

# GTPU Error Indication


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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 |
|---|---|
| Support added for signal peer (error indication and configuration is signal peer) | 2021.02.3 |
| First introduced. | 2021.02.1 |

# Feature Description

cnSGW-C supports the UPF reported GTPU errors in Session Report Request. UPF reports different GTPU errors to CP (cnSGW-C) in PFCP Session Report Request message.

cnSGW-C supports the following report requests.

- Error Indication Support (ERIR)
- Graceful Termination (GTER)
- Session Replacement (SRIR)

# How it Works

This section describes how this feature works.

## Error Indication Support

When cnSGW-C receives Error Indication with PFCP Session Report Request from UPF, it responds with PFCP Session Report Response and performs as per the configuration.

For cnSGW-C, signaling is based on configuration.

- S1U - local purge or page-ue
- S5U - local purge or peer signaling

*Table 3: Error Indication Support (ERIR) Report Type*

| Interface | Configuration | TEID | Action |
|---|---|---|---|
| S1U | Local Purge | Default | Send SxSessionDeleteRequest to clean up on UPF<br>Purge locally |
| | | Dedicated | Send SxModReq (Remove Traffic Endpoint)<br>Purge locally |
| | | IDFT | Send SxMod (Remove IDFT Traffic Endpoint) - async<br>Purge Bearer locally |
| | Page-UE | Default / Dedicated | Move UE to Idle state<br>Send Sx_Modification<br>_Request (Set FAR Action=BUFFER) |
| S5U | Local Purge | Default | Send SxDeleteSession<br>Purge locally |
| | | Dedicated | Send SxMod (Remove Traffic Endpoint)<br>Purge Bearer locally |
| | Signal Peer | Default | Send SxMod (Drop) DBR/DSR, SxDelete |
| | | Dedicated | Send DBR/DBC (Async), SxMod (Remove Traffic Endpoint) |

## Default Bearer with s1u as local-purge Call Flow

This section describes Default Bearer with s1u as local-purge call flow.

*Figure 1: Default Bearer with s1u as local-purge Call Flow*

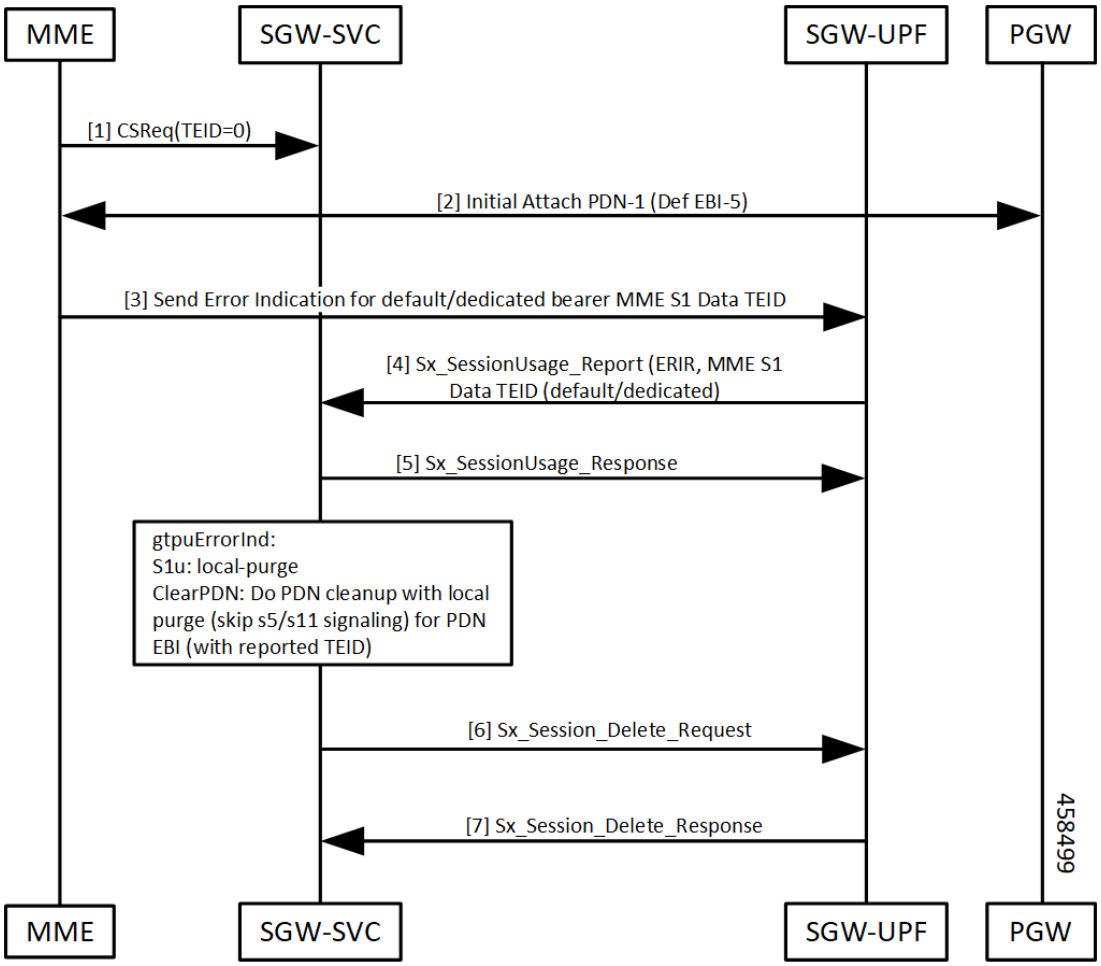



*Table 4: Default Bearer with s1u as local-purge Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | Initial attach complete. |
| 3, 4, 5 | • UPF sends Sx_Session_Report_Request with report type as ERIR and s1u TEID.<br>• cnSGW-C responds with Sx_Session_Report_Response. |

| Step | Description |
|---|---|
| 6, 7 | cnSGW-C processes Sx_Session_Report_Request.<br>gtpuErrorInd:<br>s1u: local-purge<br>If TEID received is for default bearer, submit internal transaction (T2) to clean up bearer (No peer signaling).<br>• Send Sx_Session_Deletion_Request.<br>• UPF responds with Sx_Session_Deletion_Response. |

## Dedicated Bearer with s1u as local-purge Call Flow

This section describes Dedicated Bearer with s1u as local-purge call flow.

***Figure 2: Dedicated Bearer with s1u as local-purge Call Flow***

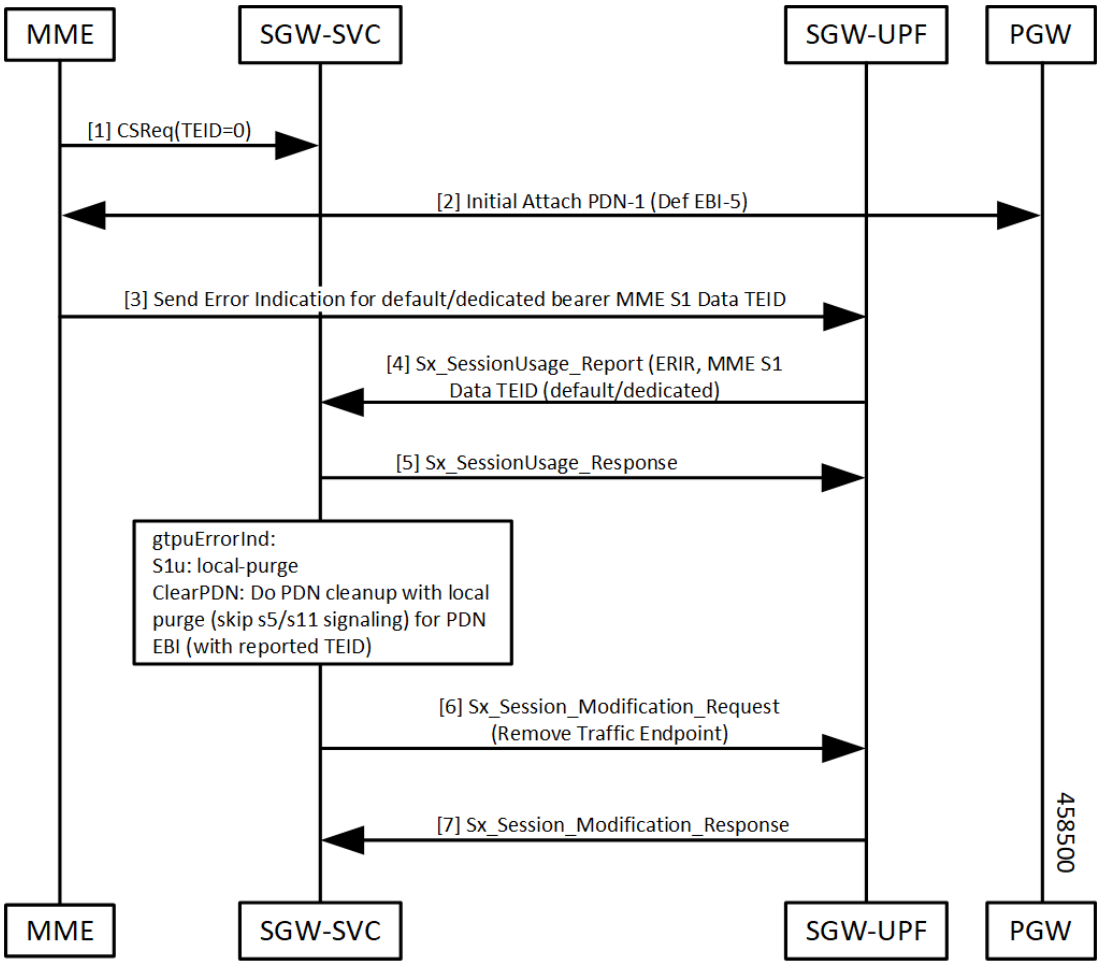


*Table 5: Dedicated Bearer with s1u as local-purge Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | Initial attach complete. |
| 3, 4, 5 | • UPF sends Sx_Session_Report_Request with report type as ERIR and s1u TEID.<br>• cnSGW-C responds with Sx_Session_Report_Response. |
| 6, 7 | cnSGW-C processes Sx_Session_Report_Request.<br>gtpuErrorInd:<br>s1u: local-purge<br>If TEID received is for dedicated bearer, submit internal transaction (T2) to clean up bearer (No peer signaling).<br>• Send Sx_Session_Modification_Request (Remove Traffic Endpoint).<br>• UPF responds with Sx_Session_Modification_Response. |

## Dedicated Bearer (IDFT) with s1u as local-purge Call Flow

This section describes Dedicated Bearer (IDFT) with s1u as local-purge call flow.

*Figure 3: Dedicated Bearer (IDFT) with s1u as local-purge Call Flow*

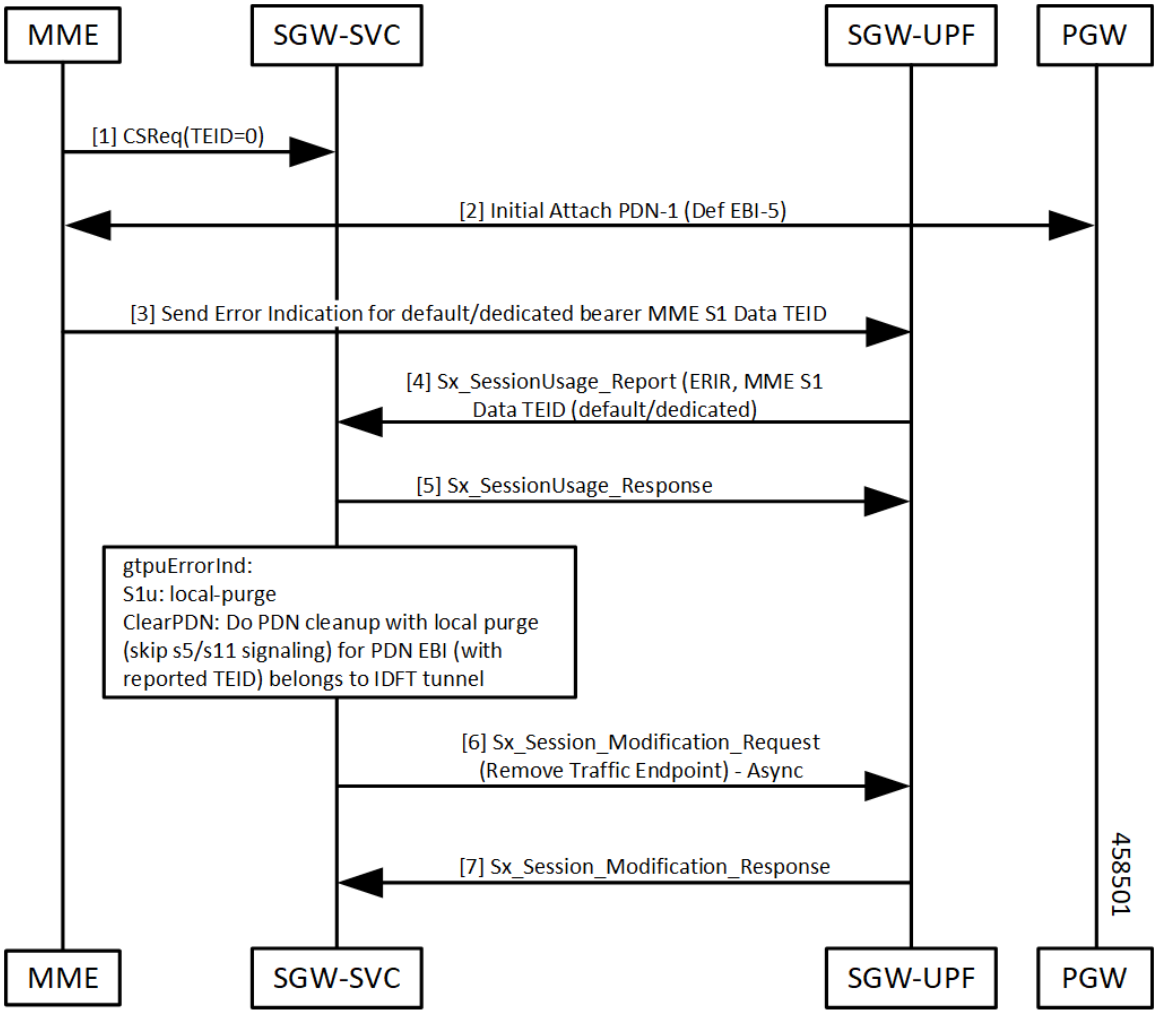



*Table 6: Dedicated Bearer (IDFT) with s1u as local-purge Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | Initial attach complete. |
| 3, 4, 5 | • UPF sends Sx_Session_Report_Request with report type as ERIR and s1u TEID.<br>• cnSGW-C responds with Sx_Session_Report_Response. |

| Step | Description |
|---|---|
| 6, 7 | cnSGW-C processes Sx_Session_Report_Request.<br>gtpuErrorInd:<br>s1u: local-purge<br>If TEID received is for dedicated bearer (IDFT), submit internal transaction (T2) to clean up bearer (No peer signaling).<br>• Send Sx_Session_Modification_Request (Remove Traffic Endpoint).<br>• UPF responds with Sx_Session_Modification_Response. |

# Default/Dedicated Bearer with s1u as page-ue Call Flow

This section describes Default/Dedicated Bearer with s1u as page-ue call flow.

***Figure 4: Default/Dedicated Bearer with s1u as page-ue Call Flow***

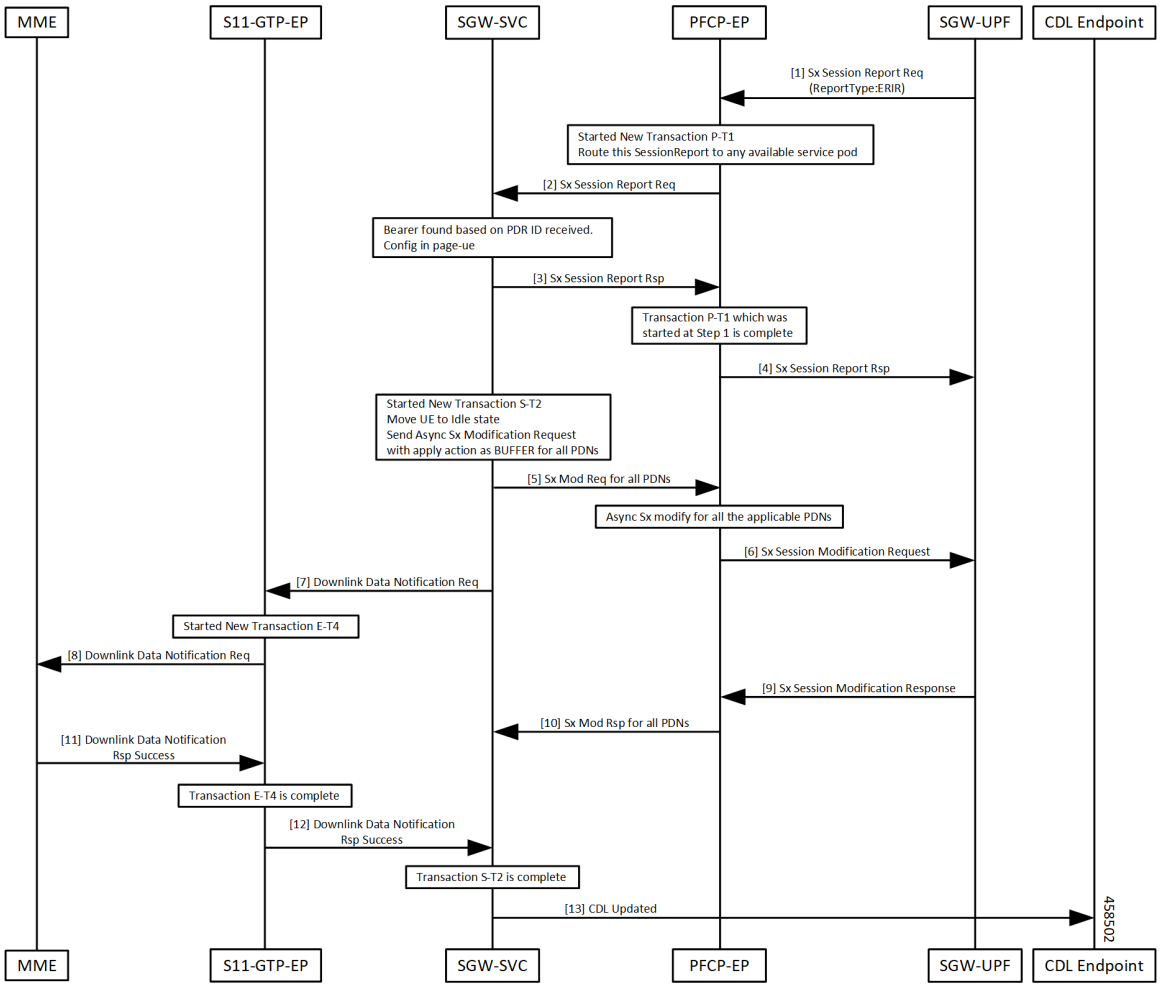


*Table 7: Default/Dedicated Bearer with s1u as page-ue Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | SGW-UP sends Sx Session Report Req with type as ERIR to SGW service POD. |
| 3, 4 | SGW service POD sends Sx Session Report Res to SGW-UPF. |
| 5, 6 | PFCP-EP sends Sx Mod Req for all PDNs to SGW service POD.<br>PFCP-EP sends Sx Session Modification Req to SGW-UP. |
| 7, 8 | SGW service POD sends Downlink Data Notification Req to S11-GTP-EP.<br>S11-GTP-EP forwards Downlink Data Notification to MME. |
| 9, 10 | SGW-UP sends Sx session Modification Rsp to SGW service POD. |
| 11, 12, 13 | MME sends Downlink Data Notification Rsp Success to S11-GTP-EP.<br>S11-GTP-EP forwards Downlink Data Notification Rsp Success to SGW service POD.<br>SGW service POD sends CDL update to CDL endpoint when S-T2 transaction gets completed. |

## Default Bearer with s5u as local-purge/signal-peer Call Flow

This section describes Default Bearer with s5u as local-purge/signal-peer call flow.

*Figure 5: Default Bearer with s5u as local-purge/signal-peer Call Flow*

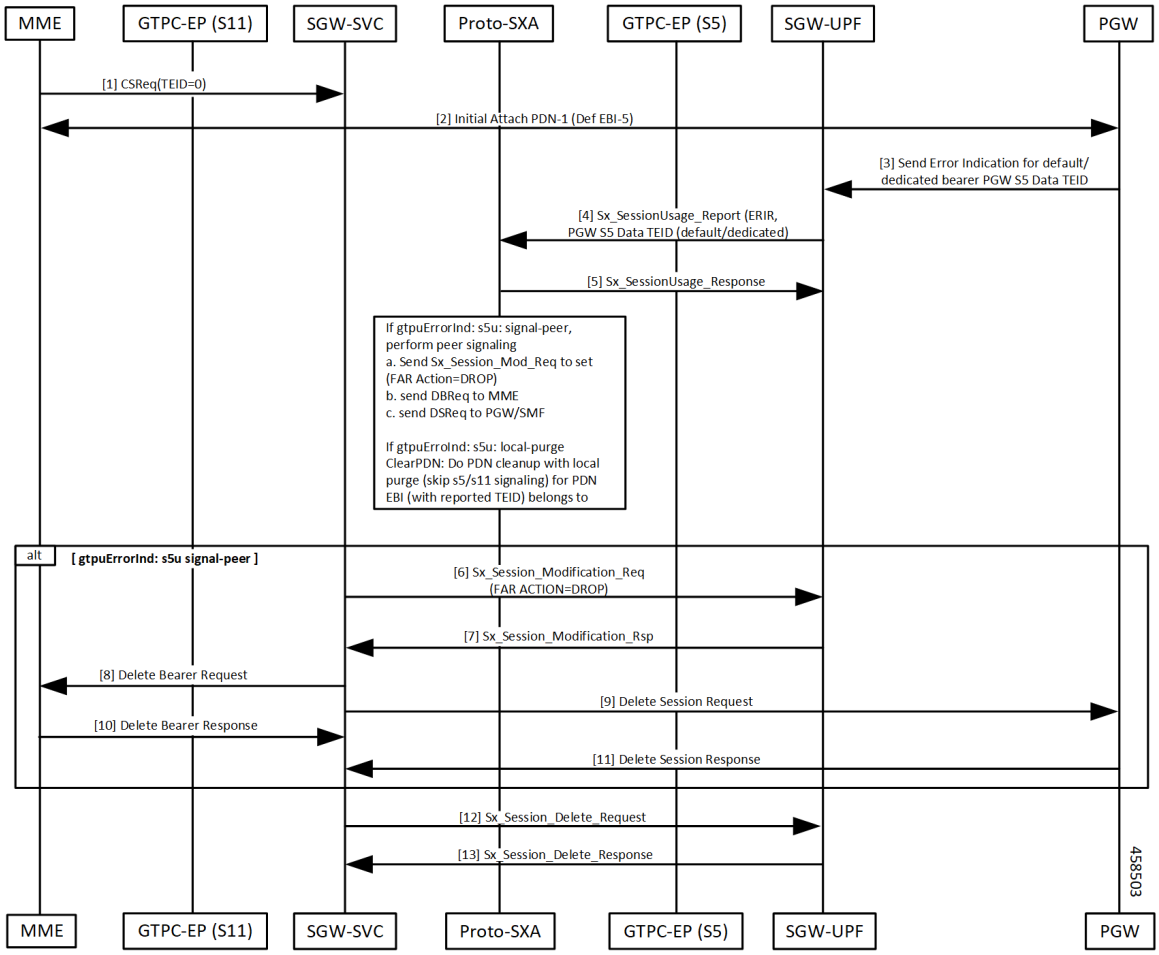



*Table 8: Default Bearer with s5u as local-purge/signal-peer Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | Initial attach complete. |
| 3, 4, 5 | GTPU Error detected on UPF.<br>• Sx_Session_Report_Request sent to cnSGW-C.<br>• cnSGW-C responds with Sx_Session_Resport_Response. |

| Step | Description |
|---|---|
| 6-11 | cnSGW-C processes Session Report Request (ERIR).<br>If TEID is received for default bearer, submit internal transaction to clean up PDN (behavior depends on CLI configured).<br>CLI: sgw-profile config<br>If gtpuErrorInd:<br>s5u: signal-peer<br>• Send Sx_Session_Report_Request to UPF to set (FAR ACTION=DROP).<br>• Send Delete Bearer Req to MME.<br>• Send Delete Session Request to PGW. |
| 12 | Send Sx_Session_Delete_Request to UPF. |
| 13 | UPF responds with Sx_Session_Delete_Response. |

## Dedicated Bearer with s5u as local-purge/signal-peer Call Flow

This section describes Dedicated Bearer with s5u as local-purge/signal-peer call flow.

*Figure 6: Dedicated Bearer with s5u as local-purge/signal-peer Call Flow*

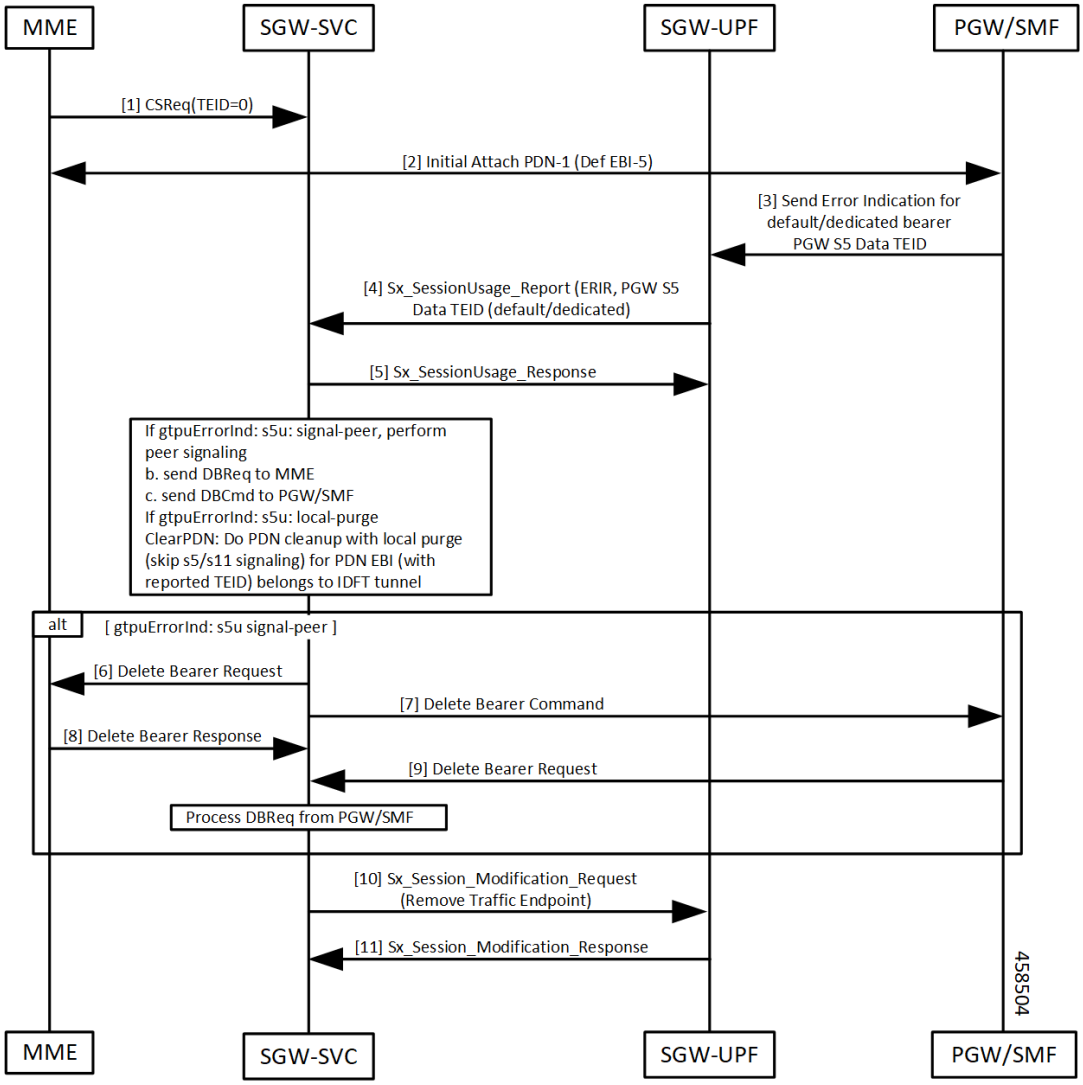



*Table 9: Dedicated Bearer with s5u as local-purge/signal-peer Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | Initial attach complete. |
| 3, 4, 5 | GTPU Error detected on UPF.<br>• Sx_Session_Report_Request sent to cnSGW-C.<br>• cnSGW-C responds with Sx_Session_Report_Response. |

| Step | Description |
|---|---|
| 6, 7, 8, 9 | cnSGW-C processes Session Report Request (ERIR). If TEID is received for dedicated bearer (s5u), submit internal transaction to clean up bearer.<br>CLI: sgw-profile config<br>If gtpuErrorInd:<br>s5u: signal-peer<br>• Send Delete Bearer Req to MME.<br>• Send Delete Bearer Command to PGW. |
| 10 | Send Sx_Session_Modification_Request (Remove Traffic Endpoint) to UPF. |
| 11 | UPF responds with Sx_Session_Modification_Response. |

# Graceful Termination

When UPF can't recover PDU session during SR/ICSR recovery, it sends PFCP session Report Request to cnSGW with type as Graceful Termination Report (GTER).

When UPF can't load session during session recovery, it sends a GTER indicating to clear up all the interfaces for this reported session.

## Graceful Termination Call Flow

This section describes Graceful Termination call flow.

*Figure 7: Graceful Termination Call Flow*

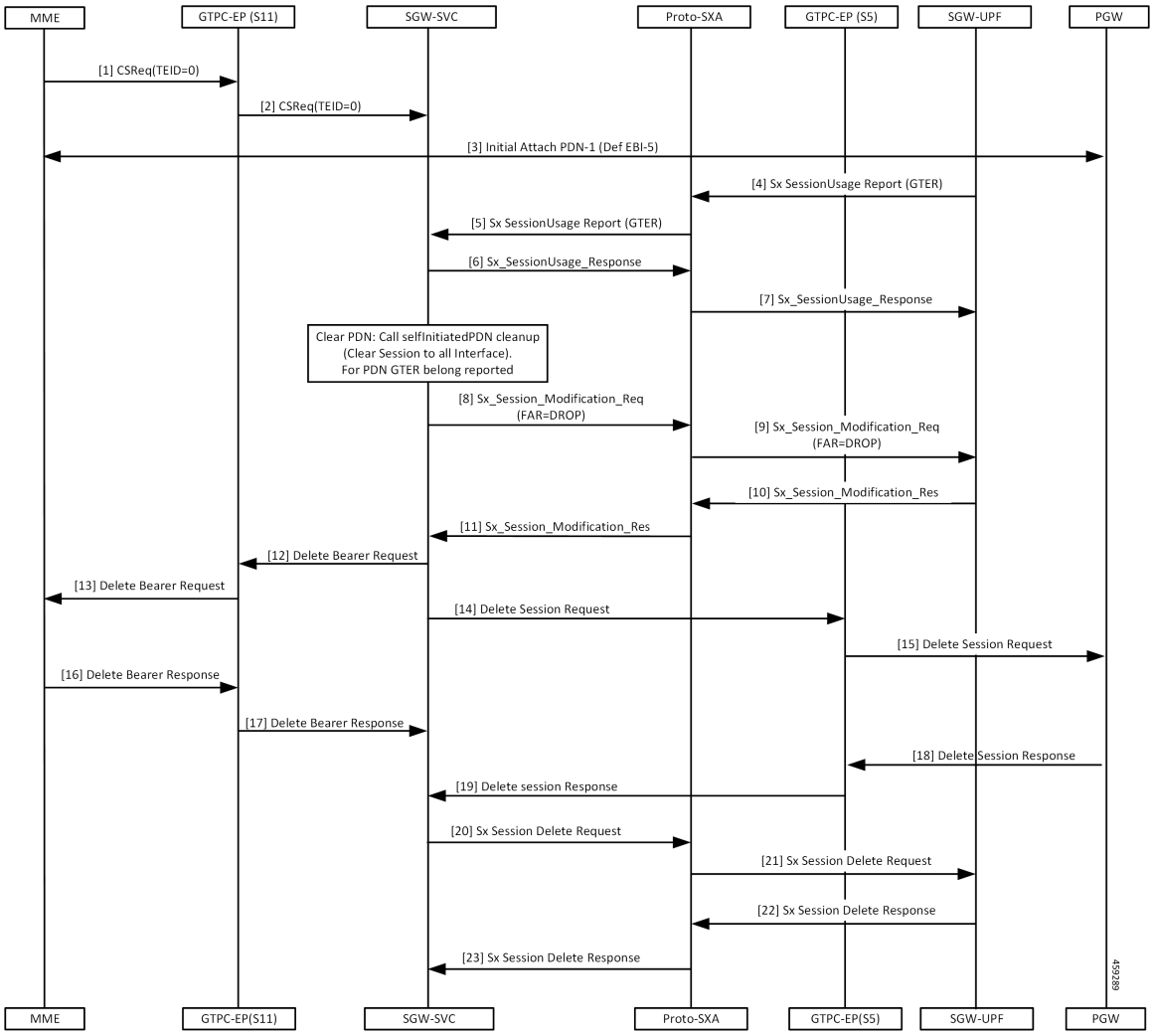



*Table 10: Graceful Termination Call Flow Description*

| Step | Description |
|---|---|
| 1, 2, 3 | Initial attach complete. |
| 4-7 | • UPF sends Sx_Session_Report_Request with report type as GTER and TEID.<br>• cnSGW-C responds with Sx_Session_Report_Response. |
| 8-11 | cnSGW-C processes Sx_Session_Report_Request and submits internal transaction (T2) to clean up PDN.<br>• cnSGW-C sends Sx_Session_Modification_Request to set FAR Action=Drop.<br>• UPF responds with Sx_Session_Modification_Response. |

| Step | Description |
|---|---|
| 12-19 | • Send Delete Bearer Req to MME.<br>• Send Delete Session Request to PGW. |
| 20-23 | • Send Sx_Session_Delete_Request.<br>• UPF responds with Sx_Session_Delete_Response. |

# Session Replacement

A Session Replacement (SRIR) is required when peer allocates same GTP-U TEID.

UPF sends SRIR report indicating to delete old session with same TEID. cnSGW-C uses GTPU path failure configuration for SRIR request processing.

***Table 11: Session Replacement***

| Interface | Configuration | TEID | Action |
|---|---|---|---|
| S1U/S5U | Local Purge | Default | Send SxDeleteSession<br>Purge locally |
| | | Dedicated | Send SxMod (Remove Traffic Endpoint)<br>Purge Bearer locally |
| | Signal Peer | Default | Send SxMod (Drop)<br>DBR/DSR<br>SxDelete |
| | | Dedicated | Send DBR/DBC (Async)<br>SxMod (Remove Traffic Endpoint) |
| IDFT | NA | NA | Send SxMod (Remove IDFT Traffic Endpoint)-async<br>Purge Bearer locally |

## Session Replacement for Default Bearer Call Flow

This section describes the Session Replacement (SRIR) for Default Bearer call flow.

*Figure 8: Session Replacement for Default Bearer Call Flow*

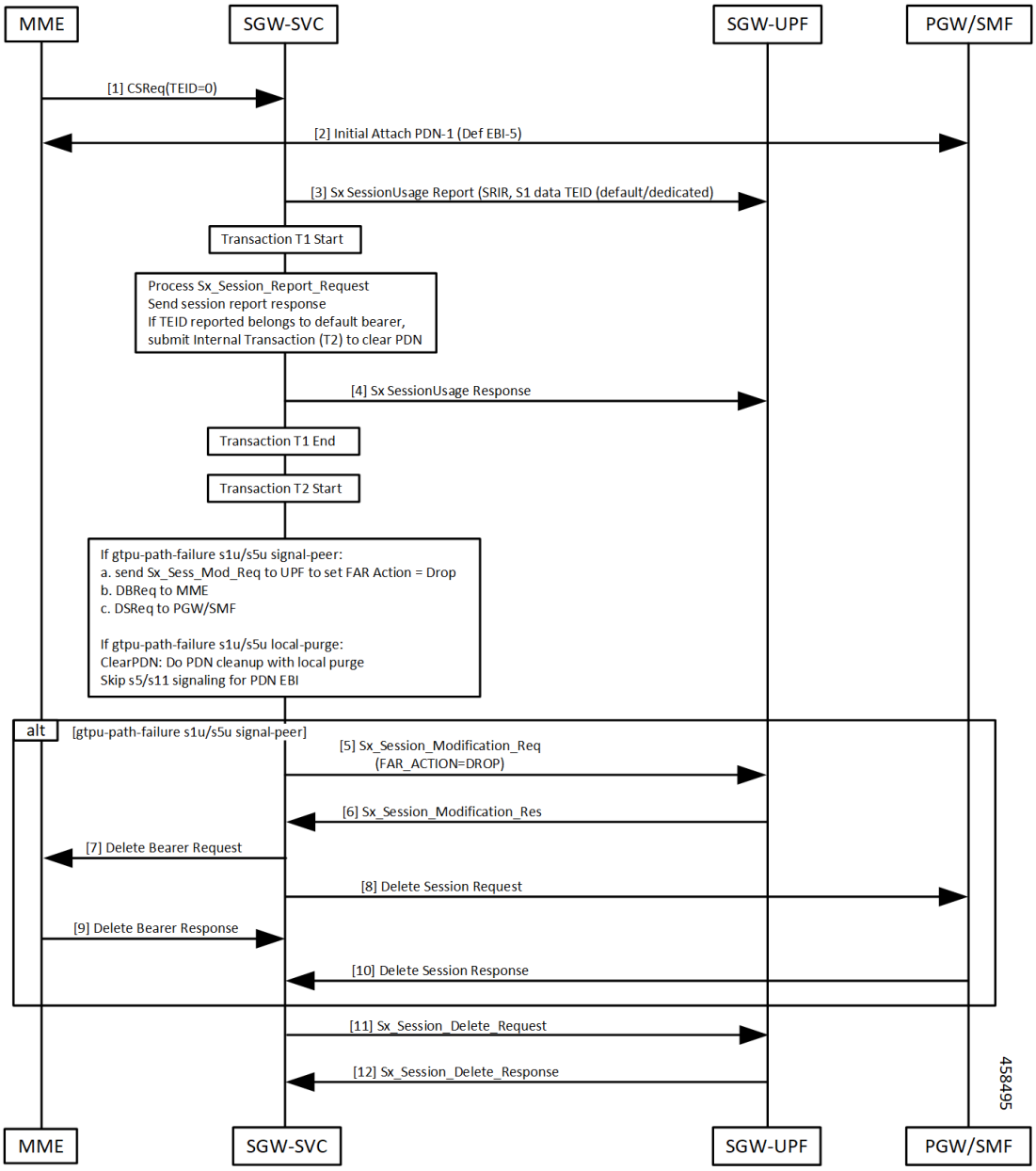



*Table 12: Session Replacement for Default Bearer Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | Initial attach complete. |
| 3, 4 | • UPF sends Sx_Session_Report_Request with report type as SRIR and TEID.<br>• cnSGW-C responds with Sx_Session_Report_Response. |

| Step | Description |
|---|---|
| 5–10 | cnSGW-C processes Sx_Session_Report_Request, wrong Session Replacement uses GTPU path failure CLI for peer-signaling or local purge.<br>If TEID is received for default bearer, submit internal transaction (T2) to clean up PDN.<br>If CLI, `gtpu-path-failure s1u/s5u signal-peer`<br>• Send Sx_Session_Report_Request to UPF to set FAR ACTION=DROP.<br>• Send Delete Bearer Req to MME.<br>• Send Delete Session Request to PGW. |
| 11, 12 | • Send Sx_Session_Delete_Request<br>• UPF responds with Sx_Session_Delete_Response. |

## Session Replacement for Dedicated Bearer Call Flow

This section describes the Session Replacement (SRIR) for Dedicated Bearer call flow.

*Figure 9: Session Replacement for Dedicated Bearer Call Flow*

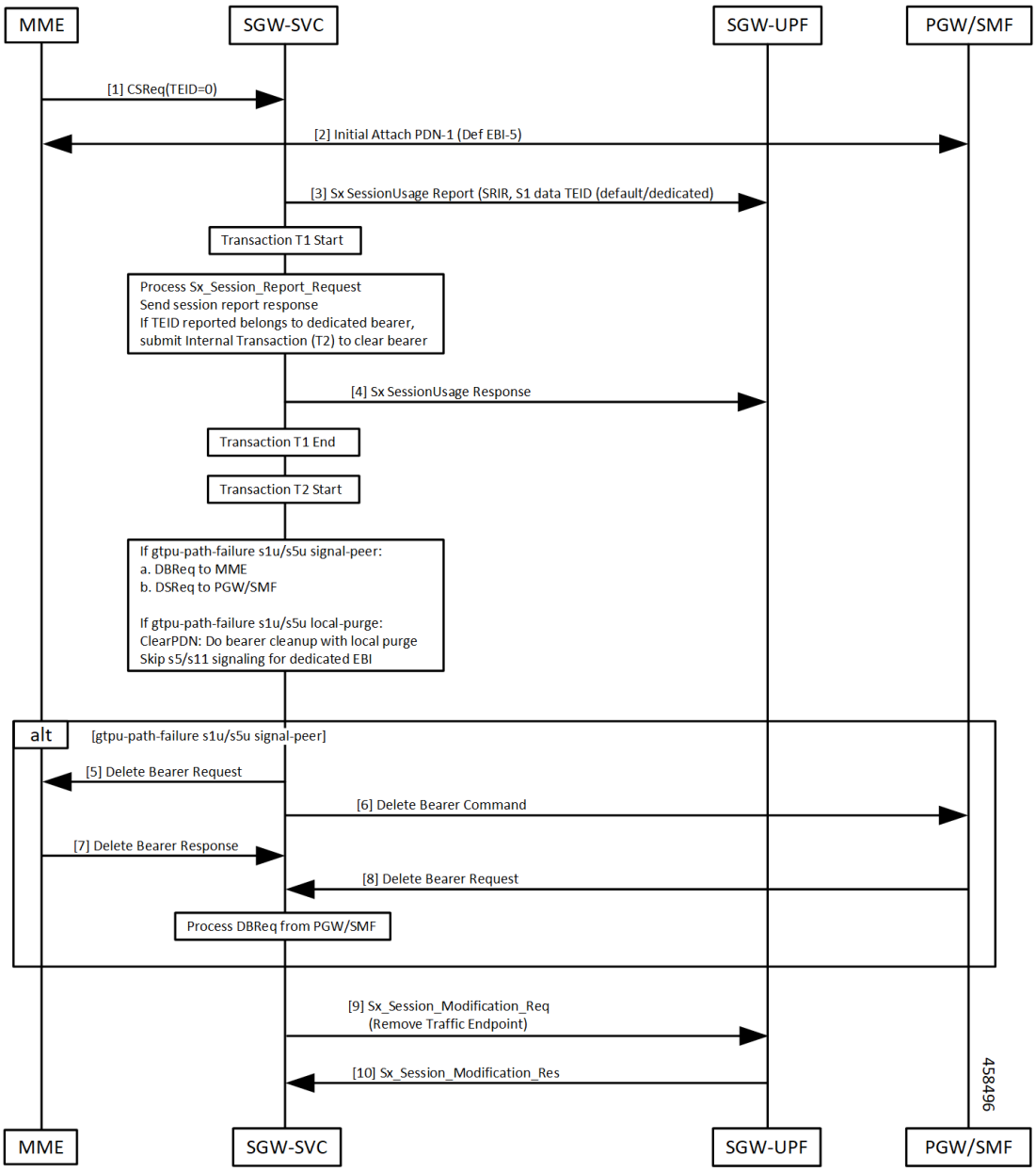



*Table 13: Session Replacement for Dedicated Bearer Call Flow Description*

| Step | Description |
|---|---|
| 1, 2 | Initial attach complete. |
| 3, 4 | • UPF sends Sx_Session_Report_Request with report type as SRIR and TEID.<br>• cnSGW-C responds with Sx_Session_Report_Response. |

| Step | Description |
|---|---|
| 5–10 | cnSGW-C processes Sx_Session_Report_Request, wrong Session Replacement uses GTPU path failure CLI for peer-signaling or local purge.<br>If TEID is received for dedicated bearer, submit internal transaction (T2) to clean up bearer.<br>If CLI, `gtpu-path-failure s1u/s5u signal-peer`<br>• Send Sx_Session_Report_Request to UPF to set FAR ACTION=DROP.<br>• Send Delete Bearer Req to MME.<br>• Send Delete Session Request to PGW. |
| 11, 12 | • Send Sx_Session_Modification_Request (Remove Traffic Endpoint)<br>• UPF responds with Sx_Session_Modification_Response. |

# Feature Configuration

This section describes how to configure the GTPU Error Indication feature.

To configure this feature, use the following configuration:

```
config
 profile sgw sgw_profile_name
  gtpu-error-ind
   s1u [ local-purge | page-ue ]
   s5u [ local-purge | signal-peer ]
   end
```

**NOTES:**

- **s1u**—S1-U interface.
- **s5u**—S5-U interface.
- **local-purge**—Locally purge the affected bearers or PDNs without informing peer.
- **page-ue**—Reset to S1-Idle state and initiate paging for this UE.
- **signal-peer**—Clear the affected bearers or PDNs with signaling towards peer.

# Configuration Example

The following is an example configuration.

```
config
profile sgw sgw1
gtpu-error-ind s1u local-purge
gtpu-error-ind s5u signal-peer s1u local-purge
end
```

# Conifguration Verification

To verify the configuration:

```
show running-config profile sgw gtpu-error-ind s1u local-purge
profile sgw sgw1
gtpu-error-ind s1u local-purge
```

# OAM Support

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

# Bulk Statistics

The following are statistics for PDN cleanup due to Error Report.

```
sgw_pdn_disconnect_stats{app_name="smf",cluster="Local",data_center="DC",instance_id="0",
pdn_type="ipv4",rat_type="EUTRAN",reason="s1u_gtpu_error",service_name="sgw-service"}
 1
```

```
sgw_pdn_disconnect_stats{app_name="smf",cluster="Local",data_center="DC",instance_id="0",
pdn_type="ipv4",rat_type="EUTRAN",reason="s5u_gtpu_error",service_name="sgw-service"}
 1
```

```
sgw_pdn_disconnect_stats{app_name="smf",cluster="Local",data_center="DC",instance_id="0",
pdn_type="ipv4",rat_type="EUTRAN",reason="s1u_gtpu_session_replacement",service_name="sgw-service"}
 1
```

```
sgw_pdn_disconnect_stats{app_name="smf",cluster="Local",data_center="DC",instance_id="0",
pdn_type="ipv4",rat_type="EUTRAN",reason="userplane_requested_graceful_termination",service_name="sgw-service"}
 1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_egress",reject_cause="",service_name="sgw-service",
sgw_procedure_type="s5u_gtpu_error_initiated_bearer_deletion",status="attempted",sub_fail_reason=""}
 1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_egress",reject_cause="",service_name="sgw-service",
sgw_procedure_type="s5u_gtpu_error_initiated_bearer_deletion",status="success",sub_fail_reason=""}
 1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_egress",reject_cause="",service_name="sgw-service",
sgw_procedure_type="s5u_gtpu_session_replacement_initiated_bearer_deletion",status="attempted",sub_fail_reason=""}
 1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_egress",reject_cause="",service_name="sgw-service",sgw_procedure_type=
"s5u_gtpu_session_replacement_initiated_bearer_deletion",status="success",sub_fail_reason=""}
 1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",sgw_procedure_type=
"s5u_gtpu_error_initiated_bearer_deletion",status="attempted",sub_fail_reason=""}
 1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",sgw_procedure_type=
"s5u_gtpu_error_initiated_bearer_deletion",status="success",sub_fail_reason=""}
1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",sgw_procedure_type=
"s5u_gtpu_session_replacement_initiated_bearer_deletion",status="attempted",sub_fail_reason=""}
 1
```

```
sgw_service_stats{app_name="smf",cluster="Local",data_center="DC",fail_reason="",gr_instance_id="1",
instance_id="0",interface="interface_sgw_ingress",reject_cause="",service_name="sgw-service",sgw_procedure_type=
"s5u_gtpu_session_replacement_initiated_bearer_deletion",status="success",sub_fail_reason=""}
 1
```

The following SGW ddn_stats_type is added for DDN initiated due to GTPU Error indication on S1u tunnel.

```
sgw_ddn_stats{app_name="smf",cluster="cn",data_center="cn",ddn_stats_type="gtpu_err_ind_triggered",
instance_id="0",service_name="sgw-service"} 2
```