Key Performance Indicators

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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.		