Intra-MME and Inter-MME Handover Procedures

- Feature Summary and Revision History, on page 1
- Feature Description, on page 1
- How it Works, on page 2
- Intra-MME and Inter-MME Handover Procedures OAM Support, on page 9

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.	2021.01.0

Feature Description

cnSGW-C supports Intra-MME Intra-SGW, and Inter-MME Intra-SGW handover.

How it Works

This section describes how this feature works.

Call Flows

This section describes the key call flows for this feature.

Inter-MME Handover Active-Active Transition Call Flow

This section describes the Inter-MME Handover Active-Active Transition call flow.

Figure 1: Inter-MME Handover Active-Active Transition Call Flow

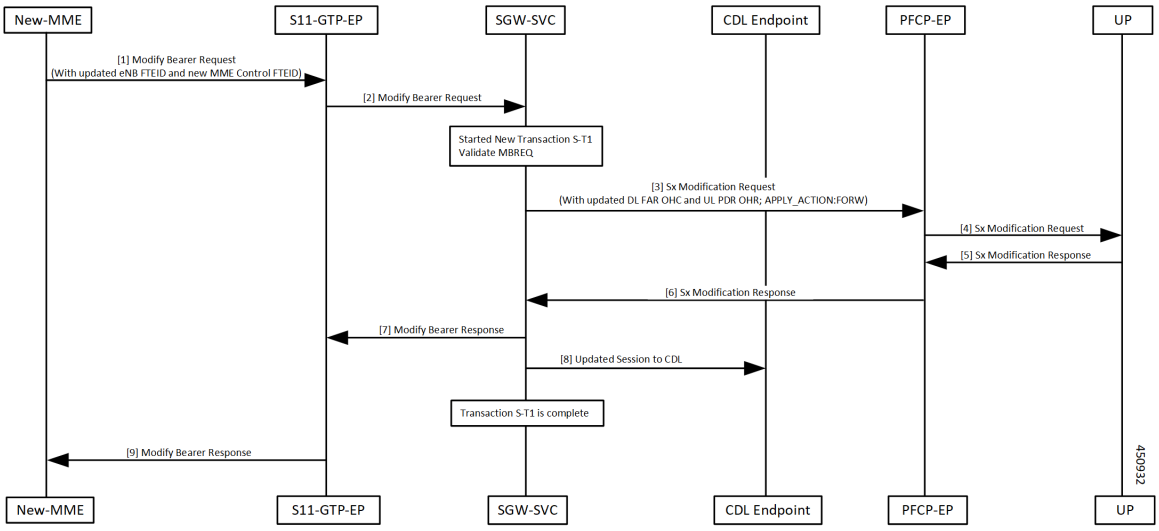


Table 3: Inter-MME Handover Active-Active Transition Call Flow Description

Step	Description
1	New-MME sends the Modify Bearer Request to the S11-GTP-EP pod, with updated eNodeB F-TEID and new MME control F-TEID.
2	S11-GTP-EP pod forwards the Modify Bearer Request to the SGW-SVC. SGW-SVC performs the following: • Creates a new transaction S-T1 • Validates the Modify Bearer Request
3	SGW-SVC sends the the Sx Modification Request with downlink FAR OHC, uplink PDR OHR, and APPLY ACTION as FORWARD, to the PFCP-EP pod.
4	PFCP-EP pod sends the Sx Modification Request to the UP.
5	UP sends the Sx Modification Response to the PFCP-EP pod.

Step	Description
6	PFCP-EP pod sends the Sx Modification Response to the SGW-SVC.
7	SGW-Service pod sends the Modify Bearer response to the S11-GTP-EP pod.
8	SGW-SVC sends the Updated Session to the CDL Endpoint. Transaction S-T1 is complete.
9	S11-GTP-EP pod sends the Modify Bearer Response to the New-MME.

Intra-MME Handover Active-Active Transition Call Flow

This section describes the Inear-MME Handover Active-Active Transition call flow.

Figure 2: Intra-MME Handover Active-Active Transition Call Flow

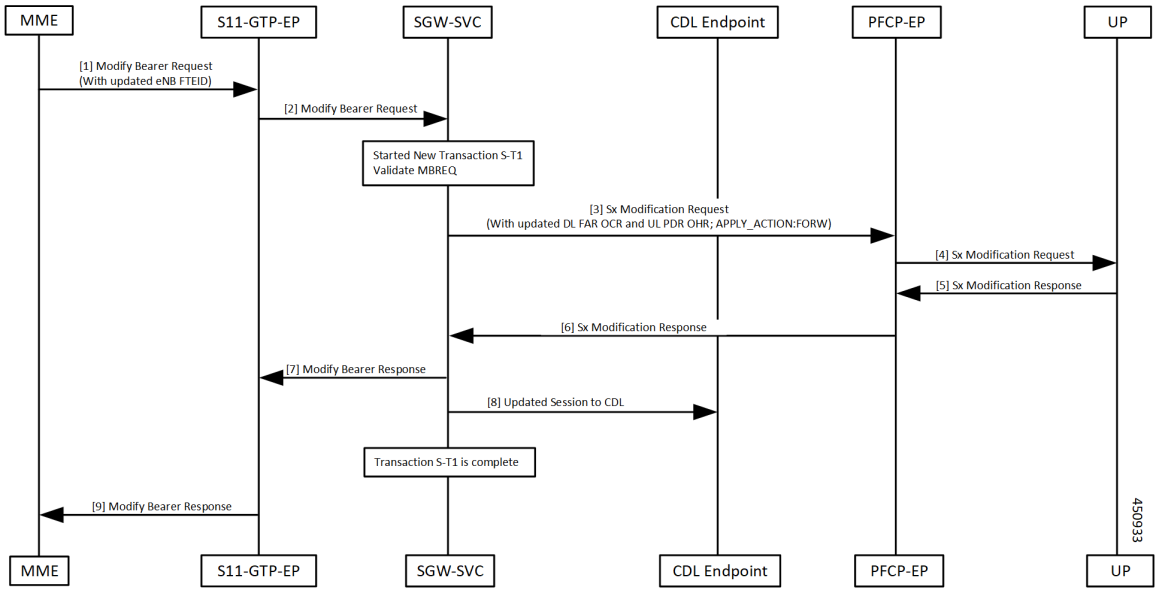


Table 4: Intra-MME Handover Active-Active Transition Call Flow Description

Step	Description
1	MME sends the Modify Bearer Request to the S11-GTP-EP pod, with the updated eNodeB F-TEID.
2	S11-GTP-EP pod sends the Modify Bearer Request to the SGW-SVC. SGW-SVC performs the following: • Creates a new transaction S-T1 • Validates Modify Bearer Request
3	SGW-SVC sends the the Sx Modification Request with downlink FAR OCR, uplink PDR OHR, and APPLY ACTION as FORWARD, to the PFCP-EP pod.

Step	Description
4	PFCP-EP pod forwards the Sx Modification Request to the UP.
5	UP sends the Sx Modification Response to the PFCP-EP pod.
6	PFCP-EP pod sends the Sx Modification Response to the SGW-SVC.
7	SGW-SVC sends the Modify Bearer Response to the S11-GTP-EP pod.
8	SGW-SVC sends the Updated Session to the CDL Endpoint. Transaction S-T1 is complete.
9	S11-GTP-EP pod sends the Modify Bearer Response to the MME.

Inter/Intra-MME Handover Idle-Idle Transition Call Flow

This section describes the Inter/Intra-MME Handover Idle-Idle Transition call flow.

Figure 3: Inter/Intra-MME Handover Idle-Idle Transition Call Flow

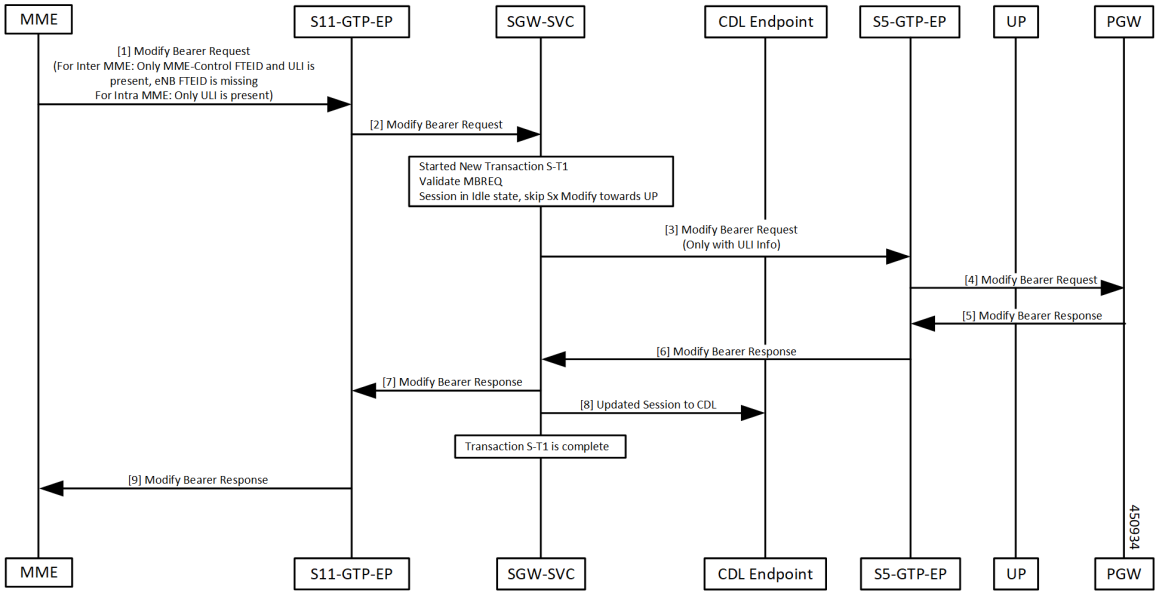


Table 5: Inter/Intra-MME Handover Idle-Idle Transition Call Flow Description

Step	Description
1, 2	For inter-MME, received Modify Bearer request at SGW-Service POD via S11-GTPC-EP POD with MME control F-TEID and ULI. There is no eNodeB F-TEID. For intra-MME, received Modify Bearer request at SGW-Service POD with only ULI present: • Create a new transaction S-T1. • Validate Modify Bearer request. • Skip Sx modification as session is in idle state.

Step	Description
3, 4	Received Modify Bearer request at S5 GTPC-EP POD from SGW-Service POD with ULI. Modify Bearer request is forwarded to PGW.
5, 6	Received Modify Bearer response at S5 GTPC-EP POD from PGW. Modify Bearer response received at SGW-Service POD.
7	SGW-Service POD forwards Modify Bearer response to S11 GTPC-EP POD ingress.
8, 9	Session updated at CDL. Transaction S-T1 is complete. S11 GTPC-EP POD forwards Modify Bearer response to MME.

Inter/Intra-MME Handover Active-Idle Transition Call Flow

This section describes the Inter/Intra-MME Handover Active-Idle transition call flow.

Figure 4: Inter/Intra-MME Handover Active-Idle Transition Call Flow

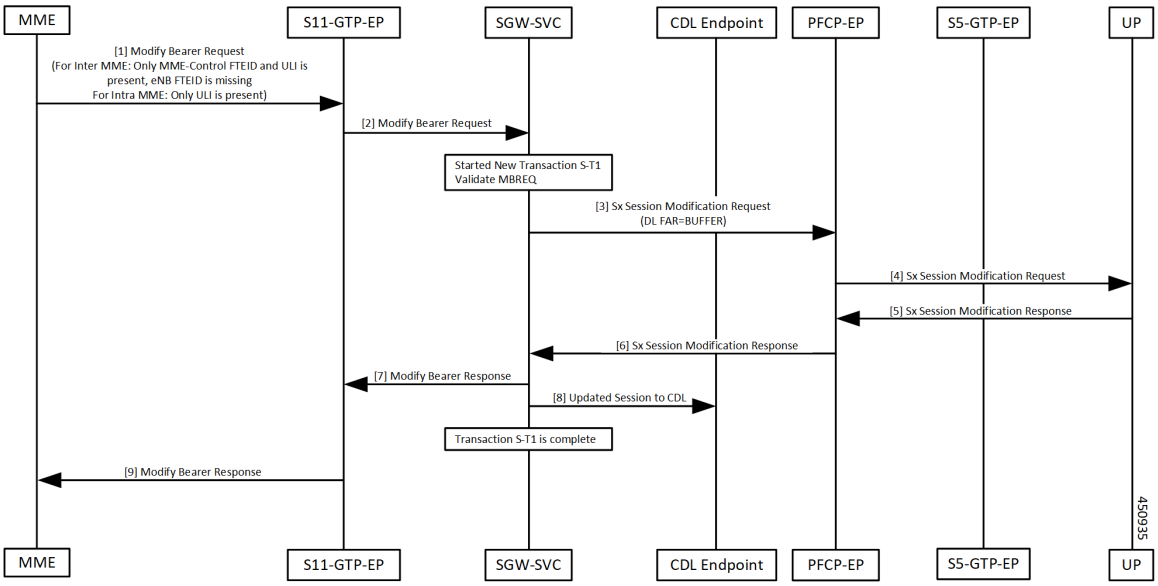


Table 6: Inter/Intra-MME Handover Active-Idle Transition Call Flow Description

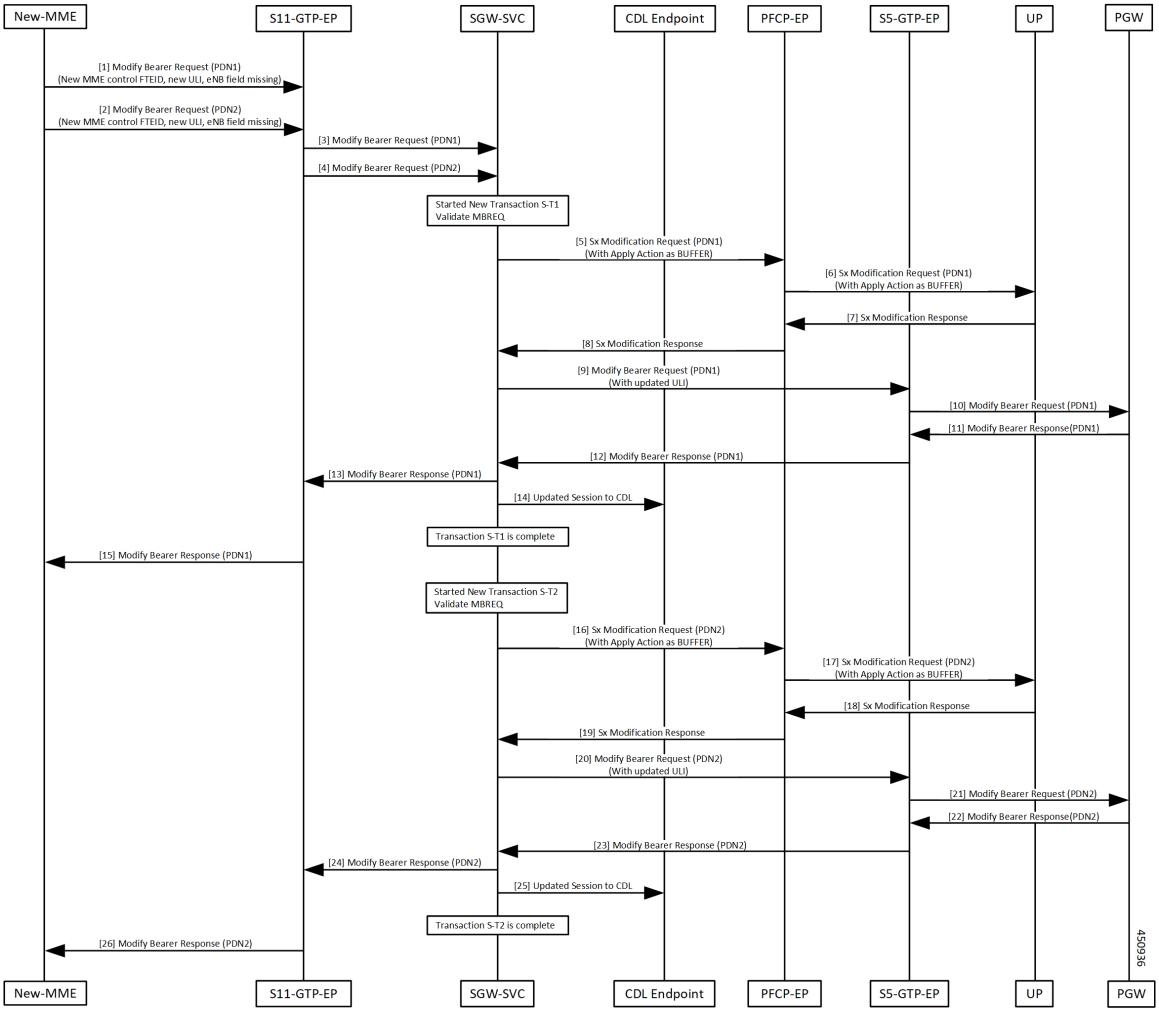
Step	Description
1, 2	For inter-MME, received Modify Bearer request at SGW-Service POD via S11-GTPC-EP POD with MME control F-TEID and ULI. There is no eNodeB F-TEID. For intra-MME, received Modify Bearer request at SGW-Service POD with only ULI present: • Create a new transaction S-T1. • Validate Modify Bearer request.
3, 4	Received Sx Modification request at PFCP-EP POD from SGW-Service POD with downlink FAR as BUFFER. Sx Modification request is forwarded to UP.

Step	Description
5, 6	Received Sx Modification response at at PFCP-EP POD from UP. Sx Modification response received at SGW-Service POD.
7	SGW-Service POD forwards Modify Bearer response to GTPC-EP POD ingress.
8, 9	Session updated at CDL. Transaction S-T1 is complete. GTPC-EP POD forwards Modify Bearer response to MME.

Inter-MME Handover and Multi-PDN Handling Active-Idle Transition with ULI Change Call Flow

This section describes the Inter-MME Handover and Multi-PDN Handling Active-Idle transition with ULI change call flow.

Figure 5: Inter-MME Handover and Multi-PDN Handling Active-Idle Transition with ULI Change Call Flow



Repeat the steps provided in the Table 7: Inter-MME Handover and Multi-PDN Handling Active-Idle Transition with ULI Change Call Flow Description, on page 7 for PDN1 and PDN2 with respective transaction S-T1 and S-T2.

Table 7: Inter-MME Handover and Multi-PDN Handling Active-Idle Transition with ULI Change Call Flow Description

Step	Description
1, 2, 3, 4	Received Modify Bearer request for both the PDNs (PDN1 and PDN2) at SGW-Service POD with new MME control F-TEID and new ULI. There is no eNodeB F-TEID present in Modify Bearer request. • Create a new transaction S-T1. • Validate Modify Bearer request.
5, 6	Received Sx Modification request from SGW-Service POD > PFCP-EP POD with APPLY ACTION as BUFFER. Sx Modification request is forwarded to UP.
7, 8	Received Sx Modification response from UP > PFCP-EP POD. Sx Modification response received at SGW-Service POD.
9, 10	Received Modify Bearer request from SGW-Service POD > S5 GTPC-EP POD with updated ULI. Modify Bearer request is received at PGW.
11, 12	Received Modify Bearer response from PGW > S5 GTPC-EP POD. Modify Bearer response received from S5 GTPC-EP POD > SGW-Service POD.
13	SGW-Service POD forwards Modify Bearer response to GTPC-EP POD ingress.
14, 15	Session updated at CDL. Transaction S-T1 is complete. GTPC-EP POD forwards Modify Bearer response to MME.

Inter-MME Handover with Bearer Context Marked for Removal Call Flow

This section describes the Inter-MME Handover with Bearer Context Marked for Removal call flow.

Figure 6: Inter-MME Handover with Bearer Context Marked for Removal Call Flow

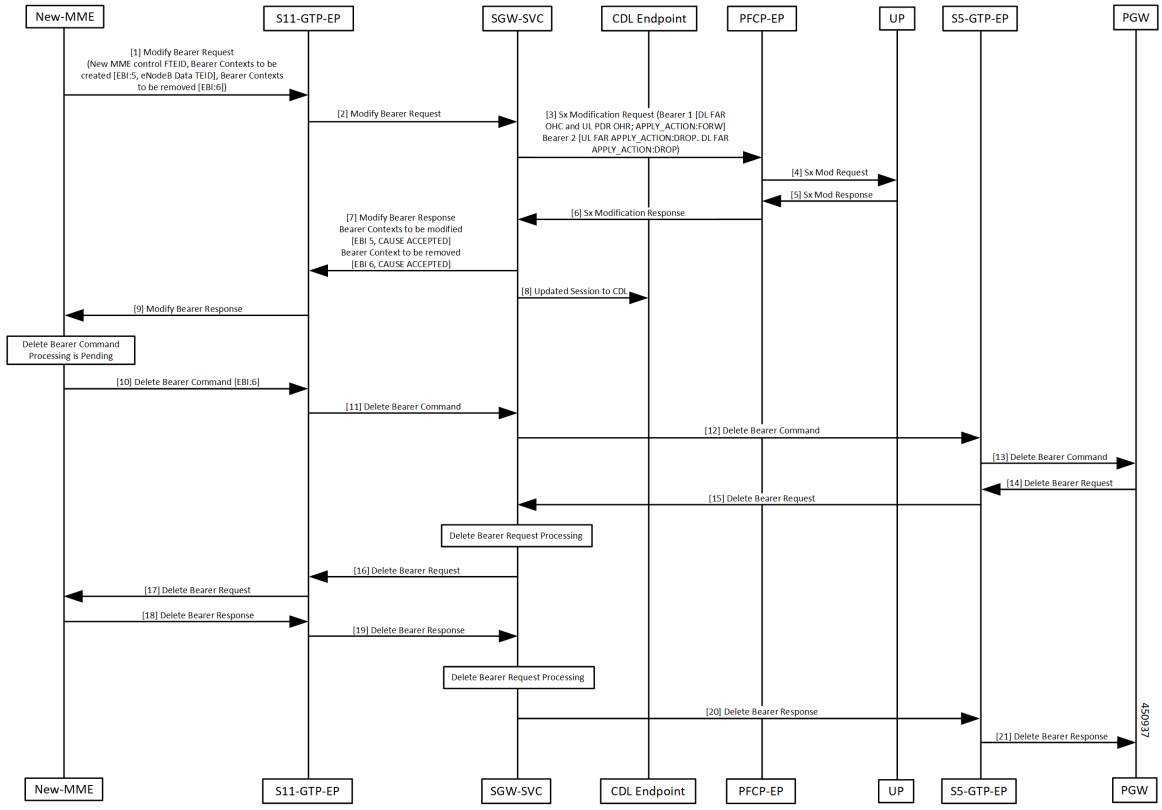


Table 8: Inter-MME Handover with Bearer Context Marked for Removal Call Flow Description

Step	Description
1, 2	Received Modify Bearer request at SGW-Service POD with new MME control F-TEID, bearer-context-1 to be created with EBI:5, eNodeB data TEID, bearer-context-2 to be removed with EBI:6. • Create a new transaction S-T1. • Validate Modify Bearer request.
3, 4	Received Sx Modification request from SGW-Service POD to PFCP-EP POD for: • bearer-context-1: downlink FAR OHC, uplink PDR OHR and APPLY ACTION as FORWARD • bearer-context-2: uplink FAR APPLY ACTION as DROP and downlink FAR APPLY ACTION as DROP Sx Modification request is forwarded to UP.
5, 6	Received Sx Modification response from UP > PFCP-EP POD. Sx Modification response is received at SGW-Service POD.

Step	Description
7	SGW-Service POD forwards Modify Bearer response to GTPC-EP POD ingress with bearer context to be modified (EBI:5, cause as ACCEPTED) and bearer context to be removed (EBI:6, cause as ACCEPTED).
8, 9	Session updated at CDL. GTPC-EP POD forwards Modify Bearer response to MME.
10, 11	Received delete bearer command at SGW-Service POD with EBI:6.
12, 13	SGW-Service POD forwards delete bearer command to S5 GTPC-EP POD. Delete bearer command received at PGW.
14, 15	Received Delete Bearer request from PGW > S5 GTPC-EP POD. Delete Bearer request received at SGW-Service POD.
16, 17	SGW-Service POD processes Delete Bearer request and forwards it to GTPC-EP POD ingress.
18, 19	Delete Bearer response received at SGW-Service POD and processed.
20, 21	Delete Bearer response received at S5 GTPC-EP POD. Delete Bearer response is received at PGW.

Intra-MME and Inter-MME Handover Procedures OAM Support

This section describes operations, administration, and maintenance information for this feature.

Bulk Statistics

The following statistics are supported for the Intra-MME and Inter-MME Handover Procedures feature.

Intra-MME Handover

```
sgw_service_stats{app_name="smf",cluster="cn",data_center="cn",fail_reason="",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",
sgw_procedure_type="intra_mme_handover",status="attempted",sub_fail_reason=""} 2
```

```
sgw_service_stats{app_name="smf",cluster="cn",data_center="cn",fail_reason="",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",
sgw_procedure_type="intra_mme_handover",status="success",sub_fail_reason=""} 2
```

Inter-MME Handover

```
sgw_service_stats{app_name="smf",cluster="cn",data_center="cn",fail_reason="",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",
sgw_procedure_type="inter_mme_handover",status="attempted",sub_fail_reason=""} 2
```

```
sgw_service_stats{app_name="smf",cluster="cn",data_center="cn",fail_reason="",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",
sgw_procedure_type="inter_mme_handover",status="success",sub_fail_reason=""} 2
Perform S1 Based SGW handover (with OI=0)
```