Network-Initiated Service Request

Feature Summary and Revision History

Summary Data

Table 1: Summary Data

Applicable Product(s) or Functional Area	SMF
Applicable Platform(s)	SMI
Feature Default Setting	Enabled – Always-on
Related Changes in this Release	Not Applicable
Related Documentation	Not Applicable

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	Pre-2020.02.0

Feature Description

The N3 tunnel profile helps in defining the forwarding action rules while moving from active to idle transition.

The N3 tunnel profile configuration includes:

- Enabling control plane notification (notify)
- Enabling buffering on UPF (buffer UPF)

How it Works

Call Flows

UE-initiated Idle to Active Transition

The following call flow depicts the UE-initiated idle to active transition.

Figure 1: Idle to Active Transition (UE-Initiated) Call Flow

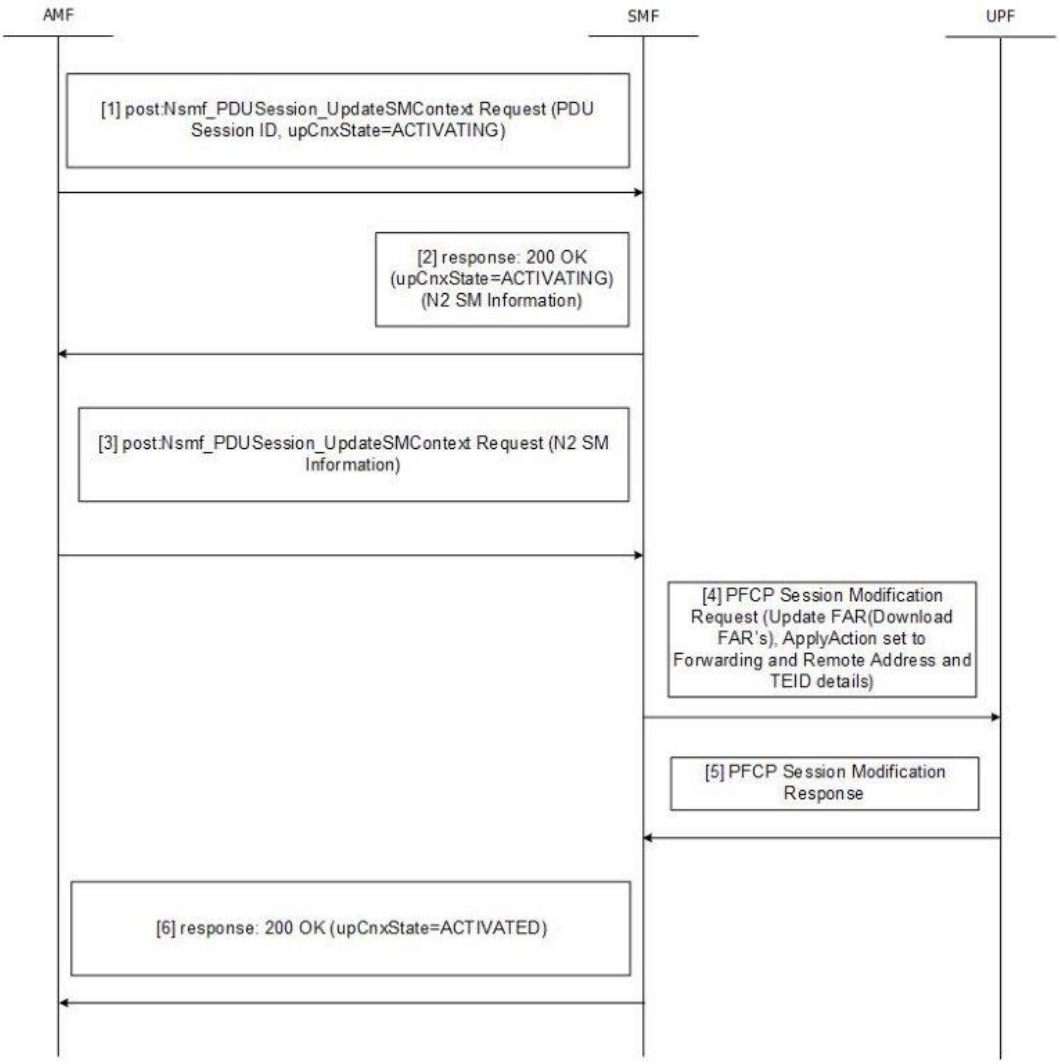

Table 3: Idle to Active Transition (UE-Initiated) Call Flow Description

Step	Description
1	The AMF requests SMF to activate the user plane connection of the PDU session by sending a POST request with the following information: • upCnxState attribute set to ACTIVATING. • User location, user location timestamp and access type associated to the PDU session (if modified). • Other information (if necessary).
2	Upon receipt of the request, the SMF starts activating the N3 tunnel of the PDU session. The SMF returns a 200 OK response with the following information: • upCnxState attribute set to ACTIVATING; • N2 SM information to request the 5G-AN to assign resources to the PDU session including the transport layer address and tunnel endpoint of the uplink termination point for the user plane data for the current PDU session (i.e. UPF's GTP-U F-TEID for uplink traffic).
3	Subsequently, the AMF requests the SMF by sending POST request with the following information: • N2 SM information received from the 5G-AN, including the transport layer address and tunnel endpoint of the downlink termination point for the user data for the current PDU session (i.e. 5G-AN's GTP-U F-TEID for downlink traffic), if the 5G-AN succeeded in establishing resources for the PDU sessions.
4	The SMF initiates PFCP Session Modification Procedure towards UPF with down link FAR updated with the following options: • Forwarding Action enabled along with remote node “forwarding parameters” details like the IP address and GTP-U F-TEID.
5	Upon receipt of successful response from UPF node, the SMF sets the upCnxState attribute to ACTIVATED for the PDU session.
6	SMF then initiates 200 OK response including the upCnxState attribute set to ACTIVATED towards AMF.

Network-initiated Idle to Active Transition

The following call flow depicts the network-initiated idle to active transition.

Figure 2: Idle to Active Transition (Network-initiated) Call Flow

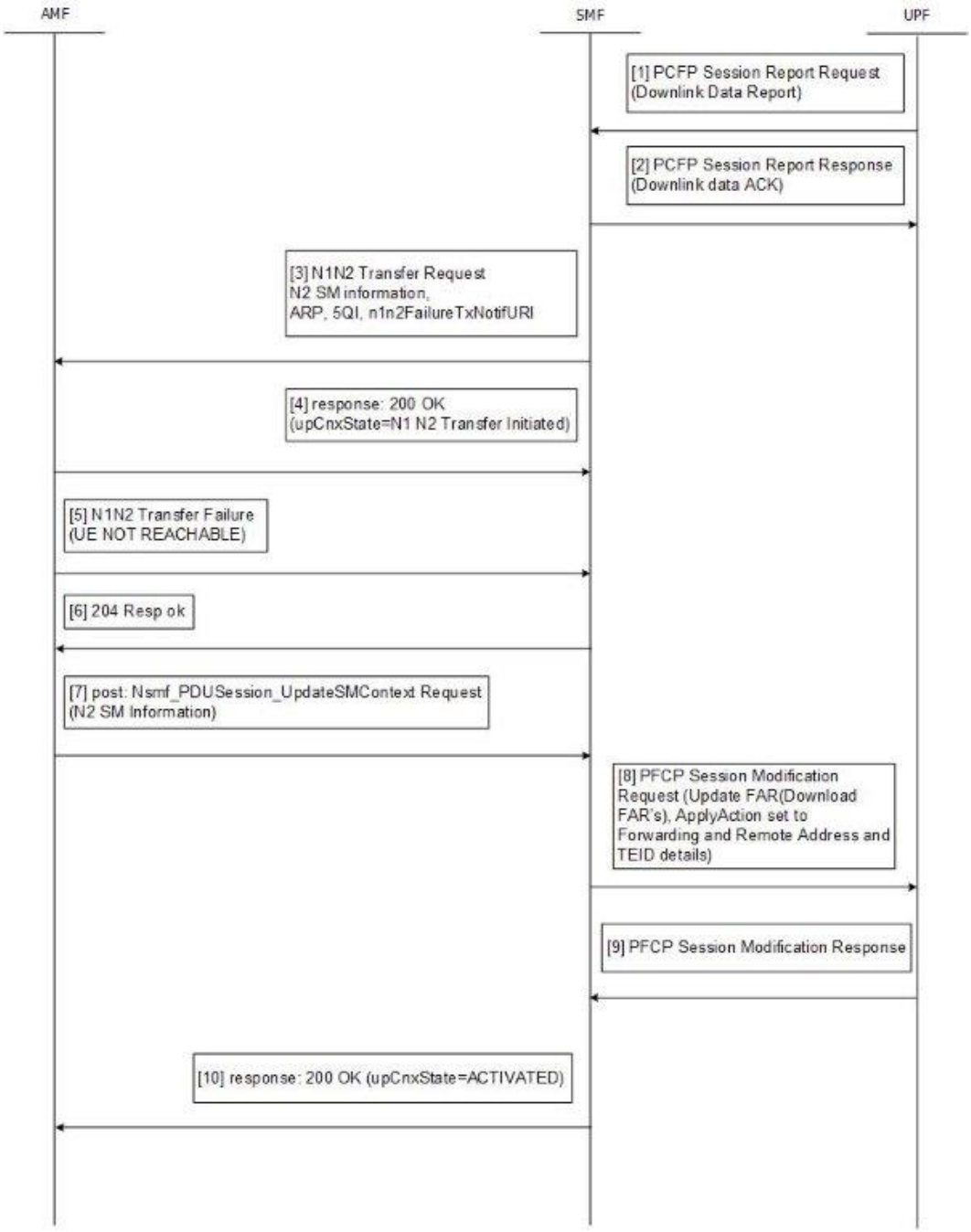

Table 4: Idle to Active Transition (Network-initiated) Call Flow Description

Step	Description
1	The UPF sends "PFCP session report request" to the SMF. • Report Type as DLDR (Downlink Data Report). • The "Downlink Data Report" IE contains corresponding "PDR ID".
2	The SMF sends the PFCP session report response.
3	The SMF sends "N1N2MessageTransfer" to AMF with the following attributes: • SUPI, PDU Session ID, • N2SMInformation as "ngapIeType":77 (id-PDUSessionResourceSetupListSUReq), "ngapMessageType":27 (id-PDUSessionResourceSetup). • PDUSessionResourceSetupListSUReq has the PDU session id, QFI, QoS profile, UPF's GTP-U F-TEID for uplink traffic, QFI, QoS profile, S-NSSAI, User Plane Security Enforcement, UE Integrity Protection Maximum Data Rate, and Cause. • Area of validity for N2 SM information, ARP, Paging Policy Indication, 5QI, N1N2TransferFailure Notification Target Address (n1n2FailureTxfNotifURI).
4	The SMF receives the “N1N2TransferResponse” with the following status codes: • 200/202 OK and cause as "N1_N2_TRANSFER_INITIATED" (proceed to Step 6). • 409/504 and Cause “UE_IN_NON_ALLOWED_AREA” (proceed to Step 7).
5	The AMF sends the N1N2 Transfer failure response. If the UE is not reachable, move to Step 7.
6	Subsequently, the AMF requests the SMF by sending POST request with the following information: • N2 SM information received from the 5G-AN, including the transport layer address and tunnel endpoint of the downlink termination point for the user data for the current PDU session (i.e. 5G-AN's GTP-U F-TEID for downlink traffic), if the 5G-AN succeeded in establishing resources for the PDU sessions.

Step	Description
7	The SMF initiates PFCP Session Modification Procedure towards UPF with down link FAR updated with following options: • If N2 Transfer is successful, Forwarding Action is enabled along with remote node "forwarding parameters" details like IP address and GTP-U F-TEID. • If the cause of transfer failure is ATTEMPTING_TO_REACH_UE or UE_IN_NON_ALLOWED_AREA: • Update FAR > Apply Action > NOCP: 1 • Update FAR > Apply Action > DROP:1 • PFCPSMReq-Flags > DROBU:1 • If the cause of transfer failure is UE_NOT_REACHABLE: • Update FAR > Apply Action > NOCP: 0 • Update FAR > Apply Action > DROP:1 • PFCPSMReq-Flags > DROBU:1
8	Upon receipt of successful response from UPF node, the SMF sets the upCnxState attribute to ACTIVATED for the PDU session.
9	The SMF then initiates 200 OK response including the upCnxState attribute set to ACTIVATED towards AMF (Only if Step 6 is completed and response is received from Step 8).

Network Initiated Service Request

During network initiated service request, SMF handles the temporary reject for N1N2 response message from AMF as mentioned in *3GPP TS 23.502, section 4.2.3.3*.

Figure 3: Temporary Reject during Network Triggered Service Request - 1

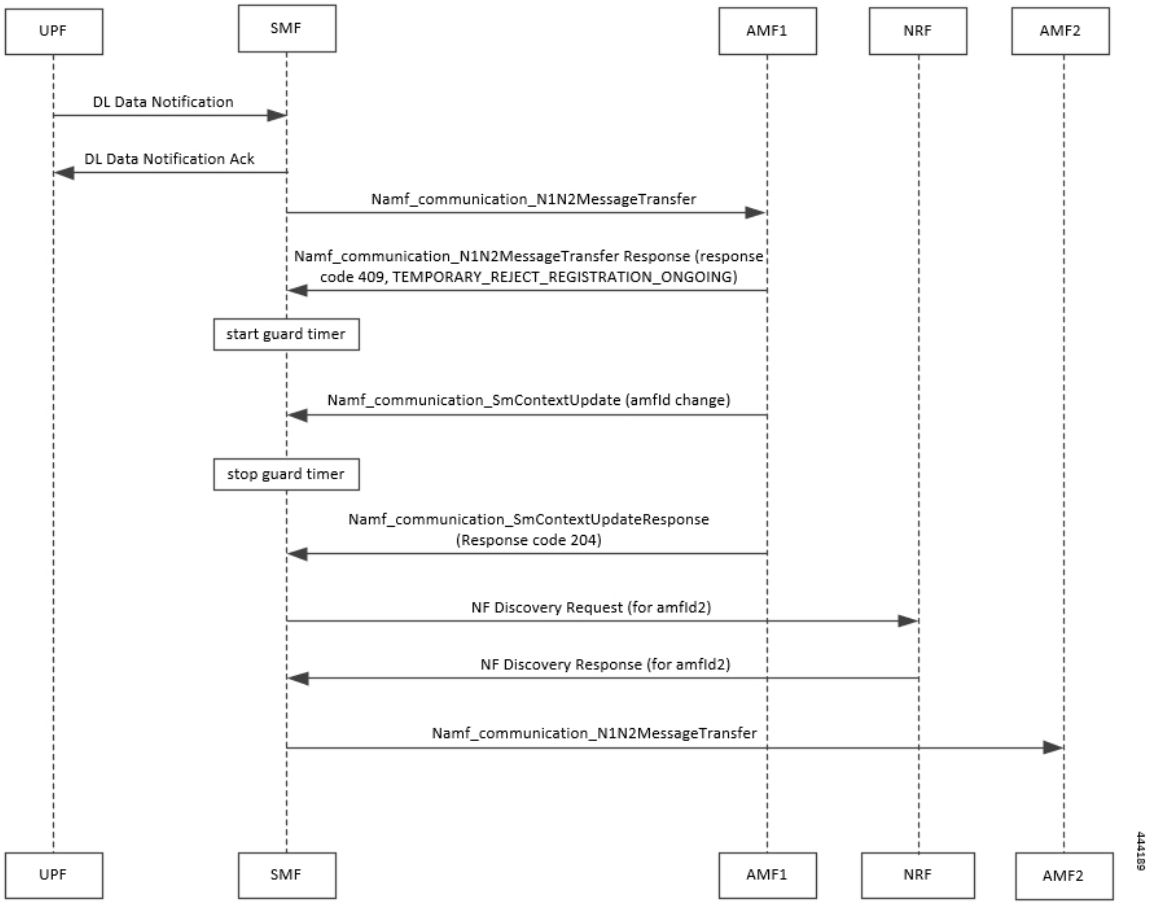

Table 5: Temporary Reject during Network Triggered Service Request - 1

Step	Description
1	On getting a trigger for service request in UP IDLE session state, SMF initiates a N1N2 message towards the AMF as part of Idle mode exit procedure.

2	If UE registration procedure with new AMF is in progress then AMF responds with temporary reject for N1N2 message with response code 409 and cause as:
	`TEMPORARY_REJECT_REGISTRATION_ONGOING`
	OR
	`TEMPORARY_REJECT_HANDOVER_ONGOING SMF`

3	On receiving the response, SMF starts a guard timer of 2 seconds that is configured locally.
4	While guard timer is running, SMF expects either a SM Context Update with AMF ID change or SM Context Update for handover.

Step	Description
5	On receiving SM Context Update with AMF ID change, SMF: **1.** Stops the guard timer. **2.** Removes the reference to the discovery information for old AMF. **3.** Stores the new UE location information, PLMN information and AMF information. **4.** Send SM Context Update response success without content. **5.** Reinitiates N1N2 message transfer to the new AMF. This involves NF discovery and subsequent transmission to the new AMF.
6	On receiving SM Context Update for N2 handover, SMF: **1.** Starts the Handover procedure. **2.** Suspends the Idle mode exit procedure and stops the guard timer. **3.** As part of the Handover procedure completion, old AMF details are removed and new AMF information is stored. **4.** Idle mode exit procedure resumes after Handover procedure is complete. **5.** Reinitiates N1N2 message transfer, if required, to the new AMF. This involves NF discovery and subsequent transmission to new AMF.

Figure 4: Temporary Reject during Network Triggered Service Request - 2

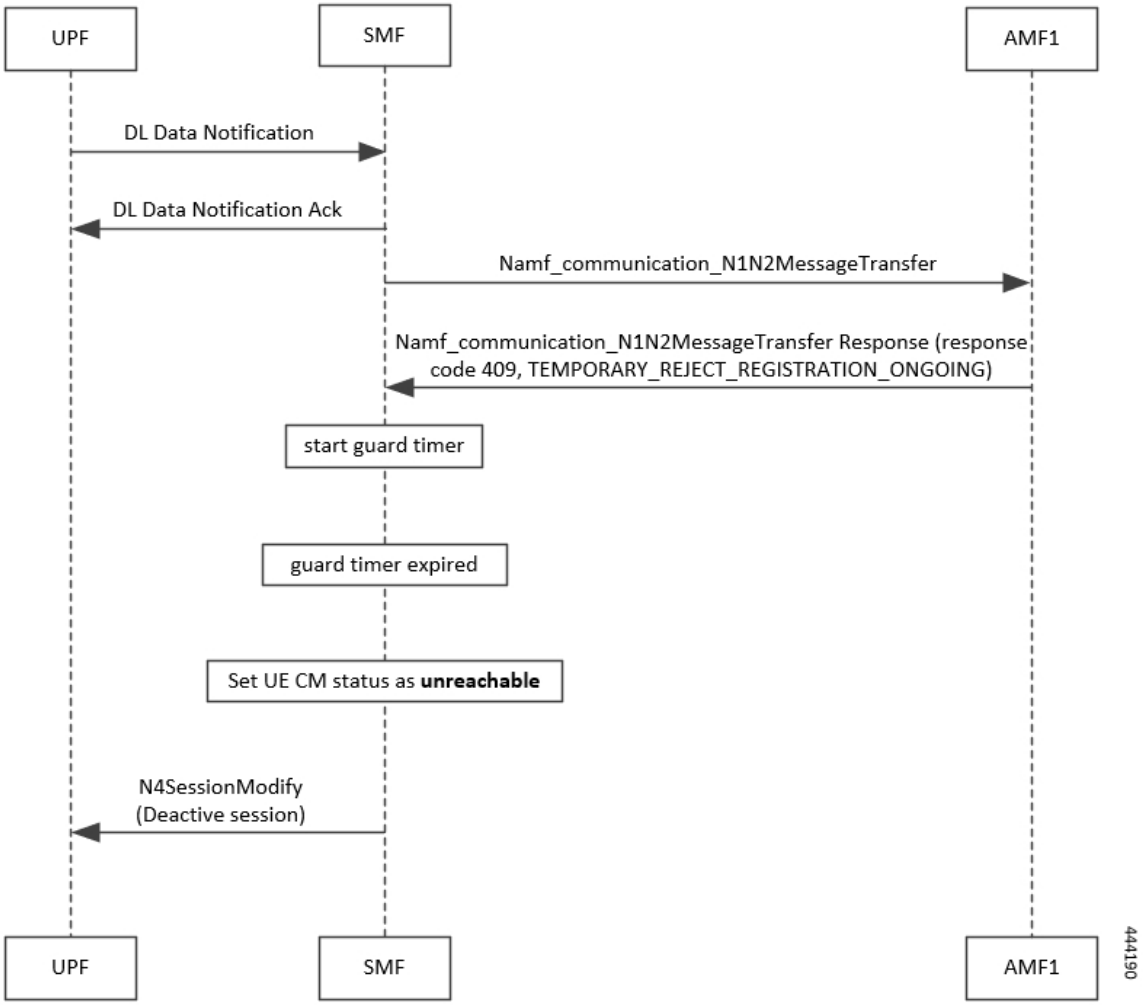

Table 6: Temporary Reject during Network Triggered Service Request - 2

Step	Description
1	On getting a trigger for service request in UP IDLE session state, SMF initiates a N1N2 message towards the AMF as part of Idle mode exit procedure.

2	If UE registration procedure with new AMF is in progress then AMF responds with temporary reject for N1N2 message with response code 409 and cause as:
	`TEMPORARY_REJECT_REGISTRATION_ONGOING`
	OR
	`TEMPORARY_REJECT_HANDOVER_ONGOING SMF`

3	On receiving the response, SMF starts a guard timer of 2 seconds that is configured locally.

Step	Description
4	Once guard timer expires, SMF: **1.** Sets the UE CM status as *NotReachable*. **2.** Deactivates the UP session state.

Limitations

The following are limitations in this release:

- It does not support location update and access-type changes.
- It does not support QoS flow modifications/errors.

Configuring N3 Tunnel Profile

To configure the N3 tunnel profile, use the following configuration:

```
config
  n3-tunnel-profile profile_name
    buffer upf
      notify
      end
```

NOTES:

- **buffer** *upf*: Configures buffering for Downlink Data.
- **notify**: Enables data notification from UPF.