Support for CSFB Procedures Suspend and Resume

- Feature Summary and Revision History, on page 1
- Feature Description, on page 1
- How it Works, on page 2

Feature Summary and Revision History

Summary Data

Table 1: Summary Data

Applicable Products or Functional Area	cnSGW-C
Applicable Platforms	SMI
Feature Default Setting	Enabled – Always-on
Related Documentation	Not Applicable

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	2022.04.0

Feature Description

Circuit Switched Fall Back (CSFB) enables the UE to camp on an EUTRAN cell and originate or terminate voice calls through a forced switchover to the circuit-switched (CS) domain or other CS-domain services,

such as Location Services (LCS) and supplementary services. Also, SMS delivery through the CS core network is realized without CSFB. As LTE EPC networks are not meant to directly anchor CS connections, when any CS voice services are initiated, any PS-based data activities on the EUTRAN network get suspended (that is, either the data transfer is suspended, or the packet switched connection is handed over to the 2G/3G network). The data activities can further be resumed to enable telephony and SMS services for LTE operators that do not plan to deploy IMS packet switched services at the initial service launch.

cnSGW-C supports the following CSFB Messaging services on an S11 interface over GTPC:

- Suspend Notification
- Suspend Acknowledgment
- Resume Notification
- Resume Acknowledgment

Along with the Resume procedure, it is possible that MME can send a nonempty Modify Bearer Request. In the suspended state, cnSGW-C supports handling the Modify Bearer Request by considering it as an implicit resume procedure.

How it Works

This section describes how this feature works.

cnSGW-C forwards Suspend Notification messages to the PGW to suspend downlink data for non-GBR traffic. Later, when the UE completes the CS services and moves back to E-UTRAN, the MME sends a Resume Notification message to cnSGW-C which forwards the message to the PGW. The downlink data traffic resumes thereafter.

Support for Empty Modify Bearer Request for Resume

In the suspended state, cnSGW-C handles the Modify Bearer Request by considering it as an implicit resume procedure. SGW resumes and forwards the empty Modify Bearer Request to PGW. If eNodeB teid exists in MBR, cnSGW-C sets the Downlink Far Action as Forward. If eNodeB teid does not exist in MBR, cnSGW-C sets the Downlink Far Action as Buffer.

Call Flows

This section describes the key call flow for this feature.

Suspend Notification Call Flow

This section describes the Suspend Notification call flow.

Figure 1: Change Notification Request Call Flow

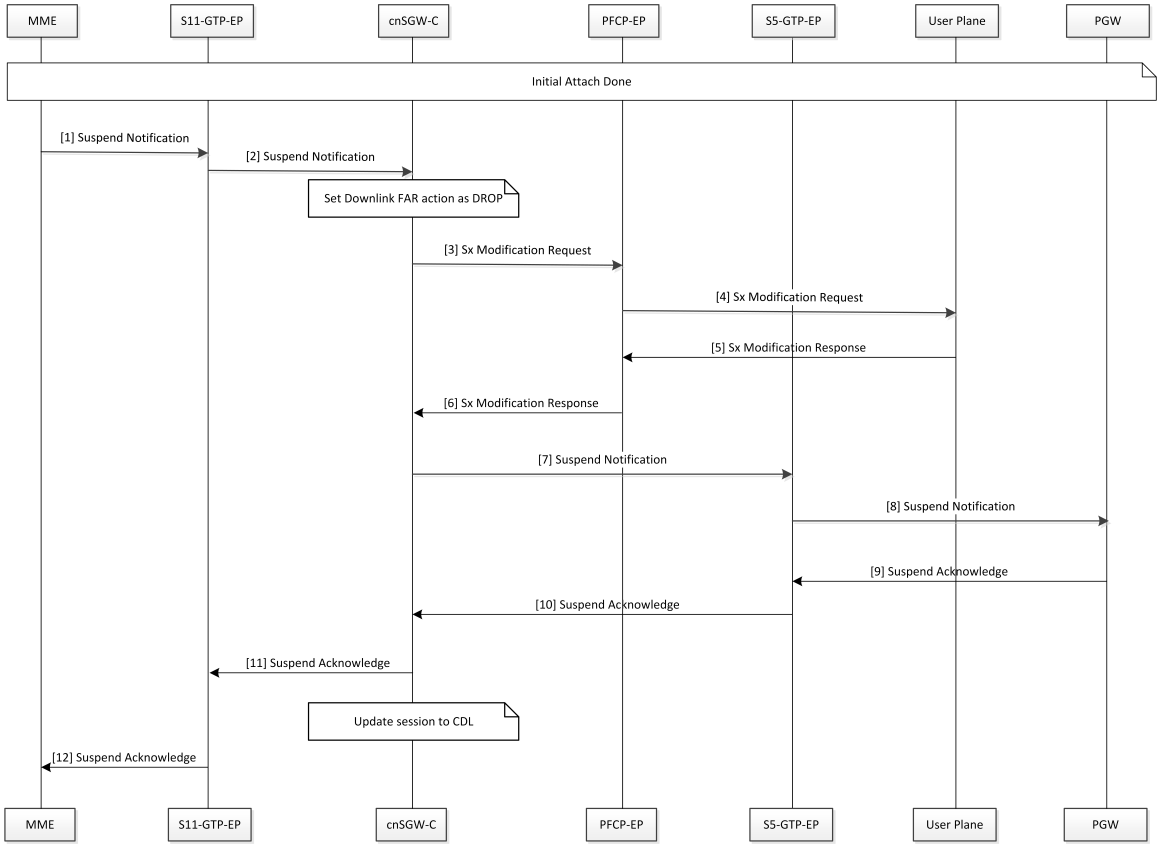

Table 3: Suspend Notification Call Flow Description

Step	Description
1	MME sends the Suspend Notification to the S11-GTP-EP pod.
2	The S11-GTP-EP pod sends the Suspend Notification to the cnSGW-c.
3	cnSGW-c updates the Download FAR action Drop by sending the Sx Session Modification Request to the SGW-U with the FAR action set as DROP. cnSGW-c sends the Sx Modification Request to the PFCP-EP.
4	PFCP-EP sends the Sx Modification Request to the User Plane.
5	The user plane sends the Sx Modification Response to the PFCP-EP.
6	PFCP-EP sends the Sx Modification Response to the cnSGW-C.
7	cnSGW-C sends the Suspend Notification to the S5-GTP-EP pod.
8	The S5-GTP-EP pod sends the Suspend Notification to the PGW.
9	PGW sends the Suspend Acknowledgment to the S5-GTP-EP pod.

Step	Description
10	The S5-GTP-EP pod sends the Suspend Acknowledgment to the cnSGW-C.
11	cnSGW-C sends the Suspend Acknowledgment to the S11-GTP-EP pod. cnSGW-C updates the session to CDL.
12	The S11-GTP-EP pod sends the Suspend Acknowledgment to the MME.

Resume Notification Call Flow

This section describes the resume notification call flow.

Figure 2: Resume Notification Call Flow

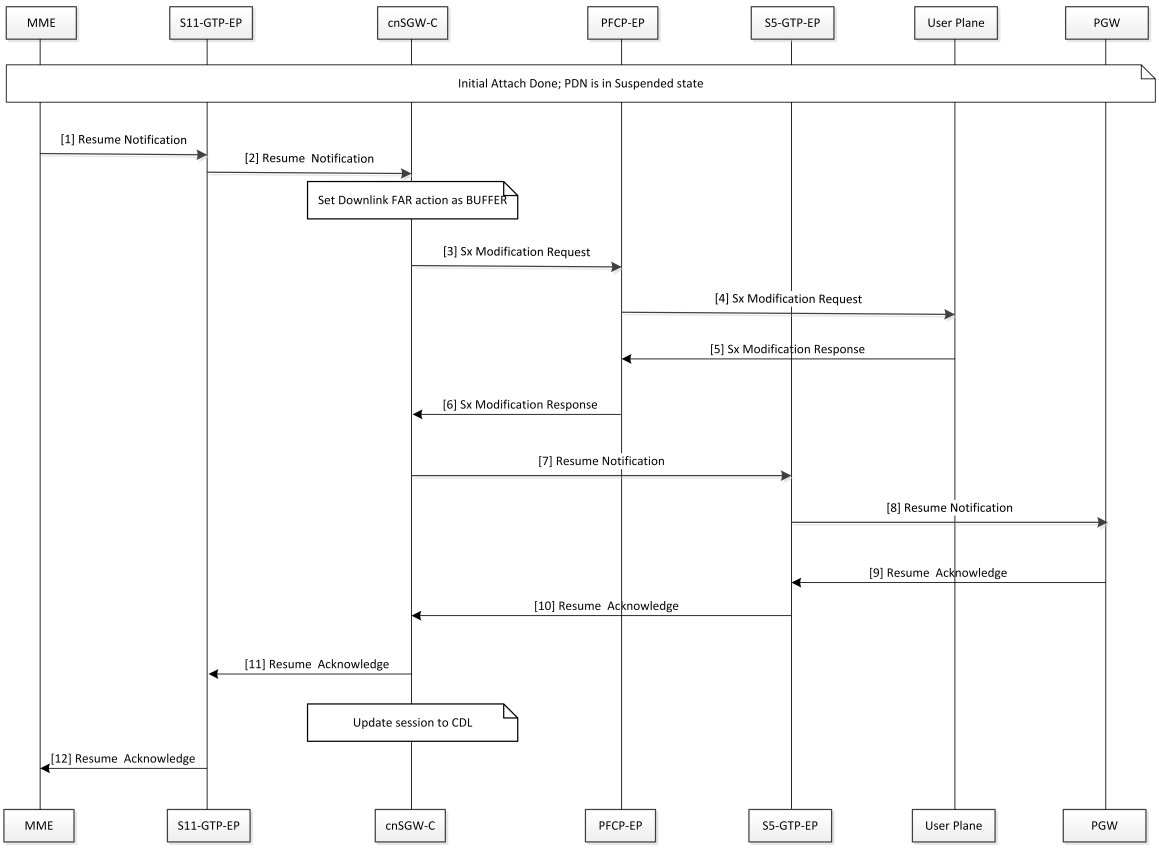

Table 4: Resume Notification Call Flow Description

Step	Description
1	MME sends the Resume Notification to the S11-GTP-EP pod.
2	The S11-GTP-EP pod sends the Resume Notification to cnSGW-c.

Step	Description
3	cnSGW-c updates the Download FAR action Buffer by sending the Sx Session Modification Request to the SGW-U with the FAR action set as BUFFER. cnSGW-c sends the Sx Modification Request to the PFCP-EP.
4	PFCP-EP sends the Sx Modification Request to the User Plane.
5	The User Plane sends the Sx Modification Response to the PFCP-EP.
6	PFCP-EP sends the Sx Modification Response to the cnSGW-C.
7	cnSGW-C sends the Resume Notification to the S5-GTP-EP pod.
8	The S5-GTP-EP pod sends the Resume Notification to the PGW.
9	PGW sends the Resume Acknowledgment to the S5-GTP-EP pod.
10	The S5-GTP-EP pod sends the Resume Acknowledgment to the cnSGW-C.
11	cnSGW-C sends the Resume Acknowledgment to the S11-GTP-EP pod. cnSGW-C updates the session to CDL.
12	The S11-GTP-EP pod sends the Resume Acknowledgment to the MME.

Empty Modify Bearer Request for Resume Call Flow

This section describes the Empty Modify Bearer Request for Resume call flow.

Figure 3: Empty Modify Bearer Request for Resume Call Flow

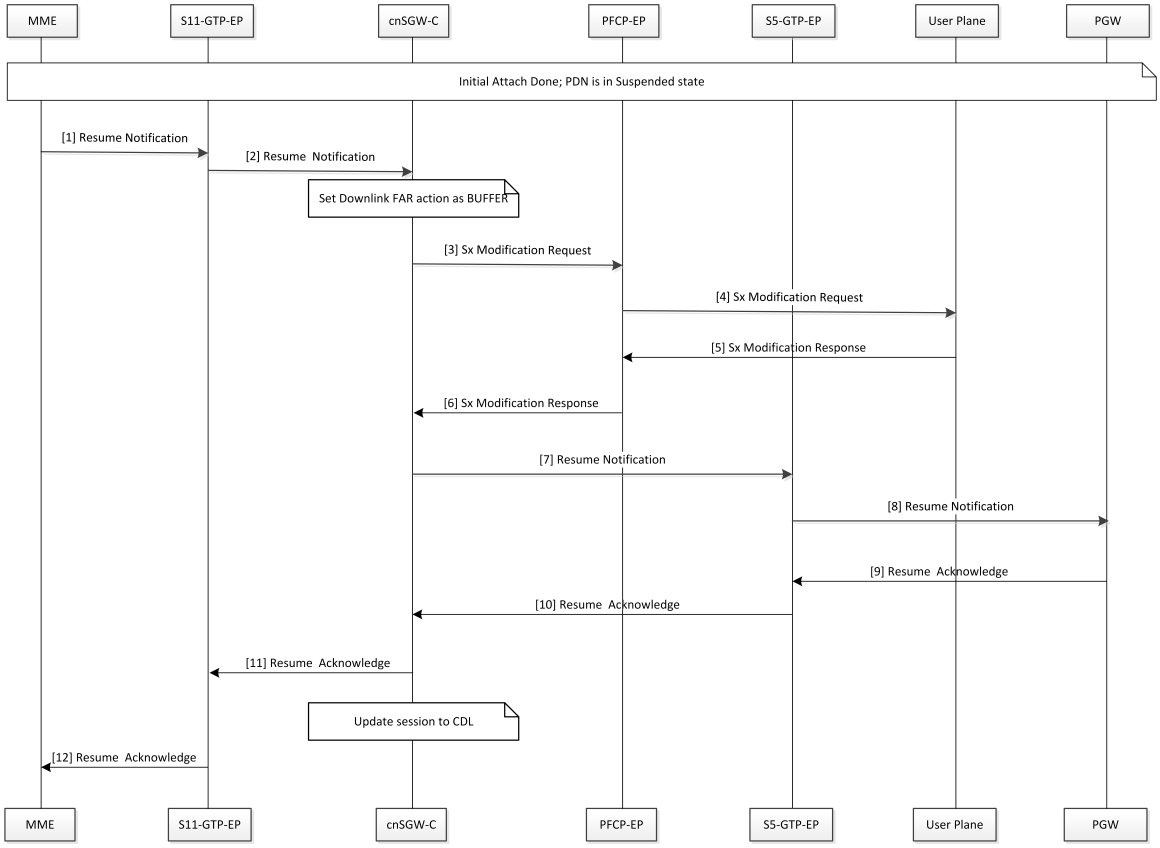

Table 5: Empty Modify Bearer Request for Resume Call Flow Description

Step	Description
1	MME sends the Modify Bearer Request to the S11-GTP-EP pod.
2	The S11-GTP-EP pod sends the Modify Bearer Request to the cnSGW-C. cnSGW-C considers the request as the implicit resume of the suspended bearers in the SGW.
3	If eNodeB exists, cnSGW-C updates Set Downlink Far action as Forward. Else cnSGW-C updates Set Downlink Far action as BUFFER. cnSGW-C sends the Sx Modify Request to the PFCP-EP pod.
4	PFCP-EP sends the Sx Modify Request to the User Plane.
5	The User Plane sends the Sx Modify Response to the PFCP-EP.
6	PFCP-EP sends the Sx Modify Response to the cnSGW-C.
7	cnSGW-C sends the Modify Bearer Request to the S5-GTP-EP pod. The implicit resume for PGW can contain zero or more IEs.

Step	Description
8	The S5-GTP-EP pod sends the Modify Bearer Request to the PGW.
9	PGW sends the Modify Bearer Response to the S5-GTP-EP pod.
10	The S5-GTP-EP pod sends the Modify Bearer Response to the cnSGW-C.
11	cnSGW-C sends the Modify Bearer Response to the S11-GTP-EP pod.
12	The S11-GTP-EP pod sends the Modify Bearer Response to the MME.