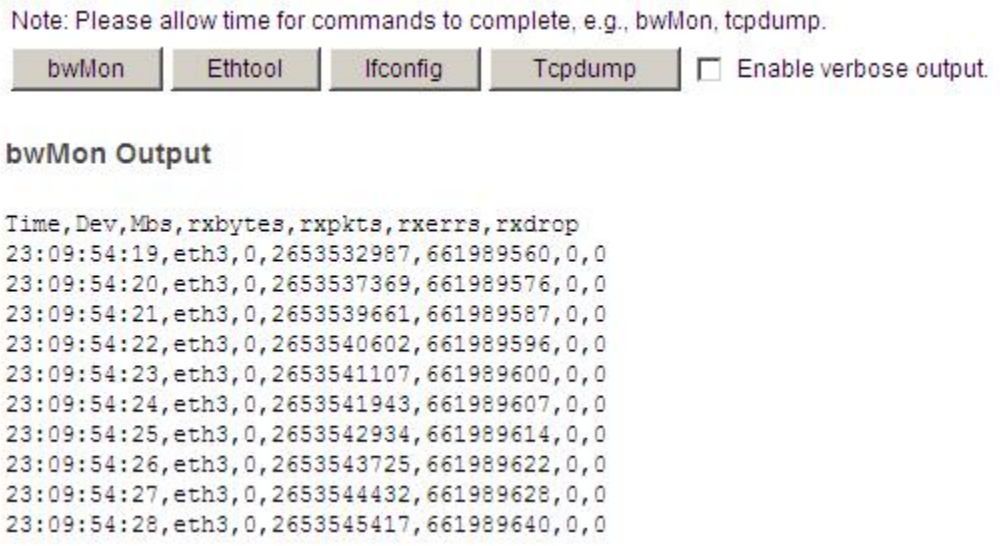


Figure 38. Example bwMon output

Field
Description

`Time`
Timestamp for the selected 1-second interval

`Dev`
The queried device

`Mbs`
Megabits per second transfer rate between the device and the IBM Tealeaf CX Passive Capture Application.

- A value of `0` can indicate an inactive device or a configuration problem.

`rxbytes`
Bytes transferred from the device to the PCA

`rxpkts`
Packets that are transferred from the device to the PCA

`rxerrs`
Number of errors in transfer from device to the PCA

`rxdrop`
Number of packets dropped from device

System Utilities

The system utilities that are provided at the bottom of the **Utilities** tab enable the generation of important diagnostic information about the PCA, the operating system hosting it, and the statistics generated by the PCA.

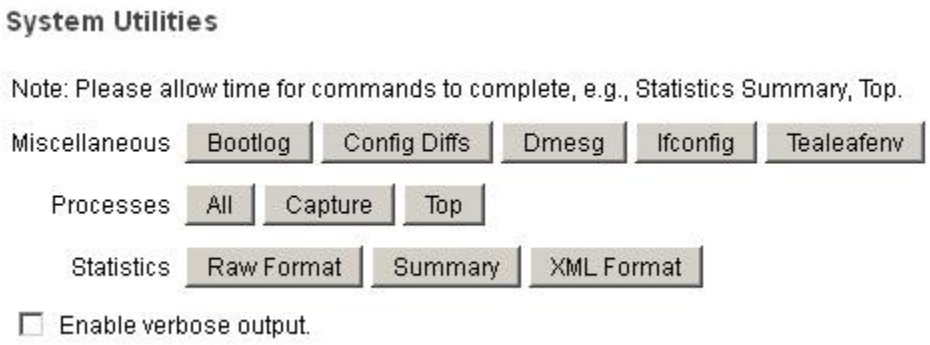


Figure 39. Web Console - Utilities Tab - System Utilities

Utility
Description

Miscellaneous

Bootlog
Review the Linux bootlog for the system that is hosting the PCA.

Config Diffs
Review the differences between the default configuration file (`ctc-conf-defaults.xml`) and the current configuration in use (`ctc-conf.xml`).

Dmesg
Execute Linux `dmesg` command, which displays the kernel ring buffer information.

Ifconfig
Execute `Ifconfig` command on each of the network interfaces.

Tealeafenv
The Tealeafenv command generates information specific to the Tealeaf PCA installation.

Processes
These commands generate statistical information about the Linux processes in use.

All
Review all system processes for all users.

Capture
Review all processes in use by the IBM Tealeaf CX Passive Capture Application user (typically `ctccap`).

Top
Run the `top` program for Linux. `top` provides a real-time view of system summary information and a list of tasks that are currently managed by the Linux kernel.

Statistics
These commands generate statistics about the IBM Tealeaf CX Passive Capture Application.

Raw Format
View statistics in raw format.

Summary
Review statistics on individual instances of the PCA.

XML Format
View PCA statistics as generated XML. For more information about these stats, see "Stats per Instance" on page 138.

PCA Web Console - Debug Page

You can manage core dump files by using the **Debug** page in the PCA Web Console. Through this page, you can download, delete, or debug core dumps that occur during PCA operations.

- Through **Debug** page, you can also download a compressed files for forwarding to Tealeaf Customer Support. See "Providing PCA ZIP to Support" on page 164.

Accessing Debug page

Note: For security purposes, to download any of the files, you must be connected to the web console through ssl, and user authentication must be enabled.

When core dumps are created, a message and link is displayed on the **Summary** tab. To open the **Debug** page, click the **View** link.

- See "PCA Web Console - Summary Tab" on page 71.

To access **Debug** page of the PCA Web Console directly:

```
https://<host_name>:8443/debug.php
```

where:

- <host_name> is the host of the PCA.

Page Overview

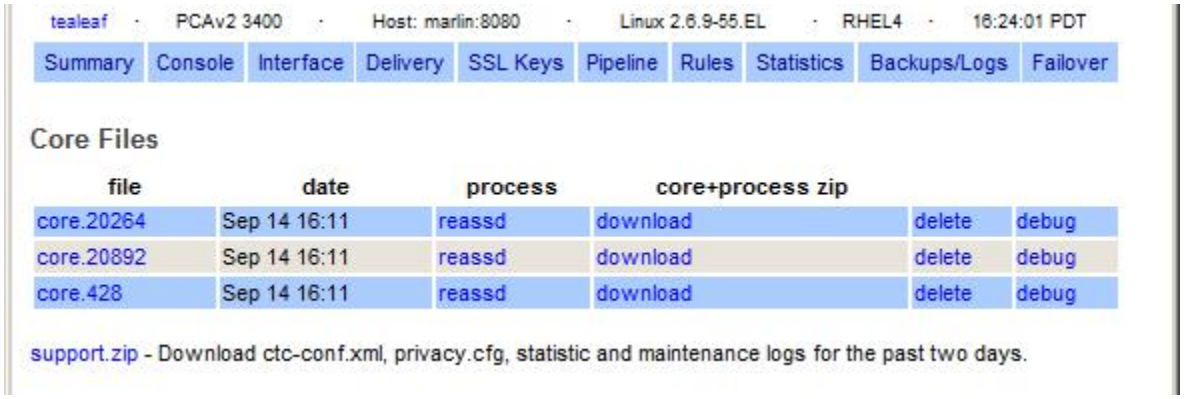


Figure 40. PCA Web Console - debug page

Note: If you are not connected through SSL and using authentication, some of the following actions are disabled.

Field
Description

file
Name of the core dump file

date
Date the core dump was created (and when the crash occurred)

process
The process that crashed, creating the core dump

core+process zip
A link to download the core and process in a single compressed file

delete
Click this link to delete the core file.

Note: This command is useful if the partition on the hard disk drive that is containing the PCA is full.

debug
Perform a simple debug of the dump. See "Debug Output" on page 164.

Debug Output

The following is an example output of the debug command:

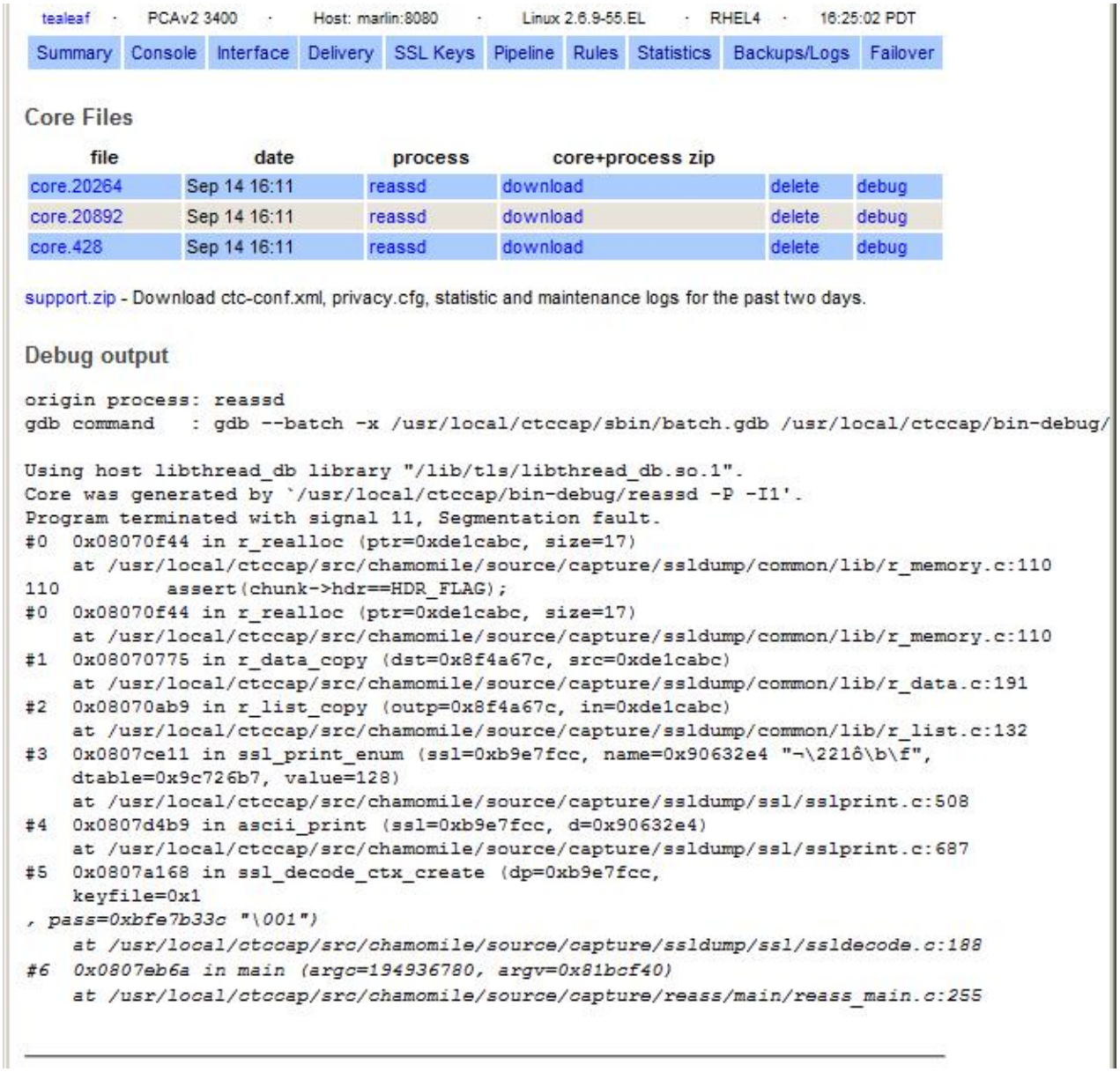


Figure 41. Debug command output

Providing PCA ZIP to Support

About this task

When you work with Customer Support and Tealeaf Engineering to resolve issues at a customer site, provide the `support.zip` file on the `debug.php` site to help troubleshooting the issue.

Note: When you provide coredumps, provide the type and version of Linux on which the PCA is installed.

ZIP file contents

Procedure

1. Core dump file

2. Binary file that created the dump
3. `ctc-conf.xml`
4. `privacy.cfg`
5. Maintenance and stats logs from the current and previous days.

Passive Capture Configuration File `ctc-conf.xml`

If you cannot login to the web console, you can edit `ctc-conf.xml` to configure the IBM Tealeaf CX Passive Capture Application.

Note: Avoid making direct changes to this configuration file. It is recommended that you make changes to your PCA configuration through the web Console, which provides a user interface onto this configuration file. For more information, see "Supported Browsers for PCA Web Console" on page 65.

This file is in the `/usr/local/ctccap/etc` directory. It can be edited with the **`vi`** editor.

Note: Some of the settings are not displayed in the default configuration file. These settings can be inserted based on configuration changes that are made through the web console. All configuration settings that are required for general use of the PCA are available in the default file.

Note: SSH is run over the standard port 22.

Note: Always make a backup copy of the configuration file before you make changes to it.

Note: Do not edit this configuration file or any PCA configuration file by using an editor on a Windows machine. The Windows end-of-line (EOL) characters are different from the UNIX EOLs used by Linux. So, configuration errors can occur when the file is reapplied in the PCA's Linux environment.

The following tables explain each configuration option in the default configuration file.

<Conf>

Table 25. Configuration settings

Configuration Option	Description
<IPv6ConsoleEnabled>	Beginning in PCA Build 3600, you may configure the PCA web Console to accept IPv6 addresses by default. To enable, set this value to 1. **Note:** For systems that have been upgraded, you must insert this setting and its value manually in the configuration file. This configuration change may also be applied to PCA Build 3502.
<Timeout>	Beginning in PCA Build 3600, you may configure this setting to a non-zero value to enable timeouts of PCA web Console sessions. The specified value defines the number of minutes that a web Console session is allowed to be idle before it is automatically timed out. Depending on your build, this setting may or may not be present in this location. Please search the file. If the setting is not present in your file, insert it here. For more information, see "PCA web Console - Console Tab" on page 83.

<Archive>

This section specifies the configuration options for enabling and managing local TCP/IP packet archiving. For more information, see "PCA Web Console - Backup-Logs Tab" on page 155.

Table 26. Archive setting	
Configuration Option	**Description**
<RecordingEnabled>	Enables local TCP/IP packet archiving. When enabled, archive files are saved to the archive recording directory (default /usr/local/ctccap/archive) in a rolling archive. Archives are partitioned into 50 MB files. This setting is disabled by default.
<MaxSize>	Specifies the maximum size of the TCP/IP packet archives. By default, MaxSize is set to 500 MB. The default directory size that is allocated to archives is 18 GB.
</Archive>	

<Capture>

Use the capture configuration settings to configure data capturing from a spanned switch port or network tap.

Table 27. Capture settings	
Configuration Option	**Description**
<HangingResponseTimeout>	Specifies the timeout setting (in seconds) between the last packet of the request and the first packet of the response. If the timeout is exceeded, the connection is marked as canceled by the client. The default is 120 seconds.
<HangingTransmissionTimeout>	<Specifies the timeout setting (in seconds) that defines how long Passive Capture waits between packets. If the timeout is exceeded, the connection is marked as a request that was canceled by the client. The default is 120 seconds.
<Ignores/>	
<ListenFullDuplex>	Defines if Passive Capture is receiving bidirectional data from a network tap or unidirectional directional from a SPAN port on a network switch or load balancer. If the Passive Capture host machine is receiving data from a network tap, set ListenFullDuplex=False. If the host machine is receiving data from a spanned port, set ListenFullDuplex=True.
<ListenOnBothInterfaces>	Indicates whether Passive Capture is listening on one or both of its Ethernet interfaces. It can be used to capture two SPAN ports. If Passive Capture is receiving data from a network tap, set ListenOnBothInterfaces=True. If it is receiving data from a spanned port, set ListenOnBothInterfaces=False.

Table 27. Capture settings (continued)

Configuration Option	Description

<ListenTo>	Nested within the <Capture> section, this subsection specifies the set of web servers to be monitored by Passive Capture. The <Address> and <Port> attributes must be configured for each web server that is being monitored.
	
	Passive Capture also supports netmasks. In the event a netmask setting is used, a <NetmaskSize> node must be added to the configuration file under the <Address> node and before the <Port> node. For example, if the IP range for web servers that are being monitored is 10.10.10.0 through 10.10.10.255 and the web servers are listening on both ports 80 and 443, the ListenTo configuration would appear as follows:
	
	`<ListenTo>`
	`<Address>10.10.10.0</Address>`
	`<NetmaskSize>24</NetmaskSize>`
	`<Port>80</Port>`
	`<Port2>443</Port2>`
	`</ListenTo>`
	
	For more information on best practices in managing IP addresses, see "Supported Browsers for PCA Web Console" on page 65.

<ListenTos>	
<Address>	Specifies the IP address of the web server that is being monitored.
<Port>	Specifies the port number the web server is listening on.
<Port2>	Specifies an extra port number associated to the Address attribute. Optimized for typical two-port monitoring.
<NetMaskSize>	Specifies the range of IP addresses to be monitored, through netmask size in bits.
</ListenTo>	
</ListenTos>	
<MaxSimultaneousConnections>	Defines the maximum number of concurrent TCP connections the Passive Capture software is set to handle. The default value is 10000.
<MaxConnectionsInSynState>	Defines the maximum number of concurrent TCP connections where partial TCP connections are established. The default value is 4000.

Table 27. Capture settings (continued)

Configuration Option	Description
<PrimaryInterface>	Specifies the name of the primary Ethernet interface. The default setting is eth0.
<SecondaryInterface>	Specifies the name of the secondary Ethernet interface.
<MaxSessionCacheSize>	Defines the number of maximum number of concurrent SSL connections that can be processed. The default value is 10,000.
<MaxInputBufferSize>	**Note:** Do not change this setting without first contacting technical support. This setting is used for debugging issues that are related to spiking traffic conditions that are overwhelming the buffer. Defines the maximum size (in bytes) of the TCP packet handling queue. The default value is 100,000,000 (approximately 100 MB). When the buffer fills, the PCA begins dropping hits. By enforcing a limit on the buffer, the system prevents a crash. However, data is dropped.
<MaxMemoryConsumption>	**Note:** Do not change this setting without first contacting technical support. This setting is used for debugging issues that are related to spiking traffic conditions that are overwhelming the buffer. Defines the maximum amount of system memory (in MB) allocated to the capture process. The default value is 1300 MB (1.3 GB). The IBM Tealeaf Passive Capture Application is a 32-bit application, which means each CX PCA process can address a maximum of 2 GB of RAM.
<TransparentLoadBalancingEnabled>	Enables or disables the transparent load balancing (TLB) feature. To enable load balancing, set TransparentLoadBalancingEnabled to True. To disable load balancing, set TransparentLoadBalancingEnabled to False. The default value is True to enable load balancing. For more information, see "CX PCA Transparent Load Balancing Overview" on page 10.
<ReassInstances>	Configures the number of reassd instances to be created. The default value is 1.

Table 27. Capture settings (continued)

Configuration Option	Description
<SslSessionInfoOnMemcachedServer>	If transparent load balancing is enabled and SslSessionInfoOnMemcachedServer is set to True, then the PCA uses memcache to cache SSL data. The default value for SslSessionInfoOnMemcachedServer is set to True.
<MaxConnectionsRoutingInfo>	Defines how much TCP connection routing information can be store in the local routerd hash table. Once the limit is reached, the oldest data is removed from the table so that a new value can be written to the table. The default value is 100000.
<MaxInputRouterdBufferSize>	Defines the buffer size, in MB, for the routered service. The default value is 50 MB.
<DeleteTcpLargeConnDisabled>	This setting is a Boolean flag, set to either True or False. If unspecified, it is treated as though set to False. If set to True, this setting prevents TCP connections that have individual request or response sizes exceeding from being closed. Special cases, such as, large pdf files or streaming traffic connections, may need to disable this feature to maintain the connection. The maximum size of individual request or responses is defined by the MaxTcpConnSize parameter.
<MaxTcpConnSize>	Maximum permitted size of an individual request or response in a TCP connection. A single TCP connection can have multiple requests or responses, and each one is checked against this limit. The default value is 2097152. If this limit is exceeded, the TCP connection is automatically closed when the DeleteTcpLargeConnDisabled setting is set to False.
<CaptureKeys/>	

Table 27. Capture settings (continued)

Configuration Option	Description
<CaptureKey>	This optional section is used to define the SSL keys necessary to support capture of HTTPS traffic from web servers. • For each private key, a CaptureKey section including the <CertificateFile> (optional), <Label> and <PrivateKeyFile> nodes need to be defined. • The <CertificateFile> and <PrivateKeyFile> entries are the fully qualified domain names of the files that contain the certificate and private keys. • The private key must be in the Tealeaf converted .PTL format for it to be usable.
<Certificate>	Specifies the location in which the Public key is to be pasted.
<Label>	Specifies the text name of private key.
<PrivateKey>	Defines the location where the Private Key is to be pasted.
</CaptureKey>	
</CaptureKeys/>	
<InstancesEnabled>	This setting provides a global setting to enable/disable multiple instances. This setting is a Boolean flag, set to either True or False. • If unspecified, it is treated as though set to False. • If set to True, then the following nested <Instances> is used for multiple instance instantiation. Otherwise, only a single instance is created.
<Instances>	Top-level node for nested multiple instance definitions.
<Instance>	Instance node for defining the attributes of an instance.
<InstanceDisabled>	This setting is a Boolean flag, set to either True or False. • If unspecified, it is treated as though set to False. • If set to True, then the local instance node is disabled. By disabling the instance node, you can disable individual instances for debugging or testing.
<ListenFullDuplex>	If defined within the instance node, it has the same meaning as the previous primary instance, but this setting applies to this specific instance. If it is not defined, then the instance inherits the value from the primary instance. Set <ListenFullDuplex> to True or False.

Table 27. Capture settings (continued)

Configuration Option	Description
<ListenOnBothInterfaces>	If defined within the Instance node, it has the same meaning as the previous primary instance, but this setting applies to this specific instance. If it is not defined, then the instance inherits the value from the primary instance. Set <ListenOnBothInterfaces> to True or False.
<TcpChecksumDisabled>	By default, the CX PCA runs a checksum validation of the TCP packets that are submitted to it. Environments where a large receive option (LRO) or checksum offloading is enabled, PCA checksum validation fails. Set the value to True to disable it. If this setting is not in the default XML, the CX PCA assumes that checksum validation is wanted and enabled. This setting appears in the XML after packet checksum validation is disabled through the **PCA Web Console Interface** tab by selecting the **Disable Packet checksum** validation check box. For more information, see "PCA Web Console - Interface Tab" on page 84.
<PipelineInstances>	Indicates the number of pipeline processes (pipelined) to create a system capable of having multiple pipelines. You can add one extra pipelined process for each additional processor core that is idle. By default, this value is set to 1. For more information on creating multiple pipelines, see "Pipeline Settings" on page 109.
<SslHwCheckDisabled>	When set to true, the CX PCA disables the scanning for and use of SSL hardware accelerator cards. The default value is False.
<MaxPipelineSHMQueueSize>	Defines the size in megabytes of the queue that feeds hits to instances of the pipeline. By default, this value is set to 100 MB. Maximum allowed value is 200 MB.
<MaxPipelineSHMQueue2Size>	Defines the size in megabytes of the queue that feeds hits from the instances of the pipeline to the Tcl engine module. By default, this value is set to 100 MB. Maximum allowed value is 200 MB. For more information on creating multiple pipelines, see "Pipeline Settings" on page 109.
</Capture>	

<Delivery>

This section includes the attributes for configuring real-time data transportation from the Passive Capture host machine to the IBM Tealeaf CX Server environment.

Table 28. Delivery setting

Configuration Option	Description
<DeliveryMode>	Configures the delivery mode for the PCA delivering to its peers. For more information, see “PCA Web Console - Delivery Tab” on page 101. `<DeliveryMode>2</DeliveryMode>`
<BatchInterval>	This setting is not used.
<MaxQueueDepth>	Defines the maximum size (in bytes) of the queue for sending data to the IBM Tealeaf CX Server. The default value is 0, which sets the queue depth to 50MB.
<MyCertificate>	This setting is not used.
<MyPrivateKey>	This setting is not used.
<StatisticsHitEnabled>	This setting is a Boolean flag, set to either `True` or `False`. • If set to `True`, then statistics hits are enabled as a feature. • If set to `False`, the feature is disabled. If no value is set, it is treated as `False`.
<StatisticsHitHost>	This setting is either the host name or IP address of the machine that runs the Tealeaf Transport Service that receives statistics hits.
<StatisticsHitIntervalSeconds>	This setting, a positive number, is the minimum number of seconds to lapse between attempts to send statistics hits. If set to 0 (zero), statistics hits are not sent.
<StatisticsHitPort>	This setting, a positive port number, is the TCP/IP port number to use while connecting to the Tealeaf Transport Service on the host.
<StatisticsHitSecure>	This setting, a Boolean flag, indicates if the connection to the Tealeaf Transport Service is enabled for SSL. It can be set to either `True` or `False`. If unspecified, it is treated as though set to False.
<TimeSourceHost>	Designates the domain name or IP address of the host running the Tealeaf Transport Service to be used as a time source. If you do not want to synchronize to a time source, leave this field empty.

Table 28. Delivery setting (continued)	
Configuration Option	**Description**
<TimeSourcePort>	Designates the port on which the time source host listens for time source queries. If you do not want to synchronize to a time source, leave this field empty.
<Peers>	
<Peer>	Defines the IP address and port of the receiving IBM Tealeaf CX Server environment. A <Peer> section must be defined for each receiving IBM TealeafCX Server machine.
<Host>	Specifies the IP address or host name of the IBM TealeafCX Server receiving data from the Passive Capture host machine.
<Port>	Specifies the IP port number on the IBM TealeafCX Server to which the data is being sent. The default value is 1966.
</Peers>	
<PollingInterval>	This setting is not currently being used.
<WatchdogTimer>	Specifies the maximum time (in seconds) allowed to make a connection to the IBM Tealeaf CX Server. If the timeout is exceeded, the connection is marked as disconnected. The default value is 30 seconds.
</Delivery>	
<ConfigurationChangeTime>	Specifies the UNIX time (seconds since January 1, 1970 Coordinated Universal Time) since the last update made to the configuration file by the web console. **Note:** Do not change this setting. This setting is automatically changed when there is an update through the web console.

<Extension/>

The <Extension/> setting is not used.

<Parse>

The following configuration settings are used to define the sessionization parameters for the Tealeaf Cookie Injector. For more information, see “Pipeline Settings” on page 109.

Table 29. Parse settings	
Configuration Option	**Description**
<UserIDName>	(Optional) Specifies the HTTP(S) header value that is set by the Tealeaf Cookie Injector as the user ID attribute. The default value is TLTUID.

Table 29. Parse settings (continued)	
Configuration Option	**Description**
<SessionIDName>	Specifies the HTTP(S) header value that is set by the Tealeaf Cookie Injector as the Session ID attribute. The default value is TLTUID.
<HitIDName>	Specifies the HTTP(S) header value that is set by the Tealeaf Cookie Injector as the Hit ID attribute. The default value is TLTUID.
<TealeafCookies>	Specifies whether Tealeaf Cookie Injector is being used. The default value is True.
<CaptureMode>	Specifies the capture mode being used. There are two possible settings: Business and BusinessIT. • If CaptureMode=Business, the software captures only HTTP(S) request and response objects for 'business' page requests (for example, HTML, ASP, JSP). The associated non-text objects are not captured (for example, GIF, JPEG) on that page. • If CaptureMode=BusinessIT, the software also captures HTTP(S) request and response objects for file objects that are associated with the 'business' page (for example, GIF, JPEG). • The default value is Business.
<ExcludeExtensions>	Specifies the files extensions to exclude from the captured DataStream. This setting can be used to refine the behavior that is specified by CaptureMode.
<IncludeExtensions>	Specifies files extensions that are fully captured. Binary files such as PDFs can now be included in capture.
<CaptureAllTypes>	Specifies Content-Types (MIME types) for which to capture a full hit (including response).
<IncludeMethods>	Specifies the HTTP methods to include. The default values are Get, Post, and Put.
<RawRequest>	Determines whether RawRequest is on. RawRequest is an aid in debugging. The default value is False (disabled). If set to True, the HTTP Request headers are added to the hit. **Note:** It is recommended to set the value to False to prevent extra data from being added to each hit.

Table 29. Parse settings (continued)	
Configuration Option	**Description**
<ResponseHeaders>	Determines whether ResponseHeaders are on. ResponseHeaders are aids in debugging. The default value is `False` (disabled). If enabled (`True`), the HTTP Response headers are added to the hit. **Note:** It is recommended to set the value to `False` to prevent extra data from being added to each hit.
<MaxResponseSize>	Specifies the largest acceptable response size (in bytes). The default value is 1572864 (1.5 MB).
<MaxDataSizeBytes>	The maximum number of bytes allowed for communication between Passive Capture and the binary hit representation that is used for communicating with the Tealeaf Transport Service. The default value is 2 MB (2097152).
<MaxRequestSizeBytes>	The maximum number of bytes allowed for HTTP requests. Exceeding this value causes a dropping of the request body or the entire request. The default value is 2 MB (2097152).
<ShrinkToFit>	If set to `True`, the hit processing code does not allocate extra space when it resizes buffers. The extra space minimizes future reallocations, which increases performance. • Set this value to `True` only if you want to exercise the hit processing code more aggressively and keep its memory usage to a minimum. • The default and recommended value is `False`.
<InflateEnabled>	If a response has a content-encoding header whose value is `deflate`, `gzip`, or `x-gzip`, then it is a candidate for having the body inflated (expanded from its compressed state). • If set to `True`, then an attempt is made to inflate the response. – If the inflate fails, a message is logged at the notice log level. – If the inflate succeeds, the value of the content-encoding header is overwritten with the character X. For example, the content-encoding header might have the value of XXXX. • The default value is `False`.

Table 29. Parse settings (continued)	
Configuration Option	**Description**
<MoveXMLToREQ>	Relocates the XML from the response to an XML section in the request. **Note:** This feature is disabled. Regardless of the value that is defined, the PCA behaves as if this attribute is set to False.
<UnReqCancelled>	If enabled, this option checks the last 100 bytes of the response body for when capturetype=1 and marked as canceled.
<CookieParsingEnabled>	If this option is selected, a cookies section is added to the request.
<URLDecodingEnabled>	This option determines whether to URL-decode urlfields.
<DelImagesEnabled>	When selected, this option enables the DelImages feature in the PCA, which automatically deletes image hits that meet specific criteria. For more information, see “Pipeline Settings” on page 109.
<TLISupportEnabled>	This option enables the capture of static content by the PCA for purposes of storing it in a TLI server that is deployed among your Windows based Tealeaf servers. • A TLI server enables the capture of static content, such as images, JavaScripts, and style sheets, into a permanent archive for highest fidelity replay and auditing requirements. For more information, see *IBM Tealeaf cxImpact Administration Manual*. • When enabled, this option overrides the DelImages feature in the PCA. Fore more information, see “Pipeline Settings” on page 109.
<SessioningEnabled>	If this option is set, hits are grouped in sessions that are based on <SessField/>.
<SessField>	The primary field on which to sessionize. It must be defined, if sessioning is enabled. This value can be any field in the request buffer, [urlfield] name-value pair, or REMOTE_ADDR in the [env] section. You may specify the primary sessioning field and alternates as a comma-delimited list of field names. Field names in separate sections can be prefaced with the section name, such as cookies:field1, urlfield:field2.
<SessSection>	Optional field that indicates which section of the request buffer the SessField is found. Use this field only if an explicit section is not referenced in the SessField value or values. If it is not specified, the entire request is searched and the first match is used.

Table 29. Parse settings (continued)	
Configuration Option	**Description**
<SessFieldMaskOff>	Specifies a substring of the SessField request field to use for sessioning. This value can be two zero-based offsets or a starting offset and the word end to use everything from the starting position to the end of the value. For example: • PrimarySessFieldMaskOff=0 end uses the entire string • PrimarySessFieldMaskOff=0 19 uses the first 20 characters • PrimarySessFieldMaskOff=14 end-4 uses the 15th character to 4th from the end • PrimarySessFieldMaskOff=end-9 end-2 uses the ninth from the end to second from the end
<SessCaseInsensitive>	When set to True, the SessField and SessSection (if specified) can have mixed-case values. **Note:** This option should be avoided, as case-insensitive matching uses more system resources than case-sensitive matching. This setting applies only to the parameter name and not the parameter value.
<TimeGradesEnabled>	If enabled, time Grading can assign a grade to a hit in one of the following three areas: • Web Server Page Gen: How long it takes the web server to serve the page. • Network Transit: Measures network speed by how much time a packet spent on the network. • Round Trip: How long it takes an arbitrary packet to travel from the client to the web server.
<WSGenBreaks>	How long it takes the web server to serve up the page. Comma-delimited name-value pairs (name:value, name:value).
<NetworkTransitBreaks>	Measures network speed by how much time a packet spent on the network. Comma-delimited name-value pairs (name:value, name:value)).
<RoundTripBreaks>	How long it takes an arbitrary packet to travel from the client to the web server. Comma-delimited name-value pairs (name:value, name:value).
<SamplingEnabled>	Session sampling, if enabled, specifies a percentage of sessions to delete from the capture.
<SamplePercentage>	The percentage of traffic to save, if sampling is enabled.
<PrivacyEnabled>	Determines if privacy is enabled.

Table 29. Parse settings (continued)

Configuration Option	Description
<InflatePreserveResponseOnErr>	Selecting this option turns on the inflate feature. If a response has a content-encoding header whose value is deflate, gzip, or x-gzip, then it is a candidate for having the body inflated and expanded from its compressed state. If the inflate fails, a message is logged at the notice log level. If the inflate succeeds, the value of the content-encoding header is overwritten with the character X. For example, the value of content-encoding might be XXXX.
<XforwardingEnable>	When set to True, the PCA is configured to parse a specified HTTP-X-FORWARDING field. **Note:** This entry is not created until X-forwarding is enabled. For more information, see "Pipeline Settings" on page 109.
<XforwardingField>	When XforwardingEnable is set to True, this field identifies the HTTP-X-FORWARDING field. This entry is not created until X-forwarding is enabled. For more information, see "Pipeline Settings" on page 109.
</Parse>	
<LastWSDescription>	When TimeGrades is enabled, the description to use for WSGen times that exceed the last time that is defined by WSGenBreaks.
<LastNTDescription>	When TimeGrades is enabled, the description to use for Network Transit times that exceed the last time that is defined by NetworkTransitBreaks.
<LastRTDescription>	When TimeGrades is enabled, the description to use for Round Trip times that exceed the last time that is defined by RoundTripBreaks.
<DeflateEnabled>	If set to True, the response of each hit is compressed (if not already) before it is sent to the delivery peer. The default value is False.
<HitArchiveEnabled>	If set to True, all captured hits are also written to an archive file (TLA) on the local drive. This is primarily for troubleshooting and is not for use normal circumstances. The default value is False.
<HitArchiveDirectory>	Directory where hit archives are written when HitArchiveEnabled=True.

Table 29. Parse settings (continued)	
Configuration Option	**Description**
<HitArchiveRollSizeMBytes>	Specify the roll file size in megabytes, default value is 100 MB.

<Failover>

You can configure failover settings through the “PCA Web Console - Failover Tab” on page 157.

Table 30. Failover settings	
Configuration Option	**Description**
<Enabled>	If failover is enabled, a backup Passive Capture host machine (subordinate) takes over if the main one (Master) fails.
<MasterAddress>	Address of the master failover machine.
<MasterPort>	Port of the master failover machine.
<SlaveAddress>	Address of the subordinate failover machine.
<SlavePort>	Port of the subordinate failover machine.
<HeartbeatInterval>	How long to wait between heartbeats.
<HeartbeatTimeout>	The amount of time Passive Capture waits for a response to a heartbeat before calling it a timeout.
<TimeoutLimit>	The number of consecutive heartbeat timeouts that are allowed before failover is forced.
<AutoFailback>	Passes control (active state) from the subordinate Passive Capture host machine back to the Master Passive Capture host machine once the master machine is ready to take control again.
<FailbackDelay>	The minimum number of seconds to wait before doing automatic failback.
<FailoverOnSvcRestart>	This option determines whether a failover is triggered when the capture services are restarted on the active IBM Tealeaf Passive Capture Application server.
<RemoteMonitors>	
<RemoteMonitor>	A Remote Monitor is a computer (represented by a host name or IP address) that is allowed to receive failover state information by sending heartbeats to a Passive Capture host machine configured for failover.
<Host>	Host name of the remote monitor.
<CanControl>	If this option is enabled, the remote monitor can force a failover or failback.
</RemoteMonitor/>	
</Failover>	
</Conf>	

<Pool>

You can configure SSL pool settings through the **SSL** tab in the PCA web console.

Table 31. SSL pool settings

Configuration Option	Description
<PoolPeer>	Contains the SSL pool configuration settings for the local PCA server. The default value is .
<IPv6>	Defines if the IP address uses IPv6. The default value is false.
<Address>	IP address for the PCA server The default value is 9.19.145.49.
<Port>	Port number for the PCA server The default value is 11211.
<CacheSize>	Defines the size in MB of the memory cache that contains the SSL session information. The default value is 256.
<Secure>	Enables or disables secure communication between PCA servers in the SSL pool. The default value is false.

Configuring Multiple Listend-Routerd Pairs

Configure Multiple Listend-Routerd Pairs (MLRP) to use multiple NICs to capture network traffic in an environment that produces a high volume of network traffic.

About this task

To configure MLRP on your CX PCA server:

Procedure

1. Log on to the PCA web console.
2. Go to the **Interface** tab.
   MLRP is only supported when transparent load balancing (TLB) is enabled. For more information about TLB, see “CX PCA Transparent Load Balancing Overview” on page 10.
3. Select **Enable Transparent Load Balancing**.
4. Select **Multi-instance Capture** to enable MLRP.
5. Select **Add Instance** to configure how many pairs you want to enable.
6. Go to **Instance List** and configure the interface settings for each instance.
7. Go to **Filter Rules** and apply your filtering rules to each instance.
   For more information about filter rules, see “PCA Web Console - Interface Tab” on page 84.

What to do next

You can view the `reassd` instance and statistics for each MLRP pair by selecting **Statistics**, select an instance, then select **Capture**.

Related concepts

"Multiple Listend-Routerd Pairs" on page 11
You can enable multiple `listend` instances using multiple `Listend-Routerd` pairs (MLRP).

Configuring SSL Pools

You can create SSL pools to group a set of PCA servers together so that the PCA servers can share SSL session information.

About this task

If you configure a group of PCA servers into an SSL pool, an SSL session that was started on one PCA server can be resumed on another PCA server within the pool. This capability gives you that ability to configure multiple PCA servers in your Tealeaf environment. Additionally, SSL pooling can be used to prevent queueing and potential data loss if an originating PCA server cannot continue to process the SSL session.

Use the following procedure to add a PCA server in to an SSL pool.

Note: Each PCA server in the SSL pool must contain an identical SSL pool configuration.

Procedure

1. Go to the PCA web console.
2. Select the **SSL** tab and scroll down to the **SSL Pool Configuration**.
   The PCA server that you are logged in to is automatically listed in the pool configuration.
3. Select **Add** to enter the network information for any additional PCA servers in the SSL pool.
4. Enter the IP address for the additional PCA server into the **Host Address** field.
5. Enter the port number for the additional PCA server into the **Host Port** field.
6. Select **OK** to continue.
7. After the PCA server is added to the pool configuration, a confirmation message is displayed. Select **OK** to return to the **SSL Pool Configuration**.
8. If you have an additional PCA server to add to the pool configuration, repeat step "3" on page 181.
9. In the **Tuning Parameters For Local Host** field, enter the size of the memory cache.
   The memory cache contains the SSL session information for the local server. The default value is 256 MB.
10. Click **Save Pool Changes** to save and apply your SSL pool configuration.

What to do next

The pool configuration for each PCA server in the SSL pool must be added to each PCA server. Log in to the web console for each PCA server that belongs to the SSL pool and repeat this procedure.

For information about removing a PCA server from the SSL pool, see "Removing a PCA Server from an SSL Pool" on page 181.

For information about the SSL pool troubleshooting utilities, see "SSL Pool Troubleshooting" on page 265.

Removing a PCA Server from an SSL Pool

Use the following steps to remove a PCA server from an SSL pool.

Procedure

1. Go to the PCA web console.

2. Select the **SSL** tab and scroll down to the **SSL Pool Configuration**.
3. Locate the PCA server that you want to remove from the SSL pool.
4. Select **X** under the **Delete** column to remove the PCA server from the pool configuration.
5. Click **Save Pool Changes** to save and apply your SSL pool configuration.

What to do next

For information about adding a PCA server from the SSL pool, see "Configuring SSL Pools" on page 181.

For information about the SSL pool troubleshooting utilities, see "SSL Pool Troubleshooting" on page 265.

Packet Forwarder Configuration

The IBM Tealeaf Packet Forwarder can be configured through the configuration files that are stored in the installation directory.

The typical scenario of a Cloud website would include an elastic load balancer (ELB) to distribute web traffic to a dynamically provisioned web server tier that consists of multiple web-server instances. Each web-server instance would have a Packet Forwarder installed to forward the captured web traffic to a centralized CX PCA. The CX PCA runs on a virtual machine instance and processes the web traffic. After the web-server instance is properly configured, an Amazon machine instance (AMI) is created for the instance. The AMI is then dynamically provisioned to provide as many instances as needed.

Note: At the time of this publication, the maximum number of web-server instances needs to be known. The number of web-server instances is used in the configuration of the packet forwarder to determine the maximum number of active TCP connections that can connect to the destination PCA socket receiver.

Configuring a Packet Forwarder to Communicate with the CX PCA

To process web traffic in a cloud-based environment, a packet forwarder must be configured to transmit data to a central CX PCA that is operating on a virtual machine.

Before you begin

The following prerequisites must be completed before you configure the packet forwarder software.

- All installation and configuration operations must be completed using the `root` user account. Using the `sudo` command may not provide sufficient permissions to allow system parameter modifications and might cause an incomplete or incorrect installation.
- Install the packet forwarder software. For more information, see "Installing the Packet Forwarder" on page 28.

About this task

Use the following steps to configure the packet forwarder and CX PCA for communication in your cloud-based environment.

Procedure

1. Locate `/usr/local/ctccap/etc/fwdr-conf.xml` on the reverse proxy server or on the virtual web server that is hosting the packet forwarder transmitter.
2. Back up the existing configuration file by copying `/usr/local/ctccap/etc/fwdr-conf.xml` to a backup directory.

   If your configuration file becomes corrupted or invalid, you can restore from your backup or create a new configuration file from `fwdr-conf-defaults.xml`. `fwdr-conf-defaults.xml` contains the default configuration settings for the packet forwarder.
3. Edit the `/usr/local/ctccap/etc/fwdr-conf.xml`.

   You can use the `vi` editor or another text editor to edit the configuration file.

4. Locate the <PrimaryInterface> tag and edit the virtual NIC device name for the packet forwarder.

   The packet forwarder captures the traffic from the web server. For most installations, eth0 is used as the device name.

5. Edit the port numbers to reflect the traffic ports that are used for your server.

   The default capture traffic filter rule is defined to listen to port 80 and 443 traffic.

   Example port settings:

```
<ListenTos>
<ListenTo>
<Port>80</Port>
<Port>443</Port>
</ListenTo>
</ListenTos>
```

6. Locate the Delivery tag and edit the delivery network connection for the packet forwarder. This connects the packet forwarder to the centralized CX PCA VM instance.

   Example delivery network connection settings:

```
<Peers>
<Peer>
<Address>127.0.0.1</Address&gt>
<Port>1888</Port>
</Peer>
</Peers>
```

7. Locate and edit the <Address> and <Port> tag match the assigned internal IP address and port of the CX PCA that is installed on the virtual machine.

   Example setting for the CX PCA VM internal IP address:

   Note: The <Port> tag defines the port number of the base network connection. This is a base port number where it defines the block of port numbers that can be used for the number of web server instances that can be provisioned. For example, if you know that there will be a maximum of five web-server instances that can be dynamically provisioned, then the block of ports that are used start with 1888. In this example, port numbers 1888 - 1892 would be used based on the maximum of five instances.

```
<Peers>
<Peer>
<Address>127.0.0.1</Address>
<Port>1888</Port>
</Peer>
</Peers>
```

8. Locate and edit the <MaxRotatePeers> tag to define the maximum number of web server instances that can be dynamically provisioned. The default is set to 1 for just one web-server instance where there are no other instances of the packet forwarder used in the web server tier.

   Note: If you are statically assigning a fixed number of web server instances with associated packet forwarders, then the <MaxRotatePeers> would remain set to the default value of 1. Each packet forwarder has to configured with a unique port number to identify a unique network connection to the centralized CX PCA VM instance. The port numbers must be assigned in sequential order. This is required by the socket receiver for the CX PCA when it is configured for the packet forwarder's network connections. If you decide to start with port number 1888 for the first packet forwarder, then defining five of them would be 1888 through 1892.

9. Save your changes to the configuration file.
10. You must configure a packet forwarder receiver instance for each Packet Forwarder transmitter instance that you have deployed. For more information, see “Configuring a Packet Forwarder Receiver and the CX PCA to Receive Forwarded Packets” on page 184.

What to do next

Once the packet forwarder is running, you can also perform the following actions:

- Check the status of a packet forwarder, by running `service pktfwdr status`.
- Stop a packet forwarder, by running `service pktfwdr stop`.
- View the statistics for a packet forwarder, by running `ctcstats -p`.

Configuring a Packet Forwarder Receiver and the CX PCA to Receive Forwarded Packets

To process web traffic in a cloud-based environment, Packet Forwarder receiver instances must be deployed to the central cloud-based CX PCA that is operating on a virtual machine.

Before you begin

For each packet forwarder transmitter instance that is deployed, you must also deploy a Packet Forwarder receiver instance on the CX PCA server. For more information about installing a packet forwarder, see "Installing the Packet Forwarder" on page 28.

Complete the following steps to configure the settings for a packet receiver.

Procedure

1. Log in to CX PCA web console.

   See "PCA Web Console Login" on page 65 for more information.
2. Change the number of pipelined instances in the Pipeline tab as desired.

   Depending on whether CX PCA privacy rules have been applied, the default number of CX PCA `pipelined` processes is set to one. This might be insufficient and can be increased to handle the processing load. This assumes that the VM instance has sufficient resources such as enough processor cores to support the increase.
3. Save the changes to the CX PCA but do not restart the CX PCA at this time.
4. Edit the CX PCA configuration file `ctc-conf.xml`.

   For more information, see "Passive Capture Configuration File ctc-conf.xml" on page 165.
5. Locate the `Capture` tag section in the configuration file and change the content of this section to:

   ```
   <ListenerSocketEnabled>true</ListenerSocketEnabled>
   <TransparentLoadBalancingEnabled>false</TransparentLoadBalancingEnabled>
   <SslSessionInfoOnMemcachedServer>false</SslSessionInfoOnMemcachedServer>
   ```

   Note: If the CX PCA is configured to decrypt SSL traffic from the packet forwarder, then set `<SslSessionInfoOnMemcachedServer>` to `true`.
6. Locate the socket receiver settings and edit the settings for your network environment.

   The following example displays the default socket receiver settings:

   ```
   <Listener>
   <Module>pktr</Module>
   <Logfile>/var/log/tealeaf/listener.log</Logfile>
   <BasePort>1888</BasePort>
   <Instances>1</Instances>
   <Options>
       <Option>
           <Value>-p</Value>
       </Option></Options>
   </Listener>
   ```

   The `BasePort` tag defines the base port number that is used by the packet forwarders. This must be the same port number for the CX PCA to correctly capture traffic from the packetforwarder or packet forwarders. The default setting is to use a base port of 1888 and only receive from one packet forwarder.

   The `Instances` tag defines the maximum number of packet forwarders that the CX PCA will connect to. Set this value according to the total or maximum number as determined by the number of deployed packet forwarders.
7. Save your changes to `ctc-conf.xml`.

8. Start the CX PCA.

   For more information, see “Start PCA” on page 41.
9. After the CX PCA has restarted, you can start your web server tier and any deployed packet forwarder. Run `service pktfwdr start` to start the packet forwarder daemon.

What to do next

Once the packet forwarder receiver is running, you can also perform the following actions:

- Check the status of a packet forwader, by running `service pktfwdr status`.
- Stop a packet forwarder, by running `service pktfwdr stop`.
- View the statistics for a packet forwarder, by running `ctcstats -p`.

Automatically configure multiple new packet forwarders from a PCA

Each PCA can support up to one Gbps. If you have multiple packet forwarders, you can set the configuration on the PCA so that any packet forwarder that connects to the PCA through `initconn` uses the defined configuration. Before you set up the configuration on the PCA, you must pick a PCA machine from which the auto-configuration service runs. This PCA is the master machine for the auto-configuration process. To create a configuration to automatically configure new packet forwarders you modify files on the PCA and the packet forwarders.

What automatic packet forwarder configuration does

The automatic packet forwarder configuration lets you use a single configuration set up to configure new packet forwarders in your deployment. You set up the configuration on one packet forwarder and run configuration service on the PCA. Once the configuration is set and the service started, all addition packet forwarders created from the original packet forwarder machine use the configuration. You do not have to configure each packet forwarder individually.

What you do on the PCA

You need to set up the auto-configuration service on the PCA. This process includes:

- Creating public and private rsa key pairs.
- Modifying the `<installdir>/etc/pfconf-conf.xml` file on the PCA. You modify the file to:
  - add the IP addresses for the PCAs that the automatically added packet forwarders will use
  - specify the number of Max Peers each PCA can interact with
- Running the `pfconf -s` command to configure all of the other new packet forwarders.
- If you have a custom default fwdr-conf-default.xml file that you want to use so that each packet forwarder uses a different configuration:
  1. copy the custom file that you have to the `<installdir>/etc` directory on the PCA.
  2. add the file name in the <ConfigFile> tag in the `pfconf-conf.xml`

Optionally, you can manually modify the packet forwarder configuration locally on the master PCA. If you want to set the configuration for just one of the packet forwarders, you edit the fwdr-conf.xml file for the packet forwarder. Each packet forwarder has a configuration file in `<installdir>/etc/pf-confs/<ipaddress>/fwdr-conf.xml`. Any changes you make to this file are picked up by the `pfconf` script when it runs. The script sends the edited configuration to the packet forwarder and restarts the service to use the new configuration. This is done after you set up auto-configuration.

What you do on the packet forwarder

You need to set up the auto-configuration on one packet forwarder in your deployment. The packet forwarder workflow includes:

- Adding a public rsa key on the packet forwarder.

- Modifying the <installdir>/sbin/initconn service on one packet forwarder. You modify the service and add the IP address for the master PCA.

PCA side commands and processes

On the primary PCA machine, use this command for the configuration process:

- pfconfig - located in <PCAinstalldir>/sbin this command assigns a PCA to the Packet Forwarder, sends the configuration file to the Packet Forwarder, then restarts the Packet Forwarder. By default this command sets the listening port to 1880. You can change this port if you need to for your solution.

On the PCA, this process listens for initconn:

- pfserv - by default, the process listens to port 1880 for information from the Packet Forwarder machine and creates the directory structure with the Packet Forwarder config file in <PCAinstalldir>/etc/pf-confs/<ipaddress> on the PCA. If you specified a different port to listen on with the pfconfig command, the pfserv process listens on that port.

Automatic configuration example

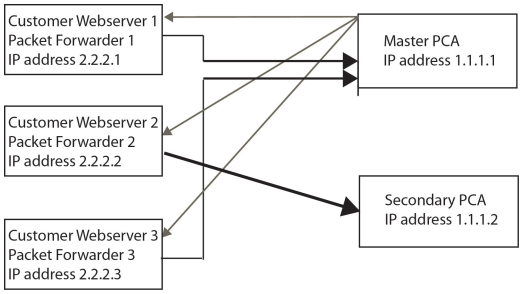
This example shows a sample configuration and the files used for the configuration.

Scenario

In this example, there are two PCAs and three packet forwarders:

- Master PCA - IP address 1.1.1.1
- Secondary PCA - IP address 1.1.1.2
- Packet forwarder 1 - IP address 2.2.2.1
- Packet forwarder 2 - 2.2.2.2
- Packet forwarder 3 - 2.2.2.3

This diagram shows the configuration:



All of the Packet Forwarders initially connect to the Master PCA to receive their config files. When the Auto-configuration script sees the new Packet Forwarders it assigns them to the available PCAs as defined in the pfconf-conf.xml file. Each packet forwarder has it's own fwdr-conf.xml file

Example pfconf-conf.xml

In this example the pfconf-conf.xml file would look like:

```
<?xml version="1.0" encoding="UTF-8"?>
<Conf>
    <PfservPort>
        <Port>1880</Port>
    </PfservPort>
    <PFOptions>
        <NIC>
            <SetNIC>true</SetNIC>
            <PrimaryInterface>eth0</PrimaryInterface>
        </NIC>
        <BasePort>
            <SetPort>true</SetPort>
            <Port>1888</Port>
        </BasePort>
```

```
        <FwdrConfig>
            <ConfigFile>fwdr-conf-defaults.xml</ConfigFile>
        </FwdrConfig>
    </PFOptions>
    <PCA>
                    <Address>1.1.1.1</Address>
                    <MaxPeers>3</MaxPeers>
    </PCA>
    <PCA>
                    <Address>1.1.1.2</Address>
                    <MaxPeers>3</MaxPeers>
    </PCA>
</Conf>
```

Example fwdr-conf.xml files

Each packet forwarder has it's own fwdr-conf. xml file.

In this example, the Packed Forwarder 1 fwdr-conf.xml would be:

```
<Conf>
    <Capture>
        <PrimaryInterface>eth0</PrimaryInterface>
    </Capture>

    <Delivery>
        <Peers>
            <Peer>
                <Address>1.1.1.1</Address>
                <Port>1888</Port>
            </Peer>
        </Peers>
    </Delivery>
</Conf>
```

In this example, the Packed Forwarder 2 fwdr-conf.xml would be:

```
<Conf>
    <Capture>
        <PrimaryInterface>eth0</PrimaryInterface>
    </Capture>

    <Delivery>
        <Peers>
            <Peer>
                <Address>1.1.1.2</Address>
                <Port>1888</Port>
            </Peer>
        </Peers>
    </Delivery>
</Conf>
```

In this example, the Packed Forwarder 3 fwdr-conf.xml would be:

```
<Conf>
    <Capture>
        <PrimaryInterface>eth0</PrimaryInterface>
    </Capture>

    <Delivery>
        <Peers>
            <Peer>
                <Address>1.1.1.1</Address>
                <Port>1889</Port>
            </Peer>
        </Peers>
    </Delivery>
</Conf>
```

Automatically configuring multiple packet forwarders from a PCA

Use this task to configure multiple packet forwarders at once, instead of one at a time.

About this task

You need to modify the `initconn` script on the packet forwarder to include the IP address of the PCA. After you modify the script you restart the `initconn` service manually on the command line or by restarting your web server.

Procedure

1. Create public and private rsa key pairs on the PCA machine.
2. On each packet forwarder, add the public rsa key to the authorized_keys file under root: cat <public key> >> ~/.ssh/authorized_keys.
3. On the packet forwarder:
   a) Modify the `initconn` script in the `sbin` directory. Add the IP address of the PCAs in your configuration to the file.
   b) Restart the initconn service by either restarting your web server or enter `service initconn restart`.
   c) Create a new image or save this image to create additional packet forwarders. For AWS, this would be creating a new AMI image.
4. Use the image you created in Step 3c to create additional packet forwarder instances that you want to be automatically configured. How you do this depends on the could platform. For AWS, this can be done by creating new instances from an AMI image.
5. On the PCA machine:
   a) Modify the `pfconf-conf.xml` file in the `<install>/dir` and enter the IP address and maximum number of peers for the PCAs in your solution.
   b) Enter `./pfconf -s` to configure the rest of the packet forwarders associated with the PCA machine. If you want the pserv process to listen on a port other than the default 1880 port, enter `./pfconf -s <port number>`
6. Optional: Manually modify the packet forwarder configuration locally on the master PCA. If you want to set the configuration for just one of the packet forwarders, you edit the fwdr-conf.xml file for the packet forwarder. Each packet forwarder has a configuration file in `<installdir>/etc/pf-confs/<ipaddress>/fwdr-conf.xml`. Any changes you make to this file are picked up by the `pfconf` script when it runs. The script sends the edited configuration to the packet forwarder and restarts the service to use the new configuration.

SSL Keys

For decrypting transmissions by using the SSL protocol, the IBM Tealeaf CX Passive Capture Application must be provided the SSL keys in use in the transaction stream.

About this task

Review and complete the instructions in this section to generate and export the private key for use by the IBM Tealeaf CX Passive Capture Application.

Procedure

1. “Encrypted SSL Key Setup” on page 189
2. “Exporting the SSL private key” on page 194
3. “Generating a Self-Signed Certificate” on page 202

Encrypted SSL Key Setup

To decrypt SSL connections, customers must provide the Passive Capture software with their valid SSL keys.

Note: Typically, SSL private keys are provided in PEM format and are converted for use in the PCA. Before you begin, verify that any PEM file that you are planning to convert contains the RSA private key and nothing else. For example, it must not contain the certificate and the Bad Attribute information.

- PEM files that are containing extra data can still be converted and added to the PCA. However, SSL key traffic fails to be properly decrypted by the PCA by using these keys, and no errors or warnings are issued by the application.

This section describes how to prepare your valid SSL keys for use and then to load them into the PCA.

- Auto-convert: You can allow the PCA to automatically convert clear-text PEM files to encrypted PTL keys on the PCA server. These keys are then automatically loaded into the PCA for use. There are some limitations on configuration of this process see “Automatic Conversion of SSL Keys” on page 189.
- Manual conversion: If you want to control each step of the conversion process, you can follow the manual conversion steps. See “Steps to Manually Convert SSL Keys” on page 190.

Overview

The software does not directly load the SSL key. Instead, it loads an encrypted file that is containing the SSL key and a machine-specific hash ID.

- The encryption protects the contents of the SSL key from unauthorized access. The file is encrypted by using the 3DES algorithm.
- The machine-specific hash prevents the encrypted file from use with another Passive Capture installation.

  Note: As part of the process of generating the encrypted PTL key, some data unique to the Network Interface Cards installed on the PCA host machine are embedded in the key. If you add or remove NICs or move the PCA to a new machine with different cards, you must regenerate the PTL keys by using the master key PEM files and the instructions that are provided .

This file is stored on the Passive Capture server in the proprietary PTL format. After the file is loaded and configured, the original SSL key files can be deleted.

Automatic Conversion of SSL Keys

You can use an automatic conversion process to assist with converting SSL keys into PTL keys that can be imported into the CX PCA.

Note: Automatic conversion requires that SSL keys are stored in the `capturekeys` directory on the PCA server. If you want to store them in a different directory or to make other configuration changes to the process, you must manually convert them. See “Steps to Manually Convert SSL Keys” on page 190.

Auto-Converting PEM to PTL on CX PCA Server

The CX PCA can automatically generate a PTL file from a PEM file during startup.

About this task

After you have a PEM file, CX PCA can generate the PTL for you.

Note: This process only works for PEM files without password protection.

Procedure

1. Copy the PEM file to the following directory:

```
/usr/local/ctccap/etc/capturekeys
```

Note: This process deletes the PEM file in this directory. Make sure that you retain a copy of it in another location.

2. Restart the IBM Tealeaf CX Passive Capture Application software.
3. On startup, the CX PCA auto-converts the PEM to a PTL key.
   For example, if the file `myprivatekey.pem` generates a PTL key named `myprivatekey.ptl`.
   - The PEM file (`myprivatekey.pem`) is deleted from the directory.
4. To verify that the PTL key was properly loaded, review the capture log file (`var/log/tealeaf/capture.log`). If the PTL is properly loaded, a message similar to the following must in the log:

```
reassd[4681]: Autoloaded key file:
/usr/local/ctccap/etc/capturekeys/myprivatekey.ptl
```

Results

Note: After you verify successful conversion, remove the PEM files from the `capturekeys` directory. Whenever the CX PCA starts or restarts, this directory is polled for files, and the files are reconverted.

Converting PFX SSL Private Key to PTL

If you have a PFX private key from an unknown source, you can use the following commands to turn it into a PTL key for use by Tealeaf:

Procedure

1. Decrypt the file and rename it as a PEM file by running the following command on the Passive Capture host machine:

```
openssl pkcs12 -nodes -nocerts -in key1.pfx -out key1.pem
```

2. When prompted for the import password, enter the password that you used when you export the certificate to a PFX file. You must receive the following message:

```
MAC verified OK.
```

3. To validate the resulting file from the pkcs12 command:

```
openssl rsa -check -noout -in <private_key_filename>
```

Steps to Manually Convert SSL Keys

The following sections describe how to perform manual steps to convert certificates into keys that the PCA can use.

Loading CX PCA with SSL Keys

You can learn to load PCA with SSL keys in this section.

To load the CX PCAwith SSL keys, you must:

1. Load the CX PCA with the required SSL keys.
2. Go to the CX PCA web console and navigate to the **SSL Keys** tab.
3. Edit the configuration to add the required `.PTL` files.

Loading CX PCA with SSL Key Files

Use the following steps to load the CX PCA with one or more SSL keys.

About this task

To load Passive Capture with one or more SSL keys:

Procedure

1. Obtain a PEM file for each SSL key. You normally run this step on the web server that is containing the SSL keys. The Passive Capture software needs the SSL key to be in PEM format and the file name to end with a .pem extension. The PEM file is an ASCII text file that is containing the SSL key in an encoded form. Following is the example of an SSL key in PEM format:

   ```
   -----BEGIN RSA PRIVATE KEY-----
   MII ... (many lines of encoding here)
   ....
   -----END RSA PRIVATE KEY-----
   ```

   If the web server does not store its private keys in PEM format, then you must export the keys and possibly convert them to PEM format. For exporting procedures, see the section "Exporting the SSL private key" on page 194.
2. Transfer the PEM files to directory `/usr/local/ctccap/etc` on the Passive Capture host machine.
3. Log on to the Passive Capture host machine as user root and change to directory `/usr/local/ctccap/etc`.
4. Encrypt the PEM files to produce a PTL file.
   a) Use the `tealeaf pem2ptl` command to generate the PTL files for one or more PEM files. For example, if you have two PEM files named `server1.pem` and `server2.pem`, you can generate PTL files for both using the following command:

      ```
      tealeaf pem2ptl server1.pem server2.pem
      ```

      The previous command creates files named `server1.ptl` and `server2.ptl` in the same directory as the PEM files.

      - The `tealeaf pem2ptl` command does not create PTL files if they exist. The command sets the ownership and permissions of the resulting PTL files to allow only the user `ctccap` to access the files.

   b) If you have an older release of the `Tealeaf-pca` package that does not provide the `tealeaf pem2ptl` command, use the following commands for each PEM file you want to encrypt, replacing `server1.pem` with the name of your PEM file:

      ```
      /usr/local/ctccap/bin/tltenc -in server1.pem
      chmod u=rw,go= server1.ptl
      chown ctccap server1.ptl
      ```

      To convert many PEM files, use the `ls` and `xargs` commands to encrypt them. The following command line must be typed on one line. It uses the `ls` command to generate a list of file names. The vertical bar allows the `xargs` command to use this list and run the tltenc utility by using each file name in the list.

      ```
      ls -1 server1.pem server2.pem server3.pem | xargs -L 1 -t \
      /usr/local/ctccap/bin/tltenc -in
      ```

      After you run the previous command, use the following commands to set the ownership and permissions of all PTL files. It is safe to use wildcards because the ownership and permissions are the ones that are needed by the PCA to access any PTL file.

      ```
      chmod u=rw,go= *.ptl
      chown ctccap *.ptl
      ```

5. Remove the PEM files from the Passive Capture host machine. Wait until you confirm that Passive Capture is successfully decoded SSL connections before you delete the PEM files.

Results

After the SSL keys are loaded onto the Passive Capture host machine and encrypted into PTL files, configure Passive Capture to use the PTL files. When you must configure a few PTL files, use the **SSL Keys** tab in the web console. When you configure PTL files, you can find it easier to use a text editor like nano or vi to edit the configuration file directly.

Loading PCA with Web Console

To use the web console **SSL Keys** tab:

Procedure

1. Log on to the Passive Capture web console with a web browser.
2. Click the **SSL Keys** tab.
3. Click **Loaded** at the top of the page to view the loaded SSL keys.
4. Enter a descriptive HTTPS key label in the **Label** field.
5. Enter the full path name for the PTL file in the **Keyfile** file name field. For example: `/usr/local/ctccap/etc/server1.ptl`.
6. Click **Add**. The newly added entry for the PTL file is displayed on the updated page.
7. Repeat steps 4 through 6 for each PTL file you want to be used by Passive Capture.
8. Click **Save Changes** to save the added PTL files to the configuration file. The capture programs restarts and uses the new PTL files that you added.
9. If capture fails to start, view `capture.log` to determine the reason.

Adding PTL Files

You can manually add PTL files to your CX PCA configuration by editing the `ctc-conf.xml` file.

About this task

To edit the configuration file to add PTL files:

Procedure

1. Log on to the Passive Capture host machine as user root and change to directory `/usr/local/ctccap/etc`.
2. Edit the Passive Capture configuration file `ctc-conf.xml`.
3. Look for the following line:

```
<CaptureKeys></CaptureKeys>
```

4. If Passive Capture is already configured with PTL files, the <CaptureKeys> and </CaptureKeys> tags are on separate lines.
5. Add a <CaptureKey> entry for each PTL file between <CaptureKeys> and </CaptureKeys>. Each entry requires a label and the full pathname of the PTL file. For example, the <CaptureKey> entry for a hypothetical PTL file named `/usr/local/ctccap/etc/web1.ptl` would look like the following:

```
<CaptureKey>
        <Label>Web1 Key </Label>
        <PrivateKeyFile>/usr/local/ctccap/etc/web1.ptl</PrivateKeyFile>
</CaptureKey>
```

Below is an example of two <CaptureKey> entries configured on a Passive Capture host machine:

```
<CaptureKeys>
        <CaptureKey>
              <Label>Web1 Key </Label>
```

```
                <PrivateKeyFile>/usr/local/ctccap/etc/web1.ptl</PrivateKeyFile>
        </CaptureKey>
                <CaptureKey>
                <Label>Web2 Key </Label>
                <PrivateKeyFile>/usr/local/ctccap/etc/web2.ptl</PrivateKeyFile>
        </CaptureKey>
</CaptureKeys>
```

6. Save changes to the configuration file and exit the editor.
7. Restart the capture programs using the following commands:

```
Tealeaf stop capture
Tealeaf start capture
```

8. If capture fails to start, view `capture.log` to determine the reason.
9. Log on to the Passive Capture Web console with a Web browser and click the SSL Keys tab to view the PTL files you've configured.

Automatically Loaded PTL Files
Through the web Console, you can automatically upload SSL certificates in clear text `.pem` or password-protected `.pfx` format.

About this task

Note: For security purposes, this functionality is only accessible through SSL with an authenticated user. If you do not access this page over `https`, you can only view the existing PTL keys.

Procedure

1. Open the web console.
2. Click the **SSL Keys** tab.
3. Click the **Capture Keys** link at the top of the page.
4. The following page is displayed:

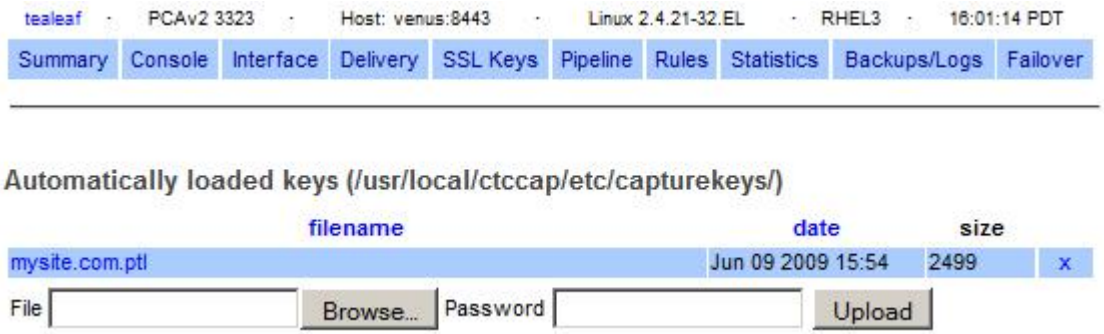


Figure 42. Uploading Keys

5. To select a file, click **Browse...**.
6. If the `.pem` key is a password-protected `.pfx` file, enter the password in the **Password** field.
   - If the file is a clear text `.pem` file, leave the **Password** field blank.
7. To convert the certificate to a key, click **Upload**.

General

About this task

- Converted keys are stored in `/usr/local/ctccap/etc/capturekeys`.
- Uploaded pem or pfx files that are valid keys are converted to ptl.
- Uploaded compressed files that contain valid pem files have their contents that are converted to ptl.

- Upon completion of a conversion, all non-ptl files are removed from /usr/local/ctccap/etc/capturekeys.
- After the required files are uploaded, the PCA must be restarted on the Console tab.

pfx

About this task

- Password protected keys (pfx) are only converted if the correct password is provided.
- Password protected keys are converted directly to ptl files.

pem

About this task

- Compressed files must be flat (no directories).
- Compressed files can onlycontain pem files.

Exporting the SSL private key

In cases where web application traffic is transmitted over HTTPS, the Passive Capture software must be configured to decrypt the SSL connections. This configuration requires exporting a copy of the private key from an existing web server to the Passive Capture software.

Note: These instructions are provided for exporting private keys from third-party systems of which Tealeaf is not component. This information is provided for reference purposes only and is not supported by Tealeaf. Tealeaf assumes no responsibility for these instructions. Consult the documentation that is provided with your web server product.

For more information about converting SSL keys for use in the PCA, see “Encrypted SSL Key Setup” on page 189.

Microsoft IIS 5 and 6

About this task

The following instructions provide the steps to export the private key from IIS in PKCS #12 format (*.PFX), using the Microsoft IIS certificate export wizard.

- For information on converting a PFX from a source other than IIS, see “Encrypted SSL Key Setup” on page 189.

Procedure

1. Start the Internet Information Service Manager.
2. On the left side pane, under the local machine name, click on the Web Sites folder.
3. On right side pane, right-click **Default Web Site** and select **Properties**.
4. Click the Directory Security tab.
5. Click **View Certificate** to display the certificate.
6. Click the Details tab.
7. Click **Copy to File...**. The Certificate Export Wizard launches.
8. Click **Next**. The Export Private Key window appears.
9. Select the Yes, export the private key radio button, and then click **Next**. The Export File Format window appears.
10. Select the Personal Information Exchange - PKCS #12 (.PFX) radio button. Select Enable strong protection and Include all certificates in the certificate path if possible. Click **Next**. The Password window appears.

11. Enter the password, if necessary. This password provides protected access to the file if the system is configured to require a password.
12. Click **Next**. The File to Export window appears.
13. Enter or browse to the file name, and then click the **Next** button. The Completing the Certificate Export Wizard window appears.
14. Click the **Finish** button. The certificate is exported to the file and a success message is displayed.
15. Copy the file to the Tealeaf Passive Capture host machine. Make sure that it is named descriptively for the web server from which it was exported.
16. Decrypt the file and rename it as a PEM file by executing the following command on the Passive Capture host machine:

```
openssl pkcs12 -nodes -nocerts -in key1.pfx -out key1.pem
```

17. When prompted for the import password, enter the password you used when exporting the certificate to a PFX file. You should receive the following message:

```
MAC verified OK.
```

18. To validate the resulting file from the pkcs12 command:

```
openssl rsa -check -noout -in <private_key_filename>
```

Microsoft IIS 3.0 and 4.0

The following instructions provide the steps to export the private key from Microsoft IIS 3.0 or 4.0.

About this task

Procedure

1. Export a backup file of the Certificate from the Key Manager.
2. From the Key menu in Key Manager, select **Export Key** and then select **Backup File**.
3. After you read the warning about downloading sensitive information to your hard disk, click **OK**.
4. Type the key name in the **File Name** box, and click **Save**. The file is given a `*.KEY` extension and is saved to a 3 1/2 -inch disk on the A: drive or your hard disk drive.
5. Transfer the key file to the `/usr/local/ctccap/etc directory` on the Passive Capture host machine.
6. Log in to the Passive Capture host machine as user root.
7. Run the following commands to generate a PEM file from the IIS key file. You can be prompted for a password whether the private key is password-protected. The following commands use several file names as examples:

```
cd /usr/local/ctccap/etc
./sbin/iis-extract-net-key.pl iis.key > iis-net.key
./bin/openssl rsa -inform NET -in iis-net.key -out iis.pem
```

   `iis.key`: The IIS key file that is exported from the IIS web server and transferred to the Passive Capture host machine
   `iis-net.key`: The portion of iis.key in the NET format
   `iis.pem`: The resulting key in PEM format
8. Validate the file by using OpenSSL:

```
../bin/openssl rsa -check -noout -in iis.pem
```

9. Validate the result:
   If the result is RSA key OK, then the key is successfully converted.
   If the result is Enter pass phrase for iis.pem, then the key is encrypted.
   If the result is another message or an error message, then the file is either in the wrong format or is not a key.
10. With a valid PEM file, you can now delete the IIS key files.

SunOne (iPlanet) 6.0

The following instructions provide the steps to export the private key from SunOne 6.0:

About this task

Note: This procedure requires OpenSSL to be installed on the web server from which the key is being extracted.

Procedure

1. Collect both certificate db and key db for the instance for which you extract the key. Normally it is available in SERVER_ROOT/alias.
2. Add the following to the PATH variable:

```
SERVER_ROOT/bin/https/admin/bin
```

3. Add the following to the LD_LIBRARY_PATH variable:

```
SERVER_ROOT/bin/https/lib:$\{LD_LIBRARY_PATH\}
```

4. Export PATH; LD_LIBRARY_PATH
5. This pk12util utility is used to export the certificate from the database to the key format. While exporting the key, you are prompted to enter the key password. Run the pk12util with the following option:

```
pk12util -o <export filename> -n <cert filename> -d <certdir> -P <db \
filename prefix for Sun DS>
```

   Note:

   -o - The name of the file to which the certificate is exported.

   -d - Option that is used to specify the location of certificate directory (path to cert8.db/key3.db)

   -P - Option that is used to specify the db prefix name (optional)

   Examples:

```
pk12util -o myCert.pk12 -n webServer.cert -d /sun/alias
pk12util -o myCert.pk12 -n webServer.cert -d /sun/alias -P "https-hostname-"
```

6. Using Open SSL, convert this file to the required PEM format by using the following option:

```
openssl pkcs12 -nodes -nocerts -in {Certname} -out https-{webinstance}.pem
```

   Note:

   -in - Option is used to specify the binary input file and is the file that you specified as the out file with the -d in step 4.

`-out` - Option is used to specify the ASCII output file.

Troubleshooting iPlanet 6.0 Issues

If you encounter the following DLL error that states `pk12util: find cert by nickname failed: Failure to load dynamic library`, then do the following steps:

Procedure

1. Run the following command:

```
wib@<servername>$ ldd pk12util
```

2. Copy the following files to the `/usr/lib` directory:

File	Source Location
libssl3.so	/opt/netsite/SunOne6.1/bin/https/lib/libssl3.so
libsmime3.so	/opt/netsite/SunOne6.1/bin/https/lib/libsmime3.so
libnss3.so	/opt/netsite/SunOne6.1/bin/https/lib/libnss3.so
libplc4.so	/opt/netsite/SunOne6.1/bin/https/lib/libplc4.so
libplds4.so	/opt/netsite/SunOne6.1/bin/https/lib/libplds4.so
libnspr4.so	/opt/netsite/SunOne6.1/bin/https/lib/libnspr4.so
libthread.so.1	/usr/lib/libthread.so.1
libnsl.so.1	/usr/lib/libnsl.so.1
libsocket.so.1	/usr/lib/libsocket.so.1
librt.so.1	/usr/lib/librt.so.1
libdl.so.1	/usr/lib/libdl.so.1
libc.so.1	/usr/lib/libc.so.1
libpthread.so.1	/usr/lib/libpthread.so.1
libmp.so.2	/usr/lib/libmp.so.2
libaio.so.1	/usr/lib/libaio.so.1
libnspr_flt4.so	/opt/netsite/SunOne6.1/bin/https/lib/cpu/sparcv8plus/libnspr_flt4.so
libc_psr.so.1	/usr/platform/SUNW,Sun-Fire-480R/lib/libc_psr.so.1

3. Copy the cert and key dbs to any directory. Then, do the following on that directory to verify its name:

```
ls -la
/opt/netsite/SunOne6.1/alias
```

- Following is the Output:

```
drwxr-xr-x 3 wib webmaster 1024 Feb 15 11:26 .
drwxr-xr-x 15 wib webmaster 1024 Nov 26 23:25 ..
drwxr-xr-x 7 wib webmaster 1024 Dec 7 12:53 certs
-rwxr-xr-x 1 wib webmaster 2481 Feb 15 07:40 gte.pem
-rwxr-xr-x 1 wib webmaster 212992 Feb 15 12:52
   https-<www.company.com>-<servername>-cert8.db
-rwxr-xr-x 1 wib webmaster 65536 Feb 15 12:52
   https-<www.company.com>-<servername>-key3.db
-rwxr-xr-x 1 wib webmaster 32768 Feb 15 07:40 secmod.db
```

4. Run the pk12util command. Include the full cert name on the -P option, including the servername and trailing dash (-) in the name of the file (anything before the cert8 or key3):

```
pk12util -o https-sunone.<URL> -n Server-Cert \
-d /opt/netsite/SunOne6.1/alias -P https-<www.company.com>-<servername>\-
```

5. A new file is created in the directory that is specified in the -d option that has the domain name with no extension.

Sun iPlanet 4.x

The following instructions provide the steps to export the private key from version 4 of Sun iPlanet.

Procedure

1. Log in to the web server as root.
2. Copy the iPlanet key and certificate.
   a) The iPlanet instance files are in /apps/netscape/server4/alias/.
   b) Copy iPlanet instance https-name**Key3.db file to /.netscape/key3.db.
   c) Copy iPlanet instance https-name-*cert7.db file to /.netscape/cert7.db.
3. Copy iPlanet instance secmod.db to /.netscape/secmodule.db.
4. Configure X-display to desktop.
5. Start the Netscape browser from the web server (/opt/netscape/netscape).
6. Click the **Security** lock icon.
7. In the dialog, click **Certificates**, and then click **Yours** (as shown in the following figure).

Figure 43. - Your Certificates

8. Click your certificate and then click **Export**. The default name is `Server-Cert`.
9. Type the password for the private key DB file.
10. Type a password to protect the exported file.
11. Save the exported file in `/.netscape/xxxxx.p12`, where `xxxxx` is name of file.
12. Close the Netscape browser.

Apache 1.3.x, 2.0.x

The following instructions provide the steps to export the private key from Apache versions 1.3.x and 2.0.x.

About this task

Note: This procedure requires OpenSSL to be installed on the web server from which the key is being extracted.

Procedure

1. If the key is encrypted, convert it to an unencrypted key. The basic command would be:

```
openssl rsa -in <old_private_key_filename> -out <new_private_key_filename>
```

   Note: You need the password to perform this conversion.
2. Extract the key from the `/etc/httpd/conf/ssl.key` directory.
3. Rename the file to have a .PEM extension.
4. Validate the file by using OpenSSL:

```
openssl rsa -check -noout -in <private_key_filename>
```

5. Validate the result: If the result is RSA key ok, then the key is successfully exported. If the result is Enter pass phrase for <private_key_filename>, then it is a key, but it is encrypted. If the result is another message or an error message, then it is either in the wrong format, or not a key.

IBM HTTP Server

The following instructions provide the steps to export the private key from the IBM HTTP Server.

Procedure

1. Select the certificate in iKeyMan, and then select **File** > **Export**.
2. Save the file with the extension PFX, set a password on it, and select weak encryption.
3. Transfer the file (in binary mode) to the Passive Capture host machine.
4. Log on to the Passive Capture host machine as root. Run the following command:

```
openssl pkcs12 -nodes -nocerts -in x.pfx -out x.pem
```

5. Enter the password that you set when you exported the file.
6. Validate the file by using OpenSSL:

```
openssl rsa -check -noout -in key1.pem
```

7. Validate the result:
   If the result is RSA key ok, then the key is successfully exported.
   If the result is Enter pass phrase for <private_key_filename>, then it is a key, but it is encrypted.
   If the result is another message or an error message, then it is either in the wrong format, or not a key.

Exporting from a Java Keystore (JKS)

Java™ Keystore (JKS) is the default implementation for certificates and key management in Java applications. For security reasons, no simple method is provided for extracting the private key from the keystore.

A common export scenario is to use the key in an Apache web server by using the PEM standard.

- If the keystore is configured to use openssl to create your digital certificate, then the private key is available transparently.
- However, if you are using ikeyman (IHS) or the Java based Keytool, private key export functions are not provided for security reasons.
  - There is a known workaround for exporting from Keytool. See “Java Keytool Workaround” on page 201.

The private key is required to convert a signed DER-format certificate that is received from a certificate authority into PKC12 format, which can be use by Tealeaf. Using ikeyman to generate the original certificate, you can receive the signed certificate from a certificate authority.

- ikeyman can receive a certificate in binary DER or base-64 encoded format.
- ikeyman can import from CMS, JKS, JCEKS or PKCS12 formats.

  Note: Extraction from IBM HTTP Server environments requires an extra step of saving the CMS database as JKS through ikeyman. After conversion, extraction works as if the database was in native JKS format.

PEM keys can then be exported to DER format, which can be consumed by Apache. To export the private key from JKS, you must find and compile Java source solution.

- For one example, visit http://se9.blogspot.com/2008/10/extracting-private-key-from-java.html.
- Several other methods are described in detail on the Internet.

To review a PEM key in DER format, use the following commands:

- For a certificate received from a certificate authority:

```
openssl x509 -noout -text -in CRT.der
```

- For an RSA private key:

```
openssl rsa -noout -text -in rsa.key
```

Java Keytool Workaround
By default, Java Keytool does not provide direct means for exporting the private key. However, if your version of the utility supports the export of a JKS type keystore to a different keystore format, then you can be able to apply the following workaround.

About this task

Note: If your keytool does not support this keystore export, the methods in the preceding section can be applied.

To export by using Java Keytool:
In the following example, the JKS keystore is exported to pkcs12, which can be consumed by Tealeaf.

Procedure

1. Export the keystore to a different keystore. In the following example, the keystore is exported to pkcs12 type with a single command:

   ```
   keytool -importkeystore -srckeystore test-app.keystore
   -destkeystore mystore.p12 -srcstoretype JKS -deststoretype PKCS12
   -srcstorepass test-app-pwd -deststorepass test-app-pwd
   -srcalias test-app -destalias test-app -srckeypass test-app-pwd
   -destkeypass test-app-pwd -noprompt
   ```

   where:

   - test-app.keystore = path to the application keystore
   - mystore.p12 = path to destination pkcs12 keystore
   - JKS = source keystore type. Must be set to JKS.
   - PKCS12 = destination keystore type. Must be set to PKCS12 when exporting to pkcs12.
   - test-app-pwd = the password to the keystore can be used for both source keystore and key passwords and the same for the destination one.
   - test-app = the alias for the keystore can be the same for source and destination.
2. When the keystore is exported to PKCS12, you use openssl to export the private key from a pkcs12 formatted key file :

   ```
   openssl pkcs12 -in mystore.p12 -out mystore.pem \
   -passin pass:test-app-pwd -passout pass:test-app-pwd
   ```
3. The password-protected private key is now contained in mystore.pem.

4. This private key can be consumed by Tealeaf.
   - For more information about validating PEM keys, see “Generating a Self-Signed Certificate” on page 202.
   - For more information about importing the key, see “Encrypted SSL Key Setup” on page 189.

Generating a Self-Signed Certificate

To generate a self-signed certificate, you must use the `openssl` utility to generate a private key and a self-signed certificate for that key.

About this task

The `Tealeaf-pca` package provides the openssl utility in the directory `/usr/local/ctccap/bin`.

The following steps assume that you logged in to the Passive Capture host machine as user root. To generate a self-signed certificate:

Procedure

1. Generate the private key. The following example generates a 2048-bit RSA key file named `example.key`:

```
/usr/local/ctccap/bin/openssl genrsa -out example.key 2048
```

2. Generate the self-signed certificate. The following example generates a self-signed certificate file named `example.crt` by using the private-key file `example.key` generated in step 1. With option `-days 365`, the certificate is valid for the next 365 days (one year):

```
/usr/local/ctccap/bin/openssl req -x509 -days 365 -newkey rsa:2048 -key \
  example.key -out example.crt
```

   The `openssl req` command interactively prompts for various values. The following table displays the prompts and sample replies:

   Prompt
   Sample Reply

   Country Name (2 letter code)
   US

   State or Province Name (full name)
   `California`

   Locality Name (for example, city)
   `San Francisco`

   Organization Name (for example, company)
   `IBM Tealeaf`

   Organizational Unit Name (for example, section)
   `Release Engineering`

   Common Name (for example, YOUR name)
   `pca.Tealeaf.com`

   Email Address
   `root@pca.Tealeaf.com`

   The common name must be the fully qualified DNS name of the Passive Capture host machine. If the host machine does not have a DNS name that is assigned to it, then use the IP address of the machine.

3. Now, set the appropriate file ownership and permissions:

a) All private key files must be readable only by the user account that needs read access to the file. The following `chmod` and `chown` commands set the ownership and permissions so that only the capture processes running as user `ctccap` can access file `example.key`:

```
chmod go= example.key
chown ctccap example.key
```

b) Place the files in a directory accessible by the user account. For certificate and key files that are used by the Passive Capture software, place the files in directory `/usr/local/ctccap/etc`.

Using SHA-2 algorithm to generate the self-signed certificate

By default, the `openssl` command uses the SHA-1 algorithm to generate the self-signed certificate on the PCA.

Optionally, you can use SHA-2 for the digital signature hash by adding the `-sha256` option, as in the following command:

Note: The following command is supported in PCA Build 3500 or later.

```
/usr/local/ctccap/bin/openssl req -x509 -sha256 -days 365 -newkey rsa:2048 \
  -key example.key -out example.crt
```

If you are not PCA Build 3500 or later, you can be able to generate the SHA-2 key on another Linux system. To determine whether it is possible, run the following command in a non-PCA environment:

```
openssl dgst ?h
```

The following line can be displayed in the generated output:

```
-sha256         to use the sha256 message digest algorithm
```

If the previous command is displayed, then the Linux installation accepts the SHA-2 option. You can run the following command without providing the PCA-specific path:

```
openssl req -x509 -sha256 -days 365 -newkey rsa:2048 -key example.key -out \
  example.crt
```

Generating a Signed Certificate Request for Internal CA Use

If you want to use your own internal Certificate Authority (CA) to generate a signed certificate, complete the following steps.

About this task

The following steps use the `openssl` utility as the example utility, although other utilities can be used.

Procedure

1. Acquire a 2048-bit RSA private key. This key can be self-generated as in the following example, which uses the default PCA install path to access PCA's openssl cmd:

```
/usr/local/ctccap/bin/openssl genrsa -out example.key 2048
```

2. Use the RSA private key to create the signed certificate request (CSR). If the key file is `example.key`, then the following cmd generates a CSR file `cert_req.csr`:

```
/usr/local/ctccap/bin/openssl req -config /usr/local/ctccap/ssl/openssl.cnf -new -key example.key -out
cert_req.csr
```

   If the previous command generates an error message that references `openssl.cnf`, then the PCA installation path to correctly locate the `openssl.cnf` file must be configured. In this case, you can apply the `-config` option to define the new, non-default installation path. In the following example, this path is `/opt/tealeaf`.

```
/opt/tealeaf/bin/openssl req -new -config /opt/tealeaf/ssl/openssl.cnf -key \
  example.key -out cert_req.csr
```

3. During generation of the CSR by using either of the previous commands, you are prompted for public certificate values. For more information about the values to insert, see “Generating a Self-Signed Certificate” on page 202.
4. When the CSR file is successfully generated, it can be used by the internal CA to complete the process to create the signed certificate.
5. The signed certificate file can now be applied in the same way as a self-signed certificate for PCA use.

Utility Scripts

The `Tealeaf-pca` package provides a script to simplify the steps for creating self-signed certificates.

The full path to the script file is `/usr/local/ctccap/sbin/gen-self-signed-cert.sh`. Specify the names of the new private key and certificate files as arguments to `gen-self-signed-cert.sh`.

The script creates a 2048-bit RSA key file and a self-signed certificate that is valid for 10 years (3,650 days). The resulting files are owned by user `ctccap`, and the private key is readable only by that user. Following is a sample invocation of this script:

```
/usr/local/ctccap/sbin/gen-self-signed-cert.sh example.key example.crt
```

The `Tealeaf-pca` package creates several self-signed certificates as needed when you install the package. If you change the host name of the Passive Capture host machine, you can regenerate these certificates. Use the following command to regenerate all of these certificates:

```
env FORCE=YES /usr/local/ctccap/sbin/all-self-signed-certs.sh
```

The previous command deletes and re-creates the following files:

```
/usr/local/ctccap/etc/tealeaf-pca.crt
/usr/local/ctccap/etc/tealeaf-pca.key
/usr/local/ctccap/etc/tealeaf-tts.crt
/usr/local/ctccap/etc/tealeaf-tts.key
/usr/local/ctccap/etc/tealeaf-tts.pem
/usr/local/ctccap/etc/tealeaf-web.crt
/usr/local/ctccap/etc/tealeaf-web.key
```

Deploying SSL Certificates for Use by the PCA Web Console

As needed, you can deploy custom SSL certificates for use by the PCA Web Console to ensure secure access to the console.

About this task

Note: The encryption strength and other characteristics of the certificate must be defined to meet your enterprise requirements.

Procedure

1. Acquire or generate the SSL certificate.
   - The PCA uses the default self-signed certificate and key provided. For more information about creating a self-signed certificate, see "Generating a Self-Signed Certificate" on page 202.
   - Tealeaf provides a utility script that simplifies the process of creating a self-signed certificate. This script produces a certificate by using with a reduced set of configuration options. See "Utility Scripts" on page 204.
2. The generated certificate and key file must be added to the Apache configuration file. This file is stored in the following location:

   ```
   /usr/local/ctccap/etc/httpd.conf
   ```

3. In the following example, the certificate file name is `tealeaf-web.crt`, and the key file name is `tealeaf-web.key`:

   ```
   Define SSLCERTFILE ${SYSCONFDIR}/tealeaf-web.crt
   Define SSLKEYFILE ${SYSCONFDIR}/tealeaf-web.key
   ```

4. Save the file.
5. Restart the PCA.
6. All web console users must now connect by using SSL.
   - For more information about how to connect by using SSL, see "Supported Browsers for PCA Web Console" on page 65.
   - For more information about changing the ports to which the PCA web console listens, see "Supported Browsers for PCA Web Console" on page 65.

Setting up the Tealeaf Transport Service for SSL Encryption

To encrypt the communication between the Passive Capture host machine and the Tealeaf Transport Service, you must obtain an SSL certificate. Then configure the Passive Capture software and the Tealeaf Transport Service to use it.

About this task

- The certificate must be 2048-bit private key.
- The certificate is installed on both the PCA and the Tealeaf Transport Service machine. The PCA requires the certificate for startup, and the Tealeaf Transport Service uses the certificate for managing secure connections with the PCA.

  Note: Transmitting through SSL between the PCA and the Tealeaf Transport Service requires more processing and can impact overall throughput.

Procedure

1. Obtain the SSL certificate.
   - If you create your own self-signed certificate, you must create a 2048-bit private key. See "Generating a Self-Signed Certificate" on page 202.

a) The `Tealeaf-pca` package creates a self-signed certificate for you to use when you configure SSL encryption of the network communication between the Passive Capture host machine and the Tealeaf Transport Service. This self-signed certificate contains the host name of the host machine at the time of the package installation.

b) The following certificate and key files are created by the `Tealeaf-pca` package:

- `/usr/local/ctccap/etc/tealeaf-tts.crt` (certificate file)
- `/usr/local/ctccap/etc/tealeaf-tts.key` (key file)
- `/usr/local/ctccap/etc/tealeaf-tts.pem` (combined certificate and key file in DOS EOL)

2. You can choose to use the above PEM file or create your own.

a) After you generate the certificate and private key files, use the script `/usr/local/ctccap/bin/crlf.sh` to generate a single DOS-EOL ASCII file that is needed by the Tealeaf Transport Service. :
For example, if your private key is in file `example.key` and your certificate is in file `example.crt`, use the following command to generate a single DOS EOL file named `example.pem`

```
/usr/local/ctccap/bin/crlf.sh example.key example.crt > example.pem
```

b) The resulting file contains a private key, so you must restrict its ownership and permissions by using the `chmod` and `chown` commands.

3. Transfer the single DOS EOL PEM file to the machine that is running the Tealeaf Transport Service. Ideally, you must restrict its access to just the Tealeaf Transport Service.

- The certificate must be installed on the root Tealeaf installation directory.

4. If required, you can use the Tealeaf Archive Reader to verify that the certificate is valid and usable. See “Testing the SSL certificate used by the Transport Service” on page 207.
5. On the Tealeaf Transport Service server, edit your `TealeafCaptureSocket.cfg` file.

- You can also perform configuration changes through the Pipeline Editor in TMS, which provides centralized versioning and assignment of Tealeaf configuration files. Edit the raw Transport Service configuration file and insert the values in the `[Globals]` section. See "TMS WorldView Tab" in the *IBM Tealeaf cxImpact Administration Manual*.

a) Add or edit the following directives in the `[Globals]` section to the path name of the PEM file. If the files are not in the Tealeaf installation directory, then specify the full path to the files.

```
CertificateFile=css-cert.pem
PrivateKeyFile=css-cert.pem
```

b) Using our sample `example.pem`, you would change `css-cert.pem` to produce the following results:

```
CertificateFile=example.pem
PrivateKeyFile=example.pem
```

c) In the `[Globals]` section, insert the port number to which the Tealeaf Transport Service listens for SSL traffic. Insert the following code :

```
SSLPort=1967:DataDrop
```

- 1967 is the port number to which the Tealeaf Transport Service listens for SSL traffic. This value is the default value. You can change it, as needed.

  Note: This port number must not be used by any other pipeline or Tealeaf component to listen for traffic.
- `DataDrop` is the first session agent in the pipeline that is configured to process the received SSL traffic.

6. Log in to the Passive Capture configuration web UI and click the **Delivery** tab. See "PCA Web Console - Delivery Tab" on page 101.
   a) In the Target Recipients section, click **Add**.
   b) The **Add Recipient for Hit Delivery** page is displayed. Enter the host address and port in the corresponding fields, select the **Secure** check box, and then click **OK**.

      Note: The entered port must match the SSL listening port on the Transport Service. The default for SSL transport is 1967.

7. The **Add Certificate for Secure Delivery** page is displayed. Paste in the certificate, and click **OK** to save the changes. The certificate is the piece of ASCII text that begins with the following line:

   ```
   -----BEGIN CERTIFICATE-----
   ```

   and extends up to and including the following line:

   ```
   -----END CERTIFICATE-----
   ```

8. Copy and paste everything from (and including) the `BEGIN` line up to (and including) the `END` line.
9. Restart the PCA.
10. Restart the Transport Service.

Testing the SSL certificate used by the Transport Service
Before you deploy the SSL certificate to the machine that is hosting the Tealeaf Transport Service, verify that the certificate is valid and usable using the Tealeaf Archive Reader.

Procedure

1. Leave the SSL certificate installed on the PCA.
2. In the `ArchiveReader.cfg` file in the Tealeaf installation directory on the machine that is hosting the Tealeaf Transport Service, locate the `[Socket]` section.
3. To configure the socket to use SSL, enter or set the following code:

   ```
   USESSL=True
   ```

4. Set the Server to be `localhost`.
5. Configure the following values to file name of the certificate that is installed in the root Tealeaf installation directory. Remove the hash mark (*#*) before the configuration line to enable it.

   ```
   CertificateFile=css-cert.pem
   PrivateKeyFile=css-cert.pem
   ```

6. Save the file.
7. Use the ArchiveReader to submit hits to the Transport Service.
   - See "TeaLeaf Archive Reader - Run Archived Sessions" in the *IBM Tealeaf CX Configuration Manual*.
8. In the TMS Pipeline Status tab, verify that hits are being captured and processed by the appropriate pipeline.
   - See "TMS Pipeline Status Tab" in the *IBM Tealeaf cxImpact Administration Manual*.
9. If hits are being captured and processed, the SSL certificate is working properly.
10. You can now apply the configuration changes to the `[Globals]` section of the `TealeafCaptureSocket.cfg`. See "Setting up the Tealeaf Transport Service for SSL Encryption" on page 205.

Enabling PCA Stats in Tealeaf Status

To enable PCA statistics information to display in the Tealeaf Status report, you must create a reference to the Capture Application Server in the **Portal Management** page.

- In the Portal menu, select **Tealeaf** > **Portal Management**.
- See "Managing Tealeaf Servers" in the *IBM Tealeaf cxImpact Administration Manual*.

Remove or View Certificate

If you want to remove or view the certificate, use the following procedure:

Procedure

1. Start Internet Explorer on the workstation that is running PortalStatus.
2. Select **Tools** > **Internet Options**.
3. Click the **Content** tab.
4. Click **Certificates**.
5. The **Certificates** window is displayed. Click the **Trusted Root Certification Authorities** tab.
6. You can now select the certificate for removal or viewing.

Validating PEM keys

To Validate the file by using OpenSSL, use the following command:

```
/usr/local/ctccap/bin/openssl rsa -check -noout -in <filename>
```

Following is the expected format:

```
-----BEGIN RSA PRIVATE KEY-----
.... (many lines of encoding here)
....
-----END RSA PRIVATE KEY-----
```

nCipher SSL Key Management System

Some Tealeaf installations use an nCipher card to offload the processing of SSL from the main processors. The following section explains how to set up this type of configuration.

Although nCipher cards can be used for SSL acceleration by offloading SSL operations to the card, its primary focus is to provide a highly secure keystore vault for SSL keys. It is also known as a Hardware Security Module (HSM) or the nCipher Key Management system.

Note: Not all nCipher cards provide HSM support.

nCipher Considerations

The number of instances that an nCipher card can handle depends on the card series you have and the number of CPUs.

Note: nCipher can change the standards of their SSL accelerator cards. To work properly with Tealeaf PCA, the drivers that are provided with the nCipher card must be OpenSSL-aware and must provide transparent access.

nCipher has several models of their SSL accelerator and key management cards, each supporting different maximum number of SSL transactions/second. For example, a 4000-series nCipher SSL accelerator card can handle approximately 4000 transactions at a maximum. Overhead in card operations is likely to reduce the rate of throughput, and multiple PCA instances can also decrease this figure.

- For more information about multi-instance PCA, see "Pipeline Settings" on page 109.

With the example above, the nCipher 4000 series card has a single instance capacity maximum of approximately 300-400 (1024-bit SSL) transactions/second. This figure varies with the number of PCA instances, typically in a downward direction.

Note: Avoid providing more SSL traffic to each instance of the PCA when the maximum throughput capacity of the accelerator card is reached.

IBM Tealeaf CX PCA and nCipher Compatibility

The following tables list the nCipher keys that are compatible with IBM Tealeaf CX PCA IBM® Tealeaf® CX PCA:

Table 32. IBM TealeafCX PCA nCipher key compatibility

nCipher key	Encryption strength (in bits)	Protocol
DES-CBC-SHA	56-bit	SSL3, TLS1.0
RC4-MD5	128-bit	SSL3, TLS1.0, TLS1.1, TSL1.2
RC4-SHA	128-bit	SSL3, TLS1.0, TLS1.2
AES128-SHA	128-bit	SSL3, TLS1.0, DTLS1, TLS1.1, TLS1.2
AES256-SHA	256-bit	SSL3, TLS1.0, DTLS1, TLS1.1, TLS1.2
DES-CBC3-SHA	192-bit	SSL3, TLS1.0, DTLS1, TLS1.1, TLS1.2
AES128-SHA256	128-bit	TLS1.2
AES256-SHA256	256-bit	TLS1.2
AES128-GCM-SHA256	128-bit	TLS1.2
AES256-GCM-SHA384	256-bit	TLS1.2

Table 33. IBM TealeafCX PCA nCipher key compatibility

Cipher Hexcode	OpenSSL Cipher String
0x000001	TLS_RSA_WITH_NULL_MD5
0x000002	TLS_RSA_WITH_NULL_SHA

Table 33. IBM TealeafCX PCA nCipher key compatibility (continued)	
Cipher Hexcode	**OpenSSL Cipher String**
0x000003	TLS_RSA_EXPORT_WITH_RC4_40_MD5
0x000004	TLS_RSA_WITH_RC4_128_MD5
0x000005	TLS_RSA_WITH_RC4_128_SHA
0x000006	TLS_RSA_EXPORT_WITH_RC2_CBC_40_MD5
0x000007	TLS_RSA_WITH_IDEA_CBC_SHA
0x000008	TLS_RSA_EXPORT_WITH_DES40_CBC_SHA
0x000009	TLS_RSA_WITH_DES_CBC_SHA
0x00000A	TLS_RSA_WITH_3DES_EDE_CBC_SHA
0x00002F	TLS_RSA_WITH_AES_128_CBC_SHA
0x000035	TLS_RSA_WITH_AES_256_CBC_SHA
0x00003B	TLS_RSA_WITH_NULL_SHA256
0x00003C	TLS_RSA_WITH_AES_128_CBC_SHA256
0x00003D	TLS_RSA_WITH_AES_256_CBC_SHA256
0x000041	TLS_RSA_WITH_CAMELLIA_128_CBC_SHA
0x000060	TLS_RSA_EXPORT1024_WITH_RC4_56_MD5
0x000061	TLS_RSA_EXPORT1024_WITH_RC2_CBC_56_MD5
0x000062	TLS_RSA_EXPORT1024_WITH_DES_CBC_SHA
0x000064	TLS_RSA_EXPORT1024_WITH_RC4_56_SHA
0x000084	TLS_RSA_WITH_CAMELLIA_256_CBC_SHA
0x000096	TLS_RSA_WITH_SEED_CBC_SHA
0x00009C	TLS_RSA_WITH_AES_128_GCM_SHA256
0x00009D	TLS_RSA_WITH_AES_256_GCM_SHA384

nCipher Installation

See "nCipher HSM Installation for PCA" on page 212.

Integrating Tealeaf SSL keys with HSM

This appendix describes integration methodologies for specific HSM vendors. A Hardware Security Module (HSM) provides both logical and physical protection of sensitive data from non-authorized use and potential adversaries.

Note: These integration methods are generalized approaches to integrating Tealeaf with each vendor's products. The described method must be customized to meet the requirements of your environment by a knowledgeable administrator of the HSM product.

In an HSM environment, the key file is stored on the HSM and retains an additional layer of access control to prevent its movement. Tealeaf creates reference keys to access the keys that are stored on the HSM. So, the keys used by the Tealeaf run time inherit the protective measures that are offered by the HSM.

Integration Methods by Manufacturer

- "Integration with nCipher HSM" on page 211

- “nCipher HSM Installation for PCA” on page 212

Integration with nCipher HSM

Following section describes a general method for integrating Tealeaf with SSL keys stored on a Hardware Security Module (HSM) for nCipher nShield products.

- This method must be customized for your HSM solution.
- This method applies to the nCipher nShield, payShield, and payShield Ultra modules.

Assumptions

Following are the assumptions of this method:

- You installed the HSM in your environment.
- You created and configured the nCipher security world.
- You have admin-level access to the security world environment and are comfortable using it.

Pre-Requisites

To provide the best possible support for the HSM in use, the HSM must meet the following requirements:

- The drivers that are provided with the card must be OpenSSL-aware.
- The card must be configured to provide not apparent access at startup.
- Verify that the key installation works on system reboot.

For more information about meeting these prerequisites, see nCipher application interfaces in the nShield/payShield User Guide provided with your nCipher product.

When the above mentioned requirements are met, Tealeaf can transparently access the true private keys by creating an alias. It can also reference keys that are generated by the SSL keys provided to Tealeaf.

PCA Setup

See “Generating a Self-Signed Certificate” on page 202.

HSM Configuration and Integration

To integrate Tealeaf with the nCipher nShield key management system, apply these general instructions to your specific environment.

Note: These steps are only a general reference and are not a step-by-step procedure for installation. The following optional steps assume that you are familiar with the installed key management software. For more information, please review the nShield/payShield User Guide provided with your nCipher product.

Note: To store private SSL keys, the clear text PEM format of the keys can be required. The nCipher utility `generatekey` creates equivalent reference PEM key files. These reference key files are used by Passive Capture for conversion to its encrypted PTL format by using the Tealeaf script option, PEM2PTL. For more information, see Generating and importing keys in the nShield/payShield User Guide.

Integration

About this task

To integrate:

Procedure

1. Confirm that Linux and the Passive Capture software is installed and that the IBM Tealeaf CX Passive Capture Application server boots up successfully.
2. Verify that nCipher card and software is properly installed, including the smart card reader. For more information, see Testing the installation in the nShield/payShield User Guide.
3. Install the nCipher software on the PCA server.

4. Add the nCipher CHIL library directory (`/opt/nfast/toolkits/hwcrhk`) to the load library path to the `/etc/ld.so.conf` file, if it is not present.
5. Reboot the PCA server to confirm it boots up successfully.
6. Run the kernel module list cmd to confirm that the nCipher kernel module (`lsmod`) is loaded.
7. On the HSM, create the security world for key import.
8. Generate and/or import the PEM key files to the HSM.
   - For more information, see Generating and importing keys in the nShield/payShield User Guide.
9. Verify that the keys are listed in KeySafe.
10. On the PCA server, run the nCipher utility to list the keys in the nCipher security world:

```
/opt/nfast/bin/nfkminfo -l
```

11. Confirm that Passive Capture is running and decrypting SSL traffic.

Disable HSM

About this task

To disable HSM integration from starting at Passive Capture boot time:

Procedure

1. Create a `DISABLED` directory in `/etc/init.d`.
2. Move the nCipher scripts from the previous directory to the `DISABLED` directory.
3. Restart Passive Capture.

Results

Note: This procedure must be done before removal of the hardware to allow Passive Capture to boot without the Hardware Security Module (HSM).

Installation Instructions

For more information about installation, see “nCipher HSM Installation for PCA” on page 212.

nCipher HSM Installation for PCA

These installation instructions apply to the nCipher Key Management series of boards to work with the IBM Tealeaf CX Passive Capture Application.

Requirements

Following are the installation instructions:

- nShield 6000e HSM
- nCipher software version 11.40
- Validated Linux platforms, see “Requirements” on page 212 for a list of supported platforms.

  Note: If you are using a 64-bit operating system, 32-bit libraries must be installed.

Although these instructions are not validated, as stated in the Requirements section, on nCipher software and Linux platforms, they must also work for the following cards:

- Older nForce/nFast/nShield 4000 series cards

Additional requirements

- These boards can be used for SSL acceleration only, but SSL keys are still required for proper operation.

- You can use other nCipher boards that support only SSL acceleration (no Key Management). The drivers must work transparently with OpenSSL (such as the CHIL library driver) and must be configured to auto-recognize OpenSSL upon startup. Verify that the installation works on system reboot, too.
- If the nCipher card is to be used as an HSM keystore, then an nCipher Security World must be created. See "Creating nCipher Security World for PCA" on page 220.

Note: The following optional steps assume that you are familiar with nCipher key management software. These steps are only a general reference and are not a step-by-step procedure for installation. When possible, enlist nCipher Support help with the software installation as it typically requires compiling their drivers on the host system.

Pre-requisites

About this task

Before you begin, verify or complete the following.

Procedure

1. The nCipher kernel driver requires building on the required Linux platform, so you must perform this build on an installed Linux development environment for the platform. Try building on the expected production machine first to determine if it is sufficient for driver creation.

   Note: For the Redhat RHEL 5.6 64-bit platform, the nCipher kernel driver must be built for 64-bit operating systems. The PCA software is a 32-bit application. The nCipher intercommunication library (`libnfhwcrhk.so`) must be 32-bit, too. To verify that `libnfhwcrhk.so` is 32-bit or 64-bit, run `file libnfhwcrhk.so` from a command prompt.
2. After the driver (`nfp.ko`) built, you can apply the built `nfp.ko` driver and the corresponding nCipher start script software to production computer for installation and deployment.
   - For more information, see the nCipher/Thales documentation.
3. These instructions assume that you don't have PCA installed the IBM Tealeaf CX Passive Capture Application.
   - If you have the PCA installed already, you must stop the PCA during the time you install and integrate the nCipher software.
4. See "Importing SSL keys into nCipher keystore" on page 223.

nCipher installation and build steps

Details about how to build and install the nCipher kernel driver, confirm installation, and configure nCipher startup scripts to boot before PCA.

Build kernel driver

Procedure

1. Retrieve the following from the version 11.40 Linux DVD (64-bit). The following commands assume that the DVD drive is mounted as `/mnt/cdrom`:

```
cd /
tar xvf /mnt/cdrom/linux/libc6_3/amd64/nfast/hwsp/agg.tar
tar xvf /mnt/cdrom/linux/libc6_3/amd64/nfast/ctls/agg.tar
```

2. Retrieve the following files:

   a) For 32-bit PCA application, acquire a 32-bit version of `libnfhwcrhk.so`:

Note: libnfhwcrhk.so is supplied as a binary file only without local compiling. This version is not an openSSL-specific version.

1) Retrieve the 32-bit version of the following file:

```
tar xvf /mnt/cdrom/linux/libc6_3/nfast/hwcrhk/user.tar
```

2) When the previous tar file is extracted, it contains a file with the relative path name to the libnfhwcrhk.so:

```
opt/nfast/toolkits/hwcrhk/libnfhwcrhk.so
```

3) Copy libnfhwcrhk.so to the following directory:

```
opt/nfast/toolkits/hwcrhk
```

b) You can also extract the same tar files that are stored on the DVD from iso's available from the nCipher download site. Retrieve the following iso's containing nCipher nCSS software:

```
nCSS_linux64_user_11_40.iso
nCSS_linux_user_11_40.iso
```

3. Based on the previous commands, the untarred software must be in the following directory:

```
/opt/nfast
```

4. To build the nCipher kernel driver (nfp.ko):

a) For instructions, see nShield_Quick_Start_Guide.pdf in the v11.40 DVD document directory. In Chapter 2, find the Installing on Linux section on page 11.

b) The configuration script looks for the kernel headers in the default directory (/lib/modules/current_kernel_version/build/include).

1) If your kernel headers are in a different directory, set the KERNEL_HEADERS environment variable so that they are in $KERNAL_HEADERS/include/. For more information, see Setting the environment variables on page 46 of the document.

2) Historically, the headers are in /usr/src/linux/include/. If the headers for your kernel are not already installed, install them from your distribution disk, or contact your kernel supplier.

5. Build commands:

```
cd /opt/nfast/driver
./configure
make
```

6. If user is not added, run the following command:

```
useradd -r nfast
```

7. Validate the kernel by running the following command:

```
groups nfast
```

Install nCipher kernel driver

About this task

Note: Before you begin, verify that the nCipher board is installed on the PCA server.

Procedure

1. The following command installs `nfp driver.ko` and its startup scripts.
   a) Command:

   ```
   /opt/nfast/sbin/install
   ```

   b) Select option 4. This option can be necessary to add `user:group`.
2. Add the OpenSSL CHIL library path to `ld.so.conf` file, which is required for reboot. Options:
   a) Option 1:
      1) Add the line `/opt/nfast/toolkits/hwcrhk` to the following file through vi:

      ```
      vi /etc/ld.so.conf
      ```

      2) Run ldconfig -v to store new entry to /etc/ld.so.cache file
   b) Option 2: Export `LD_LIBRARY_PATH=/opt/nfast/toolkits/hwcrhk`
   c) Option 3: copy the 32-bit `/opt/nfast/toolkits/hwcrhk/libnfhwcrhk.so` to `/usr/lib`.

      Note: Option 3 is the recommended approach, but it cannot be preferred because of to system administration policy.
3. If Option 1 was selected above, you can verify current `ld.so.cache` entries for `hwcrhk`, by running the following code:

```
ldconfig -p |grep hwcrhk
```

Confirm software installed

About this task

Depending on the option you followed to install the software, verify its location in either of the following directories:

```
/opt/nfast/toolkits/hwcrhk/libnfhwcrhk.so


/usr/lib/libnfhwcrhk.so
```

Note: These steps assume that the kernel driver installation is completed. See "Install nCipher kernel driver" on page 215.

Procedure

1. Run following command to verify that the nfp kernel driver loaded:

   ```
   lsmod |grep nfp
   ```

2. The expected output is something like:

   ```
   nfp   42116    2
   ```

Startup workaround

About this task

If you do not see the expected output, try stopping and starting the nCipher driver:

```
/opt/nfast/sbin/init.d-ncipher stop
/opt/nfast/sbin/init.d-ncipher start
```

To manually start/stop nCipher server, use the following command that is provided with the nCipher 11.40 software:

```
/opt/nfast/sbin/init.d-ncipher start
/opt/nfast/sbin/init.d-ncipher stop
```

Two new startup scripts for the v11.40 software that is placed in `/etc/init.d`:

Procedure

1. Start drivers:

```
nc_drivers start
```

where:

```
nc_drivers -> /opt/nfast/scripts/init.d/drivers
```

2. Start hardserver:

```
nc_hardserver start
```

where:

```
nc_hardserver -> /opt/nfast/scripts/init.d/hardserver
```

Results

Verify that the previous scripts work for valid nCipher driver operation.

Note: The previous startup scripts might not work for reboot. The nCipher card's driver and hardserver startup scripts must be started first for the PCA to recognize them.

Install the PCA software

If you do not install the PCA software, you can do so now.

- See "Installing the CX Passive Capture Application" on page 16.

Configure nCipher startup scripts to boot before PCA

About this task

The following steps configure the nCipher startup scripts to boot or reboot before the PCA startup scripts are run. The nCipher card must be initialized before the PCA can be started.

Depending on the operating system in use, complete the following sets of instructions:

Procedure

1. **"Configuring startup scripts for RedHat" on page 217**
2. **"Configuring startup scripts for SLES" on page 219**

Configuring startup scripts for RedHat

For servers using RedHat, complete the following set of instructions:

1. Test configuration

Procedure

1. Run the runlevel startup list command:

```
chkconfig --list |grep nc_
```

```
```

2. If a list is returned, the default nCipher startup scripts were correctly configured. To test, reboot the PCA and validate that it is the nCipher kernel driver. See “3. Validate PCA access to nCipher kernel driver” on page 219.
3. If nothing is listed, the default nCipher startup scripts are not correctly configured. See “2. Manual configuration” on page 218.

2. Manual configuration

Procedure

1. The following startup scripts must have the correct runlevel headers in the script file to be recognized:

```
nc_drivers
nc_hardserver
```

2. The nCipher startup scripts are symlinked to the following :

```
/opt/nfast/scripts/init.d/drivers
/opt/nfast/scripts/init.d/hardserver
```

3. Edit the nCipher startup scripts:
   a) Edit `/opt/nfast/scripts/init.d/drivers`. Add following lines:

```
# chkconfig: 2345 45 55
  # description: nCipher drivers
```

   b) Edit `/opt/nfast/scripts/init.d/hardserver`. Add following lines:

```
# chkconfig: 2345 50 50
# description: nCipher hardserver
```

   c) For example:

```
#!/bin/sh
# generated by inst-def.sh
# chkconfig: 2345 45 55
# description: nCipher drivers
```

4. It can take a few minutes for the system to automatically add the scripts to the `chkconfig --list`. If the scripts are not displayed, then enable runlevels manually, as shown in following step:
   a) Use chkconfig to turn on runlevel `2,3,4,5` for `nc_drivers` and `nc_hardserver`.

```
chkconfig --level 2345 nc_drivers on
chkcofnig --level 2345 nc_hardserver on
```

5. Validate that the PCA can access the kernel driver. See “3. Validate PCA access to nCipher kernel driver” on page 219.

3. Validate PCA access to nCipher kernel driver

Procedure

1. Restart the PCA.
2. After bootup, run the following command:

```
# lsmod |grep nfp
```

3. The output is as following. The code 2 indicates that it is 'used by':

```
nfp   42116    2
```

4. To confirm the PCA and nCipher startup scripts have the right startup priorities, the following examples show nCipher starts first, followed by PCA starts:

```
/etc/rc.d/rc2.d/S45nc_drivers
/etc/rc.d/rc2.d/S50nc_hardserver

/etc/rc.d/rc2.d/S60tealeaf-pca
/etc/rc.d/rc2.d/S55tealeaf-startup
```

5. After you complete the previous instructions, you must validate that the PCA sees the nCipher kernel driver. See “Verifying use of private SSL keys” on page 224.

Configuring startup scripts for SLES

About this task

Note: These instructions apply to nCipher v11.40 and later, unless otherwise noted.

Verify that nCipher starts up correctly with the Passive Capture application. As of nCipher v11.40, two startup scripts (symlinks) are provided in the following directories. For proper startup, these scripts must be run in the following order that is listed:

Procedure

1. `/etc/init.d/nc_drivers`
2. `/etc/init.d/nc_hardserver`

   Note: For nCipher to be properly recognized, these nCipher startup scripts must be run before the Passive Capture's startup scripts.

1. Startup workaround

About this task

Note: There can be issues with the startup sequence not working properly with Suse SLES.

Steps:
For SLES, the suggested workaround is the following sequence.

Procedure

1. Disable runlevels for `nc_drivers` and `nc_hardserver`:

```
chkconfig -s nc_drivers off
chkcofnig -s nc_hardserver off
```

2. Turn them back on with runlevels 3 and 5:

```
chkconfig -s nc_drivers on 3 5
chkcofnig -s nc_hardserver on 3 5
```

3. By default, the priority for both scripts in each runlevel is set to S01. Change startup runlevel priority of each of these scripts in the `rc3.d` and `rc5.d` directories by using the following commands:

```
mv /etc/rc.d/rc3.d/S01nc_drivers /etc/rc.d/rc3.d/S09nc_drivers
mv /etc/rc.d/rc5.d/S01nc_hardserver /etc/rc.d/rc5.d/S10nc_hardserver
```

2. Validating the nCipher driver

Procedure

1. After bootup, to validate nCipher driver is loaded properly, use the following cmd:

```
lsmod |grep nfp
```

2. The expected output must be similar as:

```
nfp   42116    2
(where '2' is expected)
```

Results

After you complete the previous instructions, you must validate that the PCA is seen the nCipher kernel driver. See “Verifying use of private SSL keys” on page 224.

Creating nCipher Security World for PCA

About this task

Note: If the nCipher card is to be used as an HSM keystore, then an nCipher Security World must be created. The following instructions apply to the creation of a nCipher Security World with some modifications specific to the IBM Tealeaf CX Passive Capture Application. These instructions work for:

- nCipher nShield 4000

- nCipher nShield 6000e

If your network environment requires a different set of policies or more configuration, refer to the nShield_Quick_Start_Guide.pdf for further instructions.

Procedure

1. Plug in the smart card reader and insert a card. A green light on reader indicates a good connection.

   Note: To create a Security World keystore, the smart card reader must be plugged in with a card for writing the AES smart card group.

   a) Importing of SSL keys does not require the card reader to be plugged in for the default FIPS140-2 level2.

   b) The card reader must be installed to run the PCA by using the Security World keystore for its SSL keys.

2. Create a Security World. For more information, see page 13 of nShield_Quick_Start_Guide.pdf.
3. Log in to the host computer as a user in the nfast group.
4. Set the module switch on the back panel of the nShield to the I position, which is the pre-initialization mode.
5. To clear the module, run the following command:

   ```
   /opt/nfast/bin/nopclearfail ca
   ```

6. Run the following command:

   ```
   /opt/nfast/bin/new-world -m 1 -s 0 -Q 1/2 -k rijndael
   ```

7. The previous command creates a FIPS Level two-compliant Security World, with OCS recovery and replacement that is enabled, and a 1/2 ACS. The Security World is protected by an AES key.

   a) The previous command generates 2 ACS smart cards, but only one is required for security access.

   b) During the smart card generation process, you must enter passphrase.
   For example:

   ```
   ACS smartcard test passphrase:  testcard123
   ```

   c) This process takes 1-2 minutes per card.

   d) When the Security World is generated, a message similar to the following must be displayed:

   ```
   Security World generated on module #1;
   hknso = 26b0b0fed1e2753c665b34af15523ebbb2a995a3
   ```

8. Set the module switch on the back of nShield to the O position, for Operational mode.

Validate Security World

About this task

To validate that the security world environment is properly created, complete the following steps.

Procedure

1. Run the following command:

```
/opt/nfast/bin/nfkminfo
```

2. The expected output must be the following, with `Usable` indicating proper validation:

```
World
  generation  #
  state       0x17270000 Initialised Usable ...
  ...
Module #1
  generation  #
  state      0x2 Usable
```

3. For more information about adding SSL keys to the nCipher Security World keystore, review the instructions for using the following command:

```
/opt/nfast/bin/generatekey
```

   - See “Importing SSL keys into nCipher keystore” on page 223.

4. The output of the previous command is a `.pem` reference SSL key. This key must be converted to the `.ptl` format that is used by the PCA. To convert the reference key file to `.ptl` key, use the following command:

```
tealeaf pem2ptl <nCipherReference>.pem
```

5. The newly created PCA `.ptl` keys can now be explicitly loaded into the PCA:
   a) Manually: See “Encrypted SSL Key Setup” on page 189.
   b) Automatic: Load the keys into the default directory:

```
/usr/local/ctccap/etc/capturekeys
```

   Note: You must create the directory and enable the proper access permissions. See “Encrypted SSL Key Setup” on page 189.

6. After you complete either of the methods, the `.ptl` keys are loaded for use by the PCA.

Importing SSL keys into nCipher keystore

About this task

To store private SSL keys for use by the PCA, the clear text PEM format of the keys is required. The nCipher utility, `generatekey`, creates equivalent reference PEM key files, which can then be converted for use by the PCA.

The following describes the general procedure for importing SSL keys into the nCipher keystore.

To install nCipher SSL Key Management System:

Procedure

1. Confirm that Linux is installed.
2. Install the nCipher hardware card.
3. Install the nCipher software, which installs the `/opt/nfast/...` directories, nfast scripts, and so on.
4. Add the nCipher CHIL library directory to the load library path, `/opt/nfast/toolkits/hwcrhk`, to the `/etc/ld.so.conf` file, if it is not present.
5. Confirm that the Passive Capture software is installed.
6. Restart the IBM Tealeaf CX Passive Capture Application server to confirm it boots up successfully.
7. Run the kernel module list cmd to confirm nfp nCipher kernel module is loaded, lsmod.
8. Create the required security world environment for key import.
9. Import the RSA PEM key files to the nCipher security world by using the nCipher utility, `/opt/nfast/bin/generatekey`.
   For example:

```
/opt/nfast/bin/generatekey -i embed
```

   a) This example assumes that keys are stored on disk in encrypted format.

      1) Run the following command:

```
[root@tstsys]# /opt/nfast/bin/generatekey -i embed
```

      2) The following prompt is displayed:

```
protect: Protected by? (token, softcard, module) [module] >
```

      3) Press RETURN to accept the default. Next, prompt:

```
pemreadfile: PEM file containing RSA key? []
```

      4) Enter the private key file: `tealeaf-web.pem`. Next, prompt:

```
embedsavefile: Filename to write key to? []
```

5) Enter the name of the ref file to write: `tealeaf-web_ref.pem`. Next, prompt:

```
plainname: Key name? []
```

6) Enter the key name alias: `tealeaf-web`.
7) Enter RETURN for the remaining prompts to accept the default values.

10. Interactive prompting for remaining information can be needed.
11. Run nCipher utility to list keys in security world:

```
/opt/nfast/bin/nfkminfo \-l
```

Verifying use of private SSL keys

Through the PCA capture log, you can verify that the PCA is able to see and use the nCipher card. In the PCA `capture.log` file, you must see following message during startup:

```
May 26 15:30:11 mammoth reassd[22722]: OpenSSL hw engine(1): CHIL hardware
engine support
```

The number of keys must also be indicated in the log:

```
Aug 20 16:53:37 mammoth reassd[10889]: Loaded 1 keys from Capture.CaptureKeys.
```

A message like the following indicates an error in accessing the nCipher card:

```
hw engine(0)
```

Disabling nCipher startup at Passive Capture boot time

About this task

Note: This procedure must be done before removal of the nCipher hardware to allow Passive Capture to boot without the hardware.

Procedure

1. Create a DISABLED directory in `/etc/init.d`.
2. If present, move the `nfast` script from `/etc/init.d` directory to the DISABLED directory.
3. If you are using v11.40 or later software, move the two scripts, `nc_drivers` and `nc_hardserver`, from `/etc/init.d` directory to the DISABLED directory.
4. In `/usr/lib`, rename the `libnfhwcrhk.so` to add `.disabled` extension

```
mv libnfhwcrhk.so libnfhwcrhk.so.disabled
```

5. Restart Passive Capture.

Securing communications between the PCA and other Tealeaf services

By enabling support in PCA for the X.509 public key infrastructure (PKI) standard, you can secure communications between the PCA and other Tealeaf services, and help protect the Tealeaf environment and data from potential attackers.

Make sure that you coordinate the steps for securing communications between the PCA and other Tealeaf services, with the steps for securing communications between the Tealeaf servers and other Tealeaf services (as documented in the *IBM Tealeaf CX Configuration Manual*). You can start with either the PCA or the Tealeaf servers, but the step for enabling communications needs to be done simultaneously on both the PCA and Tealeaf servers.

Site administrators are encouraged to take advantage of this feature to protect the Tealeaf environment and data from potential attackers.

Use the information in this section to learn how enable the X.509 public key infrastructure (PKI) standard to secure communications in PCA.

Browser considerations

Keep the following in mind before you enable secure communications:

- When presenting certificates from a browser, you must copy the valid *.p12 and add to the browser
- The steps for enabling secure communications can vary from browser to browser
- A valid password is required in order to import the `*.p12` into a browser.

  The password for importing the `*.p12` is the same password that used when creating `*.p12`.
- Consider the following with regard to PCA WebConsole behavior while accessing webConsole from the browser:
  - If a client presents a valid certificate, the user gains access to the PCA Web UI.
  - If a client presents no certificate, the user is prompted for a user name and password
  - If a client presents an invalid certificate, the connection fails.

Task flow for securing communications between the PCA and other Tealeaf services

Securing communications between the PCA and other Tealeaf services requires performing a series of tasks in a specific order, as listed here.

The following tasks must be performed in the sequence listed.

1. Upgrade the PCA server(s), to [9.0.2.6].
2. Create or acquire an X.509 certificate with an associated private key and key password, stored in PKCS#12 (PFX) format.

   You can create the X.509 certificate with a tool provided by IBM Tealeaf or by using your organization's own public key infrastructure.
3. Import the certificate onto the PCA server.
4. Enable the X.509 protocol on the PCA server.

   Enabling the X.509 protocol requires stopping and restarting the Tealeaf services that run on the PCA server.

Tealeaf servers with the X.509 protocol enabled cannot communicate with those servers which do not have it enabled, so make sure you enable communications as quickly as possible across the site.

Note: For Secure PCA-to-canister delivery, you are not required to have to have TLS enabled on all of Tealeaf. You can still use an older PCA or the latest PCA without X.509 changes to connect to HBR.

Creating X.509 certificates
You can create a self-signed X.509 certificate with the **`tlstool.exe`** provided by IBM Tealeaf, or you can create an X.509 certificate using your organization's certificate infrastructure.

About this task

The method that you choose to create the X.509 certificate depends on your organization's security requirements.

You create one certificate only for the entire site.

The following sections provide information on creating self-signed X.509 certificates and on creating certificates using your organization's certificate infrastructure .

Note: Be sure to keep the generated certificate and its associated private key password confidential. In the wrong hands, the certificate and its password might allow a person who has access to the Tealeaf environment to intercept data and disrupt services.

Related tasks
Importing the X.509 site certificate onto the PCA server
You can import the X.509 site certificate onto the PCA server.

Enabling secure communications
Servers that use X.509 will not be able to communicate with servers that do not use X.509.

Enabling Client Authentication on PCA WebConsole (Optional)
To enable the secure communication on a PCA server WebConsole, perform the steps listed here.

Disabling secure communications on the PCA server
You can disable secure communication on the PCA server.

Disabling secure communication on a PCA Server WebConsole
You can disable secure communication on the PCA Server WebConsole.

Creating a self-signed X.509 site certificate
Using the **`tlstool.exe`**, you can create a self-signed X.509 site certificate for environments where it is deemed acceptable.

About this task

Use the following procedure to create self-signed X.509 site certificate.

Procedure

Run the **`tlstool.exe`** command on a Tealeaf server as follows:

```
"C:\Program Files (x86)\IBM\IBM Tealeaf CX\Tools\TLSTool.exe" create -site path password
```

where *path* is the path name where you want the certificate file to be created, and *password* is the password used to encrypt the private key.

Note: The password must consist entirely of ASCII characters.

Example

```
"C:\Program Files (x86)\IBM\IBM Tealeaf CX\Tools\TLSTool.exe" create -site "C:\test\TCXcert.pfx" password
```

Using X.509 certificates created with your organization's certificate infrastructure

Tealeaf can use an X.509 certificate that is created with your organization's certificate infrastructure.

In order for Tealeaf to use an X.509 certificate created with your organization's certificate infrastructure, the following conditions must exist:

- The certificate must have a subject name of "`IBM Tealeaf CX`" and be suitable for use by both TLS 1.2 clients and servers.
- The certificate must be stored in a single file in PKCS#12 format containing both the certificate and its associated private key.
- The private key must be protected by a password consisting entirely of ASCII characters.

Importing the X.509 site certificate onto the PCA server

You can import the X.509 site certificate onto the PCA server.

About this task

Use the following procedure to import the X.509 site certificate onto the PCA server.

Procedure

1. Transfer the certificate file to the PCA installation path `<installdir>/etc`.

   The default PCA installation directory is `/usr/local/ctccap`
2. Extract the `.crt` and `.key` file from the .p12 or .pfx file.

   To extract the key: `<installdir>/bin/openssl pkcs12 -in TCXcert.pfx -nocerts -out TCXkey.pem`

   To extract the cert: `<installdir>/bin/openssl pkcs12 -in TCXcert.pfx -clcerts -nokeys -out TCXcert.pem`

What to do next

Once you have imported the X.509 site certificate onto the PCA server(s), you can enable secure communication.

Related tasks

Creating X.509 certificates
You can create a self-signed X.509 certificate with the **`tlstool.exe`** provided by IBM Tealeaf, or you can create an X.509 certificate using your organization's certificate infrastructure.

Enabling secure communications
Servers that use X.509 will not be able to communicate with servers that do not use X.509.

Enabling Client Authentication on PCA WebConsole (Optional)
To enable the secure communication on a PCA server WebConsole, perform the steps listed here.

Disabling secure communications on the PCA server
You can disable secure communication on the PCA server.

Disabling secure communication on a PCA Server WebConsole
You can disable secure communication on the PCA Server WebConsole.

Enabling secure communications

Servers that use X.509 will not be able to communicate with servers that do not use X.509.

About this task

Perform the following procedure to enable secure communication between services running on the PCA server.

Procedure

1. In the PCA WebConsole, under the Delivery Tab and under Target Recipients, click **Add**.
2. Configure the delivery peer with the **Secure** option checked.
3. Click **OK** and **Save Changes**.
4. In the `ctc-conf.xml`, under `<installdir>/etc/ctc-conf.xml`, edit the following Global fields:

   Note: If the following fields are not present in the `ctc-conf.xml`, refer to the default file ctc-conf-defaults.xml located in `<installdir>/etc/ctc-conf-defaults.xml` and add the fields under "Delivery" section. This default file is always updated to the latest version on installs and upgrades. Please merge the applicable fields from the `ctc-conf-defaults.xml` file to your local `ctc-conf.xml` file.

```
<ServerCertPath></ServerCertPath>
<ClientP12Path></ClientP12Path>
<ClientP12Pass></ClientP12Pass>
<ServerCertEnable>false</ServerCertEnable>
<ClientCertEnable>false</ClientCertEnable>
```

Table 34. Settings for ctc-conf.xml

Field	Set value to. . .
`ServerCertEnable`	true
`ClientCertEnable`	true
`ServerCertPath`	The full path (including filename) to the extracted certificate Tealeaf.pem from the topic “Importing the X.509 site certificate onto the PCA server” on page 227.
`ClientP12Path`	The full path (including filename) of TCXcert.pfx imported/copied from the Windows server.
`ClientP12Pass`	The Password used to create the P12 or PFX file (TCXcert.pfx). Same "password" from step “Creating a self-signed X.509 site certificate” on page 226.

   Note: Enabling the secure option in the WebConsole without enabling the fields in the `ctc-conf.xml` file does not work for Tealeaf CX that has **Client Authentication** enabled.

   Client Authentication can now be enabled or disabled from the Web Console. The fields for uploading a certificate and its password are displayed on the Web Console only when **Client Authentication**is enabled and the user accesses the Web Console through HTTPS.

   The uploaded certificate is stored in the <installdir>/etc directory. Uploading a new certificate with same name overwrites the old certificate.

   Uploading new certificate with different name will not overwrite older certificate, but delivery only uses the new certificate path in the configuration.
5. Restart PCA services by performing a "tealeaf restart all" or "tealeaf stop all" followed by "tealeaf start all".
6. Configure the target HBR or transport service for secure communications as well.

Related tasks

Creating X.509 certificates
You can create a self-signed X.509 certificate with the **`tlstool.exe`** provided by IBM Tealeaf, or you can create an X.509 certificate using your organization's certificate infrastructure.

Importing the X.509 site certificate onto the PCA server

You can import the X.509 site certificate onto the PCA server.

Enabling Client Authentication on PCA WebConsole (Optional)
To enable the secure communication on a PCA server WebConsole, perform the steps listed here.

Disabling secure communications on the PCA server
You can disable secure communication on the PCA server.

Disabling secure communication on a PCA Server WebConsole
You can disable secure communication on the PCA Server WebConsole.

Enabling Client Authentication on PCA WebConsole (Optional)
To enable the secure communication on a PCA server WebConsole, perform the steps listed here.

About this task

Although this procedure is optional, it is strongly recommended, as all other components will be using Client Authentication.

Procedure

1. Using an editor of your choosing, update the `runtime.conf` to enable the **`web_console_security_crt_enable`** as follows:
   - `/usr/local/ctccap/etc/runtime.conf`

   Then enable it, as follows:

   - **`web_console_security_crt_enable`**=YES
2. Create a username and password for PCA webconsole authentication.

   A client browser that doesn't present the certificate, needs to authenticate if `web_console_security_crt_enable` is enabled.
3. Run the following script and follow the steps to copy your certificates and to generate the p12:

   ```
   /usr/local/ctccap/etc/web-crt-gen.sh
   ```
4. In an upgrade scenario, compare your current `http.conf` with `httpd.conf.default` and copy the new additions to your `httpd.conf`.
5. For a fresh install "tealeaf start" and for an upgrade "tealeaf restart httpd"

Related tasks
Creating X.509 certificates
You can create a self-signed X.509 certificate with the **`tlstool.exe`** provided by IBM Tealeaf, or you can create an X.509 certificate using your organization's certificate infrastructure.

Importing the X.509 site certificate onto the PCA server
You can import the X.509 site certificate onto the PCA server.

Enabling secure communications
Servers that use X.509 will not be able to communicate with servers that do not use X.509.

Disabling secure communications on the PCA server
You can disable secure communication on the PCA server.

Disabling secure communication on a PCA Server WebConsole
You can disable secure communication on the PCA Server WebConsole.

Disabling secure communications on the PCA server
You can disable secure communication on the PCA server.

About this task

The following procedure describes how to disable secure communications on the PCA server.

Procedure

To disable secure communication on the PCA server, perform the following steps.

a) Set the following fields in the `ctc-conf.xml` from true to false.

- `<ServerCertEnable>false</ServerCertEnable>`
- `<ClientCertEnable>false</ClientCertEnable>`

b) Remove the "secure" option from the delivery peer in the PCA WebConsole.

c) Restart PCA services by doing "tealeaf restart all" or "tealeaf stop all" followed by "tealeaf start all".

Related tasks

Creating X.509 certificates
You can create a self-signed X.509 certificate with the **`tlstool.exe`** provided by IBM Tealeaf, or you can create an X.509 certificate using your organization's certificate infrastructure.

Importing the X.509 site certificate onto the PCA server
You can import the X.509 site certificate onto the PCA server.

Enabling secure communications
Servers that use X.509 will not be able to communicate with servers that do not use X.509.

Enabling Client Authentication on PCA WebConsole (Optional)
To enable the secure communication on a PCA server WebConsole, perform the steps listed here.

Disabling secure communication on a PCA Server WebConsole
You can disable secure communication on the PCA Server WebConsole.

Disabling secure communication on a PCA Server WebConsole

You can disable secure communication on the PCA Server WebConsole.

About this task

The following procedure describes how to disable secure communications on the PCA server WebConsole.

Procedure

To disable secure communication on a PCA Server WebConsole, peform the following steps.

a) Using an editor of your choosing, update the `runtime.conf` to disable the `web_console_security_crt_enable` as follows:

```
/usr/local/ctccap/etc/runtime.conf
```

and comment it out as follows:

```
#web_console_security_crt_enable=YES
```

b) tealeaf restart httpd

Related tasks

Creating X.509 certificates
You can create a self-signed X.509 certificate with the **`tlstool.exe`** provided by IBM Tealeaf, or you can create an X.509 certificate using your organization's certificate infrastructure.

Importing the X.509 site certificate onto the PCA server
You can import the X.509 site certificate onto the PCA server.

Enabling secure communications
Servers that use X.509 will not be able to communicate with servers that do not use X.509.

Enabling Client Authentication on PCA WebConsole (Optional)
To enable the secure communication on a PCA server WebConsole, perform the steps listed here.

Disabling secure communications on the PCA server

You can disable secure communication on the PCA server.

Performance Measurement

Performance measurement provides details on the Passive Capture software performance and timestamp measurements.

Timestamps are not part of the HTTP DataStream, so PCA must insert the timestamps as part of its capture process.

Timestamp overview

You can use `timestamp` values to analyze performance of the CX PCA.

Passive Capture provides a rich set of time values available for analysis.

Note: This timestamp information is relevant only to data captured with Passive Capture. It does not reflect any time stamping or processing that is done by other Tealeaf software.

Assumptions

The following assumptions apply to timestamps.

- All timestamps are created by the Passive Capture software at the point of capture. When the software sees data at its capture point, it then assigns a timestamp.
- The Passive Capture host machine is a short, negligible distance from the HTTP generating source. However, this factor must not impact the timestamps, since data typically flows unimpeded from the web server to the client.
- Data is sent as fast as the end-to-end network path permits. There are potential issues that can affect the timestamp accuracy of the traffic that is arriving at the PCA. If the capture point is a switch span port, the internal buffers that are used to aggregate the span traffic can change its real-time data arrival. Buffers can hold and burst the span port traffic at any time that impacts the accuracy. Other network devices can also change the data arrival times if it's part of the capture traffic path but not in the live traffic path.
- All timestamps are specified in GMT with microsecond granularity. A microsecond is one-millionth of a second.

Note: Timestamps recorded by the Tealeaf CX Passive Capture Application are best estimates. In the default Tealeaf cxImpact installation, these timestamps do not include rendering information from the client browser. When Tealeaf UI Capture is installed and enabled in your web application, that information is captured and reported through the Portal.

- For more information about client-side reporting, see "Analyzing Performance" in the *IBM Tealeaf Reporting Guide*.
- The Tealeaf CX UI Capture for AJAX is a separately licensable component of the Tealeaf CX platform.
- See "UI Capture for Ajax Guide" in the *IBM Tealeaf UI Capture for Ajax Guide*.

Example timestamps in the request

The following example values is displayed in the request after the PCA generates its timestamps.

```
RequestTimeEx=2009-02-26T15:33:58.347692Z
RequestEndTimeEx=2009-02-26T15:33:58.347836Z
ResponseStartTimeEx=2009-02-26T15:33:58.352928Z
ResponseTimeEx=2009-02-26T15:33:58.552479Z
ResponseAckTimeEx=2009-02-26T15:33:58.693390Z
TLapiArrivalTimeEx=2009-02-26T15:33:58.676361Z
ReqTTLB=144
RspTTFB=5092
RspTTLB=199551
RspTTLA=140911
```

```
ConnSpeed=628604
ConnType=DSL
WS_Generation=5092
WS_Grade=ExcellentWS
WS_GradeEx=0
NT_Total=340462
NT_Grade=ExcellentNT
NT_GradeEx=0
RT_Total=345554
RT_Grade=ExcellentRT
RT_GradeEx=0
```

Items

Usage*

RequestEndTimeEx=2009-02-26T15:33:58.
ResponseStartTimeEx=2009-02-26T15:33:58.
ResponseAckTimeEx=2009-02-26T15:33:58.
WS_Generation=5092
NT_Total=340462
RT_Total=345554

Used in calculating timestamps and network behavior

347836
352928
693390

Timestamp values that are used for later calculations

Timestamp Definitions and Values in the Request

The following table provides an explanation for each of the values in the `[timestamp]` section of the request:

Table 35. Timestamp values and definitions

Value	Description
`RequestTimeEx`	Start of the request. The timestamp when the PCA saw the first packet of the request.
`RequestEndTimeEx`	End of the request. The timestamp when the PCA saw the last packet of the request.
`ResponseStartTimeEx`	Start of the response. The timestamp when the PCA saw the first packet of the response. If no response packets were seen, then the RequestEndTimeEx value will be used.
`ResponseTimeEx`	End of the response. The timestamp when the PCA saw the last packet of the response. If no response packets were seen, then the RequestEndTimeEx value will be used.
`ResponseAckTimeEx`	Timestamp when the PCA saw that client/browser acknowledged the last TCP packet of the response. If no response packets were seen, then the RequestEndTimeEx value will be used.
`TLapiArrivalTimeEx`	This timestamp indicates when the hit arrives within the PCA's pipelined process. The completed reassembled hit time may be much later if an incomplete hit was reassembled or was delayed due to a very late last data packet. In an otherwise normal case, this timestamp should be roughly the same as the `ResponseTimeEx`. A large difference could indicate a network issue.

Table 35. Timestamp values and definitions (continued)

Value	Description
ReqTTLB	Time in microseconds from the first packet of the request to the last packet of the request (RequestEndTimeEx minus RequestTimeEx). This value does not include network time.
RspTTFB	Time (in microseconds) from the start of the request to the first of the response page (ResponseTimeStartEx minus RequestTimeEx). This value is usually an accurate approximation of the time that the Web server required to generate the response page. In particular, if the entire page is buffered (the default for ASP .NET and many J2EE environments), then this measurement is an exact predictor of how long the server-side infrastructure took to respond. This value may not be accurate if the Web server served the data in chunks.
RspTTLB	Time in microseconds from the first packet of the response to the last packet of the response (ResponseTimeEx minus ResponseStartTimeEx). This value does not include network time.
RspTTLA	Client/browser acknowledgement time of the last data packet (ResponseACKTimeEx minus ResponseTimeEx). This value is an indication of network round trip. To compute one-way time, divide this value by 2.
ConnSpeed	Connection speed, specified in bits per second (bps). This value is calculated by dividing the average size of the response by the average time it took to deliver. When determining connection speed, any detected client user interface events are ignored.
ConnType	Based on the ConnSpeed setting, this value is set to Dialup, ISDN, DSL, or T1.
WS_Generation	Time in microseconds for the web server to generate the response. This value is computed as: ResponseStartTimeEx - RequestEndTimeEx
WS_Grade	The grade assigned to the web server page generation time (WS_Generation). Possible values are the following: ExcellentWS, Very GoodWS, GoodWS, FairWS, PoorWS, or IncompleteWS. This value is indexed by default.
WS_GradeEx	A number representing the TimeGrades time range grouping between 0 and 4 for web server page generation time. See “Pipeline Settings” on page 109.
NT_Total	Time in microseconds for the network travel time.

Table 35. Timestamp values and definitions (continued)	
Value	**Description**
NT_Grade	The grade assigned to the network travel time (NT_Total). Possible values are the following: ExcellentNT, Very GoodNT, GoodNT, FairNT, PoorNT, or IncompleteNT. This value is indexed by default.
NT_GradeEx	A number representing the TimeGrades time range grouping between 0 and 4 for network travel time.
RT_Total	The total round trip travel time in microseconds.
RT_Grade	The overall grade for network performance. Possible values are the following: ExcellentRT, Very GoodRT, GoodRT, FairRT, PoorRT, or IncompleteRT. This value is indexed by default.
RT_GradeEx	A number representing the TimeGrades time range grouping between 0 and 4 for round trip travel time. See "Pipeline Settings" on page 109.

Calculating Times from Timestamps

You can measure the performance by calculating the times from the timestamp values.

About this task

The following timestamps are the most important timestamps to help determine performance.

- RequestTimeEx
- ResponseStartTimeEx
- ResponseAckTimeEx

Procedure

1. The first time value in microseconds is the difference between when the PCA sees the end of the request and the start of the response: RspTTFB = ResponseStartTimeEx - RequestTimeEx
2. The second time value in microseconds is the difference between when the PCA sees the start of the request to the end of the response: RspTTLB = ResponseTimeEx - ResponseStartTimeEx
3. The third time value in microseconds is the time for the last response to travel from the PCA to the visitor. Time that is required for the initial request to go from the user to PCA, which is a measurement of network round-trip time: RspTTLA = ResponseACKTimeEx minus ResponseTimeEx

Factors Affecting Timestamp Values

The following factors must be considered when evaluating timestamps.

- In a multitier networked environment, there is usually no storage on the network. However, large and sophisticated server farms can employ a load balancer (for example, F5), so some data storage of the HTTP request can affect timestamp values. Since these dedicated devices are highly customized for speed, this impact is hardly noticeable.
- Content-caching devices in the environment can distort time values. When content is cached, the time values are reduced.
- For large average page sizes, it is more efficient to compress data for faster transfer.

- If the HTTP/1.1 Keep-Alive option is enabled, it can affect the rate at which multiple HTTP requests can be made.
- Application Delivery settings impact performance measurement. Is buffering turned on? I.e., does the application start transmitting when the first byte is ready, or does it wait for the entire page to first be ready?
- Chunking affects timestamp values. The answer can be delivered in one chunk, or it can be chunked and delivered on demand, such as a PDF file with byte serving.
- Client-side browser settings can affect performance and time values. For example, if caching is enabled, transfer times of pages that are containing cached content are reduced. The size of the cache is a factor.

Timestamps in ReqCancelled Hits
When a request is cancelled either by the visitor or the server, timestamps may not be inserted as normal based upon the time of cancellation.

About this task

Tealeaf inserts timestamps according to the following table.

Table 36. Timestamps in ReqCancelled Hits

Current action at time of cancel	Request Timestamp	Response Timestamp
Request submitted, Response not started (Response Size = 0)	request timestamp	Use RequestEndTimeEx value
Request submitted, Response started (Response Size > 0)	request timestamp	response timestamp

The reason for a response not starting can include any of the following:

Procedure

1. Visitor cancellation
2. Server cancellation
3. Network issue
4. Server took too long to response and PCA packet timeout was exceeded
5. PCA unable to match request to response

Results

Note: When reporting using the `Req Cancelled Count` event, you can tabulate the counts of all occurrences by specifying the data type for the event to be a `[Sum]`, instead of a `[Count]`.

Hits without Timestamps
If a hit is received with improperly formatted or incomplete timestamp information, the PCA does not generate these associated timestamps.

About this task

When the hit is passed to the Processing Server for evaluation, the Processing Server applies a timestamp value of `01/01/1970` to the hit. The hit is then written to a session file with the same timestamp.

Each hour, the Processing Server deletes session archive files that are older than the number of days of data that is configured to be retained in the Processing Server. So, the hit is automatically deleted every hour.

The number of days of data that is retained by the Processing Server is defined in the Canister Services tab of Canister configuration in the Tealeaf Management System. See "Configuring the CX Canister" in the *IBM Tealeaf CX Configuration Manual*.

In addition to malformed or missing timestamps, the following types of hits cannot have timestamps:

Procedure

1. Tealeaf system statistics hits submitted by various Tealeaf components to report on their status cannot be filtered out of the Canister capture stream by the Session Router session agent.
   - For more information about these hits, see "System Statistics" in the *IBM Tealeaf cxImpact Administration Manual*.
   - See "Session Router Session Agent" in the *IBM Tealeaf CX Configuration Manual*.
2. If the IBM Tealeaf cxReveal search database is deployed, there can be references to these hits in the data that is inserted into the database. When a IBM Tealeaf cxReveal search is executed, the hits can already be purged. While the database indicates that the hits exist, they do not exist in the Canister data.

   Note: The IBM Tealeaf cxReveal search database requires separate installation and configuration. See "Configuring Session Attribute Search" in the *IBM Tealeaf cxReveal Administration Manual*.

Reporting of timestamps in portal and RTV

The portal and RTV provides the following timestamp values.

Table 37. Timestamp values and descriptions

Timestamp value	Description
Page Generation Time	Page Generation Time is the time that is required, after the request is received, for the web infrastructure (WS/AS/DB) to process the response and to begin transmitting it to the client browser. This time value in microseconds is the time between the PCA saw the last packet of the request to the time when the first packet of the response is received by PCA. This value is calculated and inserted into the request as `WS_Generation` : `WS_Generation` = `ResponseStartTimeEx` - `RequestEndTimeEx` In the example request that is displayed above, the `WS_Generation` time value is 352928-347836 = 5092 microseconds.

Table 37. Timestamp values and descriptions (continued)	
Timestamp value	**Description**
Network Time	Network Time is the time difference between when the web server starts sending the response to when the PCA receives the acknowledgment from the visitor. This value is calculated and inserted into the request as `NT_Total`: `NT_Total` = `ResponseAckTimeEx` - `ResponseStartTimeEx` In the example request that is displayed, the `NT_Total` time value is `693390` - `352928` = `340462` microseconds.

Round-Trip Time	Round-Trip Time is the time difference between when the final packet of the request is received by the PCA and when the PCA receives the acknowledgment from the visitor that the entire response is received.
	This value is calculated and inserted into the request as `RT_Total`:
	`RT_Total` = `ResponseAckTimeEx` - `RequestEndTimeEx`
	In the example request that is displayed above, the `RT_Total` time value is:
	`693390` - `347836` = `345554` microseconds
	Reviewing the two previous sections:
	`RT_Total` = `WS_Generation` + `NT_Total`

Render Time	Tealeaf UI Capture can be deployed to capture user interface events in the client browser and to monitor client-side metrics, such as the time required to render the page in the browser. If UI Capture is deployed, render time is reported to Tealeaf in milliseconds.

Testing Tealeaf Processing Performance

You can use the following test to check how quickly Tealeaf is processing hits. In an ideal system, the length of time between the PCA capturing a hit and it appearing in the Short Term Canister is a few seconds.

About this task

Note: If the Short Term Canister is spooling hits to disk, processing is delayed even more, and this test is not a reliable indicator of normal system performance.

Procedure

1. Login to the Tealeaf Portal.
2. To display the currently active sessions, select **Active** > **Portal**. Sort the display order by Time.

   Note: These operations may take up to five seconds to complete and may introduce a lag factor in the performance measurement.
3. Open a clock tool in your computer, which displays the seconds hand.
4. Record the start time of a new session.
   - Continue refreshing the Active Sessions page until a new session begins.
   - Start a new session by browsing to the web application through a new browser window.
5. As soon as a new session appears, note the current value of the seconds hand.
6. Open the same session in the Reali-Tea Viewer application or Browser-Based Replay.

7. In the first hit of the session, open the request.
8. In the `[timestamp]` section, review the value for `ResponseTimeEx`.
9. The difference in seconds between the above value and the time when the session begun provides a close approximation of the time Tealeaf currently requires to process a new hit into the Short Term Canister.

Reporting

Reports that are based on timestamp information that is captured and computed by Tealeaf can be configured and reviewed through the Tealeaf Portal.

Reports that are based on timestamp information that is captured and computed by Tealeaf can be configured and reviewed through the Tealeaf Portal.

If you deploy the IBM Tealeaf CX UI Capture for AJAX library, more client-side timing information is available in Portal-based reports.

Configuring Passive Capture on Red Hat Enterprise Linux (RHEL)

The following sections contain important information for configuring Passive Capture in a Red Hat Enterprise Linux environment:

- "Passive Capture on RHEL - Configuring DNS" on page 238
- "Passive Capture on RHEL - Configuring Network Interfaces" on page 239
- "Configuring NTP for Passive Capture on RHEL" on page 242
- Passive Capture on RHEL - Configuring Serial-Port Access

Passive Capture on RHEL - Configuring DNS

This section provides a brief description of the configuration files for Domain Name Service (DNS), the service that is used to convert between host names and IP addresses. The file `/etc/nsswitch.conf` controls the use of various system database files and name services. When DNS is enabled by the `nsswitch.conf` file, the file `/etc/resolv.conf` controls how the lookups are performed. The changes that you make to these system files take after effect you save your changes to the files.

You can also use the redhat-config-network graphical utility to configure DNS. It is available when the redhat-config-network package is installed. This package and the commands it provides are not available with a minimal RHEL installation.

Disable DNS

About this task

To disable DNS lookups:

Procedure

1. Edit file `/etc/nsswitch.conf`.
2. Place a pound sign (#) at the beginning of the line that reads `hosts: files dns`.
3. After editing, that line must look like the following code:

```
#hosts: files dns
```

Enable DNS

About this task

To enable DNS lookups:

Procedure

1. Edit `/etc/nsswitch.conf`.
2. Remove any pound signs (`#`) at the beginning of the line that reads `hosts: files dns`. After editing, that line looks like:

```
hosts: files dns
```

/etc/resolv.conf

About this task

To specify the DNS domain and servers:

Procedure

1. Edit the file `/etc/resolv.conf`.
2. When DHCP is enabled for a network interface, the file `/etc/resolv.conf` is automatically generated by the DHCP client program with the DNS servers specified by the DHCP server.
   - You normally edit `/etc/resolv.conf` only when using fixed (static) IP addresses.
3. The `/etc/resolv.conf` file should specify the domain name suffix to use when a hostname is not fully qualified.
4. You must also specify the name of at least one DNS server to use for hostname and IP resolution. Below is an example of `/etc/resolv.conf` for the domain machines `Tealeaf.com` with two DNS servers:

```
search machines.tealeaf.com
nameserver 172.16.0.5
nameserver 172.16.0.6
```

Passive Capture on RHEL - Configuring Network Interfaces

The network configuration files in the `/etc/sysconfig` directory are read and processed during system initialization. To apply changes, eboot the machine by using the command `shutdown -r` now.

- Instead of rebooting the machine, you can also bring the machine into single-user mode by using the command `shutdown now`. At the command prompt, enter the command `exit` to leave single-user mode and reenter multi-user mode, which enables networking and starts the network interfaces.

DHCP Example

This example configures a machine named capture.my.domain that retrieves its network information through DHCP on interface eth0.

File `/etc/hosts` contains the following line to ensure a hostname/IP-address mapping for the machine:

```
127.0.0.1 capture.my.domain capture localhost.localdomain localhost
```

File /etc/sysconfig/network contains the following line:

```
HOSTNAME=capture.my.domain
```

File /etc/sysconfig/network-scripts/ifcfg-eth0 contains only the following lines:

```
BOOTPROTO=dhcp
DEVICE=eth0
ONBOOT=yes
```

ETHTOOL_OPTS Example

All the network interfaces used with Passive Capture must be configured for full duplex mode. Full duplex mode ensures maximum usage of the network interfaces for capturing packets and delivering Tealeaf hits to the Tealeaf Transport Service.

You can add a variable named ETHTOOL_OPTS to the ifcfg file for a network interface to force its duplex mode. You usually must do it if the device auto-negotiates itself into half duplex. Following is the sample line that sets the ETHTOOL_OPTS variable to force the network interface into full duplex at 1 gigabit.

```
ETHTOOL_OPTS="autoneg off duplex full speed 1000"
```

You must specify the duplex and speed together and in the order that is listed. Auto-negotiation must be disabled first, and then the duplex and speed can be set. The duplex and speed must be set together to ensure the network interface's device driver does not reset either the duplex or the speed when it is changed.

With the ETHTOOL_OPTS variable defined in the ifcfg file for a network interface, the ifup command runs the ethtool utility and passes it the options that are defined by the variable. For example, if you edited ifcfg-eth0 with the previous example, then ifup runs the command:

```
ethtool -s eth0 ${ETHTOOL_OPTS}
```

The command gives the following output:

```
ethtool -s eth0 autoneg off duplex full speed 1000
```

The changes that you make to the ifcfg file for a network interface takes effect only when the ifup script runs, which is usually when the machine boots up. You can run the ethtool command manually to take effect immediately. For example:

```
ethtool -s eth0 autoneg off duplex full speed 1000
```

Listening Interface Example

This example configures network interface eth2 for capturing packets from a switch or tap.

When you capture from a switch, you need just one network interface because it is receiving bidirectional traffic. A tap usually sends unidirectional traffic (inbound and outbound) using two network cables. So for a tap, you must configure two network interfaces, one for each cable. In both cases, you configure the network interface the same way. A listening interface does not need an IP address because it only receives packets from a switch or tap. It is never used to send out packets on the wire.

File `/etc/sysconfig/network-scripts/ifcfg-eth2` contains only the following lines:

```
DEVICE=eth2
ONBOOT=yes
```

Static IP example

This example configures shows how a capture server with static IP settings is configured.

The following table shows an example of the static IP settings for a capture server.

Table 38. IP settings and values

Setting	**Value**
DNS	`my.domain`
Hostname	`capture`
IP address	`172.16.1.100`
Netmask	`255.255.255.0`
Gateway	`172.16.1.1`

The following configuration files show where the information from the example host settings is stored.

File `/etc/hosts` contains the following lines:

```
127.0.0.1 localhost.localdomain localhost
172.16.1.100 capture.my.domain capture
```

File `/etc/sysconfig/network` contains the following line:

```
HOSTNAME=capture.my.domain
```

File `/etc/sysconfig/network-scripts/ifcfg-eth0` contains the following lines:

```
BOOTPROTO=static
IPADDR=172.16.1.100
NETMASK=255.255.255.0
GATEWAY=172.16.1.1
DEVICE=eth0
ONBOOT=yes
```

Further Reading

For more information, see the
Red Hat Enterprise Linux Reference Guide: The sysconfig Directory:
http://www.redhat.com/docs/manuals/enterprise/RHEL-3-Manual/ref-guide/ch-sysconfig.html

Red Hat Enterprise Linux Reference Guide: Network Interfaces:
http://www.redhat.com/docs/manuals/enterprise/RHEL-3-Manual/ref-guide/ch-networkscripts.html

Configuring NTP for Passive Capture on RHEL

You can configure an NTP daemon to synchronize the time of the machine with one or more NTP servers.

First, install the NTP package, which is not included with a minimal installation. After you install the NTP package, select NTP servers, create configuration files, and then enable and start the service.

Table 39. Configuring NTP

Configuration overview	**Configuration steps**
Install the NTP package	If you have not done so already, install the NTP package from your Linux distribution.

Select NTP servers	To synchronize your workstation's time, the NTP daemon on your workstation contacts one or more NTP servers specified in the configuration file `/etc/ntp.conf`.
	If an NTP server is not available on the local network, do one of the following steps:
	• Select a public NTP server (visit http://www.ntp.org/ and click **Public Time Server Lists**). If you select a public NTP server, read the Rules of Engagement (click **Rules of Engagement** on the main page of the NTP site).
	• Use the NTP time server pool (visit http://www.pool.ntp.org/ and click **How do I use pool.ntp.org**).
	As user `root` on the workstation, verify that the machine can contact the selected NTP servers. Use the `ntpdate` command with the query `-q` option. For example, to query an NTP server whose IP address is `1.2.3.4`, use the following command:
	`ntpdate -q 1.2.3.4`
	The output must look like the following, which displays the contacted server and the time difference between the local workstation and the server.
	`server 1.2.3.4, stratum 2, offset 150.695779, delay 0.03366`
	`17 Nov 10:27:09 ntpdate[21597]: step time server 1.2.3.4 offset 150.695779 sec`
	If the query fails, following output is likely to come:
	`server 1.2.3.4, stratum 0, offset 0.000000, delay 0.00000`
	`17 Nov 10:29:04 ntpdate[21599]: no server suitable for synchronization found`

Table 39. Configuring NTP (continued)

Configuration overview	Configuration steps

Create configuration files	Perform the following steps as user root on the machine:
	1. Create file `/etc/ntp/step-tickers`. You can back up any existing version of the file. The file contains the host names or IP addresses of the NTP servers to contact during startup to initially set the time. If you use the NTP server pool, you must use host names, which requires DNS.
	For example, if the two NTP servers to use are 1.2.3.4 and 5.6.7.8, then use the following commands to create the file:
	`echo 1.2.3.4 > /etc/ntp/step-tickers`
	`echo 5.6.7.8 >> /etc/ntp/step-tickers`
	2. Create file `/etc/ntp.conf` with the following commands. You can back up any existing version of the file.
	`echo restrict default ignore > /etc/ntp.conf`
	`echo restrict 127.0.0.1 >> /etc/ntp.conf`
	`echo driftfile /var/lib/ntp/drift >> /etc/ntp.conf`
	3. Add entries by using the `restrict` and `server` keywords for each NTP server. The following example adds entries for the hypothetical 1.2.3.4 and 5.6.7.8 NTP servers. The mask, nomodify, notrap, and noquery options prevent the server from modifying the NTP service on the Passive Capture host machine.
	`nullecho`
	`restrict 1.2.3.4 mask 255.255.255.255 nomodify notrap noquery >> /etc/ntp.con`
	`echo server 1.2.3.4 >> /etc/ntp.conf`
	`echo restrict 5.6.7.8 mask 255.255.255.255 nomodify notrap noquery >> \`
	`/etc/ntp.con`
	`echo server 5.6.7.8 >> /etc/ntp.conf`

Enable and start the NTP service	Perform the following steps as user root on the machine:
	1. Configure the service to start at boot time by using the following command:
	`chkconfig ntpd on`
	2. Start the service immediately by using the following command:
	`service ntpd start`
	3. Verify that the service started and contacted a server by using the following command:
	`ntpq -np`
	4. View log messages for the NTP daemon in file `/var/log/messages`.

Install NTP package and select NTP servers

To synchronize your workstation's time, the NTP daemon on your workstation contacts one or more NTP servers specified in the configuration file `/etc/ntp.conf`.

If you have not done so already, install the NTP package for your Linux distribution.

If an NTP server is not available on the local network, do one of the following steps:

1. Select a public NTP server (visit http://www.ntp.org/ and click **Public Time Server Lists**). If you select a public NTP server, read the Rules of Engagement (click **Rules of Engagement** on the main page of the NTP site).
2. Use the NTP time server pool (visit http://www.pool.ntp.org/ and click **How do I use pool.ntp.org**).

As user root on the workstation, verify that the machine can contact the selected NTP servers. Use the ntpdate command with the query -q option. For example, to query an NTP server whose IP address is 1.2.3.4, use the following command:

```
ntpdate -q 1.2.3.4
```

The output must look like the following, which displays the contacted server and the time difference between the local workstation and the server.

```
server 1.2.3.4, stratum 2, offset 150.695779, delay 0.03366
17 Nov 10:27:09 ntpdate[21597]: step time server 1.2.3.4 offset 150.695779 sec
```

If the query fails, following output is likely to come:

```
server 1.2.3.4, stratum 0, offset 0.000000, delay 0.00000
17 Nov 10:29:04 ntpdate[21599]: no server suitable for synchronization found
```

Create Configuration Files

About this task

Perform the following steps as user root on the machine:

Procedure

1. Create file /etc/ntp/step-tickers. You can back up any existing version of the file. The file contains the host names or IP addresses of the NTP servers to contact during startup to initially set the time. If you use the NTP server pool, you must use host names, which requires DNS.
   For example, if the two NTP servers to use are 1.2.3.4 and 5.6.7.8, then use the following commands to create the file:

   ```
   echo 1.2.3.4 > /etc/ntp/step-tickers
   echo 5.6.7.8 >> /etc/ntp/step-tickers
   ```

2. Create file /etc/ntp.conf with the following commands. You can back up any existing version of the file.

   ```
   echo restrict default ignore > /etc/ntp.conf
   echo restrict 127.0.0.1 >> /etc/ntp.conf
   echo driftfile /var/lib/ntp/drift >> /etc/ntp.conf
   ```

3. Add entries by using the restrict and server keywords for each NTP server. The following example adds entries for the hypothetical 1.2.3.4 and 5.6.7.8 NTP servers. The mask, nomodify, notrap, and noquery options prevent the server from modifying the NTP service on the Passive Capture host machine.

   ```
   nullecho
   restrict 1.2.3.4 mask 255.255.255.255 nomodify notrap noquery >> /etc/ntp.con
   echo server 1.2.3.4 >> /etc/ntp.conf
   echo restrict 5.6.7.8 mask 255.255.255.255 nomodify notrap noquery >> \
   /etc/ntp.con
   echo server 5.6.7.8 >> /etc/ntp.conf
   ```

Enable and Start the Service

About this task

Perform the following steps as user root on the machine:

Procedure

1. Configure the service to start at boot time by using the following command:

```
chkconfig ntpd on
```

2. Start the service immediately by using the following command:

```
service ntpd start
```

3. Verify that the service started and contacted a server by using the following command:

```
ntpq -np
```

4. View log messages for the NTP daemon in file /var/log/messages.

Passive capture monitoring

You can monitor the passive capturing to diagnose performance issues.

This section provides information about how to monitor the IBM Tealeaf CX Passive Capture Application.

Related concepts

Additional tips for diagnosing issues
If the main checklist did not help to diagnose the issue, you can review the following items to verify performance of the IBM TealeafCX Passive Capture Application server.

Logging for the CX Passive Capture Application

Related tasks

Main checklist
The following checklist can be used to verify that the status of your passive capture environment.

Additional PCA configuration checklist
In addition to the main checklist, you can perform some additional checks based on the following issues:

Passive capture monitoring using Tealeaf status
The Tealeaf status report polls each active Tealeaf server that is configured in the **Portal Management** page for status information and produces a summary report within the Portal. It provides a dashboard view into the health of your system.

Checklist for diagnosing CX Passive Capture Application issues

The PCA web console provides detailed information about how to diagnose issues with the IBM TealeafCX Passive Capture Application.

You can use the following checklist to verify PCA operations through the tabs of the PCA Web Console.

Related tasks

Main checklist
The following checklist can be used to verify that the status of your passive capture environment.

Additional PCA configuration checklist
In addition to the main checklist, you can perform some additional checks based on the following issues:

Main checklist

The following checklist can be used to verify that the status of your passive capture environment.

Procedure

1. **"PCA web Console - Console Tab" on page 83** - Enable/disable passive capture.
   a) Verify that passive capture is enabled.
2. **"PCA Web Console - Summary Tab" on page 71** - Contains metrics and status information about individual PCA processes, peers, and network interfaces. Warning and error messages are displayed here. Verify:
   a) All capture processes are up and running.
   b) Delivery peers are defined and connected and are delivering hits
   c) Network interfaces are up.
      - For statistics on a network interface, click **(details)**.
      - For more diagnostics, click the **Utilities** link.
      - For more information about messages that are displayed in the Summary tab, see "PCA Web Console - Summary Tab" on page 71.
3. **"PCA Web Console - Interface Tab" on page 84** - Configuration of multiple PCA instances, network interfaces, data segmentation, and data filters. Contains performance tuning parameters. Verify:
   a) Primary interface is up and is listening to both directions of traffic.
   b) Directions of each interface are properly configured. See "PCA Web Console - Interface Tab" on page 84.
   c) Required Traffic port numbers are correctly set.
   d) Ignored Traffic filters are not filtering wanted data.
   e) If you are using multiple PCA instances, verify that any data segmentation configuration is directing traffic to the appropriate instance.
   f) Any defined filter rules are properly including or excluding port traffic.
   g) Tuning parameter settings are not impacting system performance.
4. **"PCA Web Console - Delivery Tab" on page 101** - Define and test connections to target recipients of PCA data. Enable and configure delivery of PCA statistics to the Windows pipeline. Verify:
   a) Target host names and port numbers are properly specified
   b) For diagnosing issues, delivering PCA statistics hits to the Windows pipeline enables better tracking of system performance. For more information about the statistics hit, see "Stats per Instance" on page 138.

Related concepts

Passive capture monitoring
You can monitor the passive capturing to diagnose performance issues.

Checklist for diagnosing CX Passive Capture Application issues

The PCA web console provides detailed information about how to diagnose issues with the IBM TealeafCX Passive Capture Application.

Additional PCA configuration checklist
In addition to the main checklist, you can perform some additional checks based on the following issues:

Procedure

1. SSL issues- If the PCA is not properly capturing HTTPS traffic, review the SSL keys configuration.
   - Verify that no private keys are missing.
   - Verify on the web server that the current SSL key is exported and provided to the PCA.
   - PCA requires the web server private key to be exported, converted, and then imported into the PCA.
2. Sensitive data - If sensitive data is being passed through the PCA to the Windows pipeline and the databases, you can configure privacy rules to block or mask this data as soon as it arrives at the PCA.
   - Verify that privacy rules are properly configured.
   - Review use of regular expressions in privacy rules, which can significantly affect PCA performance.
3. Failover issues- The PCA can be configured to fail over from the primary PCA instance to a secondary one as needed.

Related concepts
Passive capture monitoring
You can monitor the passive capturing to diagnose performance issues.

Checklist for diagnosing CX Passive Capture Application issues
The PCA web console provides detailed information about how to diagnose issues with the IBM TealeafCX Passive Capture Application.

Downloading Privacy Configuration
Related reference
PCA Web Console - Failover Tab

Additional tips for diagnosing issues

If the main checklist did not help to diagnose the issue, you can review the following items to verify performance of the IBM TealeafCX Passive Capture Application server.

In some situations, issues that appear in the IBM Tealeaf CX Passive Capture Application are sourced at the operating system or network level. The following tips are useful validation steps prior to contacting Tealeaf Customer Support.

- Check disk space on the volume where PCA is hosted
- Check operating system processes
- Verify recent history of PCA Web Console modifications, which are logged in the following file:

```
/var/log/tealeaf/confxxx.log
```

- Verify status of NICs using external tools such as `ifconfig` and `ethtool`
- Verify physical connections between server, NICs, and network

Related concepts
Passive capture monitoring

You can monitor the passive capturing to diagnose performance issues.

Passive capture monitoring using Tealeaf status

The Tealeaf status report polls each active Tealeaf server that is configured in the **Portal Management** page for status information and produces a summary report within the Portal. It provides a dashboard view into the health of your system.

About this task

To include reporting on the PCA in the Tealeaf Status report, complete the following steps to enable the Portal application. It communicates with the server or servers that are hosting the PCA.

Procedure

1. Log in to the Portal as a Tealeaf administrator.
2. From the Portal menu, select **Tealeaf** > **Portal Management**.
3. In the **Portal Management** page, click the **Manage Servers** link.
4. Review the list of servers. Verify that the list contains a reference for each PCA server from which you want to receive Tealeaf Status information.
5. If a server is not listed, create an entry for it:
   a) Click **New**. From the drop-down menu, select **Capture Application Server**.
   b) At the bottom of the page, specify the properties that enable the Portal application to connect to the PCA server.
   c) Verify that the Active check box is selected.
   d) To save the entry, click **Save**.
   e) The entry must be displayed in the list of servers.
   f) Select the entry. At the top of the list of servers, click the **Ping** tool to test the connection between the Portal application and the server.
6. Repeat the previous steps to create entries for other PCA servers in the environment.
7. When you finish creating entries for all PCA servers, generate a Tealeaf Status report:
   a) In the **Portal Management** page, click the **Logs** link in the left navigation panel.
   b) Click the **View Tealeaf Status** link.
   c) The Tealeaf Status report is displayed.
   d) Search the report for PCA.

Related concepts

Passive capture monitoring
You can monitor the passive capturing to diagnose performance issues.

Logging for the CX Passive Capture Application

The IBM Tealeaf CX Passive Capture Application uses the following logs.

PCA logs

The following log files can be used to troubleshoot.

Table 40. CX PCA log descriptions	
Log file name	**Description**
`capture.log`	CX PCA core software message log, including error and startup messages. • This log is rolled regularly, depending on its file size. • `syslog` is used for message generation. Other logs use native generation methods.
`conf_changelog.log`	CX PCA configuration change log. Changes to `ctc-conf.xml` configuration file.
`statistics_YYYYMMDD.log`	Minute-by-minute snapshot of CX PCA statistics. This log is rolled daily.
`maintenance_YYYYMMDD.log`	CX PCA health monitoring and time-sync messages. This log is rolled daily.
`privacy_changelog.log`	Change logon privacy configuration that is applied through the CX PCA.

Apache server logs

The following log files can be used to troubleshoot the PCA web console that is hosted by Apache server.

Table 41. Apache server log descriptions	
Log file name	**Description**
`access_log`	Apache operation error messages.
`ssl_engine_log`	Apache SSL operation messages.
`ssl_request_log`	Apache SSL request URLs.

Related concepts

Passive capture monitoring
You can monitor the passive capturing to diagnose performance issues.

Setting the log levels for PCA processes for troubleshooting

The PCA processes generate messages. For normal operations, the logging levels are set to a default level. During a troubleshooting situation, Support Services might ask you to adjust the logging levels to see additional information to resolve issues. Logging levels are set in the `.bashrc` file on the Linux server. Increasing the levels increases the number of events that are generated and the size of the log files must be checked constantly to not use up too much space. Changing the levels is only recommended for a short period for debugging.

About this task

You can set the logging levels for these PCA processes:

- pipelined
- routerd
- reassd
- listend
- tcld
- deliverd
- captured

Logging types and levels are:

To log only these messages	Set the log level to	What it is used for
LOG_EMERG	0	This level is not currently used by Tealeaf, only third-party software.
LOG_ALERT	1	This level is not currently used by Tealeaf.
LOG_CRIT	2	Needs immediate attention.
LOG_ERR	3	Some error was encountered and the software tries to correct it as best it can. This condition should be fixed for optimal operation.
LOG_WARNING	4	Things are not working as they should. This condition must be fixed for optimal operation.
LOG_NOTICE	5	Advisory log, for example the configuration was changed.
LOG_INFO	6	This level is same as NOTICE and they are used interchangeably. This level might help in debugging by providing current state information.
LOG_DEBUG	7	This level is the most useful for debugging. It provides the most in-depth information on the working of the PCA.

Procedure

1. Log in as root or Administrator with root permissions on the Linux server.
2. Find the `.bashrc` file in the root home directory.
3. Edit the `.bashrc` and add the process information and log levels to the file. Enter the process level that Support Services tells you to use. This example sets the logging for all the processes to the default level - 3:

```
PIPELINED_LOG_LEVEL=3
export PIPELINED_LOG_LEVEL
DELIVERD_LOG_LEVEL=3
export DELIVERD_LOG_LEVEL
LISTEND_LOG_LEVEL=3
export LISTEND_LOG_LEVEL
ROUTERD_LOG_LEVEL=3
export ROUTERD_LOG_LEVEL
TCLD_LOG_LEVEL=0
export TCLD_LOG_LEVEL
CAPTURED_LOG_LEVEL=3
export CAPTURED_LOG_LEVEL
REASSD_LOG_LEVEL=3
export REASSD_LOG_LEVEL
```

4. Restart the PCA for the changes to take effect.
5. After the troubleshooting is finished, use this task to reset the logging levels to the default level of 3.

Overview of passive capture maintenance

The maintenance utility performs routine maintenance and logging tasks for Tealeaf passive capture. You can use the utility to help maintain the ability of the PCA to perform passive capture.

Related concepts

Capture health check
The maintenance utility monitors the capture processes to determine whether they are in good health.

Capture restart
According to a predefined schedule, the maintenance utility stops the capture processes, clears the runtime statistics that are collected, then restarts the processes.

Log file location
For the IBM TealeafCX Passive Capture Application, log files are located in the following directories:

Statistics logging
Statistics log files are generated in the PCA log directory.

Time synchronization
The utility synchronizes the current date and time with the current date and time of a IBM TealeafCX server that is running the Tealeaf Transport Service. The maintenance log file contains the output of the time synchronization task if it is enabled.

Capture health check

The maintenance utility monitors the capture processes to determine whether they are in good health.

If the utility decides the capture processes are unhealthy, it performs a forced restart. The forced restart stops the capture processes, clears the runtime statistics that they collect, and then restarts them. The health check helps the capture processes recover from situations that degrade the effectiveness and performance of the capture processes. When the maintenance utility determines that capture is unhealthy and needs a restart, it writes a message to the maintenance log file to indicate this situation.

Related concepts

Overview of passive capture maintenance
The maintenance utility performs routine maintenance and logging tasks for Tealeaf passive capture. You can use the utility to help maintain the ability of the PCA to perform passive capture.

Capture restart

According to a predefined schedule, the maintenance utility stops the capture processes, clears the runtime statistics that are collected, then restarts the processes.

The restart occurs at a specific time every day or every week at a specific time on a specific day. The forced restart prevents the capture processes from entering unhealthy situations that would cause the health check to fail.

Note: The specified time (and optional day of the week) must be a time when capture can be forced to restart without impacting delivery of hits to the Tealeaf Transport Service. Services include routine network maintenance period, or a period of low volumes of traffic to capture.

Related concepts

Overview of passive capture maintenance
The maintenance utility performs routine maintenance and logging tasks for Tealeaf passive capture. You can use the utility to help maintain the ability of the PCA to perform passive capture.

Log file location

For the IBM TealeafCX Passive Capture Application, log files are located in the following directories:

```
/var/log/tealeaf
```

When the PCA is upgraded, the location of log file directories is never updated. If you upgrade your PCA from an initial installation before build 3206, then log files are stored in the following location:

```
/usr/local/ctccap/logs
```

The log file directory is stored in the following file:

```
/usr/local/ctccap/etc/tealeaf.conf
```

Locate the following entry:

```
logfiledir="/var/log/tealeaf"
```

Log file cleanup

The log files that are monitored by the utility are in the directory `/var/log/tealeaf` and include the date in the filename, such as `statistics_20050602.log`.

The utility monitors that age and size of specific log files. It also deletes them if they are older than a specified number of days or larger than a specified size.

Related concepts

Overview of passive capture maintenance
The maintenance utility performs routine maintenance and logging tasks for Tealeaf passive capture. You can use the utility to help maintain the ability of the PCA to perform passive capture.

Statistics logging

Statistics log files are generated in the PCA log directory.

The maintenance utility generates a file that contains various runtime statistics over time. This file is intended for debugging and diagnosis of various capture and hit delivery problems.

Statistics log files are generated in the PCA log directory, which is the following location by default:

```
/var/log/tealeaf/
```

Log files have the following file name format: `statistics_yyyymmdd.log`.

- Newer logs are in plaintext format.
- Older logs are compressed into compress files.

Converting statistics log files to output format

If needed, you can use a script that is provided by Tealeaf to convert a PCA statslog file into `.csv` or `.xml` format for more analysis. The script is in the following location:

```
/usr/local/ctccap/sbin/stat2csv
```

Note: This script assumes that the PCA software is installed in `/usr/local/ctccap`.
If the PCA software is installed in another location, the shebang at line 1 of the script must be changed to point to the correct location of the php binary: `<pca install location>/bin/php`.

Usage:

```
./stat2csv -t type -f infile -w outfile
```

where:

- `infile` - the statistics log file in plain text or compress format.
- `outfile` - the name of the `.csv` or `.xml` file to output.
- `type` - the type of file to output: `csv` or `xml`

Examples:

```
./stat2csv -t csv -f statistics_20090406.log -w statistics_20090406.csv
./stat2csv -t xml -f statistics_20090406.log.gz -w statistics_20090406.xml
```

Related concepts

Overview of passive capture maintenance

The maintenance utility performs routine maintenance and logging tasks for Tealeaf passive capture. You can use the utility to help maintain the ability of the PCA to perform passive capture.

Time synchronization

The utility synchronizes the current date and time with the current date and time of a IBM TealeafCX server that is running the Tealeaf Transport Service. The maintenance log file contains the output of the time synchronization task if it is enabled.

Related concepts

Overview of passive capture maintenance

The maintenance utility performs routine maintenance and logging tasks for Tealeaf passive capture. You can use the utility to help maintain the ability of the PCA to perform passive capture.

Manual configuration

You can manually configure the maintenance utility by editing the configuration file for the utility.

To configure the maintenance utility, you edit the file `/usr/local/ctccap/etc/runtime.conf`, and add lines that assign values to variables.

Lines that contain a pound sign ("#") at the beginning of the line are comments and are ignored by the maintenance utility.

A variable assignment must be a single line in the following format:

```
variable_name="value"
```

Note: Do not include spaces at the beginning or end of the line and before or after the equal sign. Enclose the value in quotation marks.

The following list documents the configuration variables, their default values (if unspecified in file `runtime.conf`), and their meanings.

Several are Boolean values that must either be YES or NO.

Capture health check

```
capture_health_capture_packets_dropped_in_output_high_threshold="50000"
```

If the capture statistics `Packets dropped in output` is above this value, capture is unhealthy. This value is high when capture cannot reassemble hits as fast as they are captured off the network interfaces.

```
capture_health_enable="YES"
```

Enables capture health checks. This check is enabled by default to monitor the health of the capture processes.

```
capture_health_reassd_pct_cpu_high_threshold="90"
```

If the hit reassembly process uses more than 90% of the CPU, capture is unhealthy.

```
capture_health_reassd_virtual_size_high_threshold="1024000"
```

If the hit reassembly process uses more than the specified number of kilobytes (1,024,000 kilobytes is approximately 1 gigabyte), capture is unhealthy.

```
capture_health_schedule_minutes="5"
```

The number of minutes between health checks.

Capture restart

```
capture_restart_enable="NO"
```

Forces capture to restart at a specific time each day or weekly, on a specified day of the week. This check is disabled by default because the utility does not know a safe or low traffic volume time to force a restart. To enable it, assign it a value of YES and set the capture restart time in the following property.

```
capture_restart_time_local="00:30"
```

Restart capture at the specified local time (by using a 24-hour clock). If you want to restart capture at 11:30 PM, use value "23:40". Do not include the leading zero if the hours is less than 10. For example, to specify 6:30 AM, use value "6:30".

```
capture_restart_weekday_local (no default)
```

Restart capture on the specified day of the week at the time that is specified by variable *capture_restart_time_local*. The value must be one of the following (all lowercase): `sunday`, `monday`, `tuesday`, `wednesday`, `thursday`, `friday`, `Saturday`.

Restart capture on the specified day of the week at the time that is specified by variable *capture_restart_time_local*. If you specify this value, then the forced restart occurs on the specified day at the specified time. If you do not set this variable (the default), forced restarts occurs every day at the time specified.

Debugging

```
maintenance_debug_enable="NO"
```

Enables verbose logging of settings and execution. This option exists to help diagnose the behavior of the maintenance utility. It results in lots of output in the `maintenance.log` file and must be used only when needed.

Log file cleanup

```
logfile_cleanup_enable="YES"
```

Enables log file cleanup.

```
logfile_cleanup_keepdays="14"
```

- Keep log files for the specified number of days. Log files older than the specified number of days is deleted.
- The log files that are monitored by the maintenance utility contain a date in the file name in the format <Year><Month><Day>, such as 20050601 for June 1, 2005.

- The utility uses the date that is extracted from the file name, not the date, and time of the file that is maintained by the operating system.

```
logfile_cleanup_keepsize_kb="5120"
```

- Keep log files smaller than the specified number of kilobytes. The default value keeps log files smaller than approximately 5 megabytes.
- Files larger than this size are deleted. The goal of this setting is to prevent large files from accumulating on the Passive Capture host machine.

```
logfile_cleanup_schedule_minutes="30"
```

The number of minutes between checks for cleaning up log files.

Statistics logging

```
statistics_logging_enable="YES"
```

Enables statistics logging. When enabled, the maintenance utility creates CSV files in directory `/usr/local/ctccap/logs` with the name `statistics_YYYYMMDD.log`, where YYYYMMDD is the current year, month, and day, such as `statistics_20050602.log`.

```
statistics_logging_schedule_minutes="1"
```

The number of minutes between statistics logging.

Time synchronization

```
timesource_sync_enable="NO"
```

- Enables time synchronization with a IBM Tealeaf CX server that is running the Tealeaf Transport Service.
- The configuration values for the host and port of the Tealeaf Transport Service in file `/usr/local/ctccap/etc/ctc-conf.xml` and are normally assigned through the Delivery tab on the web console.
- When the configuration values for the host and port are specified, the maintenance utility enables this feature by default. Otherwise, the maintenance utility disables time synchronization.

```
timesource_sync_schedule_minutes="15"
```

The number of minutes between time synchronizations.

Protecting memcached data from unauthorized access

An attacker with access to the memcached port (port 11211 by default) on the PCA, can read memcached operational data, read TLS session state for any active sessions, and cause the denial of service by writing specially crafted data (or just clearing the cache).

About this task

PCA uses memcached and libmemcached to manage a shared cache of shadowed TLS session state, so that it can decrypt a resumed TLS session.

The cache is used whenever TLS decryption is enabled, even if there is only one PCA.

PCA uses memcached with authentication disabled. The memcached data is not encrypted by default, but a customer can configure the system to encrypt the data (although with an AES key, that is easy to determine).

To protect memcached data from unauthorized access, perform the following steps:

Procedure

1. Create a user name and password by running the following script:

```
cd /usr/local/ctccap/sbin
   ./sasl-username-password.sh
```

2. Verify the username has been added to the SASL database by running the following command:

```
cd /usr/local/ctccap/sbin
     ./sasldblistusers2 -f $installed_path/sasldb
```

3. Update the PCA configuration by running the following command:

   Note: If you are running in the memcached pool, then the username and password must be same across the pool.

```
cd /usr/local/ctccap/sbin/etc/
```

   a) For a new PCA installation:

   Locate the Pool Section of xml and edit the following lines:

```
vim ctc-conf.xml
    <SaslAuth>true</SaslAuth>
    <MemcachedUser>username</MemcachedUser>
    <MemcachedPassword>userpassword</MemcachedPassword>
```

   b) For an upgrade of your PCA installation:

   Locate the Pool section of xml and add the following lines: (refer ctc-conf-defaults.xml):

```
vim ctc-conf.xml
    <SaslAuth>true</SaslAuth>
    <MemcachedUser>username</MemcachedUser>
    <MemcachedPassword>userpassword</MemcachedPassword>
```

Passive capture frequently asked questions (FAQ)

The following content contains frequently asked questions or scenarios that can be used to help isolate or fix an issue with your CX Passive Capture Application.

Operating System

- "Does Passive Capture support 64-bit Linux" on page 257
- "Does Passive Capture Support FreeBSD" on page 258

Upgrading the operating system
If you are performing a major version upgrade of the operating system, uninstall the PCA first and then run the upgrade.

After the upgrade is complete, install the new version of the PCA. For example, if you are upgrading from SLES9 to SLES10, you must uninstall the PCA software for SLES9. Then, upgrade the operating system, verify that the O/S upgrade is successful, and then install the SLES10 version of the PCA.

Install

- "How do I automate PCA installation and configuration" on page 258
- "What packages are required by the tealeaf-pca RPM" on page 258
- "What changes does the tealeaf-pca RPM make to the PCA server" on page 259

Web Server Configuration

PCA Configuration

Console

Logs

Other

Troubleshooting

For more information about troubleshooting, see "Troubleshooting - Capture" in the *IBM Tealeaf Troubleshooting Guide*.

Does Passive Capture support 64-bit Linux

Question

Does Passive Capture support 64-bit Linux?

Answer

Tealeaf does not provide a 64-bit version of the IBM Tealeaf CX Passive Capture Application for 64-bit distributions of Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) now.

However, you can install the PCA onto a 64-bit operating system. Tealeaf provides a 32-bit package only, which depends on 32-bit libraries. These libraries are not included in minimal installations of 64-bit distributions of RHEL and must be installed before the PCA is installed.

Note: To install the IBM Tealeaf CX Passive Capture Application on a 64-bit version of Linux, you must install the 32-bit versions of the required packages for your operating system. See “Installing the CX Passive Capture Application” on page 16.

Does Passive Capture Support FreeBSD

Question

Does the Passive Capture application support the FreeBSD operating system?

Answer

FreeBSD is no longer supported.

Note: Customers who are using the PCA on an unsupported operating system or unsupported version of a supported operating system cannot get support for capture-related issues.

Several major releases in the past, Tealeaf did support FreeBSD, a UNIX like operating system. Tealeaf did not test the IBM Tealeaf CX Passive Capture Application on FreeBSD since Tealeaf begun supporting Linux.

The biggest potential issue is the version handshake between the PCA delivery and the Transport Service on the Tealeaf Windows servers.

Ideally, customers who are currently using unsupported operating systems must switch to one of our supported versions.

How do I automate PCA installation and configuration

Question

How do I automate PCA installation and configuration?

Answer

Note: This solution requires a minimum `tpcinstaller.sh` date and version: 2007/07/05, revision 17.

You can use the `tpcinstaller.sh` script to automate the installation and configuration of the tealeaf-pca package. The script is in the `bin` subdirectory after installation, or you can request it from Tealeaf.

References

- "Installing the CX Passive Capture Application" on page 16

What packages are required by the tealeaf-pca RPM

Question

What packages are required by the tealeaf-pca RPM?

Answer

Use the following command line to have RPM display the list of packages that are required by the package file named `abc.rpm`:

```
rpm -q --requires -p abc.rpm | fgrep -v rpmlib | sort -u | while read x; \
  do rpm -q --whatprovides "\${x}"; done | sort -u
```

Note:

- Run the command as root.
- Replace file name `abc.rpm` with the name of the file you want to interrogate.

- The command uses Bourne shell syntax, so you must be running `/bin/sh`, `/bin/bash`, `/bin/ksh`, and so on.

Following are the results of running the previos command on the distributions Tealeaf supports.

Note: The tealeaf-pca RPM installs on a minimal installation of Red Hat Enterprise Linux without requiring more packages. In practice, more packages can be required.

Installing the Tealeaf 32-bit RPM on a 64-bit Linux system usually requires installing more 32-bit libraries.

- See "Installing the CX Passive Capture Application" on page 16.

Note: The package that provides a capability that is required by the Tealeaf package can differ between distributions and different releases and updates of the same distribution.

For more information about the required packages for specific operating system releases, see "Installing the CX Passive Capture Application" on page 16.

What changes does the tealeaf-pca RPM make to the PCA server

Question

What changes does the tealeaf-pca RPM make to the IBM Tealeaf CX Passive Capture Application server?

Answer

You can install Passive Capture into a directory other than the default of `/usr/local/ctccap`.

- See "How do I install into a directory other than the default one" on page 261.

The package creates the log file directory, which is `/var/log/tealeaf` by default, if it does not exist. It was `/usr/local/ctccap/logs` in earlier versions.

- When you upgrade from an old installation that contains a nonempty `/usr/local/ctccap/logs` directory, the package uses the existing `/usr/local/ctccap/logs` directory instead of `/var/log/tealeaf`. This behavior is intended to avoid surprising the user by leaving old log files in the old directory (`/usr/local/ctccap/logs`) and writing new log files to the new default (`/var/log/tealeaf`).
- This check for `/usr/local/ctccap/logs` is independent of the installation prefix that is chosen for installation for upgrade. So if you install Passive Capture into `/opt/tealeaf`, the package still looks for a nonempty directory `/usr/local/ctccap/logs`.

The package performs the following file operations:

- Create the following SSL self-signed certificate files in `/usr/local/ctccap/etc`. The package creates them automatically as a convenience for installations that do not provide their own SSL certificates:

```
/usr/local/ctccap/etc/tealeaf-pca.crt
/usr/local/ctccap/etc/tealeaf-pca.key
/usr/local/ctccap/etc/tealeaf-tts.crt
/usr/local/ctccap/etc/tealeaf-tts.key
/usr/local/ctccap/etc/tealeaf-tts.pem
/usr/local/ctccap/etc/tealeaf-web.crt
/usr/local/ctccap/etc/tealeaf-web.key
```

Note:

  - The tealeaf-pca files are currently unused and are reserved for future use.
  - The tealeaf-web files are used by the default `httpd.conf` for the web console.
  - The tealeaf-tts files are provided for convenience in configuring SSL connections with the TeaLeaf Transport Service.

  - The /usr/local/ctccap/etc directory is normally writable by root and the capture user, ctccap.
- Install crontab file: /etc/cron.d/tealeaf. The crontab file schedules the execution of tealeaf cron as user root.
- Install the following initialization scripts in /etc/init.d: tealeaf-pca, tealeaf-startup.
- Create the capture.log file in the logfile directory if the file does not exist.

The package performs the following actions that modify directories and files outside of the installation prefix:

- Create group ctccap if it does not exist.
- Create user ctccap if it does not exist.

  Note: This user is created without a password that is assigned to it, so you cannot log in with that account by default. Security risks are minimal; the ctccap user can only start and own the Tealeaf processes. Depending on your enterprise security requirements, you can assign a password to the ctccap user from the root user.
- Set /usr/local/ctccap/bin/listend and /usr/local/ctccap/bin-debug/listend as setuid root (required for listend to open eth devices for packet sniffing; drops down to user ctccap after you open the eth devices).
- Remove PHP session files in /tmp. These files are assumed to be PHP session files for the Passive Capture web console.
- Update /etc/syslog.conf (if needed) to ensure that it contains an entry for facility local0 to file capture.log in the logfile directory.
- Restart syslogd to reload its configuration and use any changes that are made to /etc/syslog.conf.

References

- "Installing the CX Passive Capture Application" on page 16

How do I specify the directory for the tealeaf symbolic link

Question

How do I specify the directory for the tealeaf symbolic link?

Answer

By default, the tealeaf-pca package creates a symbolic link from /usr/local/bin/tealeaf to /usr/local/ctccap/bin/tealeaf.

You can specify an alternative directory for the symbolic link instead of /usr/local/bin by setting environment variable TEALEAFCMDDIR. It must be the fully qualified name of a directory. You must set the environment variable before you start the rpm installation and upgrade commands and the tpcinstaller.sh script.

Following is a sample invocation that specifies an alternate installation location for the symbolic link:

```
env TEALEAFCMDDIR=/usr/bin rpm -U tealeaf-pca-3204-1.RHEL4.i386.rpm
```

How do I disable creation of the tealeaf symbolic link

Question

How do I disable creation of the tealeaf symbolic link?

Answer

By default, the tealeaf-pca package creates a symbolic link that points to the `/usr/local/ctccap/bin/tealeaf` command.

You can disable creation of this symbolic link by setting environment variable `TEALEAFCMDENABLE` to `NO`. You must set the environment variable before starting the rpm installation and upgrade commands and the `tpcinstaller.sh` script.

Following is a sample invocation that disables creation of the symbolic link.

```
env TEALEAFCMDENABLE=NO rpm -U tealeaf-pca-3204-1.RHEL4.i386.rpm
```

How do I install into a directory other than the default one

Question

How do I install into a directory other than `/usr/local/ctccap`?

Answer

Note: This solution requires a minimum `tpcinstaller.sh` date and version: 2007/07/05, revision 17.

You can relocate the tealeaf-pca package to a directory other than the default `/usr/local/ctccap`. You specify the alternate directory by using the rpm command's `--prefix` option along with the installation and upgrade commands.

Following are some sample rpm invocations:

```
rpm -i --prefix=/opt/tealeaf tealeaf-pca-3204-1.RHEL4.i386.rpm
rpm -U --prefix=/home/tealeaf tealeaf-pca-3204-1.RHEL4.i386.rpm
```

When you do not use the `--prefix` option during an installation or upgrade, RPM uses the default installation directory that is specified in the tealeaf-pca package file, which is `/usr/local/ctccap`. Once you relocate a package, you must consistently specify the alternate directory so that the package correctly checks for and updates previous installations.

If you are using the installer script, `tpcinstaller.sh`, you can specify environment variable `TPCINSTALLPREFIX` before you start the script to install the tealeaf-pca package.

If you do not specify the environment variable `TPCINSTALLPREFIX` before you start the script, it determines the current installation prefix and automatically pass it along to the RPM commands it runs. If the package is not currently installed or is not a relocatable version, the default directory, `/usr/local/ctccap`, is used by the tealeaf-pca package.

Following is a sample invocation of the `tpcinstaller.sh` script.

```
env TPCINSTALLPREFIX=/opt/tealeaf /etc/opt/tpcinstaller.sh \
  tealeaf-pca-3204-1.RHEL3-i386.rpm
```

What directories and files are not located under the installation directory

Question

What directories and files are not located under the installation directory?

Answer

Note: This solution requires a minimum `tpcinstaller.sh` date and version: 2007/07/05, revision 17.

The following list describes various directories and files that are associated with Passive Capture that do not reside with the installation directory, which defaults to `/usr/local/ctccap`. Some paths are directly used by the software. Some are user configurable, and some are touch through the course of normal administration and usage of the software.

/archive [optional]

The optional directory is documented in the procedure for performing a minimal installation of Red Hat Enterprise Linux. It exists in case packet archiving must be enabled to diagnose various capture issues. It is not required for normal operation and is not used by default.

/etc/cron.d/tealeaf

The tealeaf-pca package installs the crontab for use by the package.

```
/etc/init.d/tealeaf-pca.sh
/etc/init.d/tealeaf-startup.sh
```

The tealeaf-pca package installs the `tealeaf-pca.sh` and `tealeaf-startup.sh` scripts to control the startup and shutdown of the software.

/etc/opt/tealeaf

Passive Capture uses the directory for various configuration and installation settings. For example, the tealeaf-pca package uses this directory to record the installation directory in file `/etc/opt/tealeaf/config/installprefix` and to record the location of the tealeaf symbolic link in file `/etc/opt/tealeaf/config/tealeafcmd`. The `tpcinstaller.sh` script uses this directory for its configuration files, including SSL keys that must be automatically imported.

/etc/syslog.conf

Passive Capture uses the syslog facility to log messages, which are configured in the file.

`/etc/group`, `/etc/passwd`, and other user-account related files.

The tealeaf-pca package creates a user and a group account for running the software if they do not exist. These operations modify various system files that are updated when user accounts are created or updated.

```
/tmp/tealeaf-pca-11-prein.log
/tmp/tealeaf-pca-12-postin.log
/tmp/tealeaf-pca-21-preun.log
/tmp/tealeaf-pca-22-postun.log
```

The tealeaf-pca package creates the log files to record various installation-related activities.

/tmp/tealeaf-pca.log

The tealeaf-pca package, prior to build 3204, used the log file to record various installation-related activities.

/tmp/tpcinstaller.log

The `tpcinstaller.sh` script uses the log file to record its activities.

/usr/local/bin/tealeaf

The above file is a symbolic link to the Tealeaf command in the bin subdirectory of the installation directory. For example: `/usr/local/ctccap/bin/tealeaf`. Environment variables `TEALEAFCMDDIR` and `TEALEAFCMDENABLE` manage location and creation of this symbolic link.

/var/log/messages

Passive Capture uses the syslog facility to log messages, which can affect the log file, configured in `/etc/syslog.conf`.

/var/log/tealeaf

Passive Capture uses the directory for its log files.

How do I remove Diffie Hellman cipher from web server SSL cipher list

Diffie-Hellman is a type of SSL encryption cipher. It is designed for third parties, which are systems other than the two parties at the two endpoints of a conversation, cannot decrypt the communications traffic. A user session that is established with a web server by using this cipher cannot be captured by using the IBM Tealeaf CX Passive Capture Application.

By default, newer Firefox browser versions attempt to negotiate for the Diffie-Hellman cipher family. Because of the increasing popularity of Firefox, Tealeaf provides the following instructions to our customers on how to disable the Diffie-Hellman negotiation on their Web servers, if they choose to do so.

Note: If the web server infrastructure includes an SSL termination or acceleration device further upstream closer to the visitor's web browser than the point at which the Tealeaf IBM Tealeaf CX Passive Capture Application server (PCA server) is monitoring the traffic, then the PCA server can see all the traffic as non-SSL cleartext, even if Diffie-Hellman is applied. In this situation, the following solution does not apply. The SSL terminating device is free to negotiate Diffie-Hellman with the visitor's browser. It is because the PCA server is downstream of the encrypted traffic and does not have to do any decryption.

Locating Servers Using Diffie-Hellman

About this task

In a web application environment with many servers, locating the servers that are using the Diffie-Hellman cipher cannot be trivial.

Using Wireshark, you can apply a display filter to refine the list of servers and identify the ones that are using the Diffie-Hellman cipher.

- For more information about Wireshark, visit `http://www.wireshark.org`.

Procedure

1. Start Wireshark.
2. Load or capture a TCPdump file of the traffic that is submitted to the PCA.
3. In the **Filter** textbox, copy the following string. Edit it to remove the backslash characters at the end of each line, which are used to signal continuation. Then, paste the string to filter the wireshark traffic.

```
ssl.handshake.ciphersuite == 0x10 || ssl.handshake.ciphersuite == 0x1a || \
ssl.handshake.ciphersuite == 0x1b || ssl.handshake.ciphersuite == 0x30 \
||ssl.handshake.ciphersuite == 0x31 || ssl.handshake.ciphersuite == 0x32 || \
ssl.handshake.ciphersuite == 0x33 || ssl.handshake.ciphersuite == 0x34 \
||ssl.handshake.ciphersuite == 0x36 || ssl.handshake.ciphersuite == 0x37 || \
ssl.handshake.ciphersuite == 0x38 || ssl.handshake.ciphersuite == \
0x39||ssl.handshake.ciphersuite == 0x3a || ssl.handshake.ciphersuite == 0x63 \
|| ssl.handshake.ciphersuite == 0x65 || ssl.handshake.ciphersuite == 0x66
```

4. The filter traffic now shows only traffic from Diffie-Hellman ciphers.
5. Use of the Diffie-Hellman cipher must be disabled on the listed server or servers. For more information, complete the following steps, depending on the type of server.

Disabling

To disable the Diffie-Hellman cipher suite from your web server, follow one of the options below. If your web server is not listed, see your web server's documentation for instructions to disable this cipher suite for your particular web server.

Disabling Diffie-Hellman on IIS Servers

Procedure

1. Add or modify the following Registry key on each web server:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\
SCHANNEL\KeyExchangeAlgorithms\Diffie-Hellman\
Enabled = 0 (DWORD value)
```

2. Restart the web server for the changes to take effect.

Disabling Diffie-Hellman on Apache Servers
You can edit keyword strings in the `ssl.conf` or `httpd.conf` files to disable Diffie-Hellman on Apache Servers.

About this task

This task provides the procedure to disable Diffie-Hellman on Apache Servers by editing the **`SSLCipherSuite`** config option string in the `ssl.conf` or `httpd.conf` files.

Procedure

1. In Apache's conf directory, locate file:
   `ssl.conf`
   or
   `httpd.conf`
2. Look for the SSLCipherSuite keyword string value:

```
To disable Diffie-Hellman, please insert "!EDH:!DHE:!DH:!ECDH" after the "ALL:" in the cipher
 spec.
This is an example and you will need to make sure you include it to all the variants of
Diffie-Hellman
 to disable it on your web server.
For additional info: https://httpd.apache.org/docs/current/mod/mod_ssl.html#sslciphersuite
```

3. Repeat this edit in every SSL config section, if you are not using one global section.
4. Save the file.
5. Restart the web server for the changes to take effect.

Some SSL hits missing from Firefox browser sessions

Note: This issue is fixed in PCA Build 3611 and later.

Note: As of Build 3327, the IBM Tealeaf CX Passive Capture Application supports the SSL TLSv1 Session Ticket extension. If you are using Build 3327 or later and have this extension that is enabled on your web server, the PCA can properly capture all session data.

- If you are using a build before Build 3327, you must update to the latest available build for your release, instead of using this workaround.
- Beginning in PCA Build 3611, the PCA can capture SSL TLSv1.1. This explanation applies to TLSv1.1 for supporting builds as well. For more information on downloading IBM Tealeaf, see IBM Passport Advantage Online.

When sessions are initiated in the Firefox version 3 browser and then resumed later, SSL hits are not being decrypted. They are therefore missing from the captured traffic.

- This issue is not displayed over non-SSL traffic.
- This issue is not known or displayed in any browser other than Firefox 3.

This issue occurs because of an SSL extension feature that is implemented in version 3 of Firefox and in the OpenSSL modules use in the latest Apache web servers (and possibly other web servers). A new SSL TLSv1 protocol extension (RFC-5077) for stateless session resumption, known as SessionTicket extension, encrypts the SSL state information, which is used only if both the client browser and the web server comply with the standard.

Tealeaf does not support this SSL extension feature. If you install or upgraded to the latest Apache server v2.2 build within the last few months, it is likely that you are impacted by this new extension. Following instructions are provided for disabling this extension in Apache.

Note: You must disable this feature in your web servers.

SSL Pool Troubleshooting

You can test and troubleshoot the PCA servers in your SSL pool.

The following utilities are available to help you troubleshoot your SSL pool.

Table 42. SSL pool troubleshooting utilities

Header	**Header**
`Memping`	Pings the PCA server using the IP address and port number that is displayed.
`Memstats`	Displays statistics from the listed PCA server.
`Memflush`	**Warning:** Data is lost when you run this utility. It is recommended to contact IBM support before you use the `Memflush` utility. Flushes all of the stored SSL session information from the PCA server cache.

For information about configuring an SSL pool, see “Configuring SSL Pools” on page 181.

For information about removing a PCA server from an SSL pool, see “Removing a PCA Server from an SSL Pool” on page 181.

Symptoms

When visitors to your web application are using SSL through Firefox 3 and then stop, after they resume their session, hits are not captured by the PCA. It is because of Firefox 3's default support of this new SSL extension.

When the Firefox browser negotiates the SSL handshake with your web server to resume the session, the browser is expecting that the server supplies a 32-byte SSL unique session identifier back to the client browser.

- The intention of the feature is to reuse SSL session key information and reduce SSL usage in later SSL sessions.

Since Tealeaf does not support this SSL extension, it has no awareness of this 32-byte SSL identifier. Without this ID, the Tealeaf PCA is unable to decrypt any further SSL traffic by using the ID in resumed SSL sessions.

In the following examples, you can see how session identifiers are delivered to the visitor who is resuming a session in Firefox 3 versus Internet Explorer.

For Firefox:

```
SSL cipher used: Cipher Suite: TLS_RSA_WITH_AES_256_CBC_SHA (0x0035)
Session ID Length: 0
```

For IE:

```
SSL cipher used: Cipher Suite: TLS_RSA_WITH_RC4_128_MD5 (0x0004)
Session ID Length: 32
Session ID: 2FD9AAAEE999B2EA3DEF8FA005CD0CDD3D6EAE62E05E4975...
```

As you can see above, the Firefox SSL session ID length is 0, providing no usable value.

This new SSL TLSv1 protocol extension for stateless session resumption, which is known as SessionTicket extension, encrypts the SSL state information such as the SSL session identifier into a "ticket" package that both the client browser and server must use.

Currently, Firefox 3 is the only browser by using this extension by default. For acceptance of this extension, the server must support it as well.

To Test

To test whether this problem is occurring, you can force your web server or proxy to use the IE-selected cipher to see whether Firefox sessions are then captured correctly.

To Fix

Currently, the only method to address the issue is to disable use of this SSL extension at the web server or web proxy.

Firefox Browser

About this task

To circumvent the issue as an individual user, you can disable the use of this extension through Firefox. To disable the use of this extension in Firefox, do the following steps:

Procedure

1. Open Firefox.
2. Disable TLS 1.0 encryption in Firefox.
   a) In the Firefox menu, select **Tools** > **Options** > **Advanced** > **Encryption** tab.
   b) In the Protocols section, clear the **Use TLS 1.0** check box.
   c) Select the **Use SSL 3.0** check box.
   d) Click **OK** and save your changes.

- For more information, see https://kb.bluecoat.com/index?page=content&id=KB2887&actp=RSS.

Web Proxy

If your proxy server is managing the SSL processing, you can be able to disable use of the SSL TLSv1 SessionTicket extension feature at the proxy. Refer to the documentation that came with your proxy server product.

Apache Web Servers

About this task

Depending on the version of Apache, this feature can be enabled by default. The latest Apache mod_ssl uses openSSL 9.8j or later, which enables this TLS SessionTicket extension by default.

- It is likely that this feature first displayed in Apache Server version 2.2.

To disable:

Procedure

1. On the web server machine, edit `/usr/local/apache2/conf/httpd.conf`.
2. Add the following snippet to the corresponding location in the file:

```
SSLEngine on
SSLOptions +StrictRequire

<Directory />
    SSLRequireSSL
</Directory>

SSLProtocol +all -TLSv1 -SSLv3
SSLCipherSuite HIGH:MEDIUM:!aNULL:+SHA1:+MD5:+HIGH:+MEDIUM:!DH
```

   Note: In the above, the `!DH` reference removes the Diffie-Hellman encryption algorithm, which is required for all Tealeaf solutions. See "How do I remove Diffie Hellman cipher from web server SSL cipher list" on page 263.
3. Save the file.
4. Restart the Apache service.
   - For more information, see `http://www.securityfocus.com/infocus/1818`.

Non-Apache Web Servers

Most web servers do not provide an easy method of disabling use of the extension. You can be able to disable this extension by disabling the use of TLS 1.0 through the web server configuration options. For specific details, consult the product documentation.

How do I specify alternate configuration files

About this task

Question

About this task

How do I specify alternate configuration files?

Answer

About this task

You can use the `tpcinstaller.sh` script to automate overwriting various configurations that are created by the tealeaf-pca package when you initially install it.

These configuration files are normally created when they do not exist. Once they exist, the tealeaf-pca package does not modify or update them. If the tealeaf-pca package detects that you did not modify the files, it removes them during uninstall.

Use the `tpcinstaller.sh` script's `postinstall` command to overwrite various configuration files. The script is in the `bin` subdirectory under the installation directory after installation.

The script automates installation and configuration, but this example only demonstrates its `postinstall` command that overwrites configuration files and then starts up the software. Following is a brief example that demonstrates the basic flavor of this capability.

- It assumes that the tealeaf-pca package is already installed into `directory /opt/tealeaf`.
- Commands to be run by root are prefixed with the pound sign (*#*).

Procedure

1. Initialize the `/etc/opt/tealeaf` directory:

```
# sh /opt/tealeaf/bin/tpcinstaller.sh init
```

2. Create and/or place the custom configuration files in the `/etc/opt/tealeaf` directory that is created by step 1.
   a) To overwrite `ctc-conf.xml`, provide file `ctc-conf-custom.xml`. To have the installer script automatically convert PEM to PTL files and update the `ctc-conf.xml` file before you overwrite:
      1) Place your PEM files in `/etc/opt/tealeaf/capturekeys`.
      2) Replace the <CaptureKeys> section of your `ctc-conf-custom.xml` with:

```
<CaptureKeys>CAPTUREKEYSCONF</CaptureKeys>
```

   b) To overwrite `httpd.conf`, provide file `httpd-custom.conf`.
   c) To overwrite `privacy.cfg`, provide file `privacy-custom.cfg`.
   d) To overwrite `runtime.conf`, provide file `runtime-custom.conf`.
3. Create a configuration file that is instructing the installer script to always overwrite configuration files instead of overwriting files only when theyare not changed from the default files. Following are the contents of such a configuration file, which must be named `/etc/opt/tealeaf/tpcinstaller.conf`:

```
custom_capture_conf_enable="YES"
custom_httpd_conf_enable="YES"
custom_privacy_conf_enable="YES"
custom_runtime_conf_enable="YES"
```

4. Overwrite the configuration files and start all services:

```
# sh /etc/opt/tealeaf/bin/tpcinstaller.sh postinstall
```

   If you want to instruct the installer script to also install/update the RPM, then you must save a copy of the installer script to `/etc/opt/tealeaf` and then start it with the RPM file name. Following is the example:

Results

```
# env TPCINSTALLPREFIX=/opt/tealeaf sh /etc/opt/tealeaf/tpcinstaller.sh \
/root/tealeaf-pca-3204-1.RHEL4.i386.rpm
```

Note: Use of `TPCINSTALLPREFIX` requires PCA minimum build version of 3204.

Why are my saved changes ignored by the PCA web console

Question

Why are my saved changes ignored by the web console?

Answer

Confirm that cookies are enabled. The PCA Web Console requires cookies to be enabled in order for it to maintain the session state as you perform various tasks.

If cookies are disabled, after you click **Save Changes**, the page you are viewing reverts to the state before you made your changes.

References

- "PCA Web Console - Summary Tab" on page 71

Why can I not stop the web console processes

Question

Why can't I stop the web console processes?

Answer

In build 3100, the default location of the `httpd.pid` file that is used by the `tealeaf` script to find the web console has changed. This file used to reside in the `logfile directory` yet was moved to the `/usr/local/ctccap/var` directory to accomodate other feature work.

If you previously modified the `httpd.conf` so that it differed from the `httpd.conf.default`, then your `httpd.conf` is preserved when the new `httpd.conf.default` is installed by a later tealeaf-pca package. This preservation means the newer Tealeaf script in a 3100 or later package cannot find the `httpd.pid` because the web console continues to write it to the old location specified by the `httpd.conf`.

To resolve this issue, do the following steps:

- Stop all current web console processes by using the following command as root:

```
killall httpd
```

- Review the changes between `httpd.conf` and the default file from the package, `httpd.conf.default`. For example, you can view the changes by using the `diff` command as follows:

```
cd /usr/local/ctccap/etc
diff -c httpd.conf.default httpd.conf
```

- Isolate the changes that were made locally for the Passive Capture Application server (for example, basic authentication, disabling the non-SSL port) from the changes that are introduced by the package.
- Save off the existing `httpd.conf`, overwrite the `httpd.conf` with the `httpd.conf.default`, and merge in the isolated changes from step 3.

Where is the ctccap logs directory

Question

Where is the `/usr/local/ctccap/logs` directory?

Answer

As of build 3102, the default directory for Passive Capture log files is `/var/log/tealeaf`. When you install the tealeaf-pca package for the first time on a computer, it creates and uses `/var/log/tealeaf`.

If you are upgrading from a prior version and the `/usr/local/ctccap/logs` directory is a nonempty directory, then Passive Capture continues to use that directory instead of `/var/log/tealeaf`.

The web console's Backup/Logs page is updated to display the log file directory in use.

How do I manually change the logfile directory

About this task

Question

About this task

How do I manually change the log file directory from `/var/log/tealeaf` to XYZ?

Answer

About this task

As of build 3100, following is the default `logfile` directory that is used by new installations:

```
/var/log/tealeaf
```

If you do not want Passive Capture to use that directory, then use the following steps. The steps configures the `logfile` directory to be `/var/tealeaf`.

- Perform all the steps as user `root`.
- These steps assume that Passive Capture is already installed into `/usr/local/ctccap`.

Procedure

1. Stop all Passive Capture daemons:

   ```
   tealeaf stop
   tealeaf stop failoverd
   ```

2. Create the directory, if it does not exist, and assign its ownership and permissions.

   ```
   mkdir /var/tealeaf
   chmod u=rwx,go= /var/tealeaf
   chown ctccap:ctccap /var/tealeaf
   ```

   A long listing of just the directory must produce the following results:

   ```
   # ls -ld /var/tealeaf
   drwx------    2 ctccap   ctccap       4096 Sep  6 14:41 /var/tealeaf
   ```

   Note: The group `ctccap` was introduced in build 3101.

3. Create empty logfiles. You can use `tealeaf initlogs`. If that command is not available in the version you are running, you must create at least the `capture.log` file by using the following commands:

```
touch /var/tealeaf/capture.log
chmod u=rw,go= /var/tealeaf/capture.log
chown ctccap:ctccap /var/tealeaf/capture.log
```

A long listing of the directory must produce the following results:

```
# ls -l /var/tealeaf
total 0
-rw-------    1 ctccap   ctccap          0 Sep  6 14:42 capture.log
```

You can optionally chose to copy all your existing logfiles from `/var/log/tealeaf` to the new directory.

4. Edit the syslog daemon configuration file: `/etc/syslog.conf`. Replace the line for `local0` from :

```
local0.* -/var/log/tealeaf/capture.log
```

with this code:

```
local0.* -/var/tealeaf/capture.log
```

5. Restart the syslog daemon:

```
/etc/init.d/syslog stop
/etc/init.d/syslog start
```

On Red Hat systems, you can use:

```
service syslog stop
service syslog start
```

6. Edit file `/usr/local/ctccap/etc/runtime.conf`, which is used by the Passive Capture. Remove any existing variable definition for `logfiledir` and add the following line:

```
logfiledir="/var/tealeaf"
```

7. Start the Passive Capture daemons:

```
tealeaf start failoverd
tealeaf start
```

Results

If you look at `/var/tealeaf/capture.log`, you must see messages from Passive Capture starting.

All of the above steps are based on the processing for configuration variable `logfiledir` performed by the post-installation script `postinstallimp.sh` in the Passive Capture distribution (in the `sbin` subdirectory).

How do I make the PCA automatically clear its statistics

Question

How do I make the PCA automatically clear its statistics?

Answer

Create a cron job in `/etc/cron.d/tealeaf` to wake up and clear the stats. Examples:

```
* * * * * root /usr/local/ctccap/bin/tealeaf cron > /dev/null 2>&1
# the command 'tealeaf cron' is run every minute (already exists in
# /etc/cron.d/tealeaf



30 3 * * * root /usr/local/ctccap/bin/tealeaf clearstats > /dev/null 2>&1
# 'tealeaf clearstats' is run at 3:30 a.m. every day.



15 4 * * 2 root /usr/local/ctccap/bin/tealeaf clearstats > /dev/null 2>&1
# 'tealeaf clearstats' is run at 4:15 a.m. on Tuesdays.



01 0 1 * * root /usr/local/ctccap/bin/tealeaf clearstats > /dev/null 2>&1
# 'tealeaf clearstats' is run at 12:01 a.m. on the first day of every month.
```

What is the default port number for failover

Question

What is the default (or recommended) port number for failover?

Answer

If you do not specify a port number when you configure a failover master or subordinate, then failover uses port 9866.

How does the PCA handle duplicate TCP packets

Only TCP packets within the TCP connection are checked against their TCP sequence numbers. Duplicates are determined based on TCP sequence numbers.

While PCA processes can handle duplicate traffic packets, they represent an unnecessary usage that can impact performance when the system approaches to its maximum performance level. The submission of duplicate packets to PCA must be curtailed whenever possible.

At the TCP packet level, the IBM Tealeaf CX Passive Capture Application checks for the presence of duplicate packets in a TCP connection. PCA does it by evaluating their TCP sequence numbers. When duplicates are detected, they are handled in the following ways:

- If two packets is displayed back-to-back in the same connection, the second packet is discarded.
- If two packets is displayed in the same connection, contain a repeated sequence number, but do not is displayed back-to-back, the second packet is discarded.
- If sources and destinations of the packets are distinct, the packets are accepted by the PCA and reassembled for delivery to downstream canisters.

Through the **Statistics** tab of the PCA Web Console, you can monitor the frequency of duplicated TCP packets. Following is the the key statistic to monitor:

```
Total back-to-back duplicate packets
```

In the `stats.xml` file, this statistic is displayed as:

```
<TcpTotalDuplicatePackets>
```

A high number of duplicate packets can indicate that the network switch span ports are not properly configured. For example, if the number of duplicate packets approaches one half of the value specified in the `Total packets rcvd value` statistic. It also indicates that ports are submitting duplicate traffic to the IBM Tealeaf CX Passive Capture Application server.

See "Stats per Instance" on page 138.

How does the PCA identify ReqCanceled pages

This section provides a brief overview of how the PCA assesses and identifies pages as ReqCancelled pages.

- A **ReqCancelled** page can be canceled by request of the client browser (visitor) or the web server.

Server-side values

After it assembles an HTTP response or request page from the TCP packets, the HTTP HEADER is available. In the header, the values that are calculated by the server for HeaderSize and DataSize of the response or request are displayed. In the following example, the raw response is displayed:

```
HTTP/1.1 200 OK
Server: Apache-Coyote/1.1
Content-Type: text/html;charset=UTF-8
Date: Fri, 25 Feb 2011 14:40:14 GMT
Cache-Control: private
Content-Length: 83

<html>
  <body>
    Response
     <hr>
    Read 652 bytes in 7ms.
  </body>
</html>
```

In the previos example, the `Content-Length` value reported by the server is 83 bytes.

PCA-calculated values

The PCA also calculates the actual observed size of the hit from the packets when they are stitched together. These values are stored in the `[env]` section of the request:

```
[env]
...
RequestHeaderSize=1741
RequestDataSize=0
RequestSize=1741
ResponseHeaderSize=418
ResponseDataSize=25151
ResponseSize=25569
...
```

Analyzing content size values

As a result, the PCA uses two sets of sizing values:

- The server-side values
- The values that are observed and calculated by the PCA

These numbers must match.

Note: If the actual values observed by the PCA are lower than the server-side values inserted into the response header, the PCA marks the hit as a ReqCancelled hit.

Chunked Transfer Encoding

There is a special case when the `Content-Length` value is not reported by the server. In chunked transfer encoding, the server transfers data by using the HTTP protocol without knowing in advance the size of the entire message body. When chunked transfer encoding is enabled by the server, following is the response:

```
.HTTP/1.1 200 OK
Server: Apache-Coyote/1.1
Cache-Control: private
Pragma: no-cache
Set-Cookie: logging=CC4993FF05A9AC05B52CD9756B094B10|egapp39p|;
  Domain=.example.com; Path=/
Set-Cookie: DealDetectorUser=true; Domain=.example.com; Expires=Thu,
  20-Feb-2031 14:39:33 GMT; Path=/
P3P: CP="CAO DSP CURa ADMa DEVa TAIa PSAa PSDa IVAi IVDi CONi OUR DELi SAMi
  OTRi BUS PHY ONL UNI PUR COM NAV INT DEM STA POL HEA PRE GOV"
Content-Type: text/html
Date: Fri, 25 Feb 2011 14:39:33 GMT
Transfer-Encoding: chunked
```

In the previous example, there is no reported value for `Content-Length`. Since the length of the content is not known in advance, the following value is inserted:

```
Transfer-Encoding: chunked
```

When the PCA observes that the transfer is chunked, it assembles the packets into the hit and tracks the `DataSize` value for the page until it reaches the final chunked packet. This last packet is designated by a zero-length chunk (chunk size that is coded as `0`) and lacking any data section.

Note: Since the server does not report a `Content-Length` value in chunked transfer encoding, the header in each chunk contains an entry for the length of the chunk. As a result, the actual total length of the chunk is calculated dynamically.

- If any chunk fails to provide all of the data as reported in its header, the PCA marks the page where the chunk is displayed as a ReqCancelled page.

Identifying ReqCancelled Hits in Tealeaf

An overview of how to identify ReqCancelled Hits in Tealeaf.

Recorded Data

When a hit is identified as including a canceled request, the IBM Tealeaf CX Passive Capture Application inserts the following information into the `[env]` section:

- ReqCancelled by Visitor (client browser):

```
[env]
?
ReqCancelled=Client
?
```

- ReqCancelled by Server:

```
[env]
?
ReqCancelled=Server
?
```

HTTP Status Code

The HTTP Status Code is generated as part of the HTTP response. The Status Code for a ReqCancelled hit depends on when the hit was canceled:

When ReqCancelled occurred:
Status Code value(s)

Before the server sent any response
Status Code = 0

After the server sent any response
Some value other than 200 (OK)

Other characteristics

Depending on when and how the request was canceled, some parts of the hit data can be malformed:

- For hits submitted from IBM Tealeaf CX UI Capture for AJAX, the `[xml1]` section can be malformed or incomplete, if the POST was interrupted before completion.
- If it is included for capture by the PCA, an incomplete or malformed version of the `[RawRequest]` section can indicate that the request was canceled before processing of the response began on the server.
- For hits canceled during the generation of the response, parts of the response can be missing.

Note: Whether a hit was ReqCancelled or fulfilled, the HTTP Request header field is always included. The PCA does not capture a hit if this request header is missing.

Creating Event

About this task

Tealeaf provides a building block event that detects for the presence of a ReqCancelled hit: Req `Cancelled [BB-NoDim]`. As a building block event, it is not searchable.

Following are some general steps for creating the event object to track request canceled hits:

Procedure

1. Log in to the Portal as an administrator.

2. From the Portal menu, select **Configure** > **Event Manager**.
3. The Tealeaf Event Manager is displayed. See "Tealeaf Event Manager" in the *IBM Tealeaf Event Manager Manual*.
4. Click the **Events** tab.
5. Click **New Event...**. The **Add Event** wizard is displayed.
6. Configure the following properties:

   Property
   Description

   Name
   Suggest `Req Cancelled Type`.

   Description
   Suggest `Type of canceled request: client or server`.

   Evaluate
   Set to `Every Hit`

   Track
   Set to `First Per Session`, even though this is for a hit.

   Value Type
   Set to `Text`.
7. Leave the other values as their defaults. Click the **Condition** step.
   a) In the left panel, click the **Events** category.
   b) Click `Tealeaf Standard Events`.
   c) Select `ReqCancelled [BB-NoDim]`. The event is added as a condition to your `Req Canceled Type` event definition.
      1) From the first drop-down in the added event condition, select `Value`.
      2) From the condition operator drop-down, select `Equals`.
      3) In the third textbox, enter `server`.
      4) Leave the case-sensitive check box cleared.
   d) From the left panel, select `ReqCancelled [BB-NoDim]` again.
      1) Populate it as above, except in the third textbox enter `client`.
   e) In the drop-down at the top of the main configuration panel, select:

      ```
      Any of the following conditions must be met
      ```

   f) The Condition step is configured to test for the presence of either event condition. It must look like the following screen:

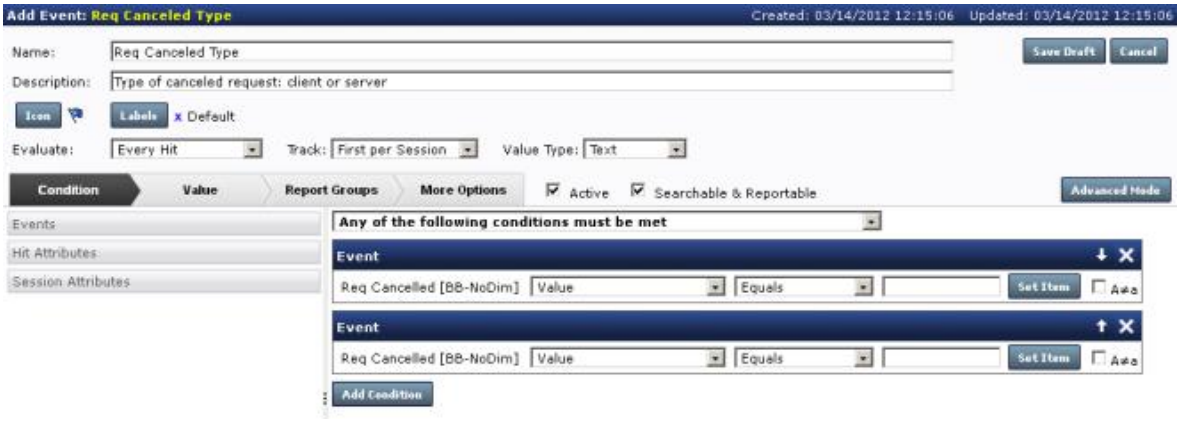


Figure 44. Req Canceled Type event - Condition step

8. Click the **Value** tab.
   a) Click **Select Item to Record...**.
   b) In the Select Item dialog, click the **Events** category.
   c) Click **Tealeaf Standard Events**.
   d) Select the `Req Cancelled [BB-NoDim]`.
   e) Leave the drop-down value as `Value`.
   f) The Value to record is configured to be the value of the `Req Cancelled [BB-NoDim]`, which is set to `server` or `client` if either of the event conditions is met. It must look like the following screen:

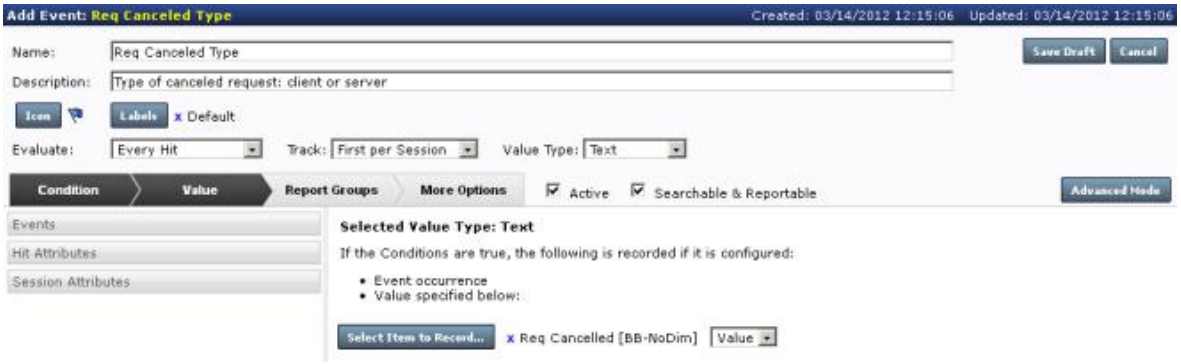


Figure 45. Req Canceled Type event - Value step

9. You must configure the other steps of the event definition as needed for your environment.
10. Click **Save Draft**.
11. In the Events tab, click the **Save Changes** to commit the new event to your server.

Searching for Sessions with ReqCancelled Type

About this task

The event mentioned above is now defined to record the value `client` or `server` if a request is canceled by the visitor or by the web server. Through the Portal, you can search for occurrences of this event.

Note: After the event is saved to the server, it is active and being processed on each hit. It can take some time before sessions with canceled requests are captured and processed by Tealeaf.

To search for the `ReqCancelled Type` event, do the following steps:

Procedure

1. In the Portal, select **Search** > **Completed Sessions**.

2. To search for the occurrence of a ReqCancelled hit in a session:
   a) Clear any of the default search terms.
   b) Click the **Events** search term.
   c) Click **<select an event**.
   d) In the **Event Selector**, clear the View by Labels check box.
   e) In the Search box, enter `Req Canceled`.
   f) Select `Req Canceled Type`.
   g) Click **Select**.
   h) Your search for the existence of the event in a session is displayed. It must look like the following screen:

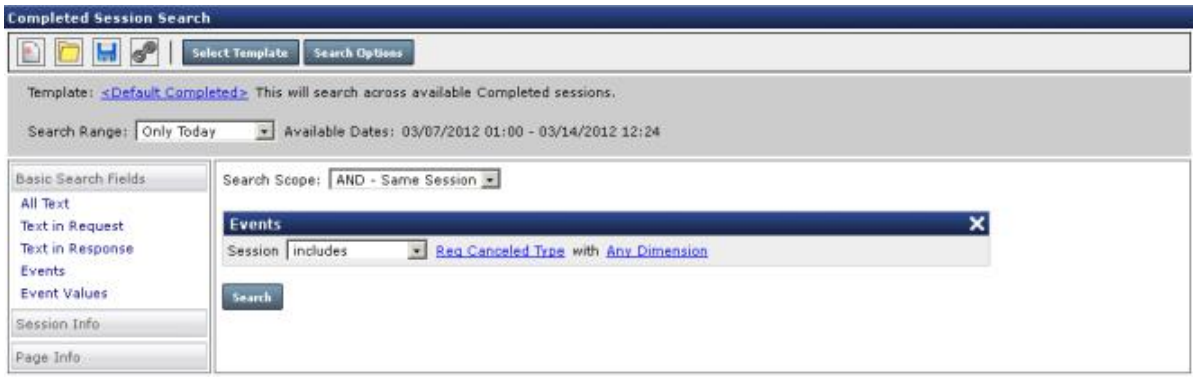


Figure 46. Req Canceled Type - Search for existence of the event

3. To search for a specific type of ReqCancelled hit in a session:
   a) Clear any of the default search terms.
   b) Click the **Event Values** search term.
   c) Click **<select an event**>.
   d) In the **Event Selector**, clear the **View by Labels** check box.
   e) In the **Search** box, enter `Req Canceled`.
   f) Select `Req Canceled Type`.
   g) Click **Select**.
   h) In the search term, verify that the search operator is set to `Includes`.
   i) In the textbox enter one of the following values:
      - `server` - search for server-initiated ReqCancelled hits
      - `client` - search for client-initiated ReqCancelled hits
   j) Your search for a specific type of ReqCancelled hit in a session is displayed. It must look like the following screen:

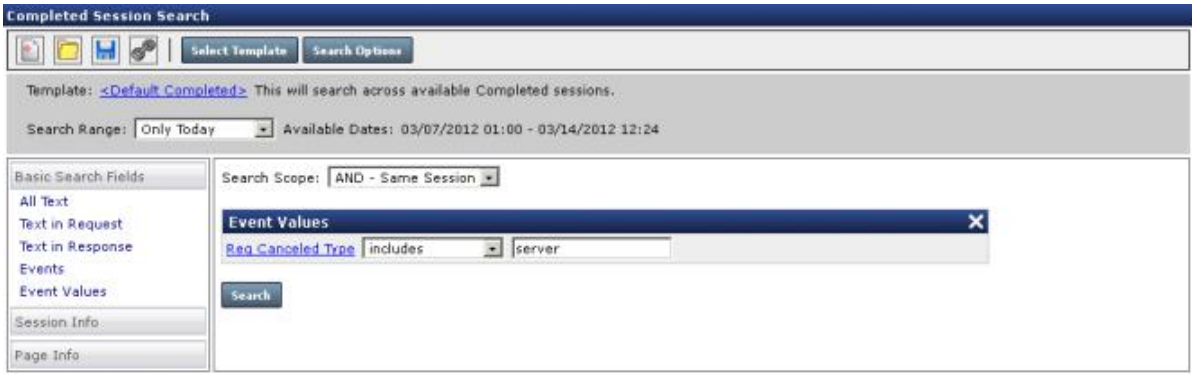


Figure 47. Req Canceled Type - Search for server ReqCancelled hits

4. To run either search, click **Search**.
5. From the displayed list of sessions, you can select one to review for more information. If sessions are returned, you can locate the hit where the ReqCancelled occurred by using the following general methods:
   - Event Tester: From the session list, you can send the session to Event Tester. In the Event Tester, select the `Req Canceled Type` event to display. In the test results, you can locate the hit where the event occurred.
   - See "Send to Event Tester" in the *IBM Tealeaf cxImpact User Manual*.
   - QuickView: From the session list, you can open QuickView, which displays event information by hit. From the Order By drop-down, select `Event Name`. Locate the hit where the `Req Canceled Type` event occurred.
   - See "QuickView" in the *IBM Tealeaf cxImpact User Manual*.

How does the PCA manage the capture of IPv6 addresses

Beginning in Release 3500, the IBM Tealeaf CX Passive Capture Application can be configured to capture of IPv6 addresses.

Note: Hosting of Tealeaf servers by using IPv6 addresses is not supported now.

Note: Support for processing of IPv6 addresses for search, replay, and reporting purposes is available in Release 8.4 and later.

Note: Enabling the capture of the PCA is available by request only. See “Enabling IPv6 Capture” on page 281.

Overview of IPv6

Internet Protocol Version 6 (IPv6) is the next-generation method for specifying Internet Protocol addresses. IPv4, the previous version, enabled 32-bit IP addresses, which permitted the specification of 2^{32} addresses. All IPv4 address blocks are assigned.

IPv6 enables the specification of 128-bit IP addresses, which supports the specification of 2^{128} addresses. This expanded specification allows the use of device-specific IP addresses for the ever-growing set of connected devices. Other features:

- Extra flexibility in allocating addresses
- Efficiency for routing traffic
- Eliminates the primary need for network address translation (NAT)

While IPv6 is supported on all major operating systems, IPv6 does not implement native interoperability features with IPv4. Typically, interoperability of the two network that is addressing schemes requires a dual network stack (a stack for each).

Note: The IBM Tealeaf CX Passive Capture Application can be configured to capture IPv6 only, IPv4 only, and mixed IPv6 and IPv4, and IPv6 with embedded IPv4.

Note: IPv6 with embedded IPv4 cannot be inserted into the PCA Web Console, but you can insert these values in the `ctc-conf.xml` file. The PCA is able to use these addresses. See "Methods for Capturing and Translating IP Addresses" on page 281.

See "Passive Capture Overview" on page 1.

IPv4 Format

The Internet Protocol specification originally formatted IP addresses in the following manner. This format was in universal use through 2009.

```
AAA.BBB.CCC.DDD:EEEE
```

In the above, each three-digit set of values is called an octet.

- The value EEEE represents a port number and is preceded by a colon (`:`).

IPv6 Format

An IPv6 address is represented as a sequence of eight groups of four hexadecimal digits. The groups are separated by colons (`:`).

The IPv6 format is designed to succeed the IP4 format, as it provides a much larger range of potential addresses. IPv6 is displayed more frequently on the Internet. It is specified in the following format:

```
2001:0db8:85a3:0000:0000:8a2e:0370:7334(8080)
```

Hexadecimal digits are not case-sensitive but must be represented in lowercase for consistency.

Port numbers

Since the specification uses the colon (`:`) as a separator, the colon cannot be used as the port number marker, as in IPv4:

```
https://langley:19000
```

Instead, the parentheses notation is used, as in the following example:

```
2001:0db8:85a3:0000:0000:8a2e:0370:7334(8080)
```

Note: The port number is included in parentheses (`8080`). For IPv6 addresses, searches by using port numbers are not supported.

Simplifications

The full representation of eight-4-digit groups can be simplified by several techniques, eliminating parts of the representation.

Leading zeroes

Leading zeroes in a group can be omitted, but each group must contain at least one hexadecimal digit. The previous example address can be simplified as:

```
2001:db8:85a3:0:0:8a2e:370:7334
```

Note the removal of two sets of leading zeros and two sets of octets that are composed of zeros.

Groups of zeroes

One or more consecutive groups of zero values can be replaced with a single empty group by using two consecutive colons (`::`).

- Substitution can only be applied once in an address, as multiple occurrences create an ambiguous representation.
- If more than one such substitution canbe applied, the substitution that replaces the most groups must be used. If the number of groups is equal, then the leftmost substitution must be used.

With these rules, the example address is further simplified:

```
2001:db8:85a3::8a2e:370:7334
```

Special addresses

Table 43. Special addresses

Address Name	Raw Address	Shortened Address
The localhost (loopback) address	`0:0:0:0:0:0:0:1`	`::1`
The IPv6 unspecified address	`0:0:0:0:0:0:0:0`	`::`

Source: `http://www.wikipedia.org`

Enabling IPv6 Capture

For more information about enabling the capture of IPv6 addresses in PCA Build 35xx or later, contact Tealeaf http://support.tealeaf.com.

Capture

This section describes methods of capturing and translating IP addresses and PCA support for IPv6.

Methods for Capturing and Translating IP Addresses

To make IPv6 addresses available for search, addresses of either IPv4 or IPv6 format must be captured. These addresses are normalized to a format that is known to Tealeaf indexing and search processes.

Tealeaf supports two methods of capturing and translating addresses:

- PCA: When PCA Build 3501 or later is deployed, capture of IPv6 addresses can be enabled. IPv4 addresses can be translated into an IPv6 format for indexing and search. See “PCA Support for IPv6” on page 282.

- Inflate session agent: If the PCA cannot be upgraded to a IPv6-supported build now, you must deploy the Inflate session agent to insert the appropriate values in the request for indexing and search of IPv6 addresses. See "Inflate Session Agent" in the *IBM Tealeaf CX Configuration Manual*.

  Note: This method is available in Release 8.4 or later.

  Note: If you cannot upgrade to PCA Build 3501 or later now, you must deploy the Inflate session agent in every Windows processing pipeline to support indexing and search of IPv6 addresses.

PCA Support for IPv6

In PCA Build 3501 or later, the IBM Tealeaf CX Passive Capture Application can be configured to capture IPv6 addresses. PCA can apply compression to those addresses, and enable configuration by using IPv6 addresses.

Note: IPv6 cannot be enabled through the PCA Web Console. For more information, contact Tealeaf http://support.tealeaf.com.

See How does the PCA manage the capture of IPv6 addresses.

Data insertions into the request

Data insertions into the request involve the IPv6 format and translate mode.

IPv6 format

When IPv6 capture is enabled and IPv6 addresses are detected in the capture stream, the following variables are inserted into the `[env]` section of the request:

```
[env]
...
IPV6_XLAT=False
IPV6=True
...
REMOTE_ADDR=fe80::20b:dbff:fe93:a462
LOCAL_ADDR=fe80::213:72ff:fe67:ed26
SERVER_NAME=fe80::213:72ff:fe67:ed26
IPV6_REMOTE_ADDR=FE80:0000:0000:0000:020B:DBFF:FE93:A462
IPV6_LOCAL_ADDR=FE80:0000:0000:0000:0213:72FF:FE67:ED26
IPV6_SERVER_NAME= fe80::213:72ff:fe67:ed26
...
```

Field
Description

IPV6_XLAT
When IPv6 is set to `True`, this option, if `True`, indicates whether IP addresses inserted into the request contain IPv4 addresses and must be translated.

IPV6
Indicates if captured traffic is IPv6, if `True`.

REMOTE_ADDR
The raw IP address, as captured, for the remote address can be in IPv6 or IPv4 format.

- This value can be inserted by the PCA.

  Note: This value can be compressed for IPv6 format.

LOCAL_ADDR
The raw IP address, as captured, for the local address can be in IPv6 or IPv4 format.

- This value can be inserted by the PCA.

  Note: This value can be compressed for IPv6 format.

SERVER_NAME
Existing field name can now accept IPv6 data.

Note: SERVER_NAME is not indexed.

IPV6_REMOTE_ADDR
The REMOTE_ADDR value that is rendered in IPv6 uncompressed format

- This value can be inserted by the PCA.

IPV6_LOCAL_ADDR
The LOCAL_ADDR value that is rendered in IPv6 uncompressed format

- This value can be inserted by the PCA.

IPV6_SERVER_NAME
New field name is used to store SERVER_NAME value in uncompressed IPv6 format.

IPv6 Translate mode

In IPv6 Translate mode, the PCA translates IPv4-native addresses into a format that is readable by using components on the Windows Tealeaf servers. The PCA inserts the following fields in the request. In addition to the fields, the original values for the following are inserted:

- IPV6_REMOTE_ADDR_ORIG
- IPV6_LOCAL_ADDR_ORIG
- IPV6_SERVER_NAME_ORIG

Example:

```
IPV6_XLAT=True
IPV6=True
REMOTE_ADDR=254.147.164.98
LOCAL_ADDR=254.103.237.38
SERVER_NAME=254.103.237.38
?
IPV6_REMOTE_ADDR=0000:0000:0000:0000:0000:FFFF:FE93:A462
IPV6_LOCAL_ADDR=0000:0000:0000:0000:0000:FFFF:FE67:ED26
IPV6_SERVER_NAME=0000:0000:0000:0000:0000:FFFF:FE67:ED26
?
IPV6_REMOTE_ADDR_ORIG=FE80:0000:0000:0000:020B:DBFF:FE93:A462
IPV6_LOCAL_ADDR_ORIG=FE80:0000:0000:0000:0213:72FF:FE67:ED26
IPV6_SERVER_NAME_ORIG=FE80:0000:0000:0000:0213:72FF:FE67:ED26
```

Field
Description

IPV6_REMOTE_ADDR_ORIG
Contains the original IPv6 address for the REMOTE_ADDR before it is translated.

IPV6_LOCAL_ADDR_ORIG
Contains the original IPv6 address for the LOCAL_ADDR before it is translated.

IPV6_SERVER_NAME_ORIG
Contains the original IPv6 address for the SERVER_NAME before it is translated.

See "IPv6 format" on page 282.

IBM Tealeaf documentation and help

IBM Tealeaf provides documentation and help for users, developers, and administrators.

Viewing product documentation

All IBM Tealeaf product documentation is available at the following website:

Tealeaf Customer Experience Support

Use the information in the following table to view the product documentation for IBM Tealeaf:

Table 44. Getting help	
To view...	**Do this...**
Product documentation	On the IBM Tealeaf portal, go to **?** > **Product Documentation**.
IBM Tealeaf Knowledge Center	On the IBM Tealeaf portal, go to **?** > **Product Documentation** and select *IBM Tealeaf Customer Experience in the ExperienceOne Knowledge Center*.
Help for a page on the IBM Tealeaf Portal	On the IBM Tealeaf portal, go to **?** > **Help for This Page**.
Help for IBM Tealeaf CX PCA	On the IBM Tealeaf CX PCA web interface, select **Guide** to access the *IBM Tealeaf CX PCA Manual*.

Available documents for IBM Tealeaf products

The following table is a list of available documents for all IBM Tealeaf products:

Table 45. Available documentation for IBM Tealeaf products	
IBM Tealeaf products	**Available documents**
IBM Tealeaf CX	• *IBM Tealeaf Customer Experience Overview Guide* • *IBM Tealeaf CX Client Framework Data Integration Guide* • *IBM Tealeaf CX Configuration Manual* • *IBM Tealeaf CX Cookie Injector Manual* • *IBM Tealeaf CX Databases Guide* • *IBM Tealeaf CX Event Manager Manual* • *IBM Tealeaf CX Glossary* • *IBM Tealeaf CX Installation Manual* • *IBM Tealeaf CX PCA Manual* • *IBM Tealeaf CX PCA Release Notes*
IBM Tealeaf CX	• *IBM Tealeaf CX RealiTea Viewer Client Side Capture Manual* • *IBM Tealeaf CX RealiTea Viewer User Manual* • *IBM Tealeaf CX Release Notes* • *IBM Tealeaf CX Release Upgrade Manual* • *IBM Tealeaf CX Support Troubleshooting FAQ* • *IBM Tealeaf CX Troubleshooting Guide* • *IBM Tealeaf CX UI Capture j2 Guide* • *IBM Tealeaf CX UI Capture j2 Release Notes*
IBM Tealeaf cxImpact	• *IBM Tealeaf cxImpact Administration Manual* • *IBM Tealeaf cxImpact User Manual* • *IBM Tealeaf cxImpact Reporting Guide*

Table 45. Available documentation for IBM Tealeaf products (continued)	
IBM Tealeaf products	**Available documents**
IBM Tealeaf cxConnect	• *IBM Tealeaf cxConnect for Data Analysis Administration Manual* • *IBM Tealeaf cxConnect for Voice of Customer Administration Manual* • *IBM Tealeaf cxConnect for Web Analytics Administration Manual*
IBM Tealeaf cxOverstat	*IBM Tealeaf cxOverstat User Manual*
IBM Tealeaf cxReveal	• *IBM Tealeaf cxReveal Administration Manual* • *IBM Tealeaf cxReveal API Guide* • *IBM Tealeaf cxReveal User Manual*
IBM Tealeaf cxVerify	• *IBM Tealeaf cxVerify Installation Guide* • *IBM Tealeaf cxVerify User's Guide*
IBM Tealeaf cxView	*IBM Tealeaf cxView User's Guide*
IBM Tealeaf CX Mobile	• *IBM Tealeaf CX Mobile Android Logging Framework Guide* • *IBM Tealeaf Android Logging Framework Release Notes* • *IBM Tealeaf CX Mobile Administration Manual* • *IBM Tealeaf CX Mobile User Manual* • *IBM Tealeaf CX Mobile iOS Logging Framework Guide* • *IBM Tealeaf iOS Logging Framework Release Notes*

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