



Performance Management Capability Guide

User Guide

Copyright

© Ericsson AB 2023. All rights reserved. No part of this document may be reproduced in any form without the written permission of the copyright owner.

Disclaimer

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. Ericsson shall have no liability for any error or damage of any kind resulting from the use of this document.

Trademark List



Contents

1	Introduction to Performance Management	1
1.1	Purpose and Scope	1
2	Performance Management Overview	2
3	Platform Component Counter Details	3
4	Performance Management in Applications	4
4.1	Grafana Dashboard Overview	4





1

Introduction to Performance Management

Performance management (PM) provides surveillance of network performance using counters provided from application components.

Note: Applications listed are not applicable to all solutions.

1.1

Purpose and Scope

The purpose of the Performance Management Capability Guide is to provide descriptions and guidelines needed to handle performance activities.



2

Performance Management Overview

PM assists the operator in the short-term surveillance of network performance and provides reliable statistics for long-term network planning. This is used to foresee bottlenecks and assure quality of service.

PM is used to predict key performance trends, measure subscriber behavior, and to obtain information about use of services.

For more information on Performance Management, see BAM documentation.



3

Platform Component Counter Details

For a list of metrics on pods states and resource usage (CPU, Memory, Disk, and so on) collected in the system-verified platform, Ericsson Cloud Container Distribution (CCD), see the Performance Management document in Ericsson Cloud Container Distribution library. For non-Ericsson CCD platforms, see the specific cloud provider's documentation.



4

Performance Management in Applications

Each application component instance generates PM counters. Refer to the applicable Performance Management Function Guide for application component PM.

The following sections provide information about Grafana dashboards that is used to visualize the performance metrics including the application and CCD metrics.

4.1

Grafana Dashboard Overview

The features provided in the Grafana Dashboard User Interface are used to customize the presentation of data.

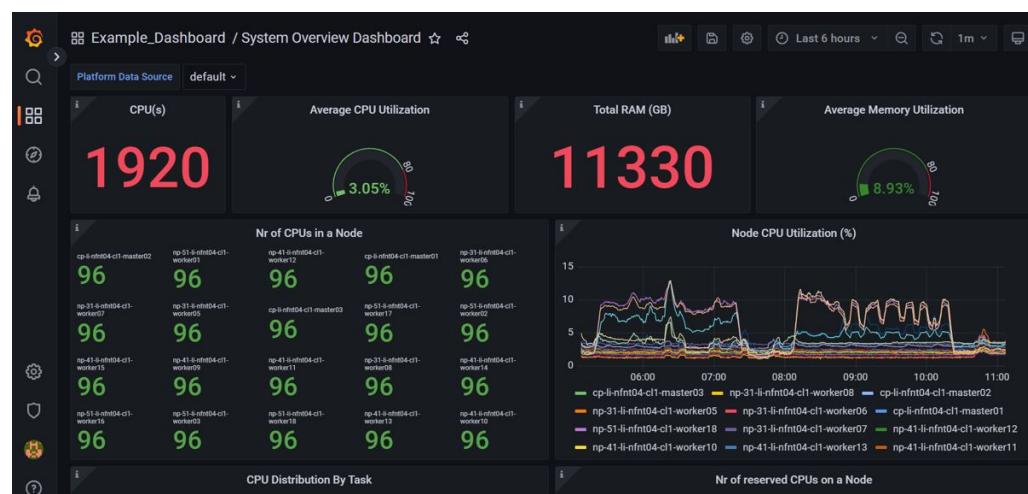
Two data sources are required to display the various dashboards listed after this section: the BAM metric server (Prometheus), which collects application metrics, and the Platform metric server (VictoriaMetrics), which gathers platform metrics provided by the system-verified platform Ericsson Cloud Container Distribution.

4.1.1

System Overview Dashboard

System Overview Dashboard provides a consolidated view of the system performance in a single place. It contains charts that pictorially represent the system status.

Figure 1 Example Dashboard - System Overview



The following table defines the metrics for System Overview Dashboard:



Table 1 Metrics for System Overview Dashboard

Data Source	Panel Name	Counter Description
Platform metric server	CPUs	Total number of CPUs.
Platform metric server	Average CPU Utilization	Average per-second rate of CPU utilization looking up to 5 minutes back for the two most recent data points per time series in the range vector.
Platform metric server	Total RAM	Total machine memory (in bytes).
Platform metric server	Average Memory Utilization	The percentage of average memory utilization on the system.
Platform metric server	Number of CPUs in a Node	Number of CPUs in each node.
Platform metric server	Number of reserved CPUs on a Node	Number of reserved CPUs in each node.
Platform metric server	CPU Distribution by Task	<p>The utilization of CPU based on the distribution of tasks. The distribution of tasks is displayed in % of CPU utilization.</p> <p>The CPU utilization based on task distribution is provided below the table.</p>
Platform metric server	Node CPU Utilization (%)	The average amount of CPU utilized by all available nodes.
Platform metric server	Node RAM available in [MB]	RAM available in each node
Platform metric server	Distribution of Memory Consumption	Depicts the used memory, free memory, and buffer or cache on all available nodes.
Platform metric server	Memory Consumption Trend(%)	The amount of memory utilization trend by all available nodes.
Platform metric server	System Load	Total CPU load on a node in last 1 min, 5 min, and 15 min.
Platform metric server	Node Memory [GB]	Total machine memory (in bytes) for each node.
Platform metric server	Node Received [5-min rate / MB]	The average network traffic received, per node, over the last 5 minutes (in MB).



Data Source	Panel Name	Counter Description
Platform metric server	Node Transmit [5-min rate / MB]	The average network traffic transmitted, per node, over the last 5 minutes (in MB).
Platform metric server	Node Packets Received [5 min rate/pkts]	The average network packets received, per node, over the last 5 minutes (in MB).
Platform metric server	Node Packets Transmitted [5 min rate/pkts]	The average network packets transmitted, per node, over the last 5 minutes (in MB).

CPU Utilization Based on Task Distribution

Distributions of the following tasks are analyzed:

- User: Percentage of CPU utilization that occurred while executing at the user level (application).
- System: Percentage of CPU utilization that occurred while executing at the system level (kernel).
- IOWait: A subcategory of the **idle** state. It marks time spent waiting for input or output operations, like reading or writing to disk. When the processor waits for a file to be opened, for example, the time spend is marked as IOWait.
- Steal: Percentage of time, a virtual CPU waits for a real CPU while the Hypervisor is servicing another virtual processor.
- Idle: Percentage of time when CPUs were idle and the system did not have an outstanding disk I/O request.

4.1.2

Applications Performance Overview Dashboard

Application Performance Overview Dashboard provides a consolidated view of the Application performance at a single place. It contains charts that pictorially represent the Application status.

Figure 2 Example Dashboard - Applications Performance Overview



The following tables define the metrics for Applications Performance Overview Dashboard:

Table 2 Applications Performance Overview Dashboard 1

Data Source	Panel Name	Counter Description
Platform metric server	<service> CPU	<p>The average amount of CPU utilized by <service> container.</p> <p>For example:</p> <ul style="list-style-type: none"> — CHA-Access CPU — CHA-Core CPU — CHA-Collector CPU — EDM-Pub CPU — CIL CPU — CIL Per AG CPU — CIL Schema Operator CPU — CIL-Seed-Controller CPU — CHA-Routing-Controller CPU — CHA-Diameter-Lb CPU — NTF CPU — MSG Kafka CPU



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none">— MSG ZK CPU— MSG MGMT CPU— MSG-Mirrormaker CPU— RMCA CPU— AEL BAE CPU— CUS CPU— AEL BAE ESRM CPU— AEL BAE TMF 637 CPU— AEL BAE TMF 654 CPU— AEL BAE TMF 666 CPU— CONFIG MANAGER CPU— AEL BAE TMF 669 CPU— BEAM Supervisor CPU
Platform metric server	<service> CPU Throttled Time	<p>The CPU Utilized throttled time for <service> container.</p> <p>For example:</p> <ul style="list-style-type: none">— CHA-Access CPU Throttled Time— CHA-Core CPU Throttled Time— CHA-Collector CPU Throttled Time— EDM-Pub CPU Throttled Time— CIL CPU Throttled Time— CIL-Seed-Controller CPU Throttled Time— CIL Schema Operator CPU Throttled Time— NTF CPU Throttled Time— MSG Kafka CPU Throttled Time



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none"> — MSG ZK CPU Throttled Time — MSG-Mirrormaker CPU Throttled Time — MSG MGMT CPU Throttled Time — RMCA CPU Throttled Time — AEL BAE CPU Throttled Time — CUS CPU Throttled Time — AEL BAE ESRM CPU Throttled Time — AEL BAE TMF 637 CPU Throttled Time — AEL BAE TMF 654 CPU Throttled Time — AEL BAE TMF 666 CPU Throttled Time — CONFIG MANAGER CPU Throttled Time — AEL BAE TMF 669 CPU Throttled Time — BEAM Supervisor CPU Throttled Time
Platform metric server	<service>Memory	<p>The amount of memory utilization trend by <service></p> <p>For example:</p> <ul style="list-style-type: none"> — CHA-Access Memory — CHA-Core Memory — CHA-Collector Memory — EDM-Pub Memory — CIL Memory — CIL-Seed-Controller Memory — CIL Schema Operator Memory



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none">— CPM Memory— NTF Memory— MSG Kafka Memory— MSG ZK Memory— MSG-Mirrormaker Memory— MSG MGMT Memory— RMCA Memory— AEL BAE Memory— CUS Memory— AEL BAE ESRM Memory— AEL BAE TMF 637 Memory— AEL BAE TMF 654 Memory— AEL BAE TMF 666 Memory— CONFIG MANAGER Memory— AEL BAE TMF 669 Memory— BEAM Supervisor Memory

The following table is applicable when the system is used with External Rate and Charge Application.

Table 3 Applications Performance Overview Dashboard 2

Data Source	Panel Name	Counter Description
Platform metric server	<service> CPU	<p>The average amount of CPU utilized by <service> container. For example:</p> <ul style="list-style-type: none">— CHA-Access CPU— CHA-Core CPU— EDM-Pub CPU— CIL CPU



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none"> — CIL-Seed-Controller CPU — CIL Schema Operator CPU — CHA-Routing-Controller CPU — CPM CPU — CHA-Diameter-Lb CPU — RMCA CPU — CUS CPU — MSG Kafka CPU — MSG ZK CPU — MSG MGMT CPU — CONFIG MANAGER CPU
Platform metric server	<service> CPU Throttled Time	<p>The CPU Utilized throttled time for <service> container.</p> <p>For example:</p> <ul style="list-style-type: none"> — CHA-Access CPU Throttled Time — CHA-Core CPU Throttled Time — EDM-Pub CPU Throttled Time — CIL CPU Throttled Time — CIL-Seed-Controller CPU Throttled Time — CIL Schema Operator CPU Throttled Time — RMCA CPU Throttled Time — CUS CPU Throttled Time — MSG Kafka CPU Throttled Time — MSG ZK CPU Throttled Time — MSG MGMT CPU Throttled Time



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none">— CONFIG MANAGER CPU Throttled Time
Platform metric server	<service> Memory	<p>The amount of memory utilization trend by <service></p> <p>For example:</p> <ul style="list-style-type: none">— CHA-Access Memory— CHA-Access Memory— EDM-Pub Memory— CIL Memory— CIL-Seed-Controller Memory— CIL Schema Operator Memory— CPM Memory— RMCA Memory— CUS Memory— MSG Kafka Memory— MSG ZK Memory— MSG MGMT Memory— CONFIG MANAGER Memory

Table 4 Applications Performance Overview Dashboard 3

Data Source	Panel Name	Counter Description
Platform metric server	<service> CPU	<p>The average amount of CPU utilized by <service> container.</p> <p>For example:</p> <ul style="list-style-type: none">— CHA-Access CPU— CHA-Core CPU— CHA-Collector CPU— EDM-Pub CPU



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none"> — CIL CPU — CIL Per AG CPU — CIL-Seed-Controller CPU — CIL Schema Operator CPU — CHA-Routing-Controller CPU — CPM CPU — CHA-Diameter-Lb CPU — NTF CPU — MSG Kafka CPU — MSG ZK CPU — MSG MGMT CPU — MSG-Mirrormaker CPU — RMCA CPU — AEL BAE CPU — CUS CPU — AEL BAE ESRM CPU — AEL BAE TMF 637 CPU — AEL BAE TMF 654 CPU — AEL BAE TMF 666 CPU — INV Controller CPU — INV Processor CPU — INV Formatter CPU — INV Post Aggregator CPU — FIN Access CPU — FIN Processor CPU



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none">— FIN Access GUI CPU— CONFIG MANAGER CPU
Platform metric server	<service> CPU Throttled Time	<p>The CPU Utilized throttled time for <service> container.</p> <p>For example:</p> <ul style="list-style-type: none">— CHA-Access CPU Throttled Time— CHA-Core CPU Throttled Time— CHA-Collector CPU Throttled Time— EDM-Pub CPU Throttled Time— CIL CPU Throttled Time— CIL-Seed-Controller CPU Throttled Time— CIL Schema Operator CPU Throttled Time— NTF CPU Throttled Time— MSG Kafka CPU Throttled Time— MSG ZK CPU Throttled Time— MSG-Mirrormaker CPU Throttled Time— MSG MGMT CPU Throttled Time— RMCA CPU Throttled Time— AEL BAE CPU Throttled Time— CUS CPU Throttled Time— AEL BAE ESRM CPU Throttled Time— AEL BAE TMF 637 CPU Throttled Time— AEL BAE TMF 654 CPU Throttled Time



Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none"> — AEL BAE TMF 666 CPU Throttled Time — INV Controller CPU Throttled Time — INV Processor CPU Throttled Time — INV Formatter CPU Throttled Time — INV Post Aggregator CPU Throttled Time — FIN Access CPU Throttled Time — FIN Processor CPU Throttled Time — FIN Access GUI CPU Throttled Time — CONFIG MANAGER CPU Throttled Time
Platform metric server	<service>Memory	<p>The amount of memory utilization trend by <service></p> <p>For example:</p> <ul style="list-style-type: none"> — CHA-Access Memory — CHA-Core Memory — CHA-Collector Memory — EDM-Pub Memory — CIL Memory — CIL-Seed-Controller Memory — CIL Schema Operator Memory — CPM Memory — NTF Memory — MSG Kafka Memory — MSG ZK Memory — MSG-Mirrormaker Memory

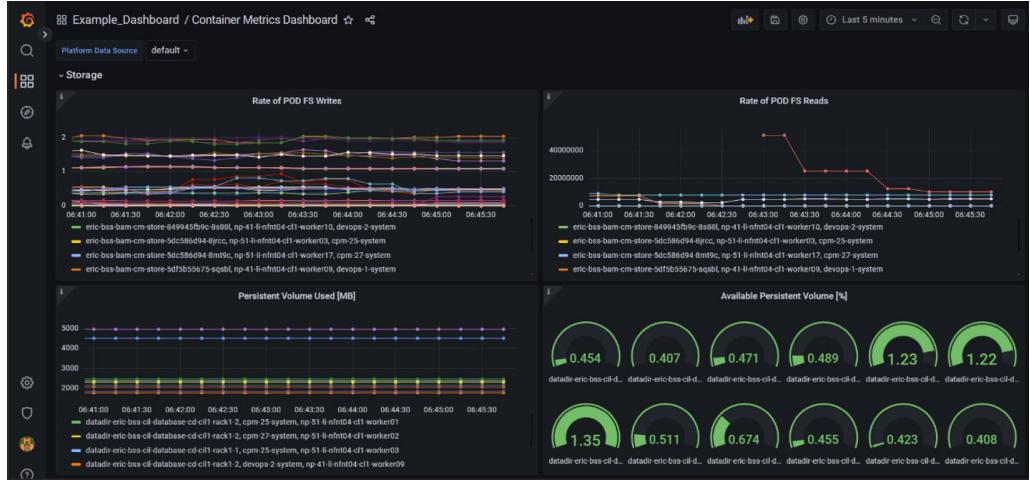


Data Source	Panel Name	Counter Description
		<ul style="list-style-type: none">— MSG MGMT Memory— RMCA Memory— AEL BAE Memory— CUS Memory— AEL BAE ESRM Memory— AEL BAE TMF 637 Memory— AEL BAE TMF 654 Memory— AEL BAE TMF 666 Memory— INV Controller Memory— INV Processor Memory— INV Formatter Memory— INV Post Aggregator Memory— FIN Access Memory— FIN Processor Memory— FIN Access GUI Memory— CONFIG MANAGER Memory

4.1.3 Container Metrics Dashboard

Container metrics Dashboard provides a consolidated view of the container storage, networking, QoS, and node System parameters. It contains charts that pictorially represent each Container status.

Figure 3 Example Dashboard - Container Metrics



The following tables define metrics for Container Metrics Dashboard:

Table 5 Container Metrics Dashboard 1

Data Source	Panel Name	Counter Description
Platform metric server	Rate of POD FS Writes	Rate of cumulative count of bytes written
Platform metric server	Rate of POD FS Reads	Rate of cumulative count of bytes read
Platform metric server	Persistent Volume Used [MB]	Disk space usage per PVC
Platform metric server	Available Persistent Volume [%]	Percentage of Persistent Volume available
Platform metric server	Volume FS Latency [ms]	Rate of cumulative count of seconds spent doing I/Os.
Platform metric server	Rate of Data Received [MB]	Rate of cumulative count of bytes received
Platform metric server	Rate of Data Transmitted [MB]	Rate of cumulative count of bytes transmitted
Platform metric server	Rate of Packets Dropped while Rx	Rate of cumulative count of packets dropped while transmitting.
Platform metric server	Rate of Packets Dropped while Tx	Rate of cumulative count of packets dropped while receiving.
Platform metric server	Rate of Rx errors	Rate of cumulative count of errors encountered while receiving
Platform metric server	Rate of Tx errors	Rate of cumulative count of errors encountered while transmitting.
Platform metric server	POD CPU Saturation	Rate of total time duration the container has been throttled.



Data Source	Panel Name	Counter Description
Platform metric server	Container CPU Utilization	CPU utilization of containers
Platform metric server	POD Memory Usage in MB	Memory usage of PODs
Platform metric server	POD OoM Terminated	PODs, whose last container terminated with Out Of Memory.
Platform metric server	POD Memory Cache Usage in MB	Cache memory usage
Platform metric server	POD Init Container Terminated	POD init container is Terminated. Example: completed
Platform metric server	POD Terminated	POD Terminated. Example reason: Evicted, OOM Terminated
Platform metric server	POD Container Status Restarts	The pods that are frequently restarted or Crashloopbackoff.
Platform metric server	POD Container Status Restarts Count	Restart count of PODs.
Platform metric server	POD Last Container Status Terminated	Last container of Pods Terminated. Example reason: Completed, Error
Platform metric server	POD Container Limits	Resource limits of POD containers
Platform metric server	POD Container Requests	Resource requests of POD containers
Platform metric server	POD CPU Utilization %	Percentage of CPU utilization of PODs

The following table is applicable only when the system is used with External Rate and Charge application.

Table 6 Container Metrics Dashboard 2

Data Source	Panel Name	Counter Description
Platform metric server	Rate of POD FS Writes	Rate of cumulative count of bytes written
Platform metric server	Rate of POD FS Reads	Rate of cumulative count of bytes read
Platform metric server	Persistent Volume Used [MB]	Disk space usage per PVC



Data Source	Panel Name	Counter Description
Platform metric server	Available Persistent Volume [%]	Percentage of Persistent Volume available
Platform metric server	Volume FS Latency [ms]	Rate of cumulative count of seconds spent doing I/Os
Platform metric server	Rate of Data Received [MB]	Rate of cumulative count of bytes received
Platform metric server	Rate of Data Transmitted [MB]	Rate of cumulative count of bytes transmitted
Platform metric server	Rate of Packets Dropped while Rx	Rate of cumulative count of packets dropped while transmitting.
Platform metric server	Rate of Packets Dropped while Tx	Rate of cumulative count of packets dropped while receiving.
Platform metric server	Rate of Rx errors	Rate of cumulative count of errors encountered while receiving
Platform metric server	Rate of Tx errors	Rate of cumulative count of errors encountered while transmitting
Platform metric server	POD CPU Saturation	Rate of total time duration the container has been throttled
Platform metric server	Container CPU Utilization	CPU utilization of containers
Platform metric server	POD Init Container Terminated	POD init container is Terminated. Example: completed
Platform metric server	POD Terminated	POD Terminated. Example reason: Evicted, OOM Terminated
Platform metric server	POD Container Status Restarts	The pods that are frequently restarted or Crashloopbackoff
Platform metric server	POD Container Status Restarts Count	Restart count of PODs.
Platform metric server	POD Last Container Status Terminated	Last container of Pods Terminated. Example reason: Completed, Error
Platform metric server	POD Container Limits	Resource limits of POD containers
Platform metric server	POD Container Requests	Resource requests of POD containers



Data Source	Panel Name	Counter Description
Platform metric server	POD CPU Utilization %	Percentage of CPU utilization of PODs

Table 7 Container Metrics Dashboard 3

Data Source	Panel Name	Counter Description
Platform metric server	Rate of POD FS Writes	Rate of cumulative count of bytes written
Platform metric server	Rate of POD FS Reads	Rate of cumulative count of bytes read
Platform metric server	Persistent Volume Used [MB]	Disk space usage per PVC
Platform metric server	Available Persistent Volume [%]	Percentage of Persistent Volume available
Platform metric server	Volume FS Latency [ms]	Rate of cumulative count of seconds spent doing I/Os.
Platform metric server	Rate of Data Received [MB]	Rate of cumulative count of bytes received
Platform metric server	Rate of Data Transmitted [MB]	Rate of cumulative count of bytes transmitted
Platform metric server	Rate of Packets Dropped while Rx	Rate of cumulative count of packets dropped while transmitting.
Platform metric server	Rate of Packets Dropped while Tx	Rate of cumulative count of packets dropped while receiving.
Platform metric server	Rate of Rx errors	Rate of cumulative count of errors encountered while receiving
Platform metric server	Rate of Tx errors	Rate of cumulative count of errors encountered while transmitting.
Platform metric server	POD CPU Saturation	Rate of total time duration the container has been throttled.
Platform metric server	Container CPU Utilization	CPU utilization of containers
Platform metric server	POD Memory Usage in MB	Memory usage of PODs
Platform metric server	POD OoM Terminated	PODs, whose last container terminated with Out Of Memory.
Platform metric server	POD Memory Cache Usage in MB	Cache memory usage



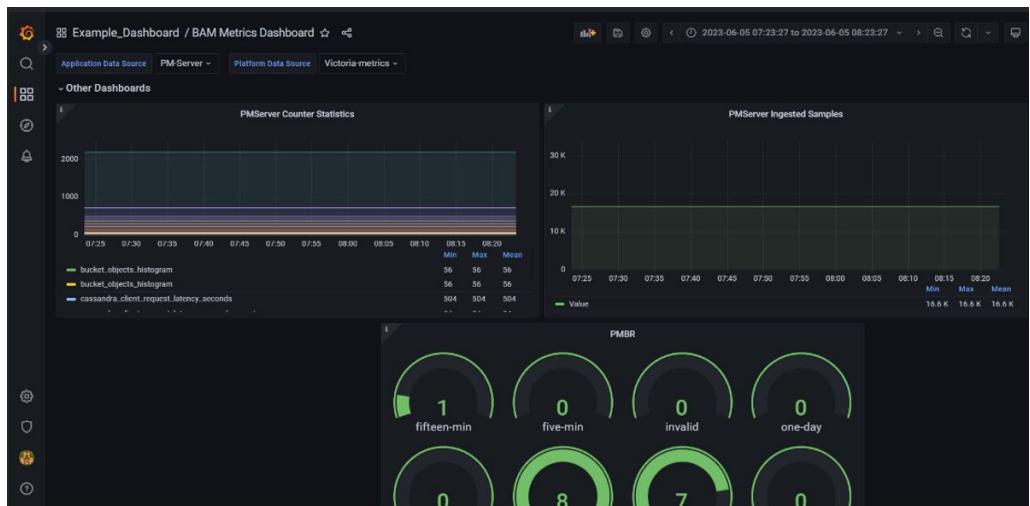
Data Source	Panel Name	Counter Description
Platform metric server	POD Init Container Terminated	POD init container is Terminated. Example: completed
Platform metric server	POD Terminated	POD Terminated. Example reason: Evicted, OOM Terminated
Platform metric server	POD Container Status Restarts	The pods that are frequently restarted or Crashloopbackoff.
Platform metric server	POD Container Status Restarts Count	Restart count of PODs.
Platform metric server	POD Last Container Status Terminated	Last container of Pods Terminated. Example reason: Completed, Error
Platform metric server	POD Container Limits	Resource limits of POD containers
Platform metric server	POD Container Requests	Resource requests of POD containers
Platform metric server	POD CPU Utilization %	Percentage of CPU utilization of PODs

4.1.4

BAM Metrics Dashboard

BAM metrics Dashboard provides a consolidated view of the BAM services. It contains charts that pictorially represent BAM service status.

Figure 4 Example Dashboard - BAM Metrics



The following table defines the metrics for BAM Metrics dashboard:



Table 8 Metrics for BAM Dashboard

Data Source	Panel Name	Counter Description
Platform metric server	PMServer Counter Statistics	Counter statistics of PM server
Platform metric server	PMServer Ingested Samples	PMServer ingested samples post relabeling.
Platform metric server	PM Bulk Reporter	Total number of configured threshold jobs by granularity period.
Platform metric server	CM Agent CPU	The average amount of CPU utilized by BAM CM Agent container.
Platform metric server	CM Agent Memory	Total memory usage of BAM CM Agent containers
Platform metric server	CM Store CPU	The average amount of CPU utilized by BAM CM Store container.
Platform metric server	CM Store Memory	Total memory usage of BAM CM Store containers
Platform metric server	CN Cert Manager CPU	The average amount of CPU utilized by BAM CN Cert Manager container.
Platform metric server	CN Cert Manager Memory	Total memory usage of BAM CN Cert Manager containers
Platform metric server	Fault Management GUI CPU	The average amount of CPU utilized by Fault Management GUI container.
Platform metric server	Fault Management GUI Memory	Total memory usage of Fault Management GUI containers
Platform metric server	BAM FC CPU	The average amount of CPU utilized by BAM Function Controller container
Platform metric server	BAM FC Memory	Total memory usage of BAM Function controller containers
Platform metric server	BAM TRF Ingress Controller Envoy CPU	The average amount of CPU Utilized by BAM TRF Ingress controller Envoy Container
Platform metric server	BAM TRF Ingress Controller Envoy Memory	Total memory usage of BAM TRF Ingress Controller Envoy containers



Data Source	Panel Name	Counter Description
Platform metric server	DBPG CPU	The average amount of CPU utilized by database Postgres container.
Platform metric server	DBPG Memory	Total memory usage of database Postgres containers
Platform metric server	DBPG BRA CPU	The average amount of CPU utilized by database Postgres BR Agent Container.
Platform metric server	DBPG BRA Memory	Total memory usage of database Postgres BR Agent containers
Platform metric server	CM Mediator CPU	The average amount of CPU utilized by CM mediator container.
Platform metric server	CM Mediator Memory	Total memory usage of CM mediator containers
Platform metric server	BRO CPU	The average amount of CPU utilized by Backup and Restore Orchestrator (BRO) containers.
Platform metric server	BRO Memory	Total memory usage of BRO containers
Platform metric server	LM License Server CPU	The average amount of CPU utilized by LM license server container.
Platform metric server	LM License Server Memory	Total memory usage of LM License server containers
Platform metric server	LogTransformer CPU	The average amount of CPU utilized by Log Transformer container.
Platform metric server	LogTransformer Memory	Total memory usage of Log Transformer POD containers
Platform metric server	ODCA DDC CPU	The average amount of CPU utilized by ODCA Diagnostic Data Collector container.
Platform metric server	ODCA DDC Memory	Total memory usage of ODCA DDC pod containers
Platform metric server	PMServer CPU	The average amount of CPU utilized by PM Server container.
Platform metric server	PMServer Memory	Total memory usage of PM Server containers.



Data Source	Panel Name	Counter Description
Platform metric server	DataSearchEngine CPU	The average amount of CPU utilized by Data Search Engine Container.
Platform metric server	DataSearchEngine Memory	Total memory usage of Data search engine containers.
Platform metric server	IAM CPU	The average amount of CPU utilized by keycloak container.
Platform metric server	IAM Memory	Total memory usage of keycloak containers.
Platform metric server	ICCR CPU	The average amount of CPU utilized by ingress controller container.
Platform metric server	ICCR Memory	Total memory usage of ingress controller containers.
Platform metric server	SIP TLS CPU	The average amount of CPU utilized by SIP TLS Container.
Platform metric server	SIP TLS Memory	Total memory usage of SIP TLS containers.
Platform metric server	Key Management CPU	The average amount of CPU utilized by KMS container.
Platform metric server	KMS Memory	Total memory usage of KMS containers.

4.1.5 Traffic Metrics Dashboard

Traffic Metrics Dashboard provides a consolidated view of the request details, response time errors, and so on.

Figure 5 Example Dashboard - Traffic Metrics



The following tables define the metrics for traffic dashboard:

Table 9 Traffic Metrics Dashboard 1

Data Source	Panel Name	Counter Description
BAM metric server	Total Incoming Traffic TPS	Incoming Traffic of NCHF Charging, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2, and Diameter VoLTE
BAM metric server	Total Outgoing Error TPS	Outgoing Errors of NCHF Charging, NCHF Charging Service session, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2 and Diameter VoLTE
BAM metric server	Total Access Traffic	Total access traffic of NCHF Charging, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2, Diameter VoLTE, External SDP SBI CIR, and External SDP CIR (Gy+VoLTE+SCAPv2)
BAM metric server	Rate And Charge SBI	NCH Total request
BAM metric server	Rate And Charge SBI Errors TPS	NCHF, NCHF Service session and NCHF Policy Errors
BAM metric server	Rate And Charge Diameter	NCHF Total
BAM metric server	Rate And Charge Diameter ERRORS	NCHF, Diameter, and TPS-Diameter Errors
BAM metric server	CHA-core- Akka internal Errors	Displays CHA-core akka internal errors and CHA-access routing internal errors



Data Source	Panel Name	Counter Description
BAM metric server	CHA-Core - Session Akka Internal Errors	Displays CHA-core - Session Akka internal Errors and CHA-access Akka internal routing Errors
BAM metric server	CHA-access Akka internal- TPS	Displays CHA-access - Akka internal requests and errors
BAM metric server	Events Created and Processed	Displays CHA-access Event, EDM CFE Fetched, EDM CNFE Fetched, EDM Recovery Fetched, Cha-core Event and EDM CCE Fetched
BAM metric server	Rate And Charge SBI - Response time	Displays CHA-access NCHF charging request
BAM metric server	Diameter-Response time	Displays NCHF charging and Diameter response time
BAM metric server	EDM Consolidation vs CHA generation, 5min/ 300s (EPS)	Displays CHA access event generation, CHA core event generation, EDM CFE Fetched, EDM CNFE Fetched, EDM CFE consolidated, EDM recovery Fetched, EDM CCE Fetched and EDM CCE consolidated
BAM metric server	Total EDM Events Transferred - Success	Displays EDM CFE, EDM CNFE and EDM CCE successful events
BAM metric server	Total EDM Events Transferred-Failure	EDM Event Publishing Failed events
BAM metric server	EDM Consolidated - TPS	Displays EDM CNFE, EDM CCE consolidated
BAM metric server	Average Translation 95,99 – Response Time	Displays Average Translation 95,99 – Response time
BAM metric server	Average CHA-access CIL – Response Time	Average CHA-access CIL – Response time
BAM metric server	Total Charging NRF Registration Requests	Total Charging NRF Registration Requests.
BAM metric server	NTF Latency	Displays NTF SMTP Latency, NTF SMPP Latency and NTF Incoming Total.
BAM metric server	Charging Core Refill Requests	Displays CHA-core Refill request duration in seconds, Total CHA-core Refill requests and Total CHA-core CIP-IP rating diameter errors.



Data Source	Panel Name	Counter Description
BAM metric server	Charging Access CIP-IP Requests	Displays Charging Access CIP-IP Request duration in seconds and Total Charging Access CIP-IP Request errors.
BAM metric server	EDM PUB SFTP Transfer	Displays Total successful EDM PUB fetched, Total EDM PUB SFTP transfer time in ms, Maximum EDM PUB collected time in ms and Total failed EDM PUB SFTP transfer.
BAM metric server	CPMBSR Request and Responses	Displays the HTTP get, post, delete request and responses of CPMBSR (successful and failed).
BAM metric server	CPM Request and Responses	Displays the HTTP get, post, delete request and responses of CPM (successful and failed).
BAM metric server	CPM Get, Post and Delete Responses Duration- Count, Sum and Max	Displays the count, sum and max response duration of CPM Pods
BAM metric server	CPMBSR Get, Post and Delete Responses Duration- Count, Sum and Max	Displays the count, sum and max response duration of CPMBSR Pods
BAM metric server	CPMBSR Scheduler Post Response Duration - Sum, Count and Max	Displays the count, max and sum of post responses of CPMBSR Scheduler
BAM metric server	CPMBSR Scheduler Post Response	Displays the http post responses of CPMBSR Scheduler (successful, failed and delayed)
BAM metric server	CPMBSR Task Status	Displays the CPMBSR total task aggregated retry count, retry count and retry success.
BAM metric server	MSG - Number of produce requests received	Displays the MSGs number of produce requests received
BAM metric server	MSG - Number of fetches (consumption)	Displays the MSGs number of fetches (consumption)
BAM metric server	CHA collector - Processed Deferred RAC events per batch total	Displays the CHA collector processed deferred RAC events per batch total
BAM metric server	CHA Collector - Processed Deferred RAC batch	Displays the CHA collector processed deferred RAC batch total and processed deferred RAC batch errors total



Data Source	Panel Name	Counter Description
BAM metric server	CHA Collector - Event posting kafka	Displays the CHA collector Event posting kafka
BAM metric server	CHA Collector - Processed Deferred RAC batch duration seconds	Displays the CHA collector processed deferred RAC batch duration seconds
BAM metric server	BAE service request	Displays the AEL BAE server http requests total and AEL BAE server http requests error total
BAM metric server	BAE response duration	Displays the AEL BAE server http requests duration seconds

The following table is applicable only when the system is used with External Rate and Charge application.

Table 10 Traffic Metrics Dashboard 2

Data Source	Panel Name	Counter Description
BAM metric server	Total Incoming Traffic TPS	Incoming Traffic of NCHF Charging, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2, and Diameter VoLTE
BAM metric server	Total Outgoing Error TPS	Outgoing Errors of NCHF Charging, NCHF Charging Service session, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2 and Diameter VoLTE
BAM metric server	Total Access Traffic	Total access traffic of NCHF Charging, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2, Diameter VoLTE, External SDP SBI CIR, and External SDP CIR (Gy+VoLTE+SCAPv2)
BAM metric server	Rate And Charge SBI	NCH Total request
BAM metric server	Rate And Charge SBI Errors TPS	NCHF, NCHF Service session and NCHF Policy Errors
BAM metric server	Rate And Charge Diameter	NCHF Total
BAM metric server	Rate And Charge Diameter ERRORS	NCHF, Diameter, and TPS-Diameter Errors
BAM metric server	CHA-core- Akka internal Errors	Displays CHA-core akka internal errors and CHA-access routing internal errors



Data Source	Panel Name	Counter Description
BAM metric server	CHA-Core - Session Akka Internal Errors	Displays CHA-core - Session Akka internal Errors and CHA-access Akka internal routing Errors
BAM metric server	CHA-access Akka internal-TPS	Displays CHA-access - Akka internal requests and errors
BAM metric server	Events Created and Processed	Displays CHA-access Event, EDM CFE Fetched, EDM CNFE Fetched, EDM Recovery Fetched, Cha-core Event and EDM CCE Fetched
BAM metric server	Rate And Charge SBI - Response time	Displays CHA-access NCHF charging request
BAM metric server	Diameter-Response time	Displays NCHF charging and Diameter response time
BAM metric server	EDM Consolidation vs CHA generation, 5min/300s (EPS)	Displays CHA access event generation, CHA core event generation, EDM CFE Fetched, EDM CNFE Fetched, EDM CFE consolidated, EDM recovery Fetched, EDM CCE Fetched and EDM CCE consolidated
BAM metric server	Total EDM Events Transferred - Success	Displays EDM CFE, EDM CNFE and EDM CCE successful events
BAM metric server	Total EDM Events Transferred-Failure	EDM Event Publishing Failed events
BAM metric server	EDM Consolidated - TPS	Displays EDM CNFE, EDM CCE consolidated
BAM metric server	Average Translation 95,99 – Response Time	Displays Average Translation 95,99 – Response time
BAM metric server	Average CHA-access CIL – Response Time	Average CHA-access CIL - Response time
BAM metric server	Average CHA-core CIL – Response Time	Average CHA-core CIL - Response Time
BAM metric server	Core - Charging Converged Rate And Charge	Core - Charging Converged Rate And Charge
BAM metric server	Core - Charging Converged Rate And Charge - Response Time	Core - Charging Converged Rate And Charge - Response Time
BAM metric server	CIL Reject	Cassandra ECOP rejections



Data Source	Panel Name	Counter Description
BAM metric server	External Rating Request DLB - TPS	Displays CHA-access external rating diameter request duration in seconds.
BAM metric server	CPM DNS Provisioning – TPS	Displays MSISDN Provisioning Total, MSISDN Provisioning Success, IMSI Provisioning Total, IMSI Provisioning Success, IMSI Provisioning Failed and MSISDN Provisioning Failed.
BAM metric server	CPM DNS Deletion – TPS	Displays MSISDN Deletion Total, MSISDN Deletion Success, IMSI Deletion Total, IMSI Deletion Success and MSISDN Deletion Failed.
BAM metric server	CPM DNS Provisioning - Response count,Response Time - Maximum and Sum	Displays Maximum time, Total response time and Response count for MSISDN, IMSI Provisioning Requests.
BAM metric server	CPM DNS Deletion - Response count,Response Time - Maximum and Sum	Displays Maximum time, Total response time and Response count for MSISDN, IMSI Deletion Requests.
BAM metric server	Total Charging NRF Registration Requests	Total Charging NRF Registration Requests.
BAM metric server	MSG - Number of produce requests received	Displays the MSGs number of produce requests received
BAM metric server	MSG - Number of fetches (consumption)	Displays the MSGs number of fetches (consumption)
BAM metric server	CHA collector - Processed Deferred RAC events per batch total	Displays the CHA collector processed deferred RAC events per batch total
BAM metric server	CHA Collector - Processed Deferred RAC batch	Displays the CHA collector processed deferred RAC batch total and processed deferred RAC batch errors total
BAM metric server	CHA Collector - Event posting kafka	Displays the CHA collector Event posting kafka
BAM metric server	CHA Collector - Processed Deferred RAC batch duration seconds	Displays the CHA collector processed deferred RAC batch duration seconds



Table 11 Traffic Metrics Dashboard 3

Data Source	Panel Name	Counter Description
BAM metric server	Total Incoming Traffic TPS	Incoming Traffic of NCHF Charging, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2, and Diameter VoLTE
BAM metric server	Total Outgoing Error TPS	Outgoing Errors of NCHF Charging, NCHF Charging Service session, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2 and Diameter VoLTE
BAM metric server	Total Access Traffic	Total access traffic of NCHF Charging, NCHF Policy, Diameter Gy, Diameter Sy, SCAPv2, Diameter VoLTE, External SDP SBI CIR, and External SDP CIR (Gy+VoLTE+SCAPv2)
BAM metric server	Rate And Charge SBI	NCH Total request
BAM metric server	Rate And Charge SBI Errors TPS	NCHF, NCHF Service session and NCHF Policy Errors
BAM metric server	Rate And Charge Diameter	NCHF Total
BAM metric server	Rate And Charge Diameter ERRORS	NCHF, Diameter, and TPS-Diameter Errors
BAM metric server	CHA-core- Akka internal Errors	Displays CHA-core akka internal errors and CHA-access routing internal errors
BAM metric server	CHA-Core - Session Akka Internal Errors	Displays CHA-core - Session Akka internal Errors and CHA-access Akka internal routing Errors
BAM metric server	CHA-access Akka internal- TPS	Displays CHA-access - Akka internal requests and errors
BAM metric server	Events Created and Processed	Displays CHA-access Event, EDM CFE Fetched , EDM CNFE Fetched, ED



Data Source	Panel Name	Counter Description
		M Recovery Fetched, Cha-core Event and EDM CCE Fetched
BAM metric server	Rate And Charge SBI - Response time	Displays CHA-access NCHF charging request
BAM metric server	Diameter-Response time	Displays NCHF charging and Diameter response time
BAM metric server	EDM Consolidation vs CHA generation, 5min/300s (EPS)	Displays CHA access event generation, CHA core event generation, EDM CFE Fet ched, EDM CNFE Fetch ed, EDM CFE consolidated , EDM recovery Fetched, EDM CCE Fetch ed and EDM CCE consolidat ed
BAM metric server	Total EDM Events Transferred - Success	Displays EDM CFE, EDM CNFE and EDM CCE succ essful events
BAM metric server	Total EDM Events Transferred-Failure	EDM Event Publishing Failed events
BAM metric server	EDM Consolidated - TPS	Displays EDM CNFE, ED M CCE consolidated
BAM metric server	Average Translation 95,99 – Response Time	Displays Average Translation 95,99 – Response time
BAM metric server	Average CHA- access CIL – Response Time	Average CHA- access CIL - Response time
BAM metric server	Average CHA-core CIL – Response Time	Average CHA-core CIL - Response Time
BAM metric server	Core - Charging Converged Rate And Charge	Core - Charging Converged Rate And Charge
BAM metric server	Core - Charging Converged Rate And Charge - Response Time	Core - Charging Converged Rate And Charge - Response Time
BAM metric server	CIL Reject	Cassandra ECOP rejections



Data Source	Panel Name	Counter Description
BAM metric server	External Rating Request DB - TPS	Displays CHA-access external rating diameter request duration in seconds.
BAM metric server	CPM DNS Provisioning – TPS	Displays MSISDN Provisioning Total, MSISDN Provisioning Success, IMSI Provisioning Total, IMSI Provisioning Success, IMSI Provisioning Failed and MSISDN Provisioning Failed.
BAM metric server	CPM DNS Deletion – TPS	Displays MSISDN Deletion Total, MSISDN Deletion Success, IMSI Deletion Total, IMSI Deletion Success and MSISDN Deletion Failed.
BAM metric server	CPM DNS Provisioning - Response count, Response Time - Maximum and Sum	Displays Maximum time, Total response time and Response count for MSISDN, IMSI Provisioning Requests.
BAM metric server	CPM DNS Deletion - Response count, Response Time - Maximum and Sum	Displays Maximum time, Total response time and Response count for MSISDN, IMSI Deletion Requests.
BAM metric server	MSG - Number of produce requests received	Displays the MSGs number of produce requests received
BAM metric server	MSG - Number of fetches (consumption)	Displays the MSGs number of fetches (consumption)
BAM metric server	CHA collector - Processed Deferred RAC events per batch total	Displays the CHA collector processed deferred RAC events per batch total
BAM metric server	CHA Collector - Processed Deferred RAC batch	Displays the CHA collector processed deferred RAC batch total and processed deferred RAC batch errors total



Data Source	Panel Name	Counter Description
BAM metric server	CHA Collector - Event posting kafka	Displays the CHA collector Event posting kafka
BAM metric server	CHA Collector - Processed Deferred RAC batch duration seconds	Displays the CHA collector processed deferred RAC batch duration seconds
BAM metric server	BAE service requests	Displays the AEL BAE server http requests total and AEL BAE server http requests errors total
BAM metric server	BAE response duration	Displays the AEL BAE server http request duration seconds
BAM metrics Server	Invoice Bill run progress	Displays Number of Calculate and Generate stage completed, Number of Formatter stage completed, Counter that increments when CDAC is posted for finance and Counter that increments when response is received from finance
BAM metrics Server	Controller RTA handling	Displays CHA usage charge event and CHA event received for processing, successfully processed, failed during processing. Successfully processed
BAM metrics Server	Processor RTA handling	Displays CHA usage charge event received for processing, successfully processed, failed during processing. Successfully processed
BAM metrics server	Controller RTA Processing time	Displays Time taken to process the CHA usage charge event and CHA event
BAM metrics server	Processor RTA Processing time	Displays Time taken to process the CHA usage charge event



Data Source	Panel Name	Counter Description
BAM metrics server	Invoice generation	Displays Number of invoices successfully generated, Number of failed invoice generation, Number of final invoices successfully generated and Number of failed final invoice generation
BAM metrics server	Invoice generation time	Displays Time taken to process customer requests successfully in Calculate stage, Time taken to process customers' requests successfully in Formatter stage
BAM metrics server	CMIS Document Interface	Displays Counter that increments when CMIS document is created, Number of Formatter stage completed.
BAM metrics server	CMIS Document response time	Displays CMIS document creation response time
BAM metrics server	Invoice finance posting interface	Displays Counter that increments when CDAC is posted for finance, Counter that increments when CDAC is posted successfully and Counter that increments when CDAC posting fails
BAM metrics server	Invoice notification triggers	Displays Counter that increments when Notification is sent, Counter that increments when Notification is sent successfully and Counter that increments when sending notification fails
BAM metrics server	Invoice cha posting interface	Displays Total counter which increments for CHA Balance Adjustment POST Request, Counter which increments after a successful CHA Balance Adjustment POST



Data Source	Panel Name	Counter Description
		Request and Counter which increments after a failed CHA Balance Adjustment POST Request.
BAM metrics server	Payment Initiation	Displays Number of requests received over the payment initiation REST interface and Number of failed responses sent over the payment initiation REST interface.
BAM metrics server	Payment Initiation duration	Displays Average time taken to process a request received over the payment initiation REST interface.
BAM metrics server	Import Invoice	Displays Number of import messages received over the invoice import interface and Number of failed imports that are received over the invoice import interface.
BAM metrics server	Import Invoice duration	Displays Average time taken to respond the import requests received over the invoice import interface.
BAM metrics server	Export Financial Data	Displays Number of requests received over the data export REST interface and Number of failed responses sent over the data export REST interface.
BAM metrics server	Export Financial Data duration	Displays Average time taken to process the data export task.
BAM metrics server	Dunning -Overdue invoices to collections	Displays Number of overdue receivables identified for the overdue receivable interface and Number of overdue receivables

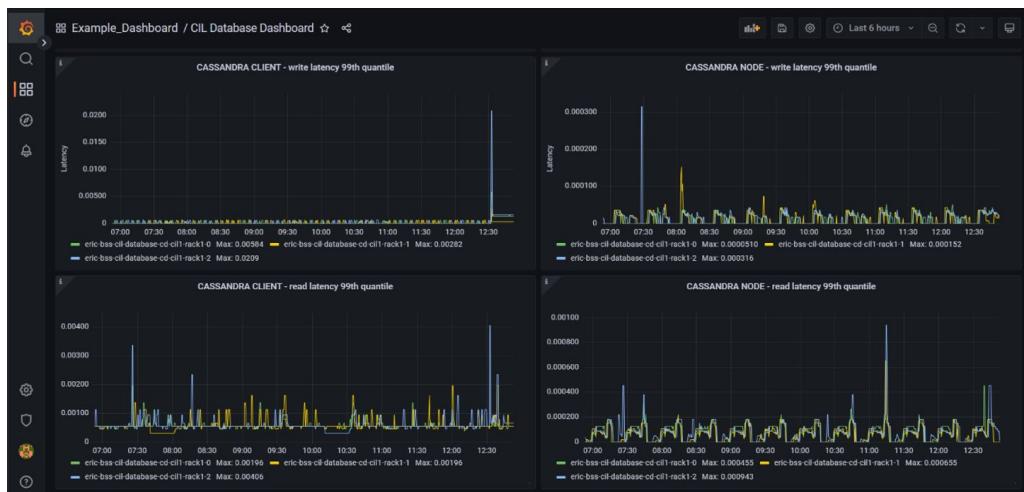


Data Source	Panel Name	Counter Description
		messages send for processing over the receivable interface.

4.1.6 CIL Database Dashboard

CIL database Dashboard provides a consolidated view of the CIL Database at a single place.

Figure 6 Example Dashboard - CIL Database Dashboard



The following table defines metrics for CIL Database Dashboard

Table 12 Metrics for CIL Database Dashboard

Data Source	Panel Name	Counter Description
BAM metric server	Used Cassandra Storage Space (%)	Used Cassandra storage in percentage shown as Gauge type
BAM metric server	Disk usage (GB) per CIL pod	Disk usage shown in GBs per CIL pod
BAM metric server	Disk usage(%) per CIL pod	Disk usage percentage per CIL pod
BAM metric server	CASSANDRA CLIENT - write latency 99th quantile	Request latency for write operation.
BAM metric server	CASSANDRA NODE - write latency 99th quantile.	Internal node latency for write operation.



Data Source	Panel Name	Counter Description
BAM metric server	CASSANDRA CLIENT - read latency 99th quantile.	Request latency for read operation.
BAM metric server	CASSANDRA NODE - latency seconds per CIL pod	Internal node latency without quantile
BAM metric server	CASSANDRA CLIENT - request latency seconds per CIL pod	Request latency without quantile
BAM metric server	CASSANDRA NODE - latency seconds per CIL pod	Internal node latency without quantile
Platform metric server	CCD CPU per CIL	CCD CPU usage per CIL POD
BAM metric server	Hint Storage Total	Storage used with hints.
BAM metric server	Cassandra Estimated Pending Compactions per pod	Cassandra Estimated Pending Compactions per POD
BAM metric server	Cassandra ECOP Request Rejections	Total number of rejected requests (since server start).

4.1.7 Disk Related Metrics Dashboard

Disk related metrics Dashboard provides a consolidated view of the Disk related data at a single place.



Figure 7 Disk Related Metrics Dashboard



Note: Disk metrics are available only if `node_exporter` is enabled.

The following table defines metrics for Disk related metrics Dashboard.

Table 13 Metrics for CIL Database Dashboard

Data Source	Panel Name	Counter Description
Platform metric server	Read Throughput	Displays the Node disk read bytes total
Platform metric server	Write Throughput	Displays the Node disk written bytes total
Platform metric server	Read Latency	Displays the Read latency
Platform metric server	Write Latency	Displays the write latency.
Platform metric server	Read IOPS	Displays Node disk read completed total
Platform metric server	Write IOPS	Displays Node disk writes completed total
Platform metric server	Read Request Size	Displays the read request size
Platform metric server	Write Request Size	Displays the write request size

4.1.8

Versioning

Grafana has the JSON schema, which has the needed parameters for implementation like dashboard version, and compatible Grafana version .

```
"schemaVersion": 36,
  "pluginVersion": "9.0.2"
  "version": "1.1.0",
```

- schemaVersion: Version of the JSON schema (integer), incremented each time a Grafana update brings changes to said schema.
- pluginVersion: Version of the Grafana.
- version: Version of the dashboard, incremented each time the dashboard is updated.