

5GS Interworking using N26 Interface Support

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	MME
Applicable Platform(s)	• ASR 5500 • VPC-DI • VPC-SI
Feature Default	Enabled-Always-On
Related Changes in This Release	Not Applicable
Related Documentation	• *Command Line Interface Reference* • *MME Administration Guide*

Revision History

Revision Details	Release
Support is introduced for the MME to utilize the HSS Interworking-5GS-Indicator to control UE mobility towards 5GS.	2026.03.0
CLI configuration support is added for enabling the reject EPS to 5Gs procedure without n1 mode support.	2024.02.0
Support is introduced for dynamic selection mechanism to select SGW-C+SMF through s11 interface.	21.28.m7
Support is introduced for dynamic selection mechanism to select PGW-C+SMF and peer-AMF.	21.25
The N26 interface for interworking with 5GS functionality is fully qualified in this release.	21.20.3
MME supports N26 interface between AMF in 5GC and MME in Evoloved Packet Core (EPC) to provide seamless session continuity for single registration mode UE. **Important** This feature is not fully qualified in this release, and is available only for testing purposes. For more information, contact your Cisco Account Representative.	21.20
First introduced. This release supports N26 Interface for interworking with 5GS functionality. **Important** This feature is not fully qualified in this release, and is available only for testing purposes. For more information, contact your Cisco Account Representative.	21.19

Feature Description

MME supports 5GS interworking with N26 interface in compliance with 3GPP 5GS standards. Interworking procedures using the N26 interface, enables the exchange of Mobility Management (MM) and Session Management (SM) states between the source and target network.

5GS interworking with the N26 interface, the User Equipment (UE) operates in the single registration mode. MME supports the N26 interface between Access and Mobility Management Function (AMF) in 5GC and MME in EPC to provide seamless session continuity (for example, for voice services) for single registration mode UE. For the 3GPP access, the network keeps only one valid MM state for the UE either in the AMF or MME.

MME uses either the static or dynamic mechanism to select PGW-C+SMF and peer-AMF.

MME supports selection of combined SGW-C/SMF on the base of DNS S-NAPTR queries using the **3gpp-x-3gpp-sgw:x-s11** service parameter for UEs supporting N1 mode and optionally matching an UE Usage type.

MME supports the following interworking procedures with the N26 interface:

- Attach
- EPS to 5GS Mobility Registration
- 5GS to EPS Idle Mode Mobility
- 5GS to EPS Handover
- EPS to 5GS Handover
- 5GS to EPS Handover Cancel
- EPS to 5GS Handover Cancel

Supported IEs and AVPs

MME supports the following IEs for the 5GS interworking feature:

S1AP (eNodeB) Interface:

- **GUMMEI Type**—The S1-AP interface supports **mappedFrom5G** in the Globally Unique Mobility Management Entity Identifier (GUMMEI) type IE. If the UE was previously registered in 5GS, the UE provides a GUMMEI in Access Stratum signaling mapped from the 5G-GUTI and is indicated as **Mapped from 5G-GUTI**.
- **Handover Type**—This indicates the type of handover that was triggered in the source side. The Handover type IE currently supports **EPSto5GS** and **5GStoEPS** type.
- **Handover Restriction List** —This supports **Core Network Type Restrictions**, **NR Restriction in 5GS** and **Last NG-RAN PLMN Identity**.

Note MME currently includes only one serving PLMN in Core Network Restrictions Type IE.

- **Target ID**—This supports **Global RAN Node ID** and **Selected TAI(5GS TAI)**.

Note Global ng-eNB under Global RAN Node ID is currently not supported.

NAS (UE) Interface

- **UE Network Capability (N1-mode)** —MME supports N1-mode handling in the UE Network Capability IE. For UE that supports N1 mode, the UE sets the N1 mode bit to **N1 mode supported** in the UE network capability IE of the ATTACH REQUEST/TRACKING AREA UPDATE REQUEST message.

- **UE Status IE** —MME supports UE Status IE in the ATTACH REQUEST/TRACKING AREA UPDATE REQUEST message and provides the network with information that is related to the current UE registration status that is used for interworking with 5GS.
- **EPS Network Feature Support (IWK N26)** — MME supports an IWK N26 indicator to specify whether interworking without N26 interface is supported or not in ATTACH ACCEPT/TAU ACCEPT message.

S6a (HSS) Interface

- **Interworking-5GS-Indicator AVP** —MME supports Interworking-5GS-Indicator to indicate whether the interworking between 5GS and EPS is subscribed or not subscribed for the APN.
- **Core-Network-Restrictions AVP** —MME supports Core-Network-Restrictions to indicate the types of Core Network that are disallowed for a user.
- **Access-Restriction-Data AVP** — MME supports bit 10 NR in 5GS Not Allowed to check whether NR is 5GS is Allowed or Not Allowed. The Access-Restriction-Data AVP is of type Unsigned32 type and contains a bit mask where each bit when set to 1 indicates a restriction.

S11 (SGW) Interface:

- **Indication Flag** — MME supports 5GSIWKI (5GS Interworking Indication) and REPREFI (Return Preferred Indication) flags.

DNS Mechanism to Select SGW-C+SMF

MME supports the SGW-C+SMF selection for Nonemergency PDN connection based on the following conditions:

- UE N1 Mode capability (UE Network Capability)
- (Optional) Matching a UE Usage type

S-NAPTR query is performed to identify the SGW-C+SMF based on the below S-NAPTR procedure with service parameters:

- MME considers the **n1-mode 5gs-interworking-with-n26 sgw-selection s11** CLI when forming the service parameter in the SGW-C+SMF DNS S-NAPTR requests.

  If the UE is in N1 mode and CLI is configured with S11 and no UE usage type is specified then MME sends the DNS S-NAPTR query using the x-3gpp-sgw:x-s11 service parameter to select the SGW-C+SMF.

- If UE is in N1 mode and CLI is configured with S11 and UUT, MME matches the UE's UUT with CLI UUTs. Then MME, sends a DNS S-NAPTR query using the **x-3gpp-sgw:x-s11** service parameter. Else, sends the DNS S-NAPTR query using the **x-3gpp-sgw:x-s5-gtp or x-3gpp-sgw:x-s8-gtp** based on local or Roamer service parameter to select the S-GW.

  If UE is in N1 mode and CLI is configured with S11 and UUT, MME matches the UE's UUT with CLI UUTs. Then MME sends a DNS S-NAPTR query using the **x-3gpp-sgw:x-s11** service parameter. Otherwise, sends the DNS S-NAPTR query using the **x-3gpp-sgw:x-s5-gtp** or **x-3gpp-sgw:x-s8-gtp** based on local or Roamer service parameter to select the S-GW.

  ```
  Example: n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129 130
  131 132 133 134 135
  ```

The S-NAPTR procedure logically displays a list of host names each with service, protocol, port, and a list of IPv4 and IPv6 addresses. From the candidate list, MME selects the best node based on the Topology, Collocation, Order, or Weight.

License Requirements

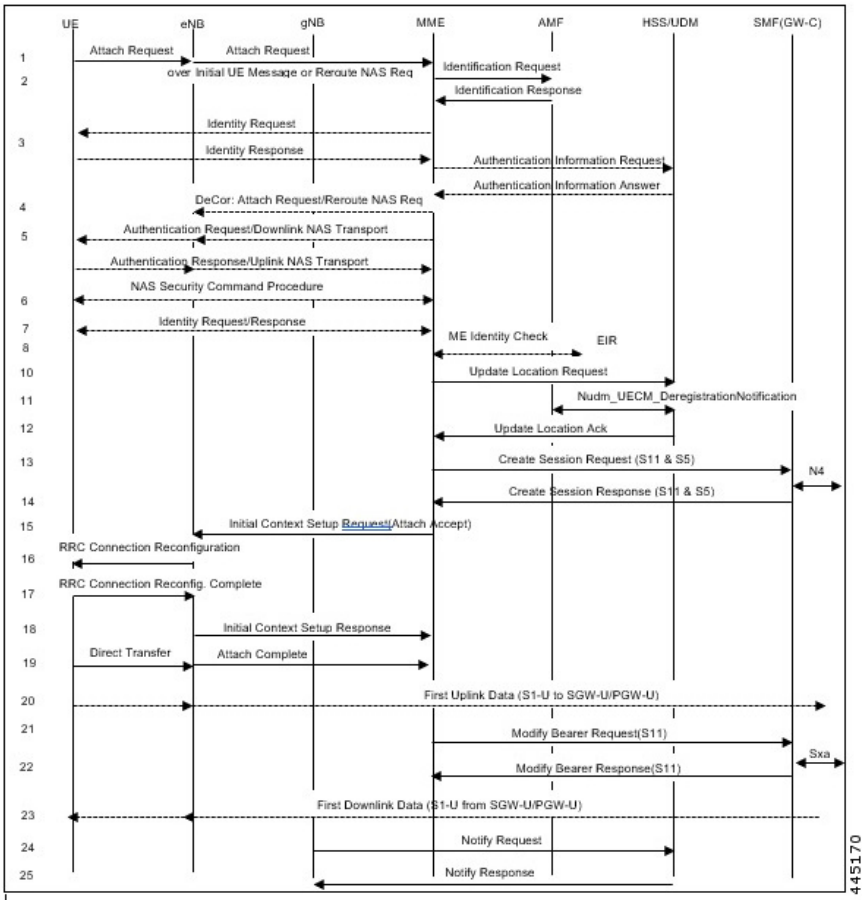
MME 5G Interworking and N26 Interface are a licensed Cisco feature that require a separate license. Contact your Cisco account representative for detailed information on specific licensing requirements. For information on installing and verifying licenses, refer to the *Managing License Keys* section of *Software Management Operations*.

How it Works

This section describes the call flow procedures that are related to 5GS interworking with the N26 interface.

The following call flow describes the working of 5Gs to an EPS attach procedure.

Figure 1: E-UTRAN Initial Attach Call Flow



E-UTRAN Initial Attach Procedure

The following table describes the 5GS to EPS attach procedure.

Table 1: E-UTRAN Initial Attach Procedure

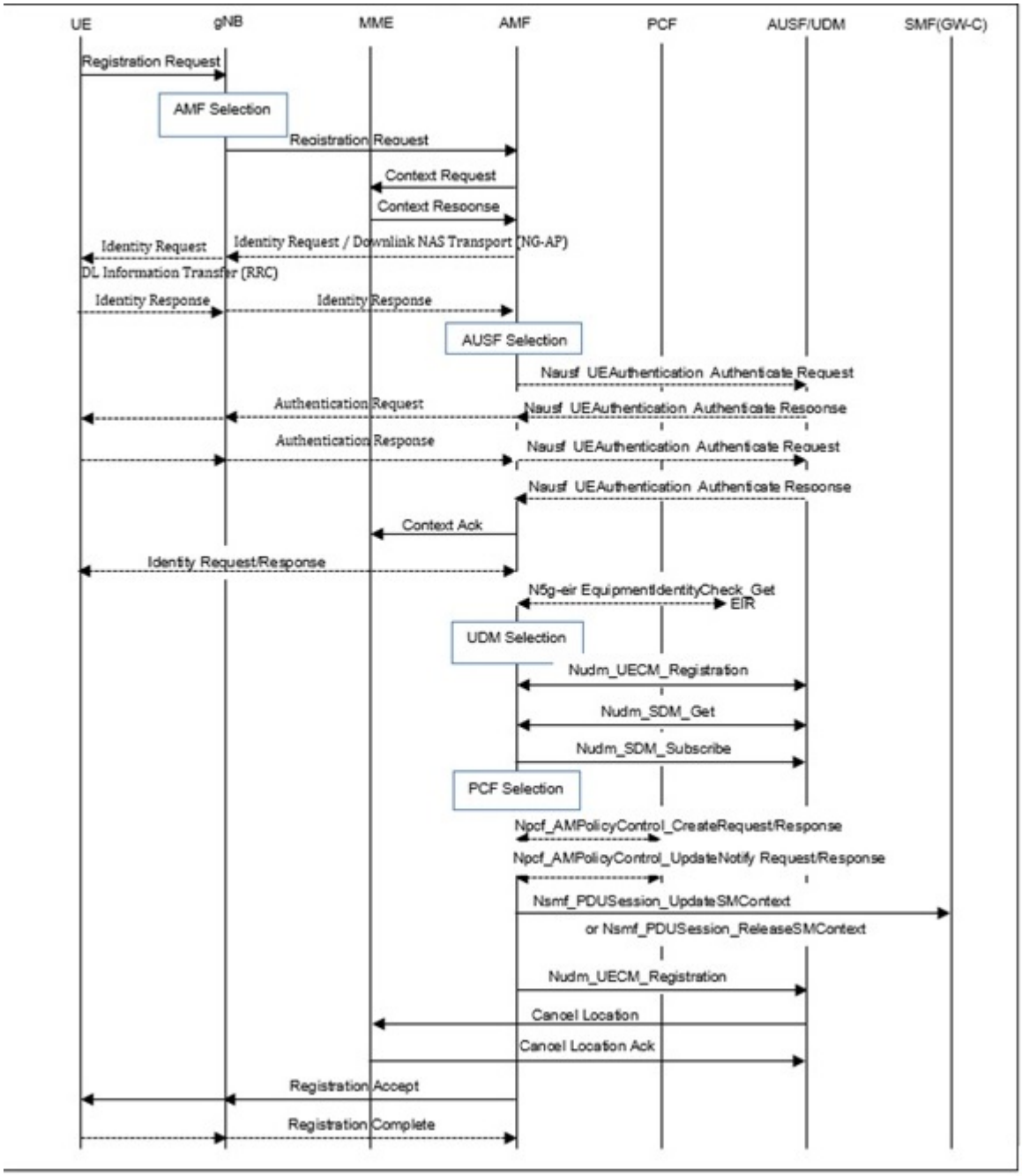
Step	Description
1	Attach Request is carried over Initial UE Message with the following conditions: • UE includes N1-mode capability in the **UE Network Capability IE**. • UE includes GUMMEI in the S1-AP message and indicates that GUMMEI is Mapped from 5G-GUTI. • UE includes a GUTI, mapped from 5G-GUTI into the EPS mobile identity IE, includes old GUTI type IE with GUTI type set to **native GUTI** and includes the UE status IE with a 5GMM registration status set to **UE is in 5GMM-DEREGISTERED state**.
2	MME construct the 5G-GUTI from the received GUTI IE according to the mapping relationship between GUTI and 5G-GUTI defined in 3GPP TS 23.003. MME uses the constructed 5G GUTI to determine the peer AMF address based on DNS or local Static AMF GUAMI configuration. If MME is unable to find the peer AMF address, the new MME sends an Identity Request to the UE to request the IMSI. The UE responds with Identity Response (IMSI). During the 5GS to EPS Attach procedure using 5G-mapped GUTI: • DNS selection happens for identifying peer AMF and for the selection of PGW-C+SMF and SGW-C/SMF. • When there is an Initial Attach using IMSI, MME only performs the DNS procedure to select the PGW-C+SMF & SGW-C/SMF (as described in DNS mechanism to select SGW-C+SMF). • In case of DNS selection failure or not Set for any, the MME would fall back to the static selection as per local configuration.
3	MME sends an Identification Request message to the selected peer AMF. .
4	The Access and Mobility Management Function (AMF) responds with Identification Response message **Note** MME sends Identification Request to the peer AMF irrespective of the "n1-mode" configuration in CC profile (or) MME Service and the feature support check is performed after receiving "Identification Response" message from peer AMF. If the feature support is disabled (or) the UE is unknown in the old AMF, MME initiates the Identity procedure with UE.
5	MME sends Update Location Request to HSS and will not set the Dual-registration 5G-indication in ULR-Flag.

Step	Description
6	MME processes and handles the below AVP in the ULA from HSS. MME uses the received information for Mobility restrictions and PGW-C+SMF gateway selection: • Interworking-5GS-Indicator • Core-Network-Restriction • Access-Restriction-Data (NR in 5GS Not Allowed) AVP
7	MME selects PGW-C+SMF based on UE Network capability and mobility restrictions based on the following mechanisms: • Static configuration • Dynamic DNS configuration
8	MME sets the **5GS Interworking Indication** in Indication flags in the Create Session Request and sends to the selected P-GW-C+SMF gateway. MME does not set the Indication bit if Standalone P-GW-C is selected.
9	If the MME receives ePCO from the UE during the Initial Attach or UE requested PDN Connectivity procedures, the MME forwards the ePCO IE to the SGW, if the MME supports ePCO. The SGW shall also forward it to the PGW if the SGW supports ePCO.
10	If UE supports N1 mode in UE network capability, and the Interworking-5GS-Indicator is set to be subscribed, MME sets IWKN26 bit to **Interworking without N26 interface not supported** in the Attach Accept message.

EPS to 5GS Mobility Registration Call Flow

The following call flow describes the registration procedure from EPS to 5GS Mobility when, N26 interface is supported for idle and connected states.

Figure 2: EPS to 5GS Mobility Registration Call Flow



The following table describes the procedure to register from EPS to 5GS.

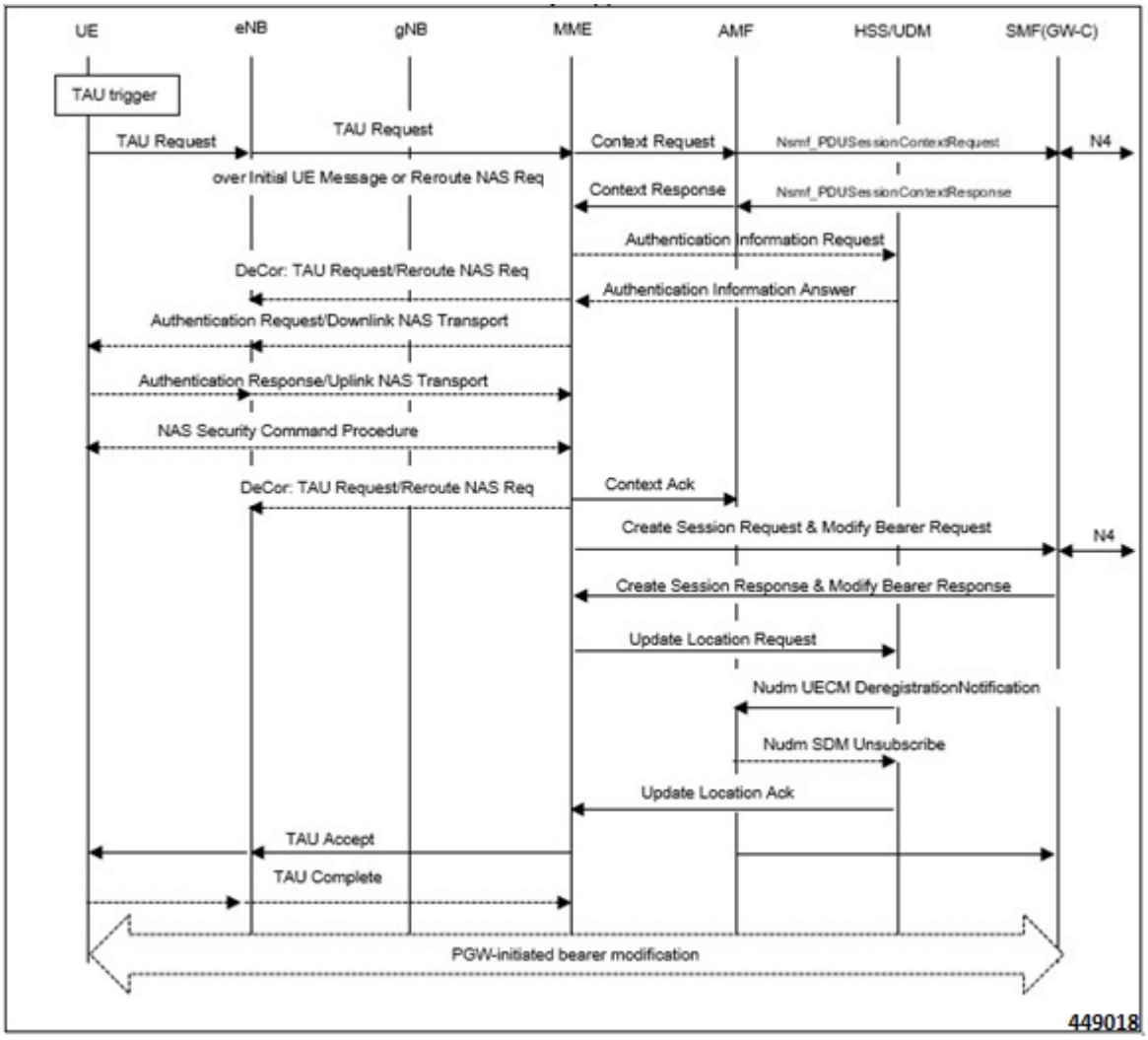
Table 2: EPS to 5GS Mobility Registration Procedure

Step	Description
1	For IDLE mode mobility, the target AMF derives the MME address and 4G GUTI from the old 5G-GUTI and sends Context Request to MME including EPS GUTI mapped from 5G-GUTI and the TAU request message according to TS 23.401. The MME validates the TAU message. **Note** • MME supports FTEID Interface types **S10/N26 MME GTP-C interface (12)** and **N26 AMF GTP-C interface (40)** received in the **Context Request** message from peer AMF. • MME would use the RAT type NR in the **Context Request** message to determine if the peer is AMF.
2	MME includes EPS MM Context, IMSI, ME Identity, UE EPS security context, UE Network Capability, and EPS Bearer context(s) in the Context Response message and sends to the peer AMF. The MME EPS Bearer context includes for each EPS PDN connection the IP address and FQDN for the S5/S8 interface of the PGW-C+SMF and APN. MME also includes in the Context Response new information Return Preferred. Return Preferred is an indication by the MME of a preferred return of the UE to the last used EPS PLMN at a later access change to an EPS shared network. Based on the Return Preferred indication, the AMF stores the last used EPS PLMN ID in UE Context. MME sends Context Response failure if feature support is disabled, Unknown RAT type other than NR is received (or) mobility is restricted.
3	The target AMF sends Context Acknowledge (Serving GW change indication) to MME.
4	HSS+UDM cancels the location of the UE in the MME. During EPS to 5GS Mobility registration (TAU), when you configure the **release-s1-s11-on-timer-expiry-upon-clr** CLI, and when MME receives CLR with MME UPDATE PROCEDURE, then MME waits for the **ho-resource-release-timeout** to expire and releases S1 and S11 resources. If it is not configured, and when MME receives CLR with MME UPDATE PROCEDURE, then MME instantly releases S1 and S11 resources.

5GS to EPS Idle Mode Mobility Call Flow

The following call flow describes the idle and connected states.

Figure 3: 5GS to EPS Idle Mode Mobility Call Flow



UE performs the Tracking Area Update (TAU) procedure in E-UTRA/EPS when it moves from NG-RAN/5GS to E-UTRAN/EPS coverage area.

During 5GS to EPS Idle Mobility using 5G-Mapped GUTI, DNS selection happens to select SGW-C+SMF nodes as described in the DNS mechanism to select SGW-C+SMF.

The procedure involves a Tracking Area Update to EPC and setup of default EPS bearer and dedicated bearers in EPC and reactivation, if necessary.

Table 3: 5GS to EPS Idle Mode Mobility Procedure

Step	Description
1	Tracking Area Update Request is carried over Initial UE Message with the following conditions: • UE includes N1-mode capability in the **UE Network Capability** IE. • UE includes GUMMEI in the S1-AP message and indicates that GUMMEI is Mapped from 5G-GUTI. • UE includes a GUTI, mapped from 5G-GUTI into the EPS mobile identity IE, includes old GUTI type IE with GUTI type set to **native GUTI** and includes the UE status IE with 5GMM registration status set to **UE is in 5GMM-REGISTERED** state.
2	MME constructs the 5G-GUTI from the received GUTI IE according to the mapping relationship between GUTI and 5G-GUTI defined in 3GPP TS 23.003. MME uses the constructed 5G GUTI to determine the peer AMF address based on DNS or local Static AMF GUAMI configuration. If the MME is unable to find the peer AMF address, the new MME rejects the TAU Request.
3	MME sends a Context Request message to the selected peer AMF.
4	The AMF responds with a Context Response message carrying mapped MM context (including mapped security context), UUT, Return preferred and SM EPS UE Context (default and dedicated GBR bearers) to the MME. If the verification of the integrity protection fails, the AMF returns an appropriate error cause. Return preferred is an optional indication by the AMF of a preferred return of the UE to the 5GS PLMN at a later access change to a 5GS shared network. The PDN GW Address and TEID(s) is part of the EPS Bearer Context for PDN connection in Context Response. However, SGW S11 IP address and TEID for Control Plane is not provided by AMF. **Note** . • MME supports **S10/N26 MME GTP-C** and **N26 AMF GTP-C** FTEID Interface types from peer AMF. • MME sends Context Request to the peer AMF irrespective of the **n1 mode** configuration in CC profile (or) MME Service and the feature support check is performed after receiving **Contect Response** message from peer AMF. If the feature support is disabled, MME rejects the TAU Request and sends the Context Acknowledgment failure.
5	MME selects new SGW-C and sends Create Session Request toward the SGW. MME sets the **5GS Interworking Indication** in Indication Flags in the Create Session Request message.
6	MME sends Update Location Request to HSS and will not set the Dual-registration 5G-indication in ULR-Flag.

Step	Description
7	MME processes and handles the following AVPs in the ULA from HSS. • Interworking-5GS-Indicator • Core-Network-Restriction • Access-Restriction-Data (NR in 5GS Not Allowed) AVP. MME uses the received information for Mobility restrictions and PGW-C+SMF gateway selection.
8	If UE supports **n1 mode** in UE network capability, and the Interworking-5GS-Indicator is set to be subscribed, MME sets the IWKN26 bit to "Interworking without N26 interface not supported" in TAU Accept.

Use Cases:

5GS to EPS Idle Mode Mobility procedure with N1-Mode=Not supported:

In step 1 of Table 3, UE can disable n1 mode in TAU request to avoid unintentional handover to 5GC. Few scenarios in which UE can disable n1 mode are:

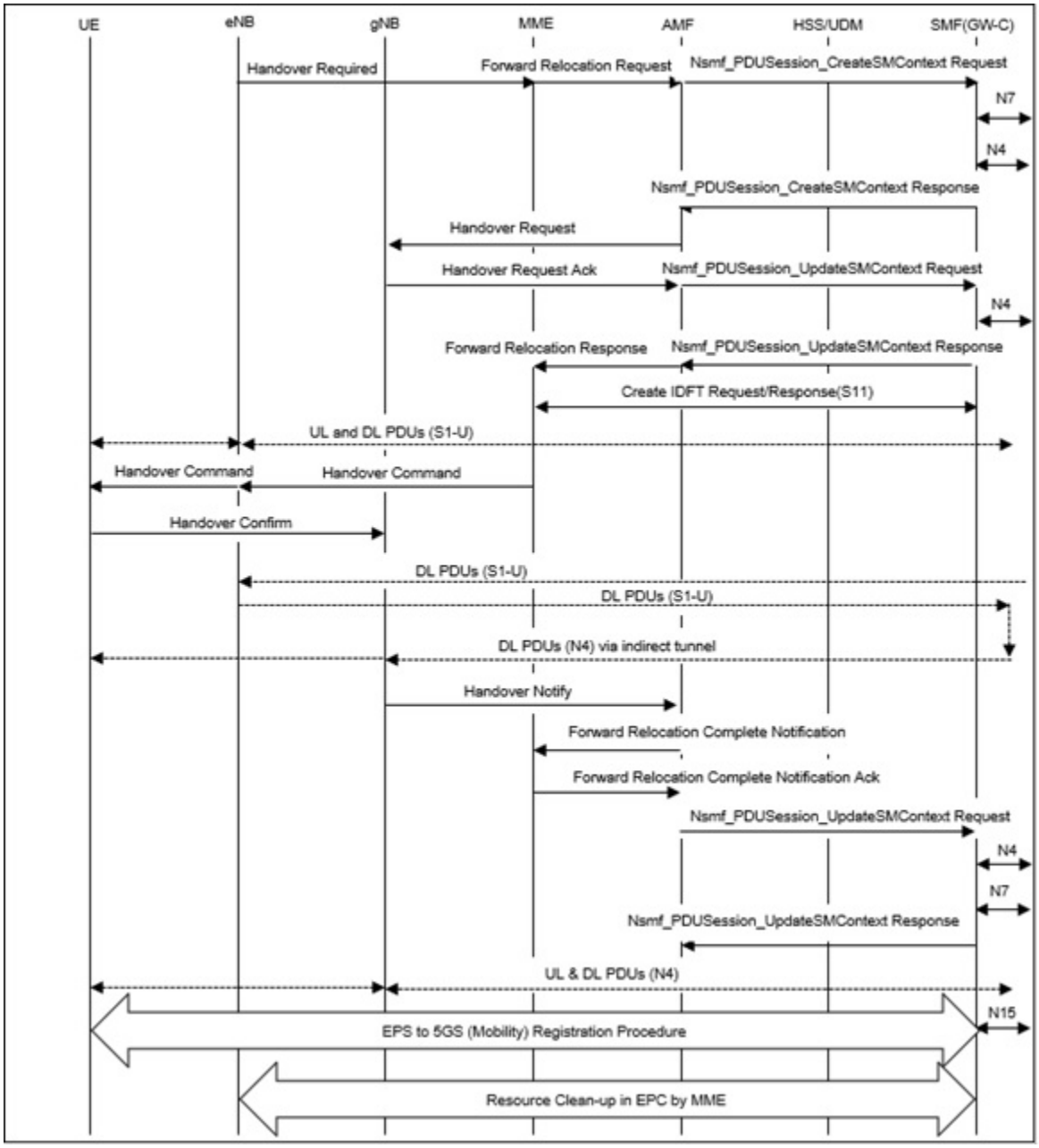
- Emergency service fallback to setup call through EPS
- Nonavailability of IMS voice over 3GPP access
- UE 's usage setting is voice-centric

MME considers AMF as a peer if the N1-Mode-Reg bit is set to **5GMM-REGISTERED** in **UE Status IE** and supports TAU with **N1-Mode=Not Supported**.

EPS to 5GS Handover Call Flow

The following call flow describes the EPS to 5GS handover using N26 interface.

Figure 4: EPS to 5GS Handover Call Flow



The following table describes the handover procedure from EPS to 5GS using the N26 interface. 5GS Mobility Registration Procedure is performed, and steps from Context Request to Context Acknowledgment are skipped during the handover to 5GS.

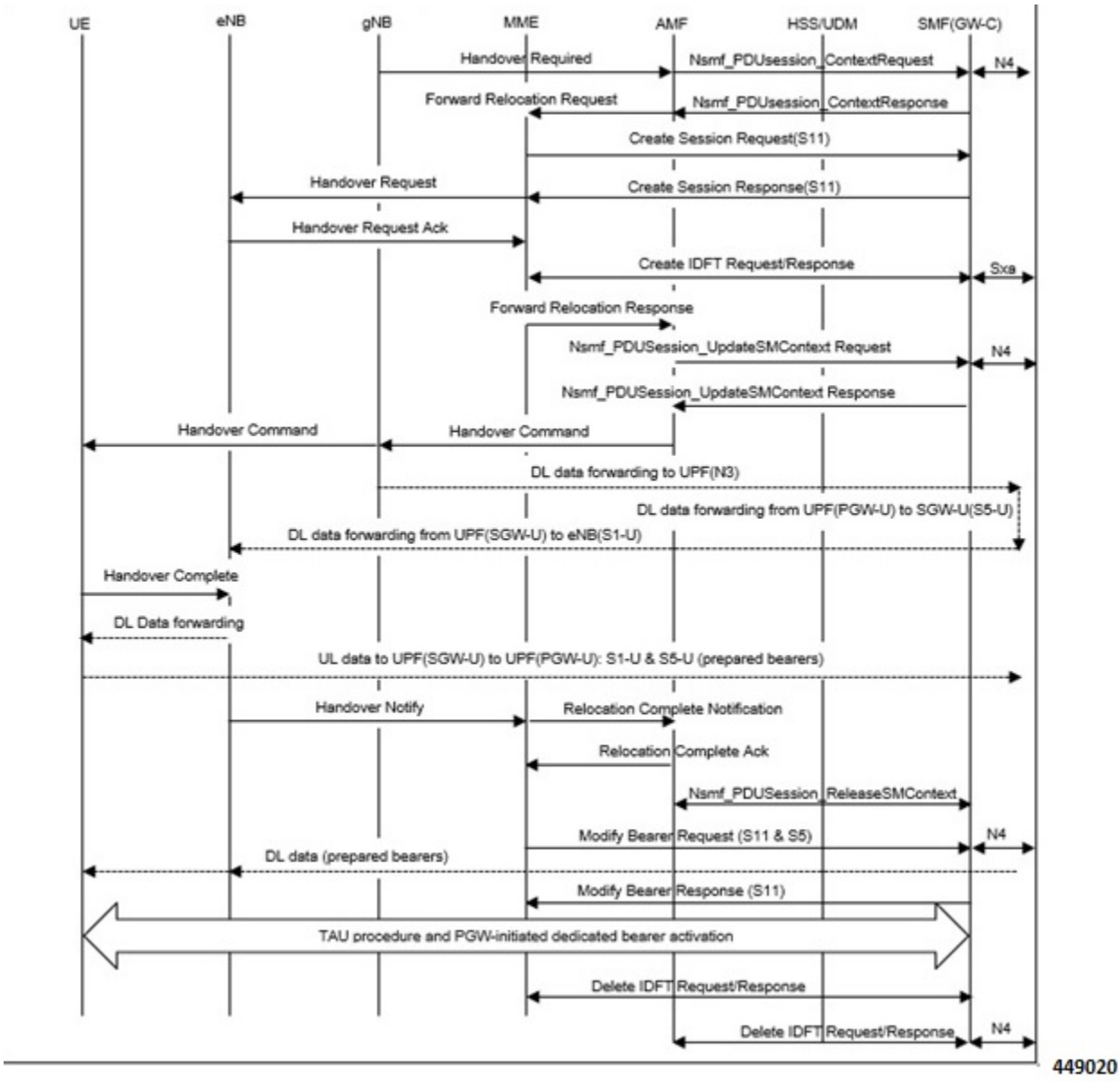
Table 4: EPS to 5GS Handover Procedure

Step	Description
1	MME receives Handover Required from eNB with the Handover type set **EPSto5GS**, Target ID with Global gNB ID and selected 5GS TAI information. **Note** Global ng-eNB is currently not supported.
2	MME uses the 5GS TAI information to determine the peer AMF address based on DNS or local Static AMF TAI configuration. If MME is unable to find the peer AMF address or the feature is disabled, MME sends Handover preparation failure to eNB.
3	MME sends Forward Relocation Request message to the selected peer AMF with the following information: • MME includes EPS MM Context, IMSI, ME Identity, UE security context, UE Network Capability, and EPS Bearer context(s) in the Forward Relocation Request message. The MME EPS Bearer context(s) includes for each EPS PDN connection the IP address and FQDN for the S5/S8 interface of the PGW-C+SMF and APN, and for each EPS bearer the IP address and CN Tunnel Info at the UPF+PGW-U for uplink traffic. • MME includes an additional optional parameter Return preferred; Return that is preferred is an optional indication that is provided by the MME to indicate a preferred return of the UE to the last used EPS PLMN at a later access change to an EPS shared network. Based on the Return Preferred indication, the AMF stores the last used EPS PLMN ID in the UE Context.
4	MME receives Forward Relocation Response (Cause, Target to Source Transparent Container, S-GW change indication, CN Tunnel Info for data forwarding, EPS Bearer Setup List, AMF Tunnel Endpoint Identifier for Control Plane, Addresses and TEIDs) from AMF. The EPS Bearer Setup list is the combination of EPS Bearer Setup list from different P-GW-C+SMF(s). **Note** MME supports **S10/N26 MME GTP-C** and **N26 AMF GTP-C** FTEID Interface types from peer AMF.
5	The source MME sends Create Indirect Data Forwarding Tunnel Request (addresses and TEIDs for forwarding) to the S-GW. If the S-GW is relocated, it includes the tunnel identifier to the target S-GW. The S-GW responds with a Create Indirect Data Forwarding Tunnel Response (S-GW addresses and TEIDs for forwarding) message to the source MME.
6	The source MME sends a Handover Command (Target to Source transparent container, Bearers subject to forwarding, Bearers to Release) message to the source eNodeB. The Bearers subject to forwarding includes a list of addresses and TEIDs allocated for forwarding. The Bearers to Release include the list of bearers to be released.
7	The NG-RAN notifies the AMF that UE is handover over to NG-RAN and AMF sends Forward Relocation Complete Notification message to the source MME. The source MME in response sends a Forward Relocation Complete Acknowledge message to the target AMF.

5GS to EPS Handover Call Flow

The following call flow describes the 5GS to EPS handover using N26 interface.

Figure 5: 5GS to EPS Handover Call Flow



The following table describes the handover procedure from 5GS to EPS using N26 interface.

Table 5: 5GS to EPS Handover Procedure

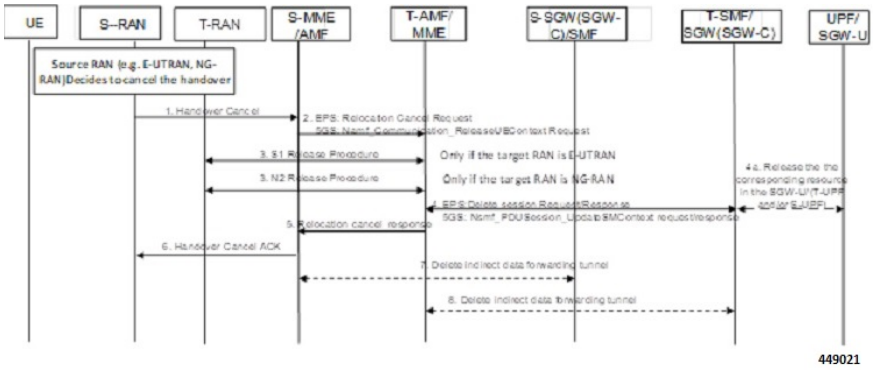
Step	Description
1	MME receives Forward Relocation Request message from AMF. AMF shall include **Return preferred Indication** to indicate preferred return of the UE to the 5GS PLMN at a later access change to a 5GS shared network. AMF includes reserved S-GW address and TEID for both the control plane or EPS bearers in the message. **Note** • MME supports FTEID Interface types **S10/N26 MME GTP-C interface (12)** and **N26 AMF GTP-C interface (40)** received in the **Context Request** message from peer AMF. • MME would use the SGW-C FTEID reserved **TEID** values in the Forward Relocation Request message to determine if the peer is AMF. • If the feature support is disabled, the MME sends Forward Relocation Response failure to peer AMF with cause **Service not supported** .
2	MME selects a new S-GW-C and would send Create Session Request to S-GW and receives Create Session Response from S-GW.
3	MME sends Handover Request message towards eNB with Handover type “5GStoEPS” and includes the Handover Restriction list for eNodeB functions. During 5GS to EPS connected mode handover the DNS selection happens to select SGW-C+SMF nodes as described in the DNS mechanism to select SGW-C+SMF.
4	The target eNodeB sends a Handover Request Acknowledge (EPS Bearer Setup list, EPS Bearers failed to set up list Target to Source transparent container) message to the target MME. The EPS Bearer Setup list includes a list of addresses and TEIDs allocated at the target eNodeB for downlink traffic on S1-U reference point (one TEID per bearer) and addresses and TEIDs for receiving forwarded data if necessary.
5	IDFT enabled MME initiates create IDFT Request message to SMF/GW-C and receives create IDFT response messages from SMF/GW-C.
6	The target MME sends a Forward Relocation Response (Cause, Target to Source transparent container, Serving GW change indication, EPS Bearer Setup List, Addresses, and TEIDs) message to the source MME. **Note** For indirect forwarding, this message includes S-GW Address and TEIDs for indirect forwarding (source or target). S-GW change indication indicates that a new S-GW has been selected.
7	The target eNodeB sends a Handover Notify (TAI+ECGI, Local Home Network ID) message to the target MME.
8	The target MME sends a Relocation Complete Notification message to the source AMF. The AMF acknowledges MME with Relocation Complete Acknowledgment message.
9	MME sends Modify bearer request to S-GW and receives Modify bearer response from S-GW.
10	UE initiates the Connected mode Tracking Area Update procedure toward MME.

Step	Description
11	If PCC is deployed, the PCF provides the previously removed PCC rules to the P-GW-C+SMF, which triggers the P-GW-C+SMF to initiate dedicated bearer activation procedure and the dedicated Bearer gets activated at MME.

Handover Cancellation Procedure

This section describes Handover cancelation call flow and procedures from EPS to 5GS and from 5GS to EPS.

Figure 6: EPS to 5GS Handover Cancel Call Flow



EPS to 5GS Handover Cancel Procedure

1. The source eNB decides to cancel the previously requested relocation of Handover resources. This may be due to not enough accepted bearers, UE returned to source cell or any other reason.
2. MME terminates the relocation towards the AMF by sending a Relocation Cancel Request message to AMF. MME also resumes operation on the resources in the source side.
3. The AMF acknowledges the release of all resources on the target side by returning a Relocation Cancel Response (Cause) message to the source MME.
4. If indirect forwarding tunnel is setup during handover preparation, then cancellation of handover triggers the MME to send a Delete Indirect Data Forwarding Tunnel Request message to the S-GW to release the temporary resources used for indirect forwarding.

5GS to EPS Handover Cancel Procedure

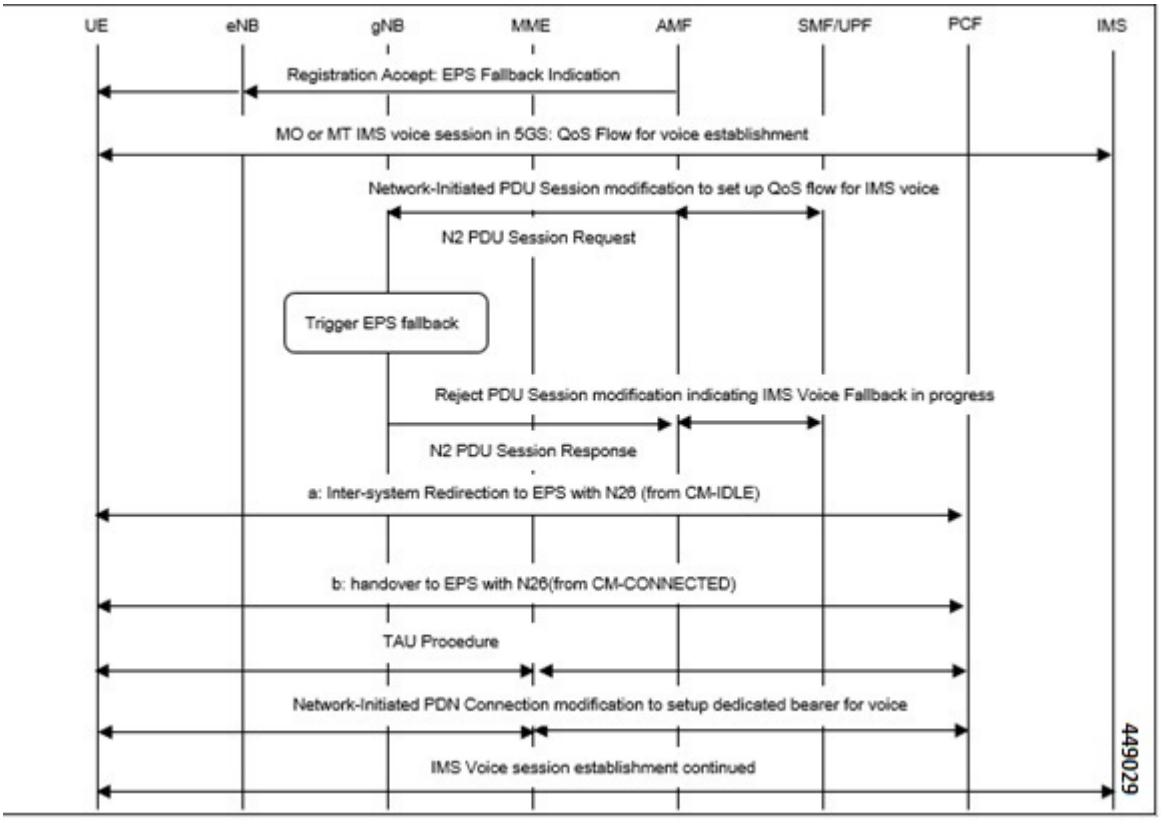
1. MME receives **Relocation Cancel Request** from AMF.
2. MME triggers release of resources towards target RAN node. The target RAN node releases the RAN resource allocated for the handover.
3. MME sends the **Delete session request** (IMSI, Relocation Cancel Indication) to the S-GW/S-GW-C. Based on the Relocation Cancel Indication, MME deletes the session resources established during handover preparation phase in S-GW (S-GW-C and S-GW-U).
4. MME sends **Relocation Cancel Response** towards the AMF.

5. AMF responds with handover cancel ACK towards the source RAN.
6. If indirect forwarding tunnel is setup during handover preparation phase, then cancellation of handover triggers MME to release the temporary resources used for indirect forwarding.

EPS Fallback for IMS Voice Support

MME supports EPS fallback for IMS voice according to 3GPP 23.502.

Figure 7: EPS Fallback for IMS Voice



Combined PGW-C and SMF Selection Procedure

MME supports DNS and Static PGW-C/SMF combined Gateway selection. You can configure PGW-C+SMF in MME Service and in APN profile configuration commands for static gateway selection. 5GSIWKI is set when combined PGW-C/SMF node is selected.

The following steps explain the static based combined P-GW-C/SMF selection procedure and how the fallback to the next available option happens if the selection fails:

1. MME chooses Combined PGW-C/SMF node that supports UE usage type and collocation with S-GW.
2. If step 1 fails, MME selects the Combined PGW-C+SMF node that supports UE usage type.
3. If step 2 fails, MME selects the Combined PGW-C+SMF node that supports collocation with S-GW.

4. If step 3 fails, MME selects the Combined PGW-C+SMF node.
5. If step 4 fails, MME selects the gateway based on UE usage type and standalone PGW collocation.
6. If step 5 fails, MME selects the standalone PGW that supports UE usage type.
7. If step 6 fails, MME selects the gateway that supports standalone PGW collocation.
8. If step 7 fails, MME selects any gateway from all configured entries.

The following steps explain the DNS-based combined PGW-C+SMF selection procedure and how fallback occurs to the next available option if the selection fails:

1. MME selects a gateway matching the UE Usage type, DCNR, and SMF network capability.
2. If step 1 fails, MME selects the gateway matching the DCNR and SMF network capability.
3. If step 2 fails, MME selects the gateway matching the UE usage type and SMF network capability.
4. If step 3 fails, MME selects the gateway matching the SMF network capability.
5. If step 4 fails, MME selects the gateway matching the UE usage type and DCNR network capability.
6. If step 5 fails, MME selects the gateway matching the DCNR network capability.
7. If step 6 fails, MME selects the gateway matching the UE usage type.
8. If step 7 fails, MME selects the gateway matching the default service parameter.
9. If step 8 fails, MME selects the gateway based on local static configuration.

Note The above steps are only for reference purpose based on probable combination where UE/MME supports UUT, DCNR and SMF capability. The selection order varies/depends based on the DNS response, UE capability and MME configuration.

EPS to 5Gs Mobility Procedure without n1 Mode Support

Feature Description

The MME accepts context requests from AMF regardless of the n1-mode support that UE indicates to EPS. This feature is enabled by default.

To reject context requests when the UE indicates that it does not support n1-mode, you can disable this feature by enabling the **reject-EPS-to-5GS-without-n1-mode** configuration.

Disabling EPS to 5G Mobility without n1 Mode

Use the following configuration to disable EPS to 5GS mobility without n1 mode support.

```
configure
  context context_name
    mme service  service_name
      [ no ] n1-mode 5gs-interworking-with-n26 [ sgw-selection |
```

```
reject-EPS-to-5GS-without-n1-mode ]
       end
```

NOTES:

- **mme-service** *service_name*: Configures MME Service. *mme_service* and must be a string of 1–63 characters.
- **n1-mode**: Configures interworking with 5Gs for UEs supporting N1 mode.
- **5gs-interworking-with-n26**: Enables 5GS-EPS interworking with N26 interface.
- **no**: Enables EPS to 5GS mobility without n1 mode support.
- **reject-EPS-to-5GS-without-n1-mode**: If this CLI is configured, MME enables rejection EPS to 5GS context request from AMF when the UE indicates N1 Mode is not supported.

Disabling EPS to 5Gs Mobility in Call Control Profile

Use the following configuration to disable EPS to 5GS mobility without n1 mode support in the Call Control Profile.

```
configure
  call-control-profile profile_name
      [ no | remove ] n1-mode 5gs-interworking-with-n26 sgw-selection
ue-usage-type | reject-EPS-to-5GS-without-n1-mode
    end
```

NOTES:

- **call-control-profile** *profile_name*: Creates an instance of a call control profile. *profile_name* specifies the name of a call control profile entered as an alphanumeric string of 1-64 characters.
- **n1-mode** : Configures interworking with 5GS for UEs supporting N1 mode.
- **5gs-interworking-with-n26** : Enables 5GS-EPS interworking with N26 interface.
- **no** : Disables the configuration..
- **remove**: Removes the configuration from the Call Control Profile and the MME service configuration applies.
- **reject-EPS-to-5GS-without-n1-mode**|: If this CLI is configured, MME enables rejection of EPS to 5GS context request from AMF when the UE indicates N1 Mode is not supported.

Limitations

This section describes the known limitations for the N26 interface functionality:

- Configuration Transfer Tunnel message is not supported.
- Feature-specific optional IEs are not supported. For example, Extended Trace Information IE.
- The MME does not support a combined AMF/MME peer node configured with the same IP address.
- A maximum of 32 peer-AMF entries can be configured for GUAMI or TAI configuration.
- NBIoT and CIOT optimization is not supported.

- PGW-C+SMF selection for Emergency Attach or Emergency PDN is not supported.

Supported Standards

The N26 feature support is compliant with the following standards:

- 3GPP 23.401 version 15.10.0 - General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access
- 3GPP 23.501 version 15.8.0 - System architecture for the 5G System (5GS
- 3GPP 23.502 version 15.8.0 - Procedures for the 5G System (5GS)
- 3GPP 33.501 version 15.7.0 - Security architecture and procedures for 5G System
- 3GPP 24.301 version 15.8.0 - Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS)
- 3GPP 36.413 version 15.8.0 - S1 Application Protocol (S1AP)
- 3GPP 29.272 version 15.10.0 - Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol
- 3GPP 29.274 version 15.9.0 - Tunnelling Protocol for Control plane (GTPv2-C)
- 3GPP 23.003 version 15.8.0 - Numbering, addressing and identification
- 3GPP 29.303 version 15.5.0 - Domain Name System Procedures

Configuring N26 Interface for MME

This section describes the configuration of 5GS Interworking support using N26 interface on MME.

Configuring 5GS Interworking using N26 Interface in Call Control Profile

Use the following configuration to enable 5GS Interworking support using N26 interface.

```
configure
  call-control-profile profile_name
    n1-mode 5gs-interworking-with-n26 [ sgw-selection { s5-or-s8 | s11
[ ue-usage-type  ue-usage-type-val [ ue-usage-type-val+ ] ]} ]
      [ no | remove] n1-mode 5gs-interworking-with-n26 sgw-selections
ue-usage-type
      [ no ] n1-mode 5gs-interworking-with-n26 sgw-selection s11
      [ no ] n1-mode 5gs-interworking-with-n26 sgw-selection s11 [
ue-usage-type  ue-usage-type-val [ ue-usage-type-val+ ] ]
    end
```

NOTES:

- **call-control-profile** *profile_name*: Creates an instance of a call control profile. *profile_name* specifies the name of a call control profile entered as an alphanumeric string of 1-64 characters.
- **n1-mode** : Configures interworking with 5GS for UEs supporting N1 mode.

- **5gs-interworking-with-n26** : Enables 5GS-EPS interworking with N26 interface.
- **no** : Disables 5GS-EPS interworking with N26 interface.

  For example, the **no n1-mode 5gs-interworking-with-n26sgw-selections ue-usage-type 130** CLI command indicates that if the N1 mode is configured and sgw-interface is configured with s11 and ue-usage-type in the Call Control Profile, then Ue-usage 130 gets removed using **no** option.
- **remove**: Removes the configuration from the Call Control Profile and the MME service configuration applies.

Configuring 5GS Interworking using N26 Interface in MME Service

Use the following configuration to enable 5GS Interworking Support using the N26 interface.

```
configure
   context context_name
      mme service  service_name
     [ no ] n1-mode 5gs-interworking-with-n26 [ [ sgw-selection { s5-or-s8
 | s11 [ ue-usage-type  ue-usage-type-val [ ue-usage-type-val+ ] ]} ]
        [ no ] n1-mode 5gs-interworking-with-n26 [ sgw-selection |
reject-EPS-to-5GS-without-n1-mode ]
        [ no ] n1-mode 5gs-interworking-with-n26 sgw-selection s11 [
ue-usage-type  ue-usage-type-val [ue-usage-type-val+ ] ]
         end
```

NOTES:

- **mme-service** *service_name*: Configures MME Service. *mme_service* and must be a string of 1–63 characters.
- **n1-mode**: Configures interworking with 5Gs for UEs supporting N1 mode.
- **5gs-interworking-with-n26**: Enables 5GS-EPS interworking with N26 interface.
- **no**: Disables 5GS-EPS interworking with N26 interface.

  For example, the **no n1-mode 5gs-interworking-with-n26 sgw-selections ue-usage-type 130** CLI command indicates that if the N1 mode is configured and the sgw-interface is configured with s11 and ue-usage-type in the MME Service, then Ue-usage 130 gets removed using the **no** option.
- **sgw-selection**: Allows dynamic S-GW selection based on either s11 or s5-or-s8. Defaults to s5-or-s8. Value under the Call Control Profile takes precedence over value under the MME service.
  - **s5-or-s8**: Dynamic S-GW selection based on the s5-or-s8 interface.
  - **s11**: Dynamic S-GW selection based on the s11 interface.
  - **ue-usage-type**: Specifies up to eight UE usage type integer values in the range 128–255.
- **reject-EPS-to-5GS-without-n1-mode**: Rejects EPS-5GS context request from AMF, if UE indicates that N1 Mode is not supported.

Peer AMF Configuration

Configure Peer AMF GUAMI

Use the following configuration to statically configure the peer AMF address in MME service.

```
configure
  context context_name
    mme service service_name
      peer-amf guami { mcc mcc_value mnc mnc_value region-id region_id set-id
 set_id pointer pointer_value address { ipv4_address | ipv6_address }
      [ no ] peer-amf guami { mcc mcc_value mnc mnc_value region-id region_id
 set-id set_id pointer pointer_value }
      end
```

NOTES:

- **mme-service** *service_name*: Configures MME Service. *mme_service* must be an alphanumeric string of 1-63 characters.
- **peer-amf**: Configures a Peer AMF for 5Gs interworking.
- **guami**: Configures Globally Unique AMF Identifier for this Peer.
- **mcc**: Configures the Mobile Country Code for this Peer AMF.
- **mnc**: Configures the Mobile Network Code for this Peer AMF.
- **region-id**: Configures the Region Identifier for this Peer AMF.
- **set-id** : Configures the Set Identifier for this Peer AMF.
- **pointer**: Configures the Pointer value for this Peer AMF.
- **address**: Configures address of Peer AMF. Must be followed by address using dotted-decimal notation. This can also be specified as an IPv6 address.

Configure Peer AMF TAI

```
configure
  context context_name
    mme service service_name
      peer-amf tai-match priority { val mccmcc_value mnc mnc_value tac area_code
 address { ipv4_address | ipv6_address }
      [ no ] peer-amf tai-match priority  val
      end
```

NOTES:

- **mme-service** *service_name*: Configures MME Service. *mme_service* must be an alphanumeric string of 1-63 characters.
- **peer-amf**: Configures a Peer AMF for 5Gs interworking.
- **tai-match**: Configures 5GS Tracking Area Information match for this Peer AMF.
- **mcc**: Configures the Mobile Country Code for this Peer AMF.

- **mnc**: Configures the Mobile Network Code for this Peer AMF.
- **address**: Configures address of Peer AMF. Must be followed by address using dotted-decimal notation. This can also be specified as an IPv6 address.

Configure PGW-C with SMF Combined

Use the following command to configure the PGW-C with smf combined configuration in mme-service.

```
configure
   context context_name
      mme service service_name
         [ no ] pgw-address ipv4_address | ipv6_address ue-usage-type  UUT_Value
collocated-node collocated_name smf-combined   weightweight_value
        end
```

Use the following command to configure the P-GW-C with smf combined configuration in apn-call-control-profile.

```
configure
   context context_name
      apn profile profile_name
         [ no ] pgw-address ipv4_address | ipv6_address ue-usage-type  UUT_Value
collocated-node collocated_name smf-combined
        end
```

NOTES:

- **mme-service** *service_name*: Configures MME Service. *mme_service* must be an alphanumeric string of 1-63 characters.
- **pgw-address**: Configures p-gw address. Must be followed by address using dotted-decimal notation. This can also be specified as an IPv6 address.
- **ue-usage-type** : Configures UE usage type for disconnecting PDN for up service area.
- **collocated-node**: Configures the Collocation name to select the collocated S/PGW node IP addresses and/or P-GW Node name for 5GS Interworking.

Note Make sure to configure P-GW Node name under **Collocated-node** for 5GS interworking with N26 interface. This configuration allows P-GW Node Name IE to include the configured name in **Context Response** and **Forward relocation Request** messages from MME to AMF over N26 interface.

- **smf-combined** : Configures a combined P-GW and SMF.
- **no**: Removes the configured PGW address.

Associate n26 interface over s10 interface

Use the configuration to enable or disable the N26 traffic over the S10 interface.

```
configure
  context context_name
    mme-service service_name
      [ no ] combine-n26-s10-interface
```

Notes:

- **combine-n26-s10-interface**: This option lets N26 traffic over the S10 interface. If S10/S3-S11 Interface Separation is not enabled, N26 and S10 use the default EGTP-C instance or service. If S10/S3-S11 Interface Separation is enabled, N26 uses a separate EGTP-C instance or service linked to S10. S10 uses its own EGTP-C instance or service.
- **no**: The no option disables N26 traffic over the S10 interface.

Configuring DNS Peer AMF

Use the following sample configuration to configure peer-AMF selection using the DNS interface:

```
configure
  mme-service mme_svc_name
    dns peer-amf
    end
```

NOTES:

- **dns peer-amf**: MME sends a DNS query to the DNS server for selecting AMF.

Note The **dns pgw** command under MME Service and Call Control Profile can be reused to configure DNS to select the PGW-C+SMF address.

HSS Interworking-5GS-Indicator based mobility restriction

The MME currently restricts UE mobility towards 5GS based on two subscription flags from the HSS: Core-Network-Restriction (CNR) and Access-Restriction-Data (ARD). The HSS provides an additional Interworking-5GS-Indicator attribute on a per-APN basis. To provide additional custom control for the operator for 5G-capable UEs, the MME can now act on the HSS Interworking-5GS-Indicator parameter to restrict or allow UE mobility towards 5GS.

The MME evaluates the Interworking-5GS-Indicator across all active PDN connections for a given UE. If at least one PDN has the indicator set to "Subscribed," the UE is considered eligible for 5GS mobility. If none of the UE's PDNs are subscribed, the UE is restricted from moving to 5GS controlled by the configuration.

If the existing ARD and CNR flags impose restrictions, the newly implemented Interworking-5GS-Indicator based restriction will not be considered.

EPS to 5GS handover

During an EPS to 5GS mobility handover, the MME checks whether any of the UE's active PDN connections have the Interworking-5GS-Indicator set to "Subscribed." If none are subscribed, the MME rejects the handover

with a response of S1AP Handover Preparation Failure and cause "unknown-targetID". If at least one PDN is subscribed, the handover proceeds normally, and the MME initiates the N26 Forward Relocation procedure towards the target AMF.

EPS to 5GS mobility

During an EPS to 5GS mobility in idle mode, the AMF sends a GTPv2 Context Request to the MME over the N26 interface to retrieve the UE's EPS context. The MME checks whether any of the UE's active PDN connections have the Interworking-5GS-Indicator set to "Subscribed." If none are subscribed, the MME rejects the context transfer with a GTPv2-C Context Response cause "5GC Not Allowed". If at least one PDN is subscribed, the MME responds with the UE's context, allowing the AMF to proceed with registration.



Note All PDNs, including those established on Standalone GW or restricted by IWK-5GS subscription data, are transferred even when one PDN has IWK-5GS interworking subscribed.

Configure 5GS interworking with N26 interface and HSS Interworking-5GS-Indicator restrictions

Use the following configuration to enable or disable this feature at the MME service level:

```
configure
  context context_name
    mme service  service_name
      n1-mode 5gs-interworking-with-n26 hss-iwk-5gs-not-subscribed {
restrict-handover | restrict-mobility | restrict-all }
     [ no ] n1-mode 5gs-interworking-with-n26 hss-iwk-5gs-not-subscribed

      end
```

Use the following configuration to enable or disable this feature at per-subscriber group level via the call-control-profile:

```
configure
  call-control-profile profile_name
     n1-mode 5gs-interworking-with-n26 hss-iwk-5gs-not-subscribed {
restrict-handover | restrict-mobility | restrict-all }
    [ no | remove ] n1-mode 5gs-interworking-with-n26
hss-iwk-5gs-not-subscribed
    end
```

NOTES:

- **mme-service** *service_name*: Configures MME Service. *mme_service* and must be a string of 1–63 characters.
- **n1-mode**: Configures interworking with 5Gs for UEs supporting N1 mode.
- **5gs-interworking-with-n26**: Enables 5GS-EPS interworking with N26 interface.
- **no**: Disables EPS to 5GS mobility without n1 mode support.
- **hss-iwk-5gs-not-subscribed**: Action when HSS Interworking-5GS-Indicator is Not-Subscribed.
- **restrict-handover**: Restricts handover to 5GS when Interworking-5GS-Indicator is Not-Subscribed.

- **restrict-mobility**: Restricts idle-mode mobility to 5GS when Interworking-5GS-Indicator is Not-Subscribed.
- **restrict-all**: Restricts both handover and idle-mode mobility to 5GS when Interworking-5GS-Indicator is Not-Subscribed.

Monitoring and Troubleshooting

This section provides information regarding show commands and outputs available to monitor and troubleshoot the N26 Interface feature.

Show Commands and Outputs

show call-control-profile full name

The output of this command includes the **5GS-EPS interworking with N26 interface** field, which indicates if the 5GS-EPS interworking with N26 interface feature is enabled or disabled under N1 mode at call control profile.

show mme-service all

The output of this command includes the following fields:

- **5GS-EPS interworking with N26 interface**
- **Peer AMF GUAMI**
- **Peer AMF TAI**

show mme-service statistics output

The output of this command includes the following fields:

Field	Description
EUTRAN<->NGRAN using N26 Interface:	
Outbound relocation using EPS-5GS Mobility procedure	Displays the number of attempts, successes, and failures of outbound relocation using EPS-5GS mobility procedure.
Outbound relocation using EPS-5GS HO procedure	Displays the number of attempts, successes, and failures of outbound relocation using EPS-5GS handover procedure.
Inbound relocation using EPS-5GS Mobility procedure	Displays the number of attempts, successes, and failures of Inbound relocation using EPS-5GS mobility procedure.
Inbound relocation using EPS-5GS HO procedure	Displays the number of attempts, successes, and failures of Inbound relocation using EPS-5GS handover procedure.
UE-Usage-Type Source:	
Peer AMF	Displays the number of Peer AMFs.

show mme-service statistics recovered-values output

The output of this command includes the following fields:

Field	Description
Outbound relocation using EPS-5GS Mobility procedure	Displays the number of attempts, successes, and failures of outbound relocation using EPS-5GS mobility procedure.
Outbound relocation using EPS-5GS HO procedure	Displays the number of attempts, successes, and failures of outbound relocation using EPS-5GS handover procedure.
Inbound relocation using EPS-5GS Mobility procedure	Displays the number of attempts, successes, and failures of outbound relocation using EPS-5GS mobility procedure.
Inbound relocation using EPS-5GS HO procedure	Displays the number of attempts, successes, and failures of Inbound relocation using EPS-5GS handover procedure.

show mme-service statistics 5gs-interworking

Table 6: show mme-service statistics 5gs-interworking Command Output Descriptions

Field	Description
Attach Procedure:	
Attach Request Rcvd	Displays the number of Attach Request messages received with UE advertising N1 Mode support.
TAU Procedure:	
TAU Request Rcvd	Displays the number of TAU Request messages received with UE advertising N1 Mode support.
Node Selection:	
PGW DNS	Displays the number P-GW DNS selection procedure.
SMF-Combined	Displays the number of times P-GW DNS selection procedures performed with DNS RR including the N1 Mode network capability.
NR Capable	Displays the number of times P-GW DNS selection procedures performed with DNS RR including the NR network capability.
Common	Displays the number of times P-GW DNS selection procedures performed with DNS RR excluding the N1 Mode network capability.
PGW Local Config	Displays the number of times P-GW selection procedures performed with locally configured P-GW address, without considering the N1 Mode network capability.
SGW DNS:	
S11	Displays the number of times S-GW selection based on s11 interface.
S5-or-S8	Displays the number of times S-GW selection based on s5-or-s8 interface.

Table 7: show mme-service statistics debug

Field	Description
N26/5GS interworking:	
EPS to 5GS handover	Displays the number of times EPS to 5GS Handover is restricted due to HSS IWK-5GS Not-Subscribed.
EPS to 5GS mobility	Displays the number of times EPS to 5GS Mobility is restricted due to HSS IWK-5GS Not-Subscribed.

show call-control-profile full name

The following show command output displays the status.

Field	Description
N1 Mode: If the N1 mode is configured and the S-GW interface is configured with s5-s8 or s11 in the Call Control Profile, the CLI command displays the following parameters:	
5GS-EPS interworking with N26 interface	Displays an enabled 5GS-EPS interworking and displays the following status: • SGW selection based on: Displays that the S-GW interface is configured with either s5-s8 or s11 in the Call Control Profile. • Ue Usage Types: Displays either no usage type or the configured usage type. For example, you can view `128 129 130` as UE usage types for the configured s11 interface.
N1 Mode: If the N1 mode is Disabled in the Call Control Profile:	
5GS-EPS interworking with N26 interface	Displays that the 5GS-EPS interworking is disabled.
N1 Mode: If N1 mode is removed under the Call Control Profile:	
5GS-EPS interworking with N26 interface	Displays that 5GS-EPS interworking is not configured.
N1 Mode: If N1 mode is configured with reject-EPS-to-5GS-without-n1-mode under the Call Control Profile:	
reject-EPS-to-5GS-without-n1-mode	Displays that the reject EPS to 5GS context request from AMF is enabled.
N1 Mode: If reject-EPS-to-5GS-without-n1-mode is disabled under the Call Control Profile:	
reject-EPS-to-5GS-without-n1-mode	Displays that the reject EPS to 5GS context request from AMF is disabled.
N1 Mode: If reject-EPS-to-5GS-without-n1-mode is removed under the Call Control Profile:	
reject-EPS-to-5GS-without-n1-mode	Displays that the reject EPS to 5GS context request from AMF is not configured.

show mme-service all

The following show command outputs didplays the status.

Field	Description
N1 Mode: If the N1 mode is configured and the S-GW interface is configured with s5-s8 or s11 in the MME service, the CLI command displays the following parameters:	
5GS-EPS interworking with N26 interface	Displays an enabled 5GS-EPS interworking and displays the following status: • SGW selection based on: Displays that the S-GW interface is configured with either s5-s8 or s11 in the MME service. • Ue Usage Types: Displays either no usage type or the configured usage type. For example, you can view `128 129 130` as UE usage types for the configured s11 interface.
N1 Mode: If the N1 mode is Disabled in the MME service:	
5GS-EPS interworking with N26 interface	Displays that the 5GS-EPS interworking is disabled.
N1 Mode: If N1 mode is removed under the MME service:	
5GS-EPS interworking with N26 interface	Displays that 5GS-EPS interworking is not configured.
N1 Mode: If N1 mode is configured with reject-EPS-to-5GS-without-n1-mode under the MME Service:	
reject-EPS-to-5GS-without-n1-mode	Displays that the reject EPS to 5GS context request from AMF is enabled.
N1 Mode: If reject-EPS-to-5GS-without-n1-mode is disabled under the MME Service:	
reject-EPS-to-5GS-without-n1-mode	Displays that the reject EPS to 5GS context request from AMF is disabled.

show session disconnect-reasons

The output of this command includes the following fields:

Field	Description
mme-reselection-to-amf	This disconnect reason is incremented, if the subscriber reselects AMF as part of the EPS to 5GS Idle Mobility Registration procedure.
mme-relocation-to-amf	This disconnect reason is incremented, if the subscriber relocates to AMF as part of the EPS to 5GS Handover procedure.

show configuration verbose

Following are the sample configuration commands of **show configuration verbose** and **show configuration** CLI commands.

The **show configuration verbose** sample configuration without the sgw-interface option configured.

```
call-control-profile ccp1
    gw-selection topology weight prefer pgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s5-or-s8
    exit

      mme-service mme1
        mme-id group-id 32769 mme-code 2
        …
        n1-mode 5gs-interworking-with-n26 sgw-selection s5-or-s8
        exit
```

The **show configuration** sample configuration without the sgw-interface option configured.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26
    exit

   mme-service mme1
    mme-id group-id 32769 mme-code 2
          …
    n1-mode 5gs-interworking-with-n26
    exit
```

The **show configuration verbose** and **show configuration** sample configuration with the sgw-interface option as s5-s8.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s5-or-s8
exit

    mme-service mme1
        mme-id group-id 32769 mme-code 2
          …
        n1-mode 5gs-interworking-with-n26 sgw-selection s5-or-s8
    exit
```

The **show configuration verbose** and **show configuration** sample configuration with the sgw-interface option configured with s11 with no UUTs.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s11
  exit

      mme-service mme1
        mme-id group-id 32769 mme-code 2
          …
        n1-mode 5gs-interworking-with-n26 sgw-selection s11
        exit
```

The **show configuration verbose** and **show configuration** sample configuration with sgw-interface option configured with s11 with UUTs 128 129.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129
  exit

      mme-service mme1
        mme-id group-id 32769 mme-code 2
          …
        n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129
        exit
```

The **show configuration verbose** and **show configuration** sample configuration with sgw-interface option reconfigured with s11 with UUTs 128 130 140.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129
  exit

      mme-service mme1
        mme-id group-id 32769 mme-code 2
          …
        n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129
        exit
```

The **show configuration verbose** and **show configuration** sample configuration with sgw-interface option reconfigured with s11 with UUTs 131 130 140 in the Call Control Profile or MME service.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129 130 131 140
  exit

      mme-service mme1
        mme-id group-id 32769 mme-code 2
          …
        n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129 130 131
140
        exit
```

The **show configuration verbose** and **show configuration** sample configuration with sgw-interface option reconfigured with s11 with UUTs 255 212 220 in the Call Control Profile or MME service.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129 130 131 140
212 220 255
  exit

      mme-service mme1
        mme-id group-id 32769 mme-code 2
          …
```

```
        n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129 130 131
140
        exit
```

The **show configuration verbose** and **show configuration** sample configuration with sgw-interface option reconfigured with s11 with a specific UUT in the Call Control Profile or MME service.

```
call-control-profile ccp1
    gw-selection topology weight prefer sgw
    n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129 130 131 140
212 220 255
  exit

      mme-service mme1
        mme-id group-id 32769 mme-code 2
          …
        n1-mode 5gs-interworking-with-n26 sgw-selection s11 ue-usage-type 128 129 130 131
140
        exit
```

The **show configuration verbose** with reject-EPS-to-5Gs-without-n1-mode not configured in the MME service.

```
call-control-profile ccp1
    remove n1-mode 5gs-interworking-with-n26
  exit

  mme-service mme1
    no n1-mode 5gs-interworking-with-n26 reject-EPS-to-5GS-without-n1-mode
  exit
```

The **show config verbose** with **n1-mode 5gs-interworking-with-n26** and **reject-EPS-to-5GS-without-n1-mode** disabled.

```
show configuration verbose/show configuration
     call-control-profile ccp1
    n1-mode 5gs-interworking-with-n26
      no n1-mode 5gs-interworking-with-n26 reject-EPS-to-5GS-without-n1-mode

  #exit

  mme-service mme1
    n1-mode 5gs-interworking-with-n26
      no n1-mode 5gs-interworking-with-n26 reject-EPS-to-5GS-without-n1-mode
  #exit
```

The following is the sample configuration of **show configuration verbose** and **show configuration** commands where, n1-mode 5gs-interworking-with-n26, sgw-selection, and reject-EPS-to-5GS-without-n1-mode option is enabled.

```
show configuration verbose/show configuration
  call-control-profile ccp1
    n1-mode 5gs-interworking-with-n26 sgw-selection s11
```

```
    n1-mode 5gs-interworking-with-n26 reject-EPS-to-5GS-without-n1-mode
  #exit

      mme-service mme1
    n1-mode 5gs-interworking-with-n26 sgw-selection s11
    n1-mode 5gs-interworking-with-n26 reject-EPS-to-5GS-without-n1-mode
   #exit
```

The following is the sample configuration of **show configuration verbose** and **show configuration** commands where, n1-mode 5gs-interworking-with-n26, reject-EPS-to-5GS-without-n1-mode is enabled and sgw-selection is not configured.

```
show configuration verbose/show configuration
  call-control-profile ccp1
       n1-mode 5gs-interworking-with-n26 reject-EPS-to-5GS-without-n1-mode
  #exit

      mme-service mme1
       n1-mode 5gs-interworking-with-n26 reject-EPS-to-5GS-without-n1-mode
        #exit
```

The **show configuration verbose** and **show configuration** The output with sample configuration of hss-iwk-5gs-not-subscribed configured in the Call Control Profile and MME service:

```
show configuration/show configuration verbose
    call-control-profile ccp1
        n1-mode 5gs-interworking-with-n26 hss-iwk-5gs-not-subscribed restrict-handover
    #exit

mme-service mme1
    n1-mode 5gs-interworking-with-n26 hss-iwk-5gs-not-subscribed restrict-mobility
#exit
```

The **show configuration verbose** output with hss-iwk-5gs-not-subscribed not configured in Call Control Profile and MME service:

```
show configuration verbose
    call-control-profile ccp1
       remove n1-mode 5gs-interworking-with-n26 hss-iwk-5gs-not-subscribed
    #exit

mme-service mme1
    no n1-mode 5gs-interworking-with-n26 hss-iwk-5gs-not-subscribed
#exit
```

Bulk Statistics

MME Schema

MME Service Bulk Statistics

The following MME Service bulk statistics are included in the MME Schema.

Counters	Description
out-mob-4gto5g-n26-attempted	Displays the total number of attempted outbound relocation using EPS to 5GS Idle mode mobility procedure in N26 interface.
out-mob-4gto5g-n26-success	Displays the total number of successful outbound relocation using EPS to 5GS Idle mode mobility procedure in N26 interface
out-mob-4gto5g-n26-failures	Displays the total number of failed outbound relocation using EPS to 5GS Idle mode mobility procedure in N26 interface.
out-ho-4gto5g-n26-attempted	Displays the total number of attempted outbound relocation using EPS to 5GS Handover procedure in N26 interface.
out-ho-4gto5g-n26-success,	Displays the total number of successful outbound relocation using EPS to 5GS Handover procedure in N26 interface.
out-ho-4gto5g-n26-failures	Displays the total number of failed outbound relocation using EPS to 5GS Handover procedure in N26 interface.
in-mob-5gto4g-n26-attempted	Displays the total number of attempted inbound relocation using 5GS to EPS Idle mode mobility procedure in N26 interface.
in-mob-5gto4g-n26-success	Displays the total number of successful inbound relocation using 5GS to EPS Idle mode mobility procedure in N26 interface.
in-mob-5gto4g-n26-failure	Displays the total number of failed inbound relocation using 5GS to EPS Idle mode mobility procedure in N26 interface.
in-ho-5gto4g-n26-attempted	Displays the total number of attempted inbound relocation using 5GS to EPS Handover procedure in N26 interface.
in-ho-5gto4g-n26-success	Displays the total number of successful inbound relocation using 5GS to EPS Handover procedure in N26 interface.
in-ho-5gto4g-n26-failures	Displays the total number of failed inbound relocation using 5GS to EPS Handover procedure in N26 interface.
mme-decor-ue-usage-type-src-peer-amf	Displays the the number of MME subscriber sessions, where UE usage type was obtained from peer AMF as part of handover.
n1-mode-atttach-req	Displays the total number of Attach Requests received with N1 mode supported.
n1-mode-tau-req	Displays the total number of TAU Requests received with N1 mode supported.

Counters	Description
n1-mode-dns-pgw-selection-smf	Displays the total number of times P-GW selection procedures were performed with locally configured P-GW address, without considering the N1 Mode network capability.
n1-mode-dns-pgw-selection-nr	Displays the number of times P-GW DNS selection procedures are performed with DNS RR including the NR network capability.
n1-mode-dns-pgw-selection-common	Displays the number of times P-GW DNS selection procedures are performed with DNS RR excluding the N1 Mode network capability.
n1-mode-dns-pgw-selection-local	Displays the total number of times P-GW selection procedures were performed with locally configured P-GW address, without considering the N1 Mode network capability.
n1-mode-dns-sgw-selection-s11	Displays the total number of times dynamic S-GW selection procedures were performed based on the s11 interface.
n1-mode-dns-sgw-selection-s5-or-s8	Displays the total number of times dynamic S-GW selection procedures were performed based on the s5 or s8 interface.

MME Service Backup Bulk Statistics

The following MME Service backup bulk statistics are included in the MME-BK Schema.

Counters	Description
recovered-out-mob-4gto5g-n26-attempted	Shows recovered values for total number of attempted outbound relocation using EPS to 5GS Idle mode mobility procedure in N26 interface.
recovered-out-mob-4gto5g-n26-success	Shows recovered values for total number of successful outbound relocation using EPS to 5GS idle mode mobility procedure in N26 interface.
recovered-out-ho-4gto5g-n26-attempted	Shows recovered values for total number of attempted outbound relocation using EPS to 5GS Handover procedure in N26 interface.
recovered-out-ho-4gto5g-n26-success	Shows recovered values for total number of successful outbound relocation using 5GS to EPS handover procedure in N26 interface.
recovered-in-mob-5gto4g-n26-attempted	Shows recovered values for total number of attempted inbound relocation using 5GS to EPS Idle mode mobility procedure in N26 interface.
recovered-in-mob-5gto4g-n26-success	Shows recovered values for total number of successful inbound relocation using 5GS to EPS Idle mode mobility procedure in N26 interface.
recovered-in-ho-5gto4g-n26-attempted	Shows recovered values for total number of attempted inbound relocation using 5GS to EPS Handover procedure in N26 interface.

Counters	Description
recovered-in-ho-5gto4g-n26-success	Shows recovered values for total number of successful inbound relocation using 5GS to EPS Handover procedure in N26 interface.