



## Diameter Transaction Rate KPIs

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This chapter describes the overview and implementation of Transaction Rate KPI feature on per Diameter interfaces configured in the StarOS software.

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### Feature Description

The existing StarOS software does not provide clearly defined Key Performance Indicators (KPIs) for measuring the session and Voice-over-LTE (VoLTE) signaling transaction rates on the gateway platforms such as eHRPD, ePDG, P-GW, SAEGW, S-GW.

Previously, KPIs did not differentiate between successful or unsuccessful PDN session activations and deactivations. In addition, the KPIs did not provide any information related to the VoLTE service.

In releases prior to 20, an external server collects bulkstats data every 2 minutes from the gateway node. The bulkstats data such as PDN session activations and deactivations events counters are used to calculate the Network Initiated Setup/Teardown KPIs per second on the external server. The gateway node does not calculate the Network Initiated Setup/Teardown KPIs; but it only provides the counters to the external server for additional processing of relevant bulkstats data.

To address these issues, Network Initiated Setup/Teardown KPIs, Session Events Per Second (SEPS), Gx Transactions Per Second (TPS), Gy-TPS, S6b-TPS, Rf-TPS, SWm-TPS KPIs have been implemented. The SEPS and Network Initiated Setup/Teardown KPIs measure the signaling load on the gateway, and also the event rate for VoLTE call setup and tear down respectively. These KPIs assist operators in performing network dimensioning/planning for the gateway node.

New show CLI commands are provided to display SEPS, network initiated setup/teardown KPIs per second, and Transactions Per Second (TPS) per Diameter application/endpoint in the specified/configured bucket intervals. The show CLI will display both the cumulative statistics as well as the historical statistics. The gateway will also provide option to fetch the new set of KPIs using bulkstats framework.

A sampling counter interval for SEPS and Network Initiated Setup/Teardown KPIs is the same as bulkstats sampling interval and is currently set to 2 minutes. The show CLI commands are capable of providing the following for all signaling interfaces:

- SEPS and Network Initiated Setup/Teardown KPI values per second, but averaged over configured bucket interval (1 to 20)

- 8 historical SEPS and Network Initiated Setup/Teardown KPI values
- Gx-TPS, Gy-TPS, S6b-TPS, Rf-TPS, and SWm-TPS KPIs per second, but averaged over 1, 10 seconds, 30 seconds, 1 minute, 5 minutes, 10 minutes and 15 minutes



**Note** TPS is computed based on average of sent and received Diameter messages per second.

Average values of all KPIs will be provided by the gateway to the external servers using bulkstats data every 2 minutes if requested. The total KPI TPS value as well as breakdown TPS values by each card (i.e., Diameter proxy) on every Diameter interface will be provided using the show CLI command and bulkstats data.

The SEPS KPI provides the following values using the CLI command and bulkstats:

- Total Session Events (session setup and session tear down) per second
- Successful Session Events (session setup and session tear down) per second
- Unsuccessful Session Events (session setup and session tear down) per second

The Network Initiated Setup/Teardown Events Per Second KPI provides the following values:

- Total Network Initiated Setup/Teardown Events (VoLTE bearer setup and tear down) per second
- Successful Network Initiated Setup/Teardown Events (VoLTE bearer setup and tear down) per second
- Unsuccessful Network Initiated Setup/Teardown Events (VoLTE bearer setup and tear down) per second

The Gx-TPS, Gy-TPS, S6b-TPS, Rf-TPS and SWm-TPS KPI counters will be incremented based on the received and sent Diameter messages.

## How It Works

This section describes the counting procedures for all KPIs.

### SEPS:

The SEPS KPI is implemented such that each session setup and session tear down is considered as a separate event.

SEPS counter is incremented by 1 in the following scenarios:

- After receiving the "Create Session Request" message or "Delete Session Request" message
- After sending the "Create Session Response" message or "Delete Session Response" message
- If "Create Session Response" message contains a failure cause
- If "Delete Session Response" message does not have the cause IE equal "Request Accepted"

### Network Initiated Setup/Teardown Events Per Second KPI:

The Network Initiated Setup/Teardown KPI is implemented such that each created and deleted VoLTE (configured QCI value) dedicated bearers are considered as a separate event.

Network Initiated Setup/Teardown KPI counter is incremented by 1 in the following scenarios for the configured QCI value:

- After receiving the "Create Bearer Response" message or "Delete Bearer Response" message
- After sending the "Create Bearer Request" message or "Delete Bearer Request" message
- If "Create Bearer Response" message does not have the cause IE equal "Request Accepted"
- If "Delete Bearer Response" message does not have the cause IE equal "Request Accepted"

**Gx-TPS:**

Gx Events Per Seconds (Gx-EPS) KPI measures the rate of sent and received Gx event/messages. This KPI indicates the number of received CCA and RAR Diameter messages (each received CCA and RAR message is used to peg the counter) and sent CCR and RAA Diameter messages (each sent CCR and RAA message is used to peg the counter). Gx-EPS KPI considers each received message (CCA and RAR) and each sent message (CCR and RAA) as a separate event.

**Gy-TPS:**

Gy Events Per Seconds (Gy-EPS) KPI measures the rate of sent and received Gy event/messages. This KPI indicates the number of received CCA Diameter messages (each received CCA message is used to peg the counter) and sent CCR Diameter messages (each sent CCR message is used to peg the counter). Gy-EPS KPI considers each received message (CCA) and each sent message (CCR) as a separate event.

**S6b-TPS:**

S6b Events Per Seconds (S6b-EPS) KPI measures the rate of sent and received S6b event/messages. This KPI indicates the number of received (AAA, ASR, STA) Diameter messages and sent (AAR, STR, ASA) Diameter messages (each received AAA, ASR, STA messages are used to peg the counter and each sent AAR, STR, and ASA messages are used to peg the counter). S6b-EPS KPI considers each received message (AAA, ASR, STA) and each sent message (AAR, STR, ASA) as a separate event.

**Rf-TPS:**

Rf Events Per Seconds (Rf-EPS) KPI measures the rate of sent and received Rf event/messages. This KPI indicates the number of received ACA Diameter message and sent ACR Diameter message (each received ACA message is used to peg the counter and each sent ACR message is used to peg the counter). Rf-EPS KPI considers each ACA received message and each ACR sent message as a separate event.

**SWm-TPS:**

SWm Events Per Seconds (SWm-EPS) KPI measures the rate of sent and received SWm event/messages. This KPI indicates the number of received STA and DEA Diameter messages and sent STR and DER Diameter messages (each received STA and DEA message is used to peg the counter and each sent STR and DER message is used to peg the counter). SWm-EPS KPI considers each STA and DEA received message and each STR and DER sent message as a separate event.

This feature does not require any specific configuration for enabling but minimal configuration of bucket intervals and QCIs is required for calculating the KPIs. For more on this feature and the configuration details, refer to the *P-GW Administration Guide*.

## Limitations

This section identifies the limitations of Transaction Rate KPI feature.

- Diameter applications do not share the same Diameter endpoints configured on ASR 5500 platforms. For example, Gx and Gy should have separate Diameter endpoints configured.
- The transaction rate statistics will be lost when the session manager/demux manager restarts.

# Monitoring and Troubleshooting the Transaction Rate KPI Feature

This section provides information regarding show commands and/or their outputs in support of the Transaction Rate KPI feature.

## Transaction Rate KPI Show Command(s) and/or Outputs

The show commands in this section are available in support of the Transaction Rate KPI feature.

### show diameter tps-statistics

This new command has been added to the Exec mode. This command enables operators to gather the Diameter message transaction rate KPI information.

These KPI statistics information are used to monitor signaling load on the gateway node, specifically session and VoLTE signaling transaction rates, so that operators can perform network dimensioning/planning for the node accordingly.

```
show diameter tps-statistics [ diamproxy diamproxy_num | application {
auth-eap | e2 | gmb | gx | gy | rf | s6a | s6b | sgmb | sta | swm } |
endpoint endpoint_name | summary | verbose ] + [ | { grep grep_options | more
} ]
```

- **diamproxy** *diamproxy\_num*: Displays the TPS KPI information for the specified diamproxy instance number specified as an integer from 1 to 144.
- **application** { **auth-eap** | **e2** | **gmb** | **gx** | **gy** | **rf** | **s6a** | **s6b** | **sgmb** | **sta** | **swm** }: Displays the TPS KPI information for specified Diameter application.
- **endpoint** *endpoint\_name*: Displays the TPS KPI information for the configured endpoint.

### clear diameter tps-statistics

This new command has been added to the Exec mode. This command clears both historical as well as cumulative KPIs for Session and Network Initiated Setup/Teardown events.

```
clear diameter tps-statistics application { auth-eap | e2 | gmb | gx |
gy | rf | s6a | s6b | sgmb | sta | swm } | endpoint endpoint_name [ | { grep
grep_options | more } ]
```

- **application** { **auth-eap** | **e2** | **gmb** | **gx** | **gy** | **rf** | **s6a** | **s6b** | **sgmb** | **sta** | **swm** }: Clears the TPS KPI information for specified Diameter application.
- **endpoint** *endpoint\_name*: Clears the TPS KPI information for the configured endpoint.

### show diameter tps-statistics Command Output

This show command displays the following fields that are added as part of the Transaction Rate KPI feature.

- **Application/ID**: The name and the identifier of configured Diameter applications for which the TPS KPI statistics are collected.
- **Average TPS**: This is the sum average of all TPS values computed.
- **Maximum TPS Time**: Indicates the maximum TPS value for the specified configuration.

- Last 1 Sec Average TPS: Average value of TPS computed for the last 1 second.
- Last 10 Secs Average TPS: Average value of TPS computed for the last 10 seconds.
- Last 30 Secs Average TPS: Average value of TPS computed for the last 30 seconds.
- Last 60 Secs Average TPS: Average value of TPS computed for the last 60 seconds.
- Last 5 Mins Average TPS: Average value of TPS computed for the last 5 minutes.
- Last 10 Mins Average TPS: Average value of TPS computed for the last 10 minutes.
- Last 15 Mins Average TPS: Average value of TPS computed for the last 15 minutes.

## Bulk Statistics Support

### Diameter TPS Schema

This schema is new in release 20. The following statistics are included in this schema in support of the Transaction Rate KPI feature:

- diameter-tps-application-id – Indicates the Application ID exchanged in CER/CEA.
- diameter-tps-application-name – Indicates the Application Name.
- diameter-tps-value – Indicates the two minutes average Diameter Transactions per Second (TPS).

