Cisco Ultra Cloud Serving Gateway Control Plane Function, Release 2021.02 - Metrics Reference

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Note The documentation set for this product strives to use bias-free language. For purposes of this documentation set, bias-free is defined as language that does not imply discrimination based on age, disability, gender, racial identity, ethnic identity, sexual orientation, socioeconomic status, and intersectionality. While any existing biased terms are being substituted, exceptions may be present in the documentation due to language that is hardcoded in the user interfaces of the product software, language used based on RFP documentation, or language that is used by a referenced third-party product.

This preface describes the *Ultra Cloud Core Serving Gateway Control Plane Function - Metrics Reference*, the document conventions, and the customer support details.

Conventions Used

The following tables describe the conventions used throughout this documentation.

Notice Type	Description
Information Note	Provides information about important features or instructions.
Caution	Alerts you of potential damage to a program, device, or system.
Warning	Alerts you of potential personal injury or fatality. May also alert you of potential electrical hazards.

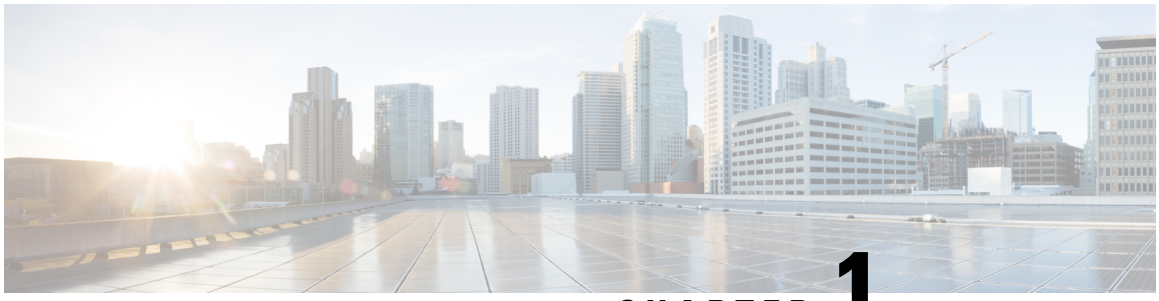
Typeface Conventions	Description
Text represented as a `screen display`	This typeface represents displays that appear on your terminal screen, for example: `Login:`

Typeface Conventions	Description
Text represented as **commands**	This typeface represents commands that you enter, for example: **show ip access-list** This document always gives the full form of a command in lowercase letters. Commands are not case sensitive.
Text represented as a **command** *variable*	This typeface represents a variable that is part of a command, for example: **show card** *slot_number* *slot_number* is a variable representing the applicable chassis slot number.
Text represented as menu or sub-menu names	This typeface represents menus and sub-menus that you access within a software application, for example: Click the **File** menu, then click **New**

Contacting Customer Support

Use the information in this section to contact customer support.

Refer to the support area of http://www.cisco.com for up-to-date product documentation or to submit a service request. A valid username and password are required to access this site. Please contact your Cisco sales or service representative for additional information.



CHAPTER 1

Key Performance Indicators

Feature Summary and Revision History

Summary Data

Table 1: Summary Data

Applicable Product(s) or Functional Area	cnSGW-C
Applicable Platform(s)	SMI
Feature Default Setting	Enabled - Always-on
Related Documentation	Not Applicable

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	2021.02.0

Feature Description

This chapter describes the Key Performance Indicators (KPIs/Bulkstats/Alerts) definitions for the Cloud Native Serving Gateway Control Plane Function (cnSGW-C).

KPI Categories

cnSGW-C KPIs are divided into the following categories:

- Session
- Bearer Level
- PLMN Level
- Procedure KPIs
- Inter/Intra RAT Handover
- Failure (Rejection/Call Disconnect Reasons)
- Pod level

Session and Bearer KPIs

The following table list the session and bearer KPIs.

Table 3: Session and Bearer KPIs

KPI Name	Description	Expression
SGW Total Number of Sessions	The total number of active UE sessions.	sum(sgw_ue_counters{rat_type=\"EUTRAN\",state=\"connected\"}) by (namespace)
SGW Total Current PDN	The total number of active PDNs.	sum(sgw_pdn_counters{ rat_type=\"EUTRAN\"}) by (namespace)
SGW Total Current Bearers	The total number of active bearers.	sum(sgw_bearer_counters{qci!='null', service_name=\"sgw-service\", status=\"active\"}) by (namespace)
SGW Total EPS Bearer Setup	The total number of bearer setups.	sum(sgw_bearer_stats{qci!='null', service_name=\"sgw-service\", status=\"setup\"}) by (namespace)

KPI Name	Description	Expression
SGW Total Current Dedicated Bearers	Total number of current active bearers – Total number of current active PDNs	sum(sgw_bearer_counters{qci!='null', service_name=\"sgw-service\", status=\"active\"}) by (namespace) - sum(sgw_pdn_counters{ rat_type=\"EUTRAN\"}) by (namespace)
SGW Total EPS Bearers Released	The total number of bearers released.	sum(sgw_bearer_stats{qci!='null', service_name=\"sgw-service\", status=\"release\"}) by (qci,namespace)
SGW Number of PDN teardown	The total number of PDN released.	sum(sgw_service_stats{pdn_type!='null', status=\"release\"}) by (namespace)
SGW PDNs Rejected Reason Distribution	PDN disconnect reasons.	sum(sgw_pdn_disconnect_stats {reason!='null'}) by (reason,namespace)

PLMN KPIs

The following table list the PLMN KPIs.

Table 4: PLMN KPIs

KPI Name	Description	Expression
SGW Home PDNs active	The total number of active homer PDNs.	sum(sgw_pdn_counters{ pdn_plmn_type=\"homer\", rat_type="EUTRAN}) by (namespace)
SGW Roaming PDNs active	The total number of active roamer PDNs.	sum(sgw_pdn_counters{ pdn_plmn_type=\"roamer\", rat_type="EUTRAN}) by (namespace)
SGW Visiting PDNs active	The total number of active visitor PDNs.	sum(sgw_pdn_counters{ pdn_plmn_type=\"visitor\", rat_type="EUTRAN}) by (namespace)

Procedure KPIs

The following table list the procedure KPIs.

Table 5: Procedure KPIs

KPI Name	Description	Expression
Attach Success Rate	The total number of attach success/total attaches attempted.	sum(rate(sgw_service_stats {sgw_procedure_type= \"initial_attach\",status=\"success\"} [5m])) by (namespace)/ sum(rate(sgw_service_stats {sgw_procedure_type= \"initial_attach\",status=\"attempted\"} [5m])) by (namespace)
Detach Success Rate	The total number of detach success/total detaches attempted.	sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type=\"delete_session_request\", status=\"success\"}[5m])) by (namespace) / sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress \",sgw_procedure_type=\ "delete_session_request\", status=\"attempted\"}[5m])) by (namespace)
Bearer Creation Success Rate	The total number of bearer success/total bearers attempted.	sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"create_bearer\",status= \"success\"}[5m])) by (namespace) / sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type=\"create_bearer\", status=\"attempted\"}[5m])) by (namespace)

KPI Name	Description	Expression
Bearer Modification Success Rate	The total number of bearer update success/total bearers update attempted.	sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type=\"update_bearer\", status=\"success\"}[5m])) by (namespace) / sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type=\"update_bearer\", status=\"attempted\"}[5m])) by (namespace)
Bearer Deletion Success Rate	The total number of bearer delete success/total bearer delete attempted.	sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type=\" pgw_initiated_dedicated_ bearer_deletion\",status=\"success\"} [5m])) by (namespace) / sum(rate(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type=\"pgw_initiated_ dedicated_bearer_deletion\", status=\"attempted\"}[5m])) by (namespace)

KPI Name	Description	Expression
Handover Success Rate	The total number of successful handovers/Total handovers attempted.	sum(rate(sgw_service_stats {sgw_procedure_type=~'s1_sgw_relocation_attach|x2_sgw_relocation_attach|inter_mme_handover|intra_mme_handover|inter_system_handover_attach|x2_gngp_to_lte_relocation_attach|s1_gngp_to_lte_relocation_attach', status=\"success\"}[5m])) by (sgw_procedure_type, namespace)/ sum(rate(sgw_service_stats {sgw_procedure_type=~'s1_sgw_relocation_attach|x2_sgw_relocation_attach|inter_mme_handover|intra_mme_handover|inter_system_handover_attach|x2_gngp_to_lte_relocation_attach|s1_gngp_to_lte_relocation_attach',status=\"attempted\"}[5m])) by (sgw_procedure_type,namespace)
Association Setup Failure	Association Setup Failure	sum(proto_udp_res_msg_total {message_name=\"association_setup_res\",status!=\"accepted\"}) by (namespace)
Association Release	Association Release	sum(sgw_ue_disconnect_stats {reason="sx_association_release", service_name="sgw-service"}) by (namespace)

KPI Name	Description	Expression
Session Establishment Failure Rate	Session Establishment Response Rejected/Total number of Session Establishment Requests	sum(proto_udp_res_msg_total {message_name= \"session_establishment_res\", status!=\"accepted\"}) by (namespace) / (proto_udp_res_msg_total {message_name= \"session_establishment_res\", status=\"accepted\"}) by (namespace) + sum(proto_udp_res_msg_total {message_name= \"session_establishment_res\", status!=\"accepted\"}) by (namespace))
Session Modification Failure Rate	Session Modification Response Rejected/Total number of Session Modification Requests	sum(proto_udp_res_msg_total {interface_type=\"SXA\", message_name= \"session_modification_res\", status!=\"accepted\"}) by (namespace) / sum (proto_udp_res_msg_total {interface_type=\"SXA\", message_name= \"session_modification_res\", status!=\"accepted\"}) by (namespace) + sum (proto_udp_res_msg_total {interface_type=\"SXA\", message_name= \"session_modification_res\", status=\"accepted\"}) by (namespace))

KPI Name	Description	Expression
Association Setup Failure Rate	Association Failure/(Association Failure + Association Success)	sum(proto_udp_res_msg_total {message_name= \"association_setup_res\", status!=\"accepted\"}) by (namespace) / sum ((proto_udp_res_msg_total {message_name=\"association _setup_res\",status!= \"accepted\"} by (namespace) + proto_udp_res_msg_total {message_name=\"association_ setup_res\",status!=\"accepted\"}) by (namespace))

Failure/Rejection/Retransmission KPIs

The following table lists Failure/Rejection/Retransmission KPIs.

Table 6: Failure/Rejection/Retransmission KPIs

KPI Name	Description	Expression
UE Disconnect Reasons	UE disconnection reasons.	sum(sgw_ue_disconnect_stats {reason!='null'}) by (reason, namespace)

KPI Name	Description	Expression
PDN Failure Rate	Total attach attempted – Total attach success/Total attach attempted	sum(sgw_service_stats{interface= \"interface_sgw_egress\", sgw_procedure_type= \"initial_attach\", status=\"attempted\"} by (namespace))-um(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type=\"initial_attach\", status=\"success\"} by (namespace))/sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type=\"initial_attach\", status=\"attempted\"} by (namespace))
PDN Disconnect Reason	PDN disconnection reason	sum(sgw_pdn_disconnect_stats {reason!='null'}) by (reason,namespace)
GTPC Path Failure	GTPC path failure	sum(rate(sgw_ue_disconnect_stats {reason=~'s11_path_failure| s5e_path-failure| s11_path_failure_local_purge| s5e_ path_failure_local_purge| s5e_recovery|s11_recovery| s5e_recovery_local_purge| s11_recovery_local_purge'} [5m])) by (namespace)

KPI Name	Description	Expression
Intra EUTRAN Handover Failure Rate	(S1 HO SGW Relocation Success + TAU HO SGW Relocation + X2 HO SGW Relocation + Inter/Intra MME HO failure) / S1 HO SGW Relocation Attempted + TAU HO SGW Relocation Attempted + TAU HO SGW Relocation Attempted + Inter/Intra MME HO Attempted)	sum(rate(sgw_service_stats {sgw_procedure_type=~ 's1_sgw_relocation_attach| x2_sgw_relocation_attach| inter_mme_handover| intra_mme_handover',status= \"rejected\"} [5m])) by (sgw_procedure_type,namespace)/ sum(rate(sgw_service_stats {sgw_procedure_type=~ 's1_sgw_relocation_attach| x2_sgw_relocation_attach| inter_mme_handover| intra_mme_handover, status=\"attempted\"}[5m])) by (sgw_procedure_type, namespace)
Inter System Handover Failure Rate	(WiFi HO Failure + GnGp HO Failure) / (WiFi HO Attempted + GnGp HO Attempted)	sum(rate(sgw_service_stats {sgw_procedure_type=~' inter_system_handover_attach| x2_gngp_to_lte_relocation_attach| s1_gngp_to_lte_relocation_attach', status=\"success\"}[5m])) by (sgw_procedure_type,namespace)/ sum(rate(sgw_service_stats {sgw_procedure_type=~' inter_system_handover_attach| x2_gngp_to_lte_relocation_attach| s1_gngp_to_lte_relocation_attach', status=\"attempted\"}[5m])) by (sgw_procedure_type,namespace)

Handover KPIs

The following table lists the handover KPIs.

Table 7: Handover KPIs

KPI Name	Description	Expression
SGW Relocation Success Rate	Total SGW Relocation Success/Total Relocation Attempted	sum(rate(sgw_service_stats {sgw_procedure_type=~ 's1_sgw_relocation_attach| x2_sgw_relocation_attach', status=\"success\"}[5m])) by (sgw_procedure_type,namespace)/ sum(rate(sgw_service_stats {sgw_procedure_type=~ 's1_sgw_relocation_attach| x2_sgw_relocation_attach', status=\"attempted\"}[5m])) by (sgw_procedure_type,namespace)
Intra EUTRAN Handover Success Rate without SGW Relocation	Total Handover Success without SGW Relocation/Total Handover Attempted without SGW Relocation	sum(rate(sgw_service_stats {sgw_procedure_type=~ 'inter_mme_handover| intra_mme_handover', status=\"success\"}[5m])) by (sgw_procedure_type, namespace)/sum(rate (sgw_service_stats {sgw_procedure_type=~ 'inter_mme_handover| intra_mme_handover', status=\"attempted\"}[5m])) by (sgw_procedure_type,namespace)

KPI Name	Description	Expression
Inter System Handover Success Rate	Wifi Handover Success + GnGp Handover Success)/Wifi Handover Attempted + GnGp Handover Attempted	sum(rate(sgw_service_stats {sgw_procedure_type=~ ’inter_system_handover_attach| x2_gngp_to_lte_relocation_attach| s1_gngp_to_lte_relocation_attach', status=\"success\"}[5m])) by (sgw_procedure_type, namespace)/sum(rate(sgw_service_stats {sgw_procedure_type=~ ’inter_system_handover_attach| x2_gngp_to_lte_relocation_attach| s1_gngp_to_lte_relocation_attach', status=\"attempted\"}[5m])) by (sgw_procedure_type,namespace)
SGW IDFT Creation Success Rate	Total IDFT Success/Total IDFT Attempted	sum(rate(sgw_service_stats {sgw_procedure_type=\ "create_indirect_data_ forwarding_tunnel\", status=\"success\"}[5m])) by (namespace)/sum(rate (sgw_service_stats {sgw_procedure_type= \"create_indirect_data_ forwarding_tunnel\", status=\"attempted\"}[5m])) by (namespace)

Pod Level KPIs

The following table lists pod level KPIs.

Table 8: Pod Level KPIs

KPI Name	Description	Expression
Average cpu_usage	Average CPU percent usage for pods.	sum(cpu_percent{ service_name=\"sgw-service\"}}) by (namespace)
Average Memory_usage	Average memory usage for pods in kb.	sum(mem_usage_kb {service_name=\"sgw-service \"}) by (namespace)

Bulkstats Categories

cnSGW-C bulkstats are divided into the following categories:

- Session/Bearer/UE
- Procedural
- Handover
- Collision
- Disconnect Reason/Failures/Retransmissions

Session/Bearer/UE Bulkstats

The following table lists Session/Bearer/UE bulkstats.

Table 9: Session/Bearer/UE Bulkstats

Bulkstats Query Name	Type	Expression	Label
active_pdns_ per_pdn_type	Gauge	sum(sgw_pdn_counters {pdn_type!='null'}) by (pdn_type,namespace)	rat_type
pdns_released_ per_pdn_type	Counter	sum(sgw_service_stats {pdn_type!='null', status=\"release\"}) by (pdn_type,namespace)	pdn_type

Bulkstats Query Name	Type	Expression	Label
pdns_setup_ per_pdn_type	Counter	sum(sgw_service_stats {pdn_type!='null',status= \"setup\"}) by (pdn_type, namespace)	pdn_type
ue_active	Gauge	sum(sgw_ue_counters {rat_type=\"EUTRAN\", state=\"connected\"}) by (namespace)	state
ue_active_ per_svc_pod	Gauge	sum(sgw_ue_counters {rat_type=\"EUTRAN\"}) by (instance_id,namespace)	instance_id
ue_idle	Gauge	sum(sgw_ue_counters {rat_type=\"EUTRAN\" ,state=\"idle\"}) by (namespace)	state
ue_released	Counter	sum(sgw_ue_counters {rat_type=\"EUTRAN\", state=\"release\"}) by (namespace)	status
ue_setup	Counter	sum(sgw_ue_counters {rat_type=\"EUTRAN\", state=\"setup\"}) by (namespace)	status
active_pdn_ per_plmntype	Gauge	sum(sgw_pdn_counters {rat_type=\"EUTRAN\", pdn_plmn_type!='null'}) by (pdn_plmn_type,namespace)	pdn_plmn_type
pdns_released_ per_plmntype	Counter	sum(sgw_pdn_counters {rat_type=\"EUTRAN\", pdn_plmn_type!='null'}) by (pdn_plmn_type,namespace)	pdn_plmn_type

Bulkstats Query Name	Type	Expression	Label
pdns_setup_ per_plmntype	Counter	sum(sgw_pdn_setup {rat_type=\"EUTRAN\", pdn_plmn_type!='null', status=\"setup\"}) by (pdn_plmn_type,namespace)	pdn_plmn_type
active_ pdn_emps	Gauge	sum(sgw_pdn_emps_ counters{status=\"active\"}) by (namespace)	status
pdn_ setup_emps	Counter	sum(sgw_pdn_emps_ stats{status=\"setup\"}) by (namespace)	status
pdn_ released_emps	Counter	sum(sgw_pdn_emps_ stats{status=\"release\"}) by (namespace)	status

Procedural Bulkstats

The following table lists procedural bulkstats.

Table 10: Procedural Bulkstats

Bulkstats Query Name	Type	Expression	Label
ue_attach_ attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type= \"initial_attach\", status=\"attempted\"}) by (namespace)	status
ue_attach_ success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type= \"initial_attach\",status=\"success\"}) by (namespace)	status

Bulkstats Query Name	Type	Expression	Label
ue_detach_ attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"delete_session_request\", status=\"attempted\"}) by (namespace)	status
ue_detach_ success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"delete_session_request\", status=\"success\"}) by (namespace)	status
modify_bearer_ request_attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type=~ 'modify_bearer_req_uli_tz_change| modify_bearer_req_initial_attach| service_request',status= \"attempted\"}) by (sgw_procedure_type, namespace)	sgw_procedure_ type
modify_bearer_ request_success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type=~ 'modify_bearer_req_uli_tz_change| modify_bearer_req_initial_attach| service_request',status= \"success\"}) by (sgw_procedure_type, namespace)	sgw_procedure_ type

Bulkstats Query Name	Type	Expression	Label
sx_association_ success	Counter	sum(proto_udp_res_msg_ total{message_name= \"association_setup_res\", status=\"accepted\"}) by (namespace)	status
sx_association_ failure	Counter	sum(proto_udp_res_msg_total {message_name= \"association_setup_res\", status!=\"accepted\"}) by (namespace)	status
sx_session_ establishment_success	Counter	sum(proto_udp_res_msg_total {message_name= \"session_establishment_res\", status=\"accepted\"}) by (namespace)	status
sx_session_ establishment_failure	Counter	sum(proto_udp_res_msg_total {message_name= \"session_establishment_res\", status!=\"accepted\"}) by (namespace)	status
sx_session_ modification_success	Counter	sum(proto_udp_res_msg_total {interface_type=\"SXA\", message_name= \"session_modification_res\", status=\"accepted\"}) by (namespace)	status
sx_session_ modification_failure	Counter	sum(proto_udp_res_msg_total {interface_type=\"SXA\", message_name= \"session_modification_res\", status!=\" accepted\"}) by (namespace)	status

Bulkstats Query Name	Type	Expression	Label
sx_session_ deletion_success	Counter	sum(proto_udp_res_msg_total {message_name= \"session_deletion_res\", status=\"accepted\"}) by (namespace)	status
sx_session_ deletion_failure	Counter	sum(proto_udp_res_msg_total {message_name= \"session_deletion_res\", status!=\"accepted\"}) by (namespace)	status
sx_session_ report_success	Counter	sum(proto_udp_res_msg_total {message_name= \"session_report_res\", status!=\"accepted\"}) by (namespace)	status
sx_session_ report_failure	Counter	sum(proto_udp_res_msg_total {message_name= \"session_report_res\", status=\"accepted\"}) by (namespace)	status
create_bearer_ attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type=\"create_bearer\", status=\"attempted\"}) by (namespace)	status
create_bearer_ success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type=\"create_bearer\", status=\"success\"}) by (namespace)	status

Bulkstats Query Name	Type	Expression	Label
create_bearer_ reject	Counter	sum(sgw_service_stats {fail_reason='gtp_cause_fail| gtp_validation_fail|sx_cause_fail| timeout',interface= \"interface_sgw_ingress\", reject_cause!='null', service_name=\"sgw-service\", sgw_procedure_type= \"create_bearer\",status=\"failure\"}) by (reject_cause,fail_ reason,namespace)	reject_cause
bearer_active_ per_qci	Gauge	sum(sgw_bearer_counters {qci!='null',service_name= \"sgw-service\",status= \"active\"}) by (qci,namespace)	qci
bearer_setup_ per_qci	Counter	sum(sgw_bearer_stats {qci!='null',service_name= \"sgw-service\",status= \"setup\"}) by (qci,namespace)	qci
bearer_released_ per_qci	Counter	sum(sgw_bearer_stats {qci!='null',service_name=\"sgw-service\",status=\"release\"}) by (qci,namespace)	qci
bearer_modified_ per_qci	Counter	sum(sgw_bearer_stats {qci!='null',service_name= \"sgw-service\",status=\"modify\"}) by (qci,namespace)	qci
bearer_attempted_ per_qci	Counter	sum(sgw_bearer_stats {qci!='null',service_name=\"sgw-service\",status=\"attempted\"}) by (qci,namespace)	qci

Bulkstats Query Name	Type	Expression	Label
update_bearer_ attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type= \"update_bearer\",status= \"attempted\"}) by (namespace)	status
update_bearer_ success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type= \"update_bearer\",status= \"success\"}) by (namespace)	status
update_bearer_ reject	Counter	sum(sgw_service_stats {fail_reason=~'gtp_cause_fail| gtp_validation_fail|sx_cause_fail| timeout',interface= \"interface_sgw_ingress\", reject_cause!='null',service_name= \"sgw-service\",sgw_procedure_type= \"update_bearer\",status= \"failure\"}) by (reject_cause, fail_reason,namespace)	reject_cause
delete_dedicated_ bearer_attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type= \"pgw_initiated_dedicated_ bearer_deletion\",status= \"attempted\"}) by (namespace)	status
delete_dedicated_ bearer_success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_egress\", sgw_procedure_type= \"pgw_initiated_dedicated_ bearer_deletion\",status=\"success\"}) by (namespace)	status

Bulkstats Query Name	Type	Expression	Label
delete_dedicated_ bearer_reject	Counter	sum(sgw_service_stats {fail_reason=~'gtp_cause_fail| gtp_validation_fail|sx_cause_fail| timeout',interface= \"interface_sgw_ingress\", reject_cause!='null',service_name= \"sgw-service\", sgw_procedure_type= \"pgw_initiated_dedicated_ bearer_deletion\",status=\"failure\"}) by (reject_cause,fail_reason, namespace)	reject_cause
modify_bearer_ command_attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"modify_bearer_command\", status=\"attempted\"}) by (namespace)	status
modify_bearer_ command_success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"modify_bearer_command\", status=\"success\"} by (namespace)	status
modify_bearer_ command_rejected	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"modify_bearer_command\", status=\"rejected\"}) by (namespace)	status

Bulkstats Query Name	Type	Expression	Label
delete_bearer_ command_attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"delete_bearer_command\", status=\"attempted\"}) by (namespace)	status
delete_bearer_ command_success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"delete_bearer_command\", status=\"success\"}) by (namespace)	status
delete_bearer_ command_rejected	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"delete_bearer_command\", status=\"rejected\"}) by (namespace)	status
ddn_attempted	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"downlink_data_notification\", status=\"attempted\"}) by (namespace)	status
ddn_success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"downlink_data_notification\", status=\"success\"}) by (namespace)	status

Bulkstats Query Name	Type	Expression	Label
ddn_failure	Counter	sum(sgw_service_stats {fail_reason!='null', interface=\"interface_sgw_ingress\", sub_fail_reason!='null', service_name=\"sgw-service\", sgw_procedure_type= \"downlink_data_notification\", status=\"failure\"}) by (sub_fail_reason, namespace)	sub_fail_ reason
secondary_pdn_ request_attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"secondary_pdn_creation\", status=\"attempted\"}) by (namespace)	status
secondary_pdn_ response_success	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"secondary_pdn_creation\", status=\"success\"}) by (namespace)	status
context_ replacement_attempt	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type= \"context_replacement\", status=\"attempted\"}) by (namespace)	status

Bulkstats Query Name	Type	Expression	Label
context_ replacement_success	Counter	sum(sgw_service_stats {interface=\"interface_sg_ingress\", sgw_procedure_type= \"context_replacement\", status=\"success\"}) by (namespace)	status

Handover Bulkstats

The following table lists handover bulkstats.

Table 11: Handover Bulkstats

Bulkstats Query Name	Type	Expression	Label
handover_ attempt	Counter	sum(sgw_service_stats {sgw_procedure_type=~ 's1_sgw_relocation_attach| x2_sgw_relocation_attach| inter_mme_handover| intra_mme_handover| inter_system_handover_attach| x2_gngp_to_lte_relocation_attach| s1_gngp_to_lte_relocation_attach', status=\"attempted\"}) by (sgw_procedure_type,namespace)	sgw_procedure_ type

Bulkstats Query Name	Type	Expression	Label
handover_ success	Counter	sum(sgw_service_stats {sgw_procedure_type=~ 's1_sgw_relocation_attach| x2_sgw_relocation_attach| inter_mme_handover| intra_mme_handover| inter_system_handover_attach| x2_gngp_to_lte_relocation_attach| s1_gngp_to_lte_relocation_attach', status=\"success\"}) by (sgw_procedure_type,namespace)	sgw_procedure_ type
handover_ failures	Counter	sum(sgw_service_stats {interface=\"interface_sgw_ingress\", sgw_procedure_type=~ 's1_sgw_relocation_attach| x2_sgw_relocation_attach| inter_mme_handover| intra_mme_handover| inter_system_handover_attach| x2_gngp_to_lte_relocation_attach| s1_gngp_to_lte_relocation_attach', fail_reason!='null',reject_cause!= 'null',status=\"rejected\"}) by (reject_cause,fail_reason, namespace)	reject_cause

Bulkstats Query Name	Type	Expression	Label
handover_modify_ bearer_attempted	Counter	sum(sgw_service_stats {sgw_procedure_type=~ 'modify_bearer_req_s1_ ho_with_sgw_relocation| modify_bearer_req_t au_ho_with_ sgw_relocation| modify_bearer_req_x2_ ho_with_sgw_relocation|modify_ bearer_req_x2_gngp_to_lte_relocation| modify_bearer_req_s1_ gngp_to_lte_relocation', status=\"attempted\"}) by (sgw_procedure_type,namespace)	status
handover_modify_ bearer_success	Counter	sum(sgw_service_stats {sgw_procedure_type=~ 'modify_bearer_req_s1_ho_ with_sgw_relocation| modify_bearer_ req_tau_ho_with_sgw_relocation| modify_bearer_req_x2_ho_with_ sgw_relocation|modify_bearer_req_x2_ gngp_to_lte_relocation|modify_ bearer_req_s1_gngp_to_ lte_relocation',status= \"success\"}) by (sgw_procedure_type,namespace)	status

Interaction Bulkstats

The following table lists interaction bulkstats.

Table 12: Interaction Bulkstats

Bulkstats Query Name	Type	Expression	Label
collision_abort_ svc_stats	Counter	sum(sgw_service_stats {fail_reason!='null', service_name=\"sgw-service\"}) by (sgw_procedure_type, interface, namespace)	sgw_procedure_ type
collision_abort_ collision_stats	Counter	sum(sgw_collision_stats {action_type!='null',new_ proc=!='null',old_proc!='null', service_name="sgw-service"}) by (action_type,new_ proc,old_proc,namespace)	action_type

Failure Bulkstats

The following table lists failure bulkstats.

Table 13: Failure Bulkstats

Bulkstats Query Name	Type	Expression	Label
attach_ failure	Counter	sum(sgw_service_stats {fail_reason!='null', interface=\"interface_sgw_ingress\", reject_cause!='null',service_name= \"sgw-service\",sgw_procedure_type= \"initial_attach\",status= \"rejected\"}) by (reject_cause, fail_reason,namespace)	reject cause
ue_disconnect_ reason	Counter	sum(sgw_ue_disconnect_ stats{reason!='null'}) by (reason,namespace)	reason
pdn_disconnect_ reason	Counter	sum(sgw_pdn_disconnect_ stats{reason!='null'}) by (reason,namespace)	reason

Bulkstats Query Name	Type	Expression	Label
retransmissions	Counter	sum(sgw_service_stats {interface!='null', status=\"rejected\", fail_reason=\"gtp_peer_ not_responding\"}) by (interface,namespace)	interface

Alerts

cnSGW-C alerts are divided into the following categories:

- Procedural
- Handovers
- Disconnect Reasons
- Interface

LTE Procedure Alerts

The following table lists LTE procedure alerts.

Table 14: LTE Procedure Alerts

Alert Rule	Severity	Duration (in mins)	Type
attach_success_rate	Major	15	Communication Alarm
	Expression: sum(rate(sgw_service_stats {sgw_procedure_type=\"initial_attach\", status=\"success\"}[5m])) by (namespace)/sum(rate(sgw_service_stats {sgw_procedure_type=\"initial_attach\",status=\"attempted\"} [5m])) by (namespace) < 0.90 **Description:** This alert is triggered when attach success rate is less than 90%.		

Alert Rule	Severity	Duration (in mins)	Type
detach_success_rate	Major	15	Communication Alarm
	Expression: sum(rate(sgw_service_stats{interface= \"interface_sgw_ingress\",sgw_procedure_type=\"delete_session_request\", status=\"success\"}[5m])) by (namespace) / sum(rate(sgw_service_stats{interface=\"interface_sgw_ingress\", sgw_procedure_type=\"delete_session_request\",status= \"attempted\"}[5m])) by (namespace) < 0.90 **Description:** This alert is triggered when detach success rate is less than 90%.		
bearer_creation_ success_rate	Major	15	Communication Alarm
	Expression: sum(rate(sgw_service_stats{interface= \"interface_sgw_ingress\",sgw_procedure_type=\"create_bearer\", status=\"success\"}[5m])) by (namespace) / sum(rate(sgw_service_stats{interface=\"interface_sgw_ingress\", sgw_procedure_type=\"create_bearer\",status=\"attempted\"} [5m])) by (namespace) < 0.90 **Description:** This alert is triggered when bearer creation rate is less than 90%.		
bearer_deletion_ success_rate	Major	15	Communication Alarm
	Expression: sum(rate(sgw_service_stats{interface= \"interface_sgw_ingress\",sgw_procedure_type= \"pgw_initiated_dedicated_bearer_deletion\",status= \"success\"}[5m])) by (namespace) / sum(rate(sgw_service_stats{interface=\"interface_sgw_ingress\", sgw_procedure_type=\"pgw_initiated_dedicated_bearer_deletion\", status=\"attempted\"}[5m])) by (namespace) < 0.90 **Description:** This alert is triggered when bearer deletion success rate is less than 90%.		

Alert Rule	Severity	Duration (in mins)	Type
bearer_modification_ success_rate	Major	15	Communication Alarm
	Expression: sum(rate(sgw_service_stats{interface= \"interface_sgw_ingress\",sgw_procedure_type=\"update_bearer\", status=\"success\"}[5m])) by (namespace) / sum(rate(sgw_service_stats{interface=\"interface_sgw_ingress\", sgw_procedure_type=\"update_bearer\",status=\"attempted\"} [5m])) by (namespace) < 0.90 **Description:** This alert is triggered when bearer modification success rate is less than 90%.		
ddn_failure_rate	Major	15	Communication Alarm
	Expression: sum(rate(sgw_service_stats {fail_reason!='null',interface=\"interface_sgw_ingress\", sub_fail_reason!='null',service_name=\"sgw-service\", sgw_procedure_type=\"downlink_data_notification\",status= \"failure\"}[5m])) by (sub_fail_reason,fail_reason,namespace) > 0.10 **Description:** This alert is triggered when DDN failure rate is greater than 10%.		

Handover Alerts

The following table lists Handover alerts.

Table 15: Handover Alerts

Alert Rule	Severity	Duration (in mins)	Type
handover_ success_rate	Major	15	Communication Alarm
	Expression: sum(rate(sgw_service_stats{sgw_procedure_type= 's1_sgw_relocation_attach|x2_sgw_relocation_attach| inter_mme_handover|intra_mme_handover|inter_system_handover_attach| x2_gngp_to_lte_relocation_attach|s1_gngp_to_lte_relocation_attach', status=\"success\"}[5m])) by (sgw_procedure_type,namespace)/ sum(rate(sgw_service_stats{sgw_procedure_type= 's1_sgw_relocation_attach|x2_sgw_relocation_attach| inter_mme_handover|intra_mme_handover|inter_system_handover_attach| x2_gngp_to_lte_relocation_attach|s1_gngp_to_lte_relocation_attach', status=\"attempted\"}[5m])) by (sgw_procedure_type,namespace) < 0.90 **Description:** This alert is triggered when handover success rate is less than 90%.		

Disconnect Reason Alerts

The following table lists disconnect reason alerts.

Table 16: Disconnect Reason Alerts

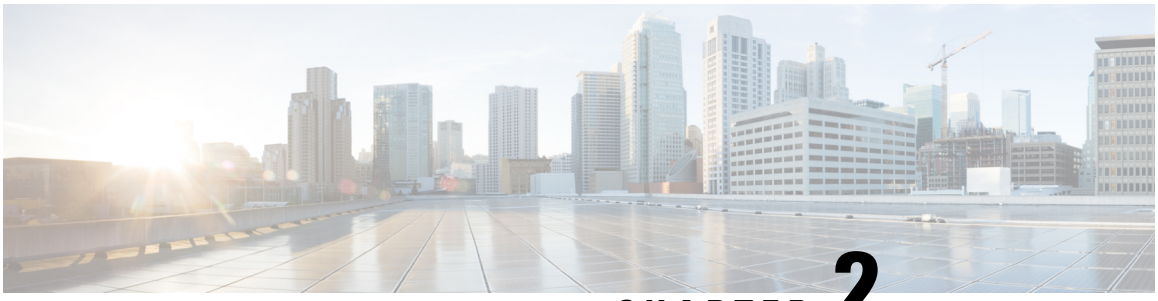
Alert Rule	Severity	Duration (in mins)	Type
up_path_failure	Major	15	Communication Alarm
	Expression: sum(rate(sgw_ue_disconnect_stats {reason=\"sx_association_release\"}[5m])) by (namespace) > 10 **Description:** This alert is triggered when up path failure is detected.		
gtpc_path_failure	Major	15	Communication Alarm
	Expression: sum(rate(sgw_ue_disconnect_stats {reason=~'s11_path_failure|s5e_path-failure| s11_path_failure_local_purge|s5e_ path_failure_local_purge|s5e_recovery|s 11_recovery|s5e_recovery_local_purge|s11_recovery_local_purge'} [5m])) by (namespace) > 1 **Description:** This alert is triggered when GTPC path failure is detected.		

Sx Procedure Alerts

The following table lists disconnect reason alerts.

Table 17: Disconnect Reason Alerts

Alert Rule	Severity	Duration (in mins)	Type
sx_association_ failure	Major	15	Communication Alarm
	Expression: sum(proto_udp_res_msg_total {message_name=\"association_setup_res\",status!= \"accepted\"}) by (namespace) > 0 **Description:** This alert is triggered when Sx association failure is detected.		
sx_peer_ status_down	Major	15	Communication Alarm
	Expression: sum(nodemgr_up_peer_status {interface_type=\"SXA\",service_name=\"nodemgr\", up_peer_ip!='null',up_peer_status=\"up_peer_path_down\"}) by (up_peer_ip,namespace) > 0 **Description:** This alert is triggered when up path is down.		
sx_peer_ status_up	Major	15	Communication Alarm
	Expression: sum(nodemgr_up_peer_status {interface_type=\"SXA\",service_name=\"nodemgr\",up_peer_ip!='null', up_peer_status=\"up_peer_path_up\"}) by (up_peer_ip,namespace) > 0 **Description:** This alert is triggered when up path failure is detected.		



CHAPTER 2

cnSGW-C Metrics Reference

Overview

This section provides details of bulk statistics. Bulk statistics are divided in two types:

- Gauge - Snapshot value that shows the statistic at the reporting moment (for example, the number of current UE, current PDN connections). These statistics can increment or decrement continuously.
- Counter - Historic value accumulated over a period (for example, the total number of CSR requests received). These values get incremented except in the following two cases:
  - Rollover - where a counter exceeds its maximum value and rolls over to zero.
  - Reset - where a counter is manually reset to zero.

cnSGW Metrics Reference

CDL Active Sessions Category

db_records_total

Description: CDL active sessions. each label is prefix with SGW.

Sample Query: `avg(db_records_total{service_name=\"datastore-ep\"})by(session_type)`

Labels:

- Label: `emergency_call`

  Label Description: Number of emergency calls in cnSGW

  Example: SGW:emergency_call:true

- Label: `rat_type`

Label Description: Rat type of sessions. For cnSGW there is only one rat_type EUTRAN

Example: SGW:rat_type:EUTRAN

- Label: `state`

  Label Description: Number of active or idle subscriber state.

  Example: SGW:state:active , SGW:state:idle

- Label: `total`

  Label Description: Total number of sessions in CDL

  Example: total

CDR Container Operations Category

sgw_charging_cdr_container

Description: CDR container operations total

Sample Query:
`sgw_charging_cdr_container{action=\"close_final\",change_condition=\"recordClosure\",pdn_type=\"ipv4v6\",pdn_plmn_type= \"visitor\"}`

Labels:

- Label: `action`

  Label Description: Type of CDR operation

  Example: close_final, close_interim, open

- Label: `change_condition`

  Label Description: Reason for container close operation

  Example: recordClosure,qoSChange,userLocationChange,apnAmbrChange

- Label: `event`

  Label Description: Event that triggered CDR action

  Example: StartAccounting,SGWChange,NormalRelease etc.

- Label: `pdn_type`

  Label Description: The pdn_type indicates the address type of PDN

  Example: ipv4, ipv6, ipv4v6, unknown

- Label: `pdn_plmn_type`

  Label Description: The pdn_plmn_type indicates the plmn type

  Example: homer,visitor,roamer,unknown

CDR Operations Category

sgw_charging_cdr

Description: CDR operations total

Sample Query: `sgw_charging_cdr{action=\"close_final\",cause=\"servingNodeChange\",pdn_type=\"ipv4v6\",pdn_plmn_type= \"visitor\"}`

Labels:

- Label: `action`

  Label Description: Type of CDR operation

  Example: close_final, close_interim, open

- Label: `cause`

  Label Description: Reason for CDR close operation

  Example: maxChangeCond,servingNodeChange,volumeLimit,LTEServingNodeChange,abnormalRelease etc.

- Label: `event`

  Label Description: Event that triggered CDR action

  Example: StartAccounting,SGWChange,NormalRelease etc.

- Label: `pdn_type`

  Label Description: The pdn_type indicates the address type of PDN

  Example: ipv4, ipv6, ipv4v6, unknown

- Label: `pdn_plmn_type`

  Label Description: The pdn_plmn_type indicates the plmn type

  Example: homer,visitor,roamer,unknown

SGW Usage Report Statistics Category

sgw_sx_usage_report_stats

Description: Total Sx Session usage reports processed

Sample Query: `sgw_sx_usage_report_stats{Status=\"success\"}`

Labels:

- Label: `Status`

  Label Description: Processing status

  Example: Success, ur_dropped_invalid_urr_seqNo, ur_dropped_bearer_not_found

SGW Bearer Level Counters Category

sgw_bearer_counters

Description: Bearer Level counters

Sample Query: `sgw_bearer_counters{gr_instance_id=\"1\",status=\"active\",qci=\"5\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `status`

  Label Description: Bearer Status

  Example: active

- Label: `qci`

  Label Description: Bearer QCI

  Example: 1, 2, 3, 4, 5, 6, 7, 8, 9, 65, 66, 69, 70, 80, 82, 83, non-std-qci

SGW Bearer Level Statistics Category

sgw_bearer_stats

Description: Bearer and Qci level statistics

Sample Query:
`sgw_bearer_stats{gr_instance_id=\"1\",status=\"attempted\",qci=\"5\",numBearer=\"2\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `status`

  Label Description: Bearer Status

  Example: attempted, setup, release, modified

- Label: `qci`

  Label Description: Bearer QCI

  Example: 1, 2, 3, 4, 5, 6, 7, 8, 9, 65, 66, 69, 70, 80, 82, 83, non-std-qci

SGW Collision Statistics Category

sgw_collision_stats

Description: SGW Collision counters

Sample Query: `sgw_collision_stats{gr_instance_id=\"1\",action_type=\"abort\",new_proc=\"PDN Disconnect - UE initiated\",old_proc=\"Create Bearer\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `action_type`

  Label Description: The pre-defined action taken to handle the collision. The action can be

  Example: abort_new, abort_old, discard_new, discard_old

- Label: `new_proc`

  Label Description: The new procedure and message type"

  Example: Unknown, PDN Setup, PDN Modify, Create Bearer, Update Bearer, Delete Bearer, PDN Disconnect - UE initiated, PDN Disconnect - Admin initiated, PDN Disconnect - PGW initiated, PDN Disconnect - Self initiated, Modify Bearer Command, Delete Bearer Command, Release Access Bearer, Downlink Data Notification, Clear Subsciber - S5e Recovery Initiated,Clear Subsciber - Sx Recovery Initiated,Clear Subsciber - S11 Recovery Initiated,Clear Subsciber - S5e Path Failure Initiated,Clear Subsciber - Sx Path Failure Initiated,Clear Subsciber - S11 Path Failure Initiated,Clear Subsciber - S11 Path Failure Local Purge Initiated,Clear Subsciber - S11 Recovery Local Purge Initiated,Clear Subsciber - S5e Path Failure Local Purge Initiated,Clear Subsciber - S5e Recovery Local Purge Initiated,Clear Subscriber - Sx Association Release Initiated

- Label: `old_proc`

  Label Description: Indicates the ongoing procedure at eGTP-C when a new message arrived at the interface which caused the collision. The Msg Type in brackets specifies which message triggered this ongoing procedure"

  Example: Unknown, PDN Setup, PDN Modify, Create Bearer, Update Bearer, Delete Bearer, PDN Disconnect - UE initiated, PDN Disconnect - Admin initiated, PDN Disconnect - PGW initiated, PDN Disconnect - Self initiated, Modify Bearer Command, Delete Bearer Command, Release Access Bearer, Downlink Data Notification, Clear Subsciber - S5e Recovery Initiated,Clear Subsciber - Sx Recovery Initiated,Clear Subsciber - S11 Recovery Initiated,Clear Subsciber - S5e Path Failure Initiated,Clear Subsciber - Sx Path Failure Initiated,Clear Subsciber - S11 Path Failure Initiated,Clear Subsciber - S11 Path Failure Local Purge Initiated,Clear Subsciber - S11 Recovery Local Purge Initiated,Clear Subsciber - S5e Path Failure Local Purge Initiated,Clear Subsciber - S5e Recovery Local Purge Initiated,Clear Subscriber - Sx Association Release Initiated

SGW DDN Statistics Category

sgw_ddn_stats

Description: Total SGW DDN Stats

Sample Query: `sgw_ddn_stats{gr_instance_id=\"1\",ddn_stats_type=\"high_priority_initiated\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `ddn_stats_type`

  Label Description: The pre-defined ddn_stats_type

  Example: high_priority_initiated, high_priority_suppressed, throttled, delayed, control_proc_triggered, data_triggered, gtpu_err_ind_triggered

SGW PDN Disconnect Statistics Category

sgw_pdn_disconnect_stats

Description: SGW PDN disconnects counters

Sample Query:
`sgw_pdn_disconnect_stats{gr_instance_id=\"1\",pdn_type=\"ipv4v6\",rat_type=\"EUTRAN\",reason=\"mme_init_pdn_sess_rel\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `pdn_type`

  Label Description: The pdn_type indicates the address type of PDN

  Example: ipv4, ipv6, ipv4v6, unknown

- Label: `rat_type`

  Label Description: The rat_type indicates which Radio Access Technology is currently serving the UE"

  Example: EUTRAN

- Label: `reason`

  Label Description: The reason indicates the disconnect reason associate with the pdn"

  Example: admin_init_disconnect, remote_init_disconnect, pgw_init_pdn_sess_rel, mme_init_pdn_sess_rel, sx_request_rejected, sx_context_not_found, sx_msg_invalid_length, sx_no_resource_available, sx_no_response, sx_reason_unknown, no_response, s5_context_not_found, s11_context_not_found, local_disconnect, no_cause, userplane_info_not_available, setup_timeout, admin_init_local_purge,

db_conflict_init_disconnect, context_replacement, userplane_session_idle_timeout, userplane_requested_graceful_termination, s1u_gtpu_error, s5u_gtpu_error, s1u_gtpu_session_replacement, s5u_gtpu_session_replacement, sx_recovery, sx_path_failure,s11_path_failure, s5e_path-failure,s11_path_failure_local_purge, s5e_path_failure_local_purge,s5e_recovery, s11_recovery, s5e_recovery_local_purge,s11_recovery_local_purge

SGW PDN EMPS Counter Category

sgw_pdn_emps_counter

Description: Total number of active emps session

Sample Query: `sgw_pdn_emps_counters{gr_instance_id=\"1\",status=\"active\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `status`

  Label Description: Active emps session

  Example: active

SGW PDN EMPS Statistics Category

sgw_pdn_emps_stats

Description: Total number of emps session

Sample Query: `sgw_pdn_emps_stats{gr_instance_id=\"1\",status=\"release\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `status`

  Label Description: Status of emps session

  Example: setup, release

SGW PDN Level Counters Category

sgw_pdn_counters

Description: Pdn level counters

Sample Query:
`sgw_pdn_counters{ratType=\"EUTRAN\",pdnConnType=\"ipv4\",plmnType=\"homer\",grInstanceID=\"1\"}`

Labels:

- Label: `rat_type`

  Label Description: The rat_type indicates which Radio Access Technology is currently serving the UE"

  Example: EUTRAN

- Label: `pdn_type`

  Label Description: The pdn_type indicates the address type of PDN

  Example: ipv4, ipv6, ipv4v6, unknown

- Label: `pdn_plmn_type`

  Label Description: It indicates the plmn type for the subscriber

  Example: homer, visitor, roamer, unknown

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

SGW PDN Level Statistics Category

sgw_pdn_stats

Description: Pdn level statistics

Sample Query:
`sgw_pdn_stats{ratType=\"EUTRAN\",status=\"setup\",pdnConnType=\"ipv4\",plmnType=\"homer\",grInstanceID=\"1\"}`

Labels:

- Label: `rat_type`

  Label Description: The rat_type indicates which Radio Access Technology is currently serving the UE"

  Example: EUTRAN

- Label: `status`

  Label Description: Subscriber status

  Example: setup, release

- Label: `pdn_type`

  Label Description: The pdn_type indicates the address type of PDN

Example: ipv4, ipv6, ipv4v6, unknown

- Label: `pdn_plmn_type`

  Label Description: It indicates the plmn type for the subscriber

  Example: homer, visitor, roamer, unknown

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

SGW Procedure Category

sgw_service_stats

Description: SGW call flow procedure counters

Sample Query: `sgw_service_stats{gr_instance_id=\"1\",sgw_procedure_type=\"create_bearer\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `sgw_procedure_type`

  Label Description: The procedure type associated with the call flow procedure

  Example: initial_attach, secondary_pdn_creation, mme_initiated_deletion, pgw_initiated_deletion, update_bearer, create_bearer, downlink_data_notification, downlink_data_notification_retry, pgw_initiated_dedicated_bearer_deletion, release_access_bearer, inter_mme_intra_sgw_idle_mode, intra_mme_intra_sgw_idle_mode, service_request, modify_bearer_req_initial_attach, inter_mme_handover, intra_mme_handover, inter_system_handover, modify_bearer_req_uli_tz_change, admin_initiated_deletion, s5_cnf_initiated_deletion, s11_cnf_initiated_deletion, sx_cnf_initiated_deletion, local_initiated_deletion, setup_timeout_deletion, create_indirect_data_forwarding_tunnel, delete_indirect_data_forwarding_tunnel, indirect_data_forwarding_tunnel_guard_timer_expiry, db_conflict_initiated_deletion, s1_sgw_relocation_attach, context_replacement, modify_bearer_command, delete_bearer_command, inter_system_handover_attach, x2_gngp_to_lte_relocation_attach, s1_gngp_to_lte_relocation_attach, inter_system_handover, modify_bearer_req_x2_gngp_to_lte_relocation, modify_bearer_req_s1_gngp_to_lte_relocation, change_notification, upf_sess_idle_timeout_deletion, upf_initiated_deletion, s5_path_failure_initiated_deletion, s5_recovery_initiated_deletion, s11_path_failure_initiated_deletion, s11_recovery_initiated_deletion, sx_path_failure_initiated_deletion, sx_recovery_initiated_deletion

- Label: `interface`

  Label Description: The interface type associated with the call flow procedure

  Example: interface_sgw_ingress, interface_sgw_egress

- Label: `status`

  Label Description: The status of the call flow procedure. In case of procedure failure it can indicate whether the message was rejected or was the message discarded.

Example: attempted, success, failure, rejected, discarded

- Label: `fail_reason`

  Label Description: High level reason for failure status. For sucessess and attempted it will be Empty

  Example: gtp_validation_fail, gtp_cause_fail, gtp_peer_not_responding, sx_validation_fail, sx_cause_fail, sx_peer_not_responding, timeout, internal_failure, userplane_selection_fail, gtp_partial_fail, sx_oci_throttling_reject, collision_abort, collision_discard, gtp_entity_in_congestion

- Label: `sub_fail_reason`

  Label Description: Incoming negative GTP/Sx Cause or type of TIMEOUT that led to the failure. For other failures it will be Empty

  Example: invalid_msg_format, version_not_supported, service_not_supported, imsi_imei_not_known, preferred_pdn_type_unsupported, mand_ie_missing, cond_ie_missing, invalid_len, mand_ie_incorrect, no_resource_available, temp_rejected_due_to_handover_in_progress, peer_not_responding, context_not_found, unable_to_page_ue, unable_to_page_ue_due_to_suspension, ue_already_reattached, temp_rejected_due_to_ho_in_progress, sx_req_rejected, invalid_fw_policy, invalid_fteid_alloc_opt, rule_creation_mod_fail, no_estab_sx_assoc, system_failure, pfcp_entity_in_congestion, procedure_timeout, ipc_timeout, transaction_timeout, missing_or_unknown_apn

- Label: `reject_cause`

  Label Description: In case of procedure failure it will be used to indicate the outgoing GTP/Sx cause being sent to the peer. In other cases it will be Empty.

  Example: invalid_msg_format, version_not_supported, invalid_len, mandatory_ie_missing, conditional_ie_missing, mandatory_ie_incorrect, service_not_supported, imsi_imei_not_known, preferred_pdn_type_unsupported, system_failure, no_resources_available, temp_rejected_due_to_handover_in_progress, service_denied, peer_not_responding, context_not_found, request_rejected, missing_or_unknown_apn, entity_in_congestion

SGW Resource Management Statistics Category

sgw_resource_mgmt_stats

Description: It gives information about number of allocated/deallocated ID's from resource manager

Sample Query:
```
sgw_resource_mgmt_stats{label_id_type=\"id_alloc\",status=\"success\",grInstanceID=\"1\"}
```

Labels:

- Label: `label_id_type`

  Label Description: The label_id_type indicates if its ID allocation or deallocation"

  Example: id_alloc, id_dealloc

- Label: `status`

  Label Description: The status of ID allocation/deallocation

  Example: attempted, success, failure

- Label: `gr_instance_id`

Label Description: GR instance ID

Example: 1, 2

SGW Sx Session Report Statistics Category

sgw_sx_session_report_stats

Description: Total Sx Session-Report-Requests processed

Sample Query:
`sgw_sx_session_report_stats{sx_session_report_type=\"USAR\",sx_usage_report_status=\"success\"}`

Labels:

- Label: `sx_session_report_type`

  Label Description: Type of the session-report

  Example: USAR,DLDR

- Label: `sx_usage_report_status`

  Label Description: Processing status of usage report

  Example: success, failure

SGW UE Disconnect Statistics Category

sgw_ue_disconnect_stats

Description: SGW UE disconnects counters

Sample Query: `sgw_ue_disconnect_stats{gr_instance_id=\"1\",reason=\"admin_init_disconnect\"}`

Labels:

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

- Label: `reason`

  Label Description: The reason indicates the disconnect reason associated with the UE

  Example: admin_init_disconnect, remote_init_disconnect, pgw_init_pdn_sess_rel, mme_init_pdn_sess_rel, sx_request_rejected, sx_context_not_found, sx_msg_invalid_length, sx_no_resource_available, sx_no_response, sx_reason_unknown, no_response, s5_context_not_found, s11_context_not_found, local_disconnect, no_cause, userplane_info_not_available, db_conflict_init_disconnect, userplane_session_idle_timeout, userplane_requested_graceful_termination, s1u_gtpu_error, s5u_gtpu_error, s1u_gtpu_session_replacement, s5u_gtpu_session_replacement, sx_recovery, sx_path_failure,s11_path_failure, s5e_path-failure,s11_path_failure_local_purge, s5e_path_failure_local_purge,s5e_recovery, s11_recovery, s5e_recovery_local_purge, s11_recovery_local_purge

SGW UE Level Counters Category

sgw_ue_counters

Description: UE level counter

Sample Query: `sgw_ue_counters{ratType=\"EUTRAN\",state=\"idle\",grInstanceID=\"1\"}`

Labels:

- Label: `rat_type`

  Label Description: The rat_type indicates which Radio Access Technology is currently serving the UE"

  Example: EUTRAN

- Label: `state`

  Label Description: Subscriber state

  Example: idle, connected

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2

SGW UE Level Statistics Category

sgw_ue_stats

Description: UE level statistics

Sample Query: `sgw_ue_stats{ratType=\"EUTRAN\",status=\"setup\",grInstanceID=\"1\"}`

Labels:

- Label: `rat_type`

  Label Description: The rat_type indicates which Radio Access Technology is currently serving the UE"

  Example: EUTRAN

- Label: `status`

  Label Description: Subscriber status

  Example: setup, release

- Label: `gr_instance_id`

  Label Description: GR instance ID

  Example: 1, 2