Cisco Expressway Serviceability Guide

Maintain and Operate Guide

Last Updated: December 2016

X8.9
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Preface

Change History

<table>
<thead>
<tr>
<th>Date</th>
<th>Change</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2016</td>
<td>Added information on Smart Call Home.</td>
<td>X8.9 release.</td>
</tr>
<tr>
<td>November 2015</td>
<td>Added Call Detail Record information.</td>
<td>X8.7 release.</td>
</tr>
</tbody>
</table>
Introducing System Metrics Collection

What is System Metrics Collection, and how does it work on Expressway?

System Metrics Collection is a feature on Expressway that publishes system performance statistics, enabling remote monitoring of performance.

The Expressway collects statistics about the performance of the hardware, OS, and the application, and publishes these statistics to a remote host (typically a data analytics server) that aggregates the data.

Where do I configure System Metrics Collection?

You can configure this feature on Expressway via the web interface or the command line. The configuration from one peer applies throughout the cluster, so we recommend that you configure it on the primary peer if you are monitoring a cluster.

There is also some configuration required on the remote server; the collectd daemon should be running on the server, and should have the collectd network plugin configured to listen on an address that can be seen by the clients. Further details depend on your monitoring environment and are beyond the scope of this information.

How can I use this data?

You can use the data to generate graphs, aggregate statistics, and analyze performance, using tools such as Circonus and Graphite.
Configure System Metrics Collection on Expressway

In the following procedure you’ll use the web interface to configure the Expressway to collect statistics and publish them to a specified server. For more detailed descriptions of the options, see System Metrics Reference, page 12.

1. Log on to the Expressway and go to Maintenance > Logging.
2. Toggle System Metrics Collection to On.
3. Enter the Collection server address.
   You can use IP address, hostname or FQDN to identify the remote server.
4. Change the Collection Interval and Collection server port if necessary.
   You may need to change the port if the collection server is listening on a different port to the default (25826).
   You may need to change the collection interval if your policy requires finer metrics than the default interval (60s).
5. Click Save.

Configure System Metrics on Remote Server

Selection and configuration of the server you choose for data analytics in your environment is beyond the scope of this document. Circonus and Graphite are applications that can handle collectd information.

Your analytics tool must support receiving data from the collectd daemon. This daemon is running on the Expressway and pushes the metrics to your analytics server, using the collectd network plugin.

The network plugin implements the collectd binary protocol for data encapsulation. The analytics server must be able to parse and present this data. Your analytics server will probably have its own UI for configuring how it collects and shows the data, which could be based on collectd or an alternative software.

If you are using collectd on the analytics server, you need to modify collectd.conf file so that the server:

- listens for data from the collectd clients (eg. Expressway); you need to enable the network plugin and configure the listen block with the server’s IP address. For example:
  ```xml
  <Plugin "network">
    Listen "198.51.100.15"
  </Plugin>
  ```
- stores the data it receives in a human readable form (eg. to CSV files); you need to enable the csv plugin tell it where to write the files. For example:
  ```xml
  <Plugin "csv">
    DataDir "/var/lib/collectd/csv"
    StoreRates true
  </Plugin>
  ```

See also

- [https://collectd.org/documentation/manpages/collectd.conf.5.shtml#plugin_network](https://collectd.org/documentation/manpages/collectd.conf.5.shtml#plugin_network)
- [https://collectd.org/documentation/manpages/collectd.conf.5.shtml#plugin_csv](https://collectd.org/documentation/manpages/collectd.conf.5.shtml#plugin_csv)

Troubleshooting System Metrics

Is the Expressway sending data?

Take a TCP dump from the Expressway and check for packets sent to the address of your data analytics server:
Go to Maintenance > Diagnostics > Diagnostics logging, check the box labeled Take tcpdump while logging, and then start logging.
Call Detail Records (CDRs)

The system can capture CDRs if you enable the service (which is off by default), and can publish them as syslog messages if you are using remote logging.

If you select Service only the system keeps the CDRs for 7 days, and these CDRs can only be read via the Representational State Transfer (REST) API to the Expressway. If you select Service and logging, the local data is exposed in the Event Log, and the CDRs are also sent as INFO messages to your syslog host.

How to Configure CDRs

To configure CDRs on Expressway:

1. Go to Maintenance > Logging.
2. In the Logging Options section, set the Call Detail Records field following the below guide.

<table>
<thead>
<tr>
<th>CDR Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>CDRs are not logged locally (default).</td>
</tr>
<tr>
<td>Service Only</td>
<td>CDRs are stored locally for 7 days and then deleted. The records are not accessible via the web GUI.</td>
</tr>
<tr>
<td>Services and Logging</td>
<td>CDRs are stored locally for 7 days and then deleted. The records are accessible from the local event log and the external syslog server if external logging has been enabled.</td>
</tr>
</tbody>
</table>

APIs to access CDRs

You can use the following secure REST APIs to gather the information you require.

- get_all_records (returns all records up to seven days old).
- get_records_for_interval (returns records from during the time specified).
- get_records_for_filter (filters results using any combination).
- get_all_csv_records (returns all records up to seven days old in csv format).

To access your desired API use the following URL: https://<Expressway_IP>/api/external/callusage/<API>

Examples

- http://<Expressway_IP>/callusage/get_all_records

Input Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fromtime</td>
<td>The start time from which the CDR records are required. It must be entered in the format 'YYYY-MM-DD HH:Mi:SS' (mandatory parameter).</td>
</tr>
<tr>
<td>totime</td>
<td>The end time from which the CDR records are required. It must be entered in the format 'YYYY-MM-DD HH:Mi:SS' (mandatory parameter).</td>
</tr>
</tbody>
</table>
Call Detail Records (CDRs)

- http://<Expressway_IP>/callusage/get_records_for_filter?uuid=<uuid>&src_alias=<src_alias>&dest_alias=<dest_alias>&protocol=<protocol> (for example http://10.50.157.80:8000/callusage/get_records_for_filter?uuid=6e3b5a8a-346c-421b-aa2e-f4409c43a81a&src_alias=TC149-057-h323@domain.com&dest_alias=TC149-065-h323@domain.com&protocol=H323%20%3C-%3E%20H323)

**Input Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>uuid</td>
<td>The unique identifier of the record.</td>
</tr>
<tr>
<td>src_alias</td>
<td>The origin point of the call.</td>
</tr>
<tr>
<td>dest_alias</td>
<td>The destination point of the call</td>
</tr>
<tr>
<td>protocol</td>
<td>The protocol that was used for the call (SIP, H323 etc).</td>
</tr>
</tbody>
</table>

- http://<Expressway_IP>/callusage/get_all_csv_records

**Limitations**

- The call history is only stored locally for seven days and deleted automatically.

For sample CDRs and property definitions, see the Example Call Detail Records, page 10 in the Additional Information section.
Smart Call Home (SCH)

About Smart Call Home

Smart Call Home is a free embedded support capability for Expressway. It offers proactive diagnostics and real-time alerts, enabling higher network availability and increased operational efficiency.

Smart Call Home notifies users of Schedule- and Event-based notifications.

- Schedule-based: inventory, telemetry and configuration messages used to generate a Device Report and improve hardware and software quality by identifying failure trends. You can find these notifications posted on the first day of every month.
- Event-based: asynchronous events already supported by Expressway such as alarms and ACRs. You will find these notifications posted to the Smart Call Home server as and when they occur.

How to Configure Smart Call Home

To turn on Smart Call Home:

1. Go to Maintenance > Serviceability > Smart Call Home.
2. In the Configuration section, select your preferred mode in the Smart Call Home field.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off (Default)</td>
<td>The Expressway does not send information to the Smart Call Home server.</td>
</tr>
<tr>
<td>On</td>
<td>Turn on the Smart Call Home service. The Replace Smart Call Home server certificate and Your Contact Details options appear.</td>
</tr>
<tr>
<td>On (Anonymous)</td>
<td>Turn on the Smart Call Home Service in Anonymous mode. The Replace Smart Call Home server certificate option appears. The Expressway still sends reports to Smart Call Home, but the customer details will be kept anonymous so that Smart Call Home server will not be able to send notifications.</td>
</tr>
</tbody>
</table>

Note: The Expressway already has the Smart Call Home server certificate installed, so it can communicate securely with the Smart Call Home server. You do not need to replace it unless the Smart Call Home servers update their certificates.

3. If you choose to turn Smart Call Home On, you must enter an email address as a minimum requirement in the Your Contact Details section.
4. Click Save.
Example Call Detail Records

Sample CDR

```
{"initial_call": false, "protocol": "SIP <-> SIP", "protocol_summary": "", "disconnect_reason": "200 OK", "licensed": false, "tag": "b8d52a60-16a1-4dbb-be93-f5a675408811", "aside_request_uri": "", "box_call_serial_number": "22cd0e7d-c498-4068-9239-624038fe5130", "source_alias": "sip:10000005@10.196.4.82", "uid": "800fe013-83f4-4094-a5e6-e2f9489912e2", "last_updated_timestamp": "1444725389", "details": 
{"Call": 
{"SerialNumber": "800fe013-83f4-4094-a5e6-e2f9489912e2", "BoxSerialNumber": "22cd0e7d-c498-4068-9239-624038fe5130", "Tag": "b8d52a60-16a1-4dbb-be93-f5a675408811", "State": 
"InitialCall": "False", "Licensed": "False", "SourceAlias": 
"sip:10000005@10.196.4.82", "DestinationAlias": "sip:10000010@cucm-82", "ToLocalB2BUA": "False", "Audio": "False", 
"License": 
{"Traversal": "0", 
"CollaborationEdge": "0", 
"Cloud": 
"0", 
"Duration": 
"3", 
"Legs": [{"Protocol": "SIP", "Address": "10.196.4.61:5073", 
"Transport": "TLS", 
"Aliases": [{"Alias": "Unknown", "Value": "0"}], 
"Type": "Url", 
"Origin": "Unknown", 
"Value": "sip:10000005@10.196.4.82"}], 
"Duration": 
"0", 
"NonTraversal": 
{"Protocol": "SIP", "Address": "10.196.4.61:5073", 
"Transport": "TLS", 
"Aliases": [{"Alias": "Unknown", "Value": "0"}], 
"Type": "Url", 
"Origin": "Unknown", 
"Value": "sip:10000010@10.196.4.116"}], 
"BandwidthNode": 
{"Traversal": "0", 
"Zone": "0", 
"NonTraversal": 
{"Protocol": "SIP", "Address": "10.196.4.71:7001", 
"Transport": "TLS", 
"Aliases": [{"Alias": "Unknown", "Value": "0"}], 
"Type": "Url", 
"Origin": "Unknown", 
"Value": "sip:10000010@cucm-82"}], 
"Source": 
{"Traversal": "0", 
"Zone": "0", 
"NonTraversal": 
{"Protocol": "SIP", "Address": "10.196.4.71:7001", 
"Transport": "TLS", 
"Aliases": [{"Alias": "Unknown", "Value": "0"}], 
"Type": "Url", 
"Origin": "Unknown", 
"Value": "sip:10000000@10.196.4.82"}], 
"BandwidthNode": 
{"Session": [{"Status": "Completed", 
"MediaRouted": false, 
"CallRoute": true, 
"Participants": [{"Leg": 
"11", 
"Leg": 
"01", 
"Incoming": [{"Leg": 
"11", 
"Outgoing": [{"Leg": 
"21", 
"End": "2015-10-13 03:36:29.745651"}]], 
"EndTime": "2015-10-13 03:36:29.745651"}], 
"status": 
"Disconnected", 
"destination_alias": "sip:1000010@cucm-82", 
"licensed_as_traversal": false, 
"service_uhid": 
"e6723df-5ca2-11e1-b86c-0800200c9a66", 
"start_time": "2015-10-13 01:36:26.485636", 
"traversal_license_tokens": 0, 
"bside_destination_alias": 
"false", 
"media_traversal": false, 
"adsis_destination_alias": 
"true", 
"non_traversal_license_tokens": 0, 
"bside_request_uri": 
"false", 
"end_time": "2015-10-13 01:36:29.745651", 
"audio": false]}
```

Note: The above sample CDR applies to all APIs with the exception of csv.

Sample csv CDR

```
800fe013-83f4-4094-a5e6-e2f9489912e2,e6723df-5ca2-11e1-b86c-0800200c9a66,uuid,service_uhid,active,initial_call,licensed_as_traversal,status,tag,box_call_serial_number,start_time,end_time,source_alias,destination_alias,asidedestination_alias,bside_destination_alias,asidedestination_alias,bside_request_uri,bside_request_uri,protocol_summary,protocol,media_routed,audio,licensed,disconnect_reason,details,last_updated_timestamp
```

---

**Reference**

Cisco Expressway Serviceability Guide Maintain and Operate Guide

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**Example Reference**

```
Cisco
Expressway
Serviceability
Guide
```

---

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Definitions

The below table defines the properties that are visible in the CDRs.

<table>
<thead>
<tr>
<th>Field</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>uuid</td>
<td>This is the ID of the CDR entry.</td>
</tr>
<tr>
<td>service_uuid</td>
<td>The ID used to identify whether a record is from a proxy, Lync B2BUA or Encryption B2BUA.</td>
</tr>
<tr>
<td>active</td>
<td>Details whether a call is a live or a historical one.</td>
</tr>
<tr>
<td>initial_call</td>
<td>Used internally to tie to a B2BUA call when it is a multiple-component one (involves a B2BUA hop).</td>
</tr>
<tr>
<td>licensed</td>
<td>This field shows you if a call used a license.</td>
</tr>
<tr>
<td>licensed_as_traversal</td>
<td>This field shows you if a call used a traversal license.</td>
</tr>
<tr>
<td>status</td>
<td>A 200 OK message will signal that a call was successful. This field will contain an error message if the call was unsuccessful.</td>
</tr>
<tr>
<td>tag</td>
<td>The call ID.</td>
</tr>
<tr>
<td>box_call_serial_number</td>
<td>An extra ID added to tie multiple calls together (e.g. through B2BUA).</td>
</tr>
<tr>
<td>start_time</td>
<td>This field shows the date and time of the call. The time zone can be set in <strong>System &gt; Times &gt; Time Zone</strong> and the date format is YYYY-MM-DD.</td>
</tr>
<tr>
<td>end_time</td>
<td>This field shows the end time of the call.</td>
</tr>
<tr>
<td>source_alias</td>
<td>This field shows the alias of the caller.</td>
</tr>
<tr>
<td>destination_alias</td>
<td>This field shows the alias of the callee.</td>
</tr>
<tr>
<td>aside_destination_alias</td>
<td>The alias of the caller (or MS Lync client if Lync Interop).</td>
</tr>
<tr>
<td>bside_destination_alias</td>
<td>This alias of the callee (or non-Lync client).</td>
</tr>
<tr>
<td>aside_request_uri</td>
<td>The request uri of the caller (or MS Lync client if Lync Interop).</td>
</tr>
<tr>
<td>bside_request_uri</td>
<td>The request uri of the callee (or non-Lync client).</td>
</tr>
<tr>
<td>protocol</td>
<td>This field shows if the call was SIP -&gt; SIP, SIP -&gt; H323, H323 -&gt; SIP, or H323 -&gt; H323.</td>
</tr>
<tr>
<td>protocol_summary</td>
<td>This field is as above but can have extra info like if a call was multi-component, DVO, etc.</td>
</tr>
<tr>
<td>media_routed</td>
<td>This field shows if media was sent during the call (e.g. NAT/IWF/B2BUA).</td>
</tr>
<tr>
<td>audio</td>
<td>This field shows if the call was an audio-only one.</td>
</tr>
</tbody>
</table>
traversal_license_tokens

This field indicates if a call fork/branch took media (audio equates to 1 token and video 2).*

non_traversal_license_tokens

This field indicates if a call fork/branch did not need to take media (audio equates to 1 token and video 2).*

disconnect_reason

This field gives reasons for a call drop such as normal call teardown or other errors i.e. last status.

details

This field gives more details of the call, including media statistics.

last_updated_timestamp

Shows the last time that any of the above fields were updated.

* Once a call is set up only one of these entries will have a non-zero value (i.e. only for the answered fork/branch).

System Metrics Reference

What are the configuration options on the Expressway?

Table 2  Configuration commands for collectd on Expressway

<table>
<thead>
<tr>
<th>What the command does</th>
<th>Web UI location</th>
<th>Example CLI command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toggle Metrics Collection on/off</td>
<td>Maintenance &gt; Logging &gt; System Metrics Collection</td>
<td>xconfig log SystemMetrics mode: on</td>
</tr>
<tr>
<td>Specify the server address</td>
<td>Maintenance &gt; Logging &gt; Collection server address</td>
<td>xconfig log SystemMetrics network address: address</td>
</tr>
<tr>
<td>Specify the listening port</td>
<td>Maintenance &gt; Logging &gt; Collection server port</td>
<td>xconfig log SystemMetrics network port: 25826</td>
</tr>
<tr>
<td>Specify the collection interval</td>
<td>Maintenance &gt; Logging &gt; Collection Interval</td>
<td>xconfig log SystemMetrics interval: 60</td>
</tr>
<tr>
<td>Read System Metrics configuration</td>
<td>Maintenance &gt; Logging</td>
<td>xstatus SystemMetrics</td>
</tr>
</tbody>
</table>

What metrics are collected from the Expressway?

The following hardware statistics are monitored:

- aggregation-cpu-sum
- aggregation-cpu-average
- Per-core CPU usage for each core in the system
- df
- disk
- load
- protocols-Tcp
- protocols-Udp
- swap
- Users
The following application data are monitored by the custom exec-app plugin for collectd:

- `gauge-active_alarms` is the count of active alarms on this Expressway
- `gauge-active_calls` is the count of calls being handled by this Expressway
- `gauge-<service name>` is the status of each system service.
- `gauge-<zone name>_ActiveCalls` counts the active calls in the named zone
- `gauge-<zone name>_BandwidthAllocated` measures the total bandwidth allocated to the named zone
- `gauge-<zone name>_BandwidthLimit`

Each of these metrics uses the collectd GAUGE data source type, which allows free-form data. On the collection server, the full collectd value name will be shown, for example `collectd
Hostname
collectd.exec-app.gauge-active_calls`.

Note that zone names are user-configurable and may thus be in conflict with the naming schema for collectd metrics. If your collection server is enforcing the schema, there is a chance that metrics from some zones will not be accepted.

What data is sent to the collection server?

The network plugin uses the `collectd binary protocol` to encapsulate numeric, string, and value data representing the monitored hardware resources and software processes.

The network plugin pushes the metrics data packets to the analytics server once every interval, using UDP 25826 by default. The analytics server parses and presents the data in human readable form.

If the analytics server is using the collectd network plugin and csv plugin, then the metrics are stored as small CSV files, using the metric name and timestamp to create the filename, for example `gauge-H323-2015-05-21`.

Which collectd plugins are implemented on Expressway?

<table>
<thead>
<tr>
<th>Plugin name</th>
<th>Description / more information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregation</td>
<td>Aggregates CPU values into the counters <code>aggregation_cpu_sum</code> and <code>aggregation_cpu_average</code>.</td>
</tr>
<tr>
<td>CPU</td>
<td>Processor information. The raw information is aggregated into <code>aggregation_cpu_average</code> and <code>aggregation_cpu_sum</code>.</td>
</tr>
<tr>
<td>DF</td>
<td>File system information; see <a href="#">DF description on collectd Wiki</a>.</td>
</tr>
<tr>
<td>Disk</td>
<td>Hard disk performance; see <a href="#">Disk description on collectd Wiki</a>.</td>
</tr>
<tr>
<td>Exec-app</td>
<td>Customized version of <code>exec</code> that returns specific Expressway information on calls, alarms, zones, and services.</td>
</tr>
<tr>
<td>Load</td>
<td>System load based on task queue.</td>
</tr>
<tr>
<td>Memory</td>
<td>Memory statistics.</td>
</tr>
</tbody>
</table>
### Table 3  collectd plugins implemented in the Expressway application (continued)

<table>
<thead>
<tr>
<th>Plugin name</th>
<th>Description / more information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network</td>
<td>Enables publishing to a remote address. The plugin implements the collectd binary protocol for data encapsulation. The remote server must have the appropriate parsing tool</td>
</tr>
<tr>
<td>Protocols</td>
<td>Configurable subset of the protocols used by the Expressway</td>
</tr>
<tr>
<td>Process</td>
<td>Counts the system processes and groups them by state (e.g. running, sleeping, zombies)</td>
</tr>
<tr>
<td></td>
<td>It also collects detailed statistics about specific processes. The plugin monitors the following processes in detail:</td>
</tr>
<tr>
<td></td>
<td>■ app</td>
</tr>
<tr>
<td></td>
<td>■ bramble</td>
</tr>
<tr>
<td></td>
<td>■ credentialmanagerservermain</td>
</tr>
<tr>
<td></td>
<td>■ cvs_main</td>
</tr>
<tr>
<td></td>
<td>■ erlang-beam</td>
</tr>
<tr>
<td></td>
<td>■ erlang-epmd</td>
</tr>
<tr>
<td></td>
<td>■ httpd</td>
</tr>
<tr>
<td></td>
<td>■ httpserver</td>
</tr>
<tr>
<td></td>
<td>■ ivy</td>
</tr>
<tr>
<td></td>
<td>■ licensemanagerservermain</td>
</tr>
<tr>
<td></td>
<td>■ managementconnectormain</td>
</tr>
<tr>
<td></td>
<td>■ managementframework</td>
</tr>
<tr>
<td></td>
<td>■ openssl2nss</td>
</tr>
<tr>
<td></td>
<td>■ policyservermain</td>
</tr>
<tr>
<td></td>
<td>■ syslog-ng</td>
</tr>
<tr>
<td></td>
<td>■ XCP</td>
</tr>
<tr>
<td>Swap</td>
<td>The amount of system memory written to disk</td>
</tr>
<tr>
<td>Uptime</td>
<td>Tracks system uptime, providing counters like average running time or maximum uptime for a particular period; see Uptime description on collectd Wiki</td>
</tr>
<tr>
<td>Users</td>
<td>Count of currently logged in users</td>
</tr>
</tbody>
</table>
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