

# Flow Failure Handling for Access and Mobility Procedures


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# 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 | Disabled - Configuration Required |
| 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 SMF supports the QoS flow failures for access and mobility procedures. The SMF receives the QoS flow failure details as part of the following call flows from NG-RAN to N2 messages.

- Xn handover
- Service request procedures (UE and network-initiated)
- N2 handover with or without changing AMF
- N26 4G to 5G handover
- N26 5G to 4G handover

# How it Works

The SMF processes N11 messages with N2 message details to determine the accepted and failed QoS flow IDs. For failed QoS flow IDs, the SMF excludes the resources locally and communicates the following information to the external interfaces:

- Sends the N4 Session Modification Request to UPF to delete the QERs, URRs, UL or DL PDRs, UL or DL FARs which are applicable to the QoS flow IDs.
- Sends the Charging Data Update Request to CHF by including multi-unit usage details for the removed URRs. If SMF receives a usage report from UPF, SMF sends this report to CHF.
- Sends the N1 N2 transfer message with N1 message details to UE as the PDU Session Modification Command.
- Based on the received Policy Control Request Triggers and SM Policy Decision last Request Rule Data, SMF sends the Rule Reports SM Policy Control Update to PCF.

## Call Flows

This section describes the following call flows:

- QoS flow failure handling for Xn handover call flow
- QoS flow failure handling for N2 handover call flow
- QoS Flow failure handling for N26 4G to 5G handover call flow
- QoS flow failures for service request procedures
- PDU UE synchronization procedure
- Flow Failure Management Call Flows

### QoS Flow Failure Handling During Xn Handover

This section describes the QoS flow failure handling during the Xn handover.

*Figure 1: QoS Flow Failure Handling during Xn Handover*

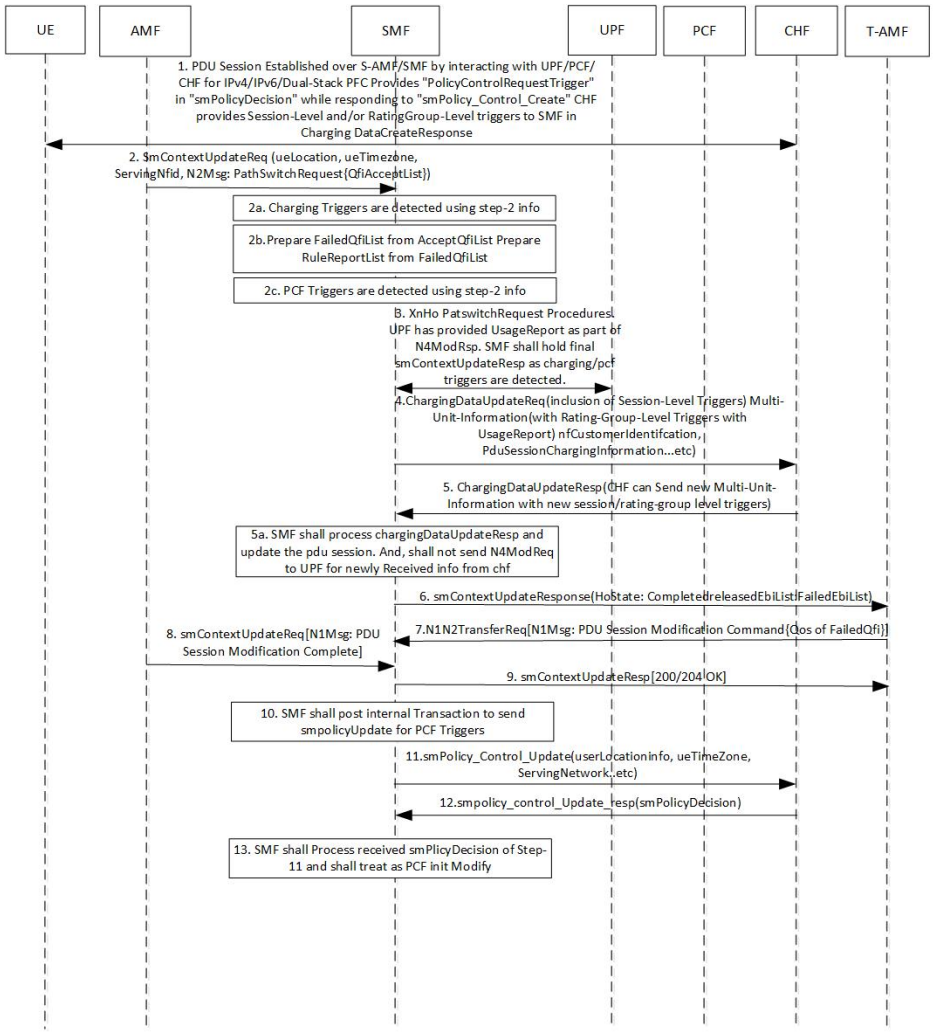



*Table 3: QoS Flow Failure Handling Call Flow Description*

| Step | Description |
|---|---|
| 1 | The PDU session is established over S-AMF and SMF by communicating with UPF, PCF, or CHF for IPv4, IPv6, or dual-stack.<br>The PCF provides Policy Control Request trigger for SM policy decision as response to the request for creation of SM policy control.<br>The CHF provides session-level and rating-group-level triggers to the SMF as the Charging Data Create Response. |
| 2 | The AMF sends SM Context Update Request to SMF. This request includes the information on UE location, UE time zone, and N2 message path switch request with the list of the accepted QoS Flow Identifier (QFI). |

| Step | Description |
|---|---|
| 2a | The SMF identifies the access-side modifications that are received in SM Context Update Request. The charging triggers are identified through the information that is received in Step 2. |
| 2b | The SMF extracts the list of failed QFI, failed rule report, and failed EPS bearer ID (EBI) from the received list of the accepted QFIs. |
| 2c | The PCF triggers are identified through the information that is received in Step 2. |
| 3 | For Xn handover preparation procedures, the SMF sends the N4 Session Modification Request to the UPF to update the received DL tunnel information of T-gNB. After the tunnel information is updated, the UPF sends the usage report to the SMF as N4 modification response. The SMF retains the final SM Context Update Response as charging or PCF triggers are identified. |
| 4 | The SMF sends the Charging Data Update Request to the CHF. This request includes the details, such as session-level triggers, multi-unit information with rating-group-level triggers and usage report, customer identification information, and the PDU session charging information. |
| 5 | The CHF sends the Charging Data Update Response to the SMF. This response may include the multi-unit information with new session or rating-group-level triggers. |
| 5a | The SMF processes the Charging Data Update Response and updates the PDU session. SMF does not send the N4 Mode Request to the UPF for the information that is received from the CHF. |
| 6 | The SMF sends the SM Context Update Response by including the N2 message path switch request acknowledgment and the list of failed EBI list. |
| 7 | The SMF and T-AMF process the N1 N2 Transfer Request for the PDU Session modification for the QoS about failed QFIs. The SMF includes the PDU Session Modification command to communicate the information on the QoS flow failure list to the UE. |
| 8 | The AMF sends the SM Context Update Request N1 message to the SMF to communicate about the handover completion. |
| 9 | The SMF sends the SM Context Update Response as “200/204 OK” to T-AMF. The SMF does not process the received N1 message from UE. |
| 10 | The SMF posts the internal transaction to send the SM Policy Update for PCF triggers to send to the PCF. The SMF posts this information to communicate Rule Report for the failed QFIs or any identified armed access-side triggers. |
| 11 | The SMF sends the SM Policy Control Update to the PCF. This update includes details, such as user location information and UE time zone. |
| 12 | The PCF sends the SM Policy Control Update Response, which is the SM policy decision, to the SMF. |
| 13 | The SMF processes the received SM policy decision and initiates the PCF modify procedures. |

## QoS Flow Failure Handling During N2 Handover

This section describes the flow failure handling procedure during the N2 handover.

*Figure 2: Flow Failure Handling During N2 Handover*

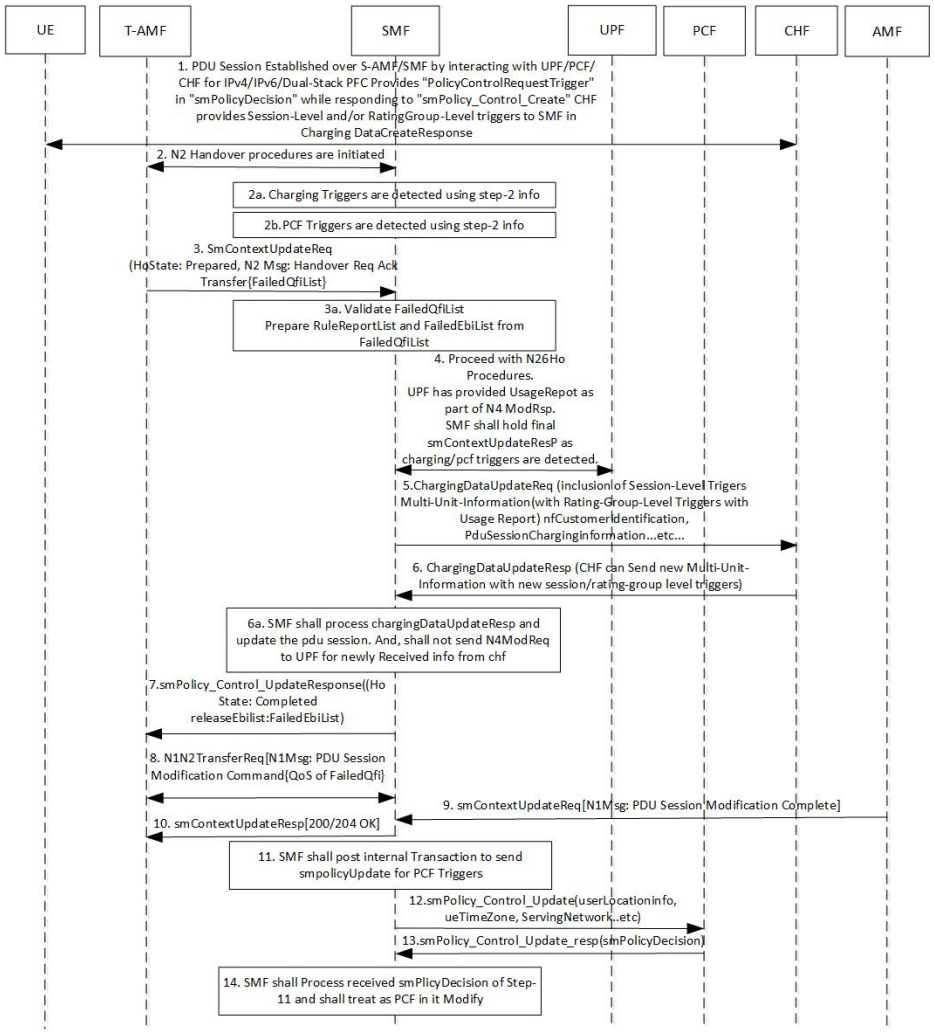



*Table 4: Description for Flow Failure Handling During N2 Handover*

| Step | Description |
|---|---|
| 1 | The PDU session is established over S-AMF and SMF by communicating with UPF, PCF, or CHF for IPv4, IPv6, or dual-stack.<br>The PCF provides Policy Control Request trigger for SM policy decision as response to the request for creation of SM policy control.<br>The CHF provides session-level and rating-group-level triggers to the SMF as the Charging Data Create Response. |
| 2 | The T-AMF sends SM Context Update Request to the SMF. This request includes the information on handover state as preparing, UE location, UE time zone, target serving NF ID, and serving network. In case of inter-AMF handoff, the AMF includes the target serving NF ID. |

| Step | Description |
|---|---|
| 2a | The SMF identifies the access-side modifications that are received in SM Context Update Request. The charging triggers are identified through the information that is received in Step 2. |
| 2b | The PCF triggers are identified through the information that is received in Step 2. |
| 3 | The T-AMF sends the SM Context Update Request to the SMF. This request includes the information on handover state as prepared along with N2 message on Handover Required Transfer Request. The transfer request includes the list of failed QFIs. |
| 3a | The SMF validates the list of failed QFIs to extract the list of failed rule report and failed EBIs. |
| 4 | For N2 handover preparation procedures, the SMF sends the N4 Session Modification Request to the UPF to update the received DL tunnel information of T-gNB. After the tunnel information is updated, the UPF sends the usage report to the SMF as N4 modification response. The SMF retains the final SM Context Update Response as charging or PCF triggers are identified. |
| 5 | The SMF sends the Charging Data Update Request to the CHF. This request includes the details, such as session-level triggers, multi-unit information with rating-group-level triggers and usage report, customer identification information, and the PDU session charging information. |
| 6 | The CHF sends the Charging Data Update Response to the SMF. This response contains the multi-unit information along with new session-level or rating-group level triggers. |
| 6a | The SMF processes the Charging Data Update Response and updates the PDU session. The SMF does not send the N4 Mode Request to the UPF for the information that is received from the CHF. |
| 7 | The SMF sends the SM Context Update Response to the T-AMF with handover state as completed. This response also includes list of the released EBIs and the failed EBIs. |
| 8 | The SMF and T-AMF process the N1 N2 Transfer Request. This request includes the N1 message as PDU Session Modification Command to communicate the information on the QoS flow failure list to the UE. |
| 9 | The CHF sends the SM Context Update Request with an N1 message for the completion of the PDU session modification. |
| 10 | The SMF sends the SM Context Update Response as “200/204 OK” to the T-AMF. The SMF does not process the received N1 message from the UE. |
| 11 | The SMF posts the internal transaction to send the SM Policy Update for PCF triggers. The SMF sends this update to communicate the rule report about the failed QFIs or any armed access-side triggers. |
| 12 | The SMF sends the SM Policy Control Update to the PCF. This update includes the details on the user location and UE time zone. |
| 13 | The PCF sends the SM Policy Control Update response, which is the SM policy decision, to the SMF. |
| 14 | The SMF processes the SM policy decision and treats it as the PCF-initiated PDU Session Modification procedure. |

## QoS Flow Failure Handling During N26 4G to 5G Handover

This section describes the flow failure handling procedure during the N26 4G to 5G handover.

*Figure 3: QoS Flow Failure Handling During N26 4G to 5G Handover*

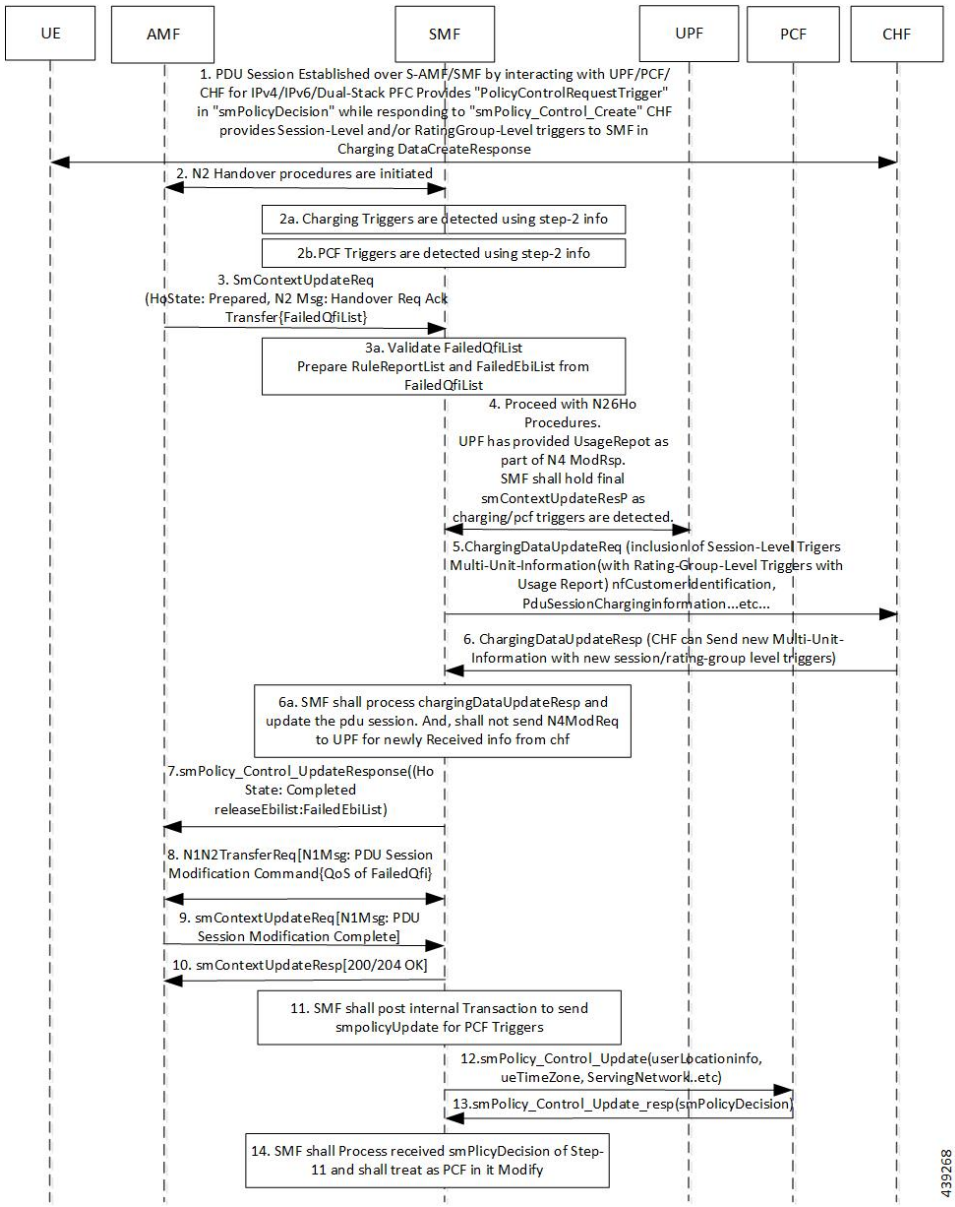



*Table 5: Description for QoS Flow Failure Handling During N26 4G to 5G Handover*

| Step | Description |
|---|---|
| 1 | The PDU session is established over S-AMF and SMF by communicating with UPF, PCF, or CHF for IPv4, IPv6, or dual-stack.<br>The PCF provides Policy Control Request trigger for SM policy decision as response to the request for creation of SM policy control.<br>The CHF provides session-level and rating-group-level triggers to the SMF as the Charging Data Create Response. |

| Step | Description |
|---|---|
| 2 | The T-AMF sends SM Context Update Request to the SMF. This request includes the information on handover state as prepared, UE location, UE time zone, target serving NF ID, serving network. In case of inter-AMF handoff, the AMF includes the target serving NF ID and the N2 message path switch request with the list of the accepted QFIs to the SMF. |
| 2a | The SMF identifies the access-side modifications that are received in SM Context Update Request. The charging triggers are identified through the information that is received in Step 2. |
| 2b | The PCF triggers are identified through the information that is received in Step 2. |
| 3 | The T-AMF sends the SM Context Update Request to the SMF. This request includes the information on handover state as prepared along with N2 message on Handover Required Transfer Request. The transfer request includes the list of failed QFIs. |
| 3a | The SMF validates the list of failed QFIs to extract the list of failed rule report and failed EBIs. |
| 4 | For N26 handover preparation procedures, the SMF sends the N4 Session Modification Request to the UPF to update the received DL tunnel information of T-gNB. After the tunnel information is updated, the UPF sends the usage report to the SMF as N4 Modification Response. The SMF retains the final SM Context Update Response as charging or PCF triggers are identified. |
| 5 | The SMF sends the Charging Data Update Request to the CHF. This request includes the details, such as session-level triggers, multi-unit information with rating-group-level triggers and usage report, customer identification information, and the PDU session charging information. |
| 6 | The CHF sends the Charging Data Update Response to the SMF. This response contains the multi-unit information along with new session-level or rating-group level triggers. |
| 6a | The SMF processes the Charging Data Update Response and updates the PDU session. The SMF does not send the N4 Mode Request to the UPF for the information that is received from the CHF. |
| 7 | The SMF sends the SM Context Update Response to the T-AMF with the handover state as completed. This response also includes list of the released EBIs and the failed EBIs. |
| 8 | The SMF and T-AMF process the N1 N2 Transfer Request. This request includes the N1 message as PDU Session Modification Command to communicate the information on the QoS flow failure list to the UE. |
| 9 | The CHF sends the SM Context Update Request with an N1 message for the completion of the PDU session modification. |
| 10 | the SMF sends the SM Context Update Response as “200/204 OK” to the T-AMF. The SMF does not process the received N1 message from the UE. |
| 11 | The SMF posts the internal transaction to send the SM Policy Update for PCF triggers. The SMF sends this update to communicate the rule report about the failed QFIs or any armed access-side triggers. |
| 12 | The SMF sends the SM Policy Control Update to the PCF. This update includes the details on the user location and UE time zone. |
| 13 | The PCF sends the SM Policy Control Update response, which is the SM policy decision, to the SMF. |
| 14 | The SMF processes the SM policy decision and treats it as the PCF-initiated PDU Session Modification procedure. |

# QoS Flow Failures for Service Request Procedures

The SMF supports both UE and Network Service Request procedures. For these procedures, the SMF processes the received SM Context Update Request to update the N3 tunnel path from idle to active state.

The QoS flow failures for service request procedures are handled in the same way as described in the 3GPP 23.502, Section 4.2.3.2. However, QoS flow failure list is handled with the PDU Session Setup Response Transfer N2 message, which is received as SM Context Update Response when subscriber moves from Idle to Active State.

***Figure 4: PDUIM Idle to Active Mode***

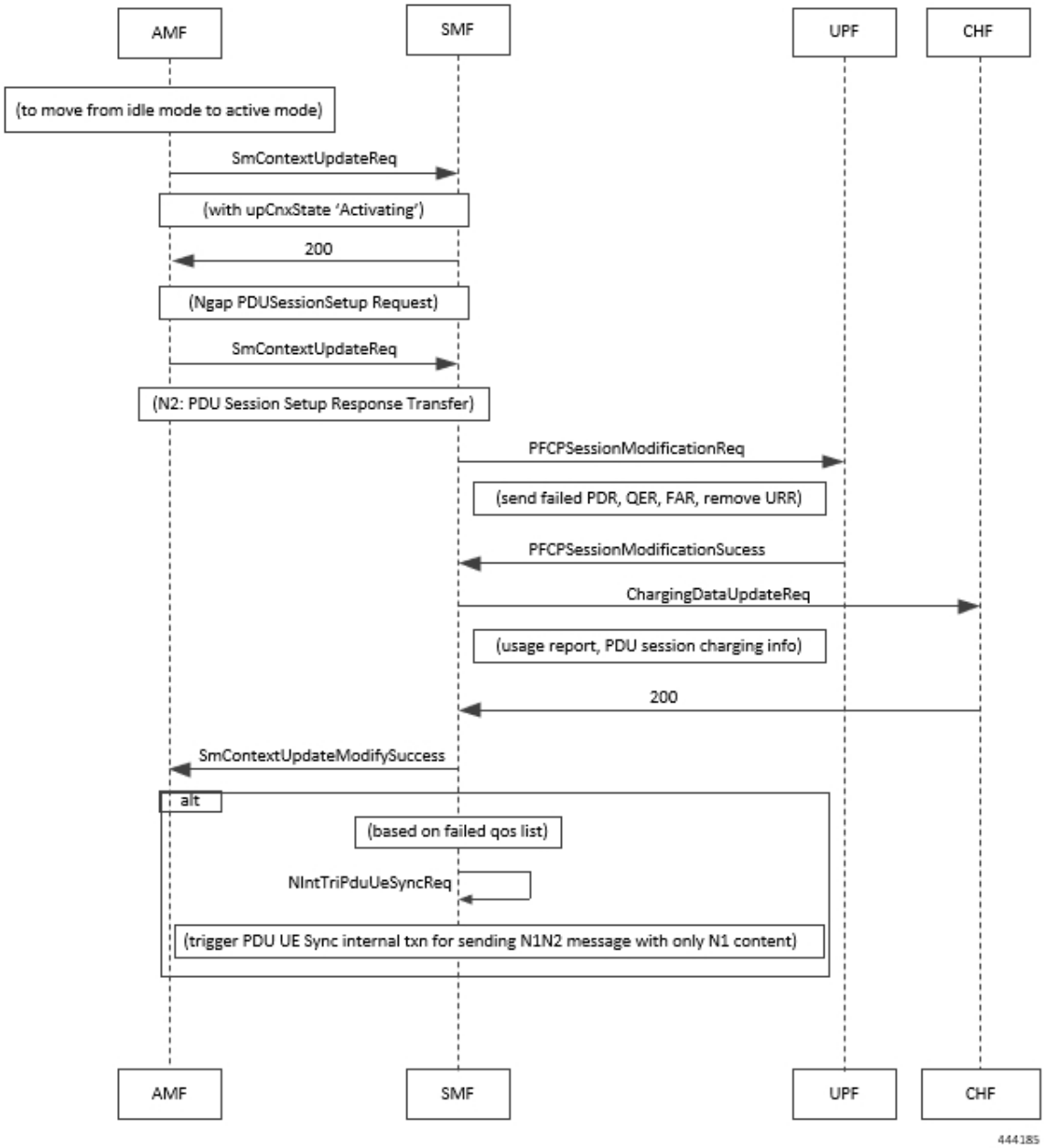


*Table 6: QoS Flow Failures for Service Request Procedure*

| Step | Description |
|---|---|
| 1 | The SMF sends the SM Context Update Request message for the User Plane Connection State as Activated. |
| 2 | SMF sends 200 response along with PDU Session Setup Request towards AMF. AMF sends N2 message **PDU Session Setup Response Transfer** which contains QoS flow faliure list. |
| 3 | SMF validates failed QFIs to extract failed PCC rules and failed flows. |
| 4 | SMF updates received DL tunnel information (gNB, delete PDRs, delete QERs). After the tunnel information is updated, SMF removes URR based on failed flows and sends N4 Session Modification Request towards UPF. |
| 5 | UPF provides usage report as part of N4 Session Modification Response. SMF sends SM Context Update Response for User Plane Connection State as Activated along with released EBIs as failed EBIs and triggers internal transaction to process charging and PCF triggers. |
| 6 | SMF sends Charging Data Update Request to CHF. This request includes the details, such as session-level triggers, multi-unit information with rating-group-level triggers and usage report, customer identification information, and the PDU session charging information. |
| 7 | SMF sends internal transaction based on failed QFIs to initiate PDU UE Sync Procedure to send N1/NAS signalling. Refer to PDU UE Sync Procedure call flow diagram for N1N2 message transfer |

## PDU UE Synchronization Procedure

This section describes the UE synchronization procedure.

1. PDU UE synchronization procedure in idle mode receives the failed QFIs, QoS rules and EBIs.
2. UE synchronization procedure fills N1 message PDU Session Modification command with QoS Descriptions, QoS Rules, and EPS Bearer Context from received QFI, QoS rule ID, and EBI respectively.
3. The SMF includes the created N1 container to N11 message without any N2 content.
4. The SMF sends N1N2 Transfer Request message towards AMF and starts the N1N2 retransmission timer. The SMF waits for N1N2 Transfer Response.
5. If N1N2 Transfer Success is received, the SMF waits for SM Context Update Request with N1 update. The N1 update includes resource modify success/resource modify reject information.

### Statistics

This procedure creates statistics for the following events:

- N1N2TransferRequest Attempt
- N1 modify success
- N1 modify failure
- UE sync procedure suspend

- On resuming UE sync procedure if it was suspended by other procedure

## N1N2 Retransmission

Once N1N2 retransmission timer expires, following action is taken:

1. SMF increments the N1N2 retry counter
2. SMF sends N11N1N2 Transfer Request message towards AMF and restarts the N1N2 retransmission timer. SMF waits for N1N2 Transfer Response.
3. If N1N2 Transfer Success is received, SMF waits for SM Context Update Request with N1 update. The N1 update includes resource modify success/resource modify reject information.
4. Once the N1N2 retry counter reaches the configured maximum number, the procedure is aborted.

## Collision Case

AMF informs SMF about HO procedure by rejecting the N1N2 Transfer Request with temporary reject cause. Also any other procedure can pre-empt the UE synchronization procedure while it is awaiting N1 update from the UE.

*Figure 5: Collision Case*

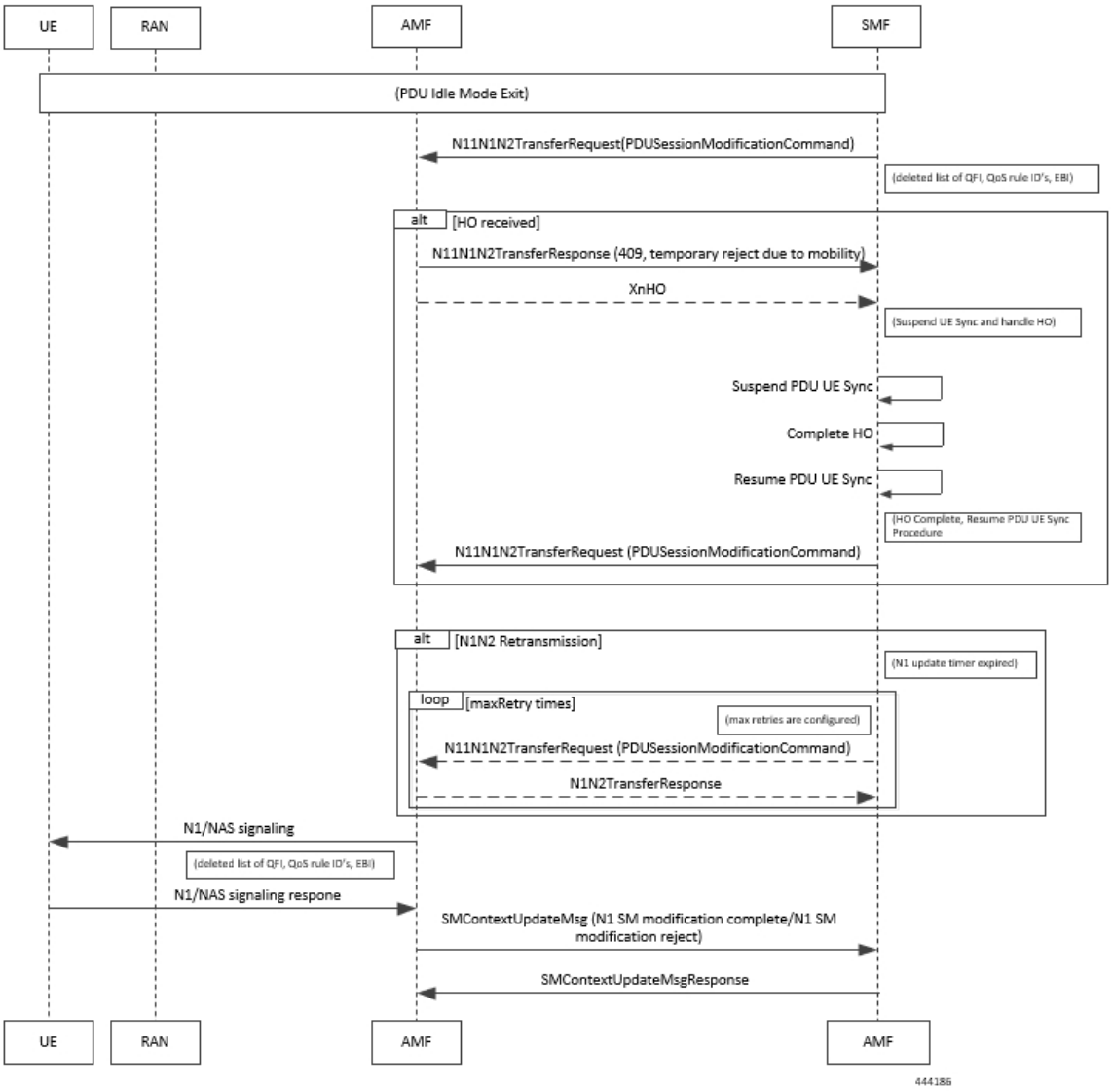



*Table 7: Collision Case*

| Step | Description |
|---|---|
| 1 | If N1N2 Transfer Failure with cause as **Temporary Reject Handover Ongoing** is received, SMF awaits HO procedure to pre-empt PDU UE Sync Procedure. |
| 2 | While awaiting N1 Update or handover from UE, if any procedure (including handover) is triggered then:<br>• If suspended by the handover procedure, it starts the N1N2 retry timer.<br>• If aborted by PDU release or PDU setup procedure, it cleans up all the timers and aborts the N1N2 retry. |

| Step | Description |
|---|---|
| 3 | In case UE sync procedure is suspended by handover then on expiry of N1N2 Retry Timer, UE sync resumes after handover is processed. |
| 4 | On resuming if the UE sync procedure finds that the RAT has changed then it aborts the procedure and stop any timers. |
| 5 | On resuming the procedure in the same RAT the UE sync procedure reinitiates N11N1N2Transfer request message. |

## Handling Failed QoS Flow Identifier During PDU Setup Procedure

The SMF supports handling of the failed QoS Flow Identifier (QFI) during the PDU setup procedure.

NG-RAN rejects a QoS flow due to various reasons. When the NG-RAN node reports unsuccessful establishment of a QoS flow, the SMF uses cause value to identify the reason for the unsuccessful establishment.

***Figure 6: Handling Failed QFIs During PDU Setup***

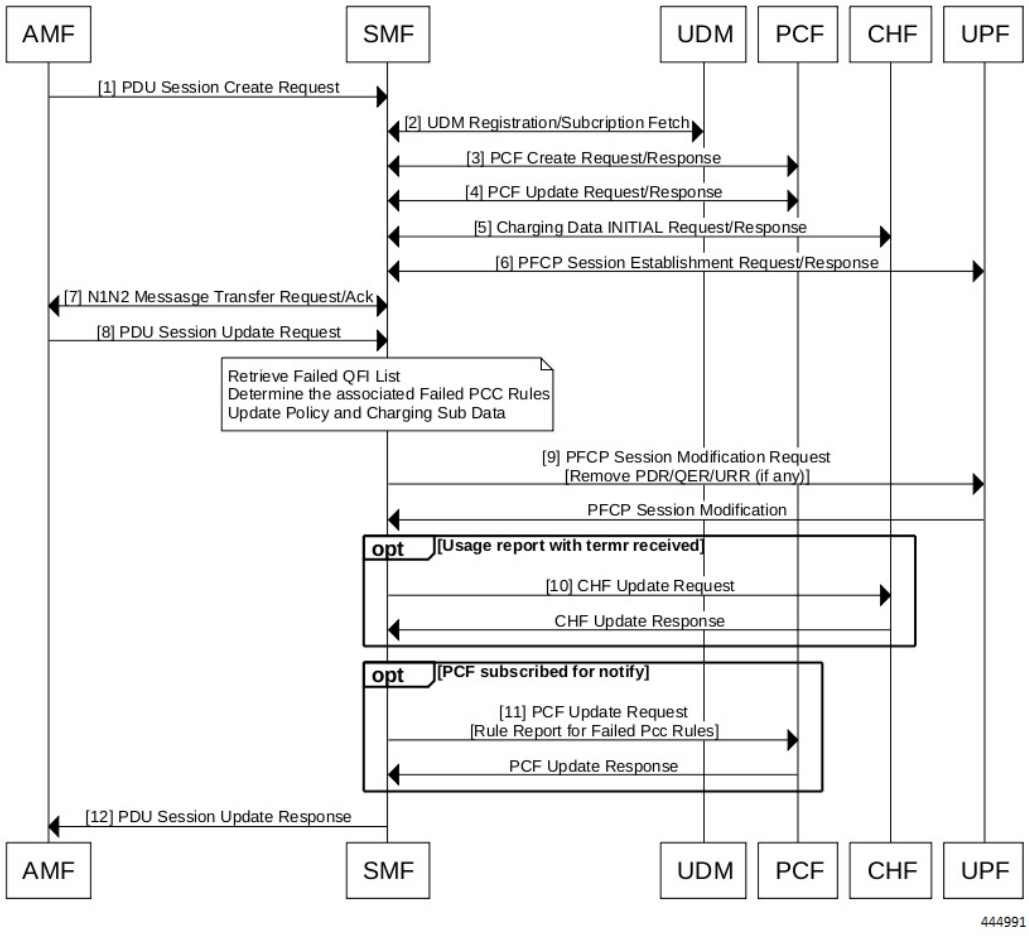


*Table 8: Description for Failed QFI Handling During PDU Setup*

| Step | Description |
|---|---|
| 1-7 | The SMF, AMF, UDM, PCF, CHF, and UPF communicate with each other to perform the PDU setup procedure as defined in the 3GPP specification. |
| 8 | The AMF sends SM Context Update Request to the SMF. This request carries N2 payload “PDU Session Resource Setup Response Transfer”. This message includes the list of QoS flows failed to be established, if any, in the QoS Flow Failed to Setup List IE.<br>The SMF marks the failed PCC rules and the charging descriptors associated with them for deletion. |
| 9 | The SMF sends PFCP Session Modification message to the UPF. This message carries Remove Packet Detection Rules (PDR), Remove QoS Enforcement Rules (QER), and Remove Usage Reporting Rules (URR) for the failed PCC rules in addition to the existing Update FAR for Downlink (DL) Tunnel Endpoint Identifier (TEID) of the successful PCC rules. |
| 10 | The SMF sends the CHF Update Request message to the CHF upon receiving a termination request. The CHF sends the CHF Update Response as an acknowledgment. |
| 11 | If the PCF has subscribed for notification on failed PCC rules, the SMF sends PCF Update Request with rule report containing the failed PCC rules dropped by the NG-RAN. |
| 12 | The SMF sends the PDU Session Update Response to the AMF.<br>The SMF triggers internal transaction based on the failed QFI list. Then, the SMF initiates PDU UE Sync Procedure to send N1/NAS signalling.<br>The SMF notifies the UE about the failed QoS flows using N1 messaging, and the UPF and PCF nodes about the associated failed PCC rules. |

## Handling Failed QoS Flow Identifier During PDU Session Modification

The SMF supports handling of the failed QoS flows over N2 interface during the PDU session modification.

If the modification of a PDU session or a QoS flow fails, the NG-RAN node falls back to the older configuration. That is, it falls back to the configuration of the session or the flow that was available before receiving the PDU SESSION RESOURCE MODIFY REQUEST message.

The SMF receives the QoS Flow Identifier for which the flow add/modify failed during the PDU SESSION RESOURCE MODIFY REQUEST.

If the new flow addition fails, the SMF performs the following:

- Removes the failed flow towards N1 (UE)
- Stops sending the failed flow-related information towards N4 (UPF)
- Stops sending the failed flow-related information towards N40 (CHF)
- Checks if the triggers are enabled and then sends the rule report for the failed flow towards N7 (PCF).

If the modification of flow fails, the SMF performs the following:

- Replaces the old information for the failed flow towards N1 (UE)
- Stops sending the modified flow-related information towards N4 (UPF)

- Stops sending the modified flow-related information towards N40 (CHF)
- Checks if the triggers are enabled and then sends the Rule Report for the failed flow towards N7 (PCF).

The following table captures the SMF behavior for the cause values included in the PDU Session Resource Modify Unsuccessful Transfer IE. These cause values are applicable for the PDU session modification procedure.

| Cause Group | Cause Value | SMF Behavior | Comment |
|---|---|---|---|
| Radio Network Layer Cause | | | |
| | Unspecified | | General |
| | Unknown PDU Session ID | Delete the session | N1 FiveGSM Cause reactivation requested |
| | Unknown QoS Flow ID | Send delete details to N1<br>Send PCF report about rule(s) | |
| | Multiple PDU Session ID Instances | Delete the session | |
| | Multiple QoS Flow ID Instances | Delete the session | N1 FiveGSM Cause reactivation requested |
| | Xn handover triggered | Act based on collision handling | |
| | Not supported 5QI value | Send delete details to N1<br>Send PCF report about rule(s) | |
| | IMS voice EPS fallback or RAT fallback triggered | Already supported | |
| Transport Layer Cause | | | |
| | Transport resource unavailable | Send delete details to N1<br>Send PCF report about rule(s) | |
| | Unspecified | | |
| NAS Cause | | | |
| | Normal release | Delete the session | |
| | Authentication failure | Delete the session | |
| | Deregister | Delete the session | |
| | Unspecified | Delete the session | |

| Cause Group | Cause Value | SMF Behavior | Comment |
|---|---|---|---|
| Protocol Cause | | | |
| | Transfer syntax error | N1 rollback<br>Error log fail procedure | |
| | Abstract syntax error (reject) | N1 rollback<br>Error log fail procedure | |
| | Abstract syntax error (ignore and notify) | N1 rollback<br>Error log fail procedure | |
| | Message not compatible with receiver state | N1 rollback<br>Error log fail procedure | |
| | Semantic error | N1 rollback<br>Error log fail procedure | |
| | Abstract syntax error (falsely constructed message) | N1 rollback<br>Error log fail procedure | |
| | Unspecified | N1 rollback<br>Error log fail procedure | |
| Miscellaneous Cause | | | |
| | Control processing overload | N1 rollback<br>Error log fail procedure | |
| | Not enough user plane processing resources | N1 rollback<br>Error log fail procedure | |
| | Hardware failure | Delete the session | |
| | O&M intervention | N1 rollback<br>Error log fail procedure | |
| | Unknown PLMN | Delete the session | |

### Bulk Statistics

The following statistics provide details about the failed QoS flows over the N2 interface.

- policy_pdu_flows_total
  - total attempted
  - total succeeded

- total failed

- policy_pdu_flows_current
  - current attempted
  - current succeeded
  - current failed

## Flow Failure Management Call Flows

The following call flow provides the details of the different flow failure scenarios during the EPS to 5GS handover. This call flow also describes how the SMF manages these failures and keeps the flows intact across 5GS network elements and the subscriber.

- Flow failure from source in EPS to 5GS Handover
- Flow failure from target in EPS to 5GS Handover

***Figure 7: Flow Failure Management Call Flow***

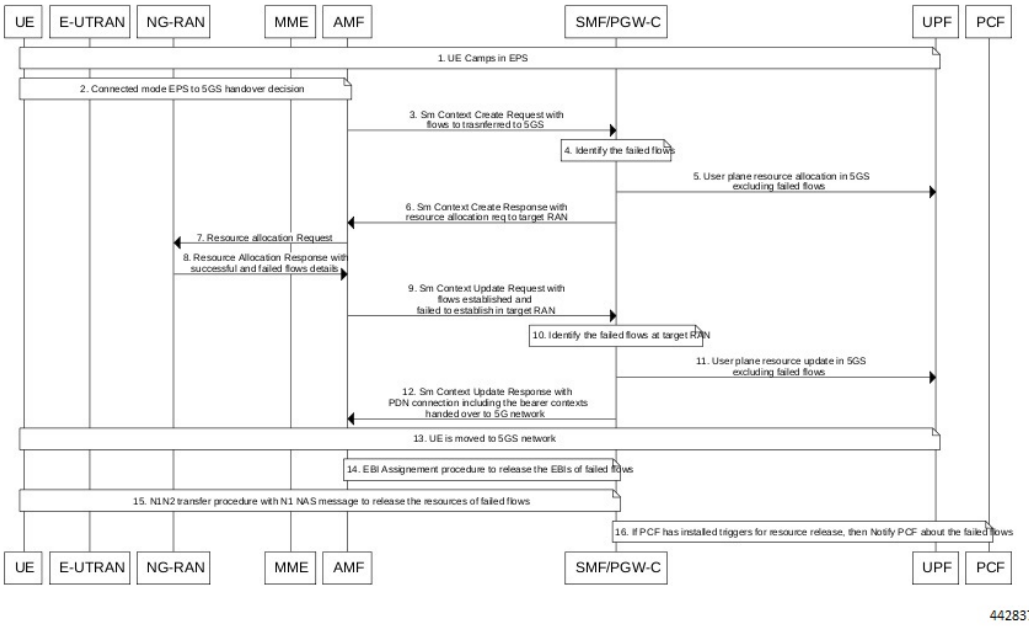



***Table 9: Flow Failure Management Call Flow Description***

| Step | Description |
|---|---|
| 1 | The EPS interworking capable UE initially camps on the EPS network. |
| 2 | This step involves taking the connected mode EPS to 5GS handover decision. |
| 3 | During the EPS to 5GS handover procedure, the PDN Connection in the Sm Context Create request from the AMF carries the EPS bearer contexts to be handed over to 5GS network. |

| Step | Description |
|---|---|
| 4 | The SMF identifies the bearer contexts that were established in EPS and missing in PDN connection as failed flows. |
| 5 | The SMF performs the resource allocation in 5GS network and sends it to the UPF excluding the failed flows. |
| 6 | The SMF sends the Sm Context Create Response with resource allocation request to the target RAN. |
| 7 | The AMF forwards the resource allocation request to the NG-RAN. |
| 8 | The NG-RAN sends the resource allocation response with the details of successful and failed flows to the AMF.<br>The target RAN node may not be able to allocate the resources for all the requested flows during EPS to 5GS handover procedure. The target RAN shares information about such failed flows in the resource allocation response. |
| 9 | The AMF sends the Sm Context Update Request with flows established and failed to establish in the target RAN. |
| 10 | The SMF identifies the failed flows at the target RAN. |
| 11 | The SMF performs the user plane resource update in 5G network excluding the failed flows. |
| 12 | The SMF sends the Sm Context Update Response with PDN connection including the bearer contexts handed over to the 5GS network. |
| 13 | The UE is moved to the 5GS network. |
| 14 | The SMF uses the EBI assignment procedure to release the EBIs of failed flows. |
| 15 | The SMF sends the N1N2 transfer request with the N1 NAS message to the UE to remove the resources of failed flows. |
| 16 | If the PCF has installed triggers to release the resources, then the SMF notifies the PCF about the failed flows. |

### Handling of Flow Failures from Source in EPS to 5GS Handover

The following call flow depicts the handling of flow failure from source RAN in EPS to the 5GS handover.

*Figure 8: Flow Failure Handling Call Flow (From Source in EPS to 5GS Handover)*

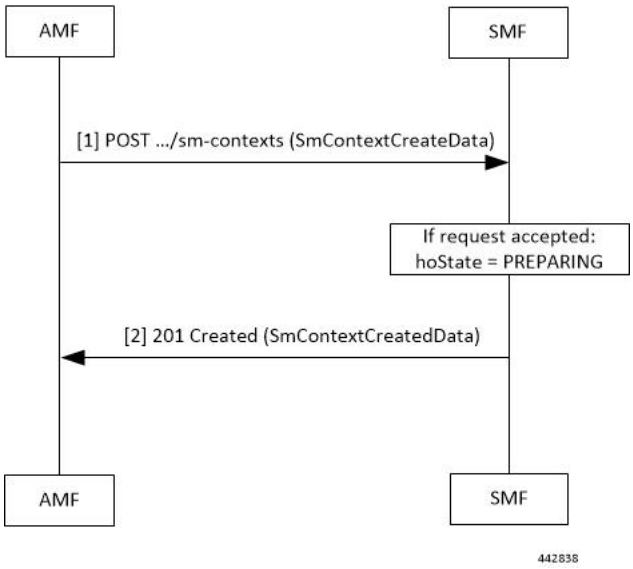



*Table 10: Flow Failure Handling Call Flow Description (From Source in EPS to 5GS Handover)*

| Step | Description |
|---|---|
| 1 | The AMF sends a POST request for Sm Context Create Service, with the following additional information:<br>• UE EPS PDN connection, including the EPS bearer contexts, representing the individual SM context resource to be created. The UE EPS PDN connection may not carry the flows which source does not want to establish in the 5GS network.<br>• hoState attribute set to PREPARING<br>• targetId identifying the target RAN Node ID and TAI based on the Target ID IE received in the Forward Relocation Request message from the source MME. |
| 2 | If the corresponding PDU session is detected based on the EPS bearer contexts and the handover of the PDN connection to 5GS network is possible, then the SMF returns a 201 Created response including the following information:<br>• hoState attribute set to PREPARING and N2 SM information to request the target RAN to assign resources to the PDU session, excluding the flows which are not received in the UE EPS PDN connection.<br>• PDU Session ID corresponding to the default EPS bearer ID of the EPS PDN connection.<br>• allocatedEbiList containing the EBIs allocated to the PDU session.<br>The POST response includes the Location header and the URI of the created SM context resource.<br>The AMF stores the association of the PDU Session ID and the SMF ID, and the allocated EBIs associated to the PDU Session ID. |

## Handling of Flow Failures from Target in EPS to 5GS Handover

The following call flow depicts the handling of flow failure from target RAN in EPS to the 5GS handover.

***Figure 9: Flow Failure Handling Call Flow (From Target in EPS to 5GS Handover)***

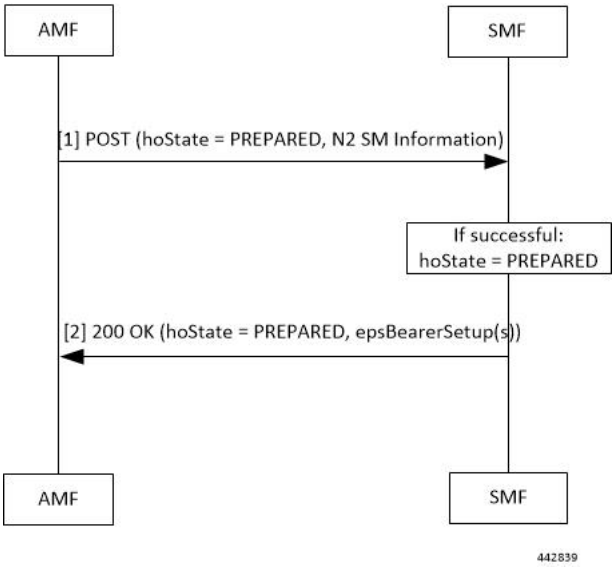



***Table 11: Flow Failure Handling Call Flow Description (From Target in EPS to 5GS Handover)***

| Step | Description |
|---|---|
| 1 | The AMF updates the SM context in the SMF by sending POST request with the following information:<br>• hoState attribute set to PREPARED<br>• N2 SM information received from the target RAN, including the transport layer address and tunnel endpoint of the downlink termination point for the user data for this PDU session (that is, GTP-U F-TEID of the target RAN for downlink traffic), if the target RAN succeeded in establishing resources for the PDU session; the target RAN may not be able to establish resources for all the flows; the target RAN includes such failed flows information |
| 2 | If the target RAN succeeded in establishing resources for the PDU sessions, the SMF sets the hoState attribute to PREPARED and returns a 200 OK response including the following information:<br>• hoState attribute set to PREPARED<br>• the epsBearerSetup IEs containing the list of EPS bearer contexts successfully handed over to the 5GS and the CN tunnel information for data forwarding, generated based on the list of accepted QFIs received from the RAN; This is the final list of flows handed over to the 5GS network. |

# Standards Compliance

The QoS Flow Failure Handling for Access and Mobility Procedures feature complies with the following standards:

- *3GPP TS 23.502 V16.1.1 (2019-06)*