N26 Interface Support

This chapter describes the following topics:

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
First introduced. This release supports N26 Interface for interworking with 5GS fuctionality. **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 the N26 interface for interworking with 5GS and functionality in compliance with 3GPP 5GS standards. Interworking procedures using the N26 interface, enables the exchange of Mobilty Management (MM) and Session Management (SM) states between the source and target network. The N26 interface may be either intra-PLMN or inter-PLMN, for example, to enable inter-PLMN mobility.

When you use interworking procedures with N26, the User Equipment (UE) operates in single-registration mode. For the 3GPP access, the network keeps only one valid MM state for the UE either in the:

- Access Management Function (AMF) or Mobility Management Entity (MME)

- AMF or the MME is registered in the HSS and UDM

In StarOS 21.19 and later releases, the MME supports 5GS to Evolved Packet System (EPS) Attach Procedure.

How it Works

This section describes the external interfaces required to support the 5GS to EPS Initial Attach using N26 Interface:

S1AP (eNodeB) Interface

- **GUMMEI Type** – The S1-AP interface supports **mappedFrom5G** in the Globally Unique Mobility Management Entity Identifier (GUMMEI) type IE to indicate that UE was previously registered in N1-mode and that the identifier is mapped from 5GS.

NAS (UE) Interface

- **UE Network Capability (N1-mode)** – 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. MME supports the handling in the ATTACH REQUEST message.

- **UE Status IE** – MME supports UE Status IE in the ATTACH REQUEST message and provides the network with information related to the current UE registration status that is used for interworking with 5GS.

- **EPS Network Feature Support (IWK N26)** – MME supports IWK N26 indicator to specify whether interworking without N26 interface is supported or not.

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" AVP 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.

S11 (SGW) Interface

- **Indication Flag** – MME supports the 5GS Interworking Indication (5GSIWKI) flag if the UE supports N1 mode and the PDN connection is not restricted from interworking with 5GS by user subscription ("5GC" bit within Core-Network-Restrictions AVP and Interworking-5GS-Indicator AVP).

Call Flows

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

Figure 1: EPS Attach Request and Response Call Flow
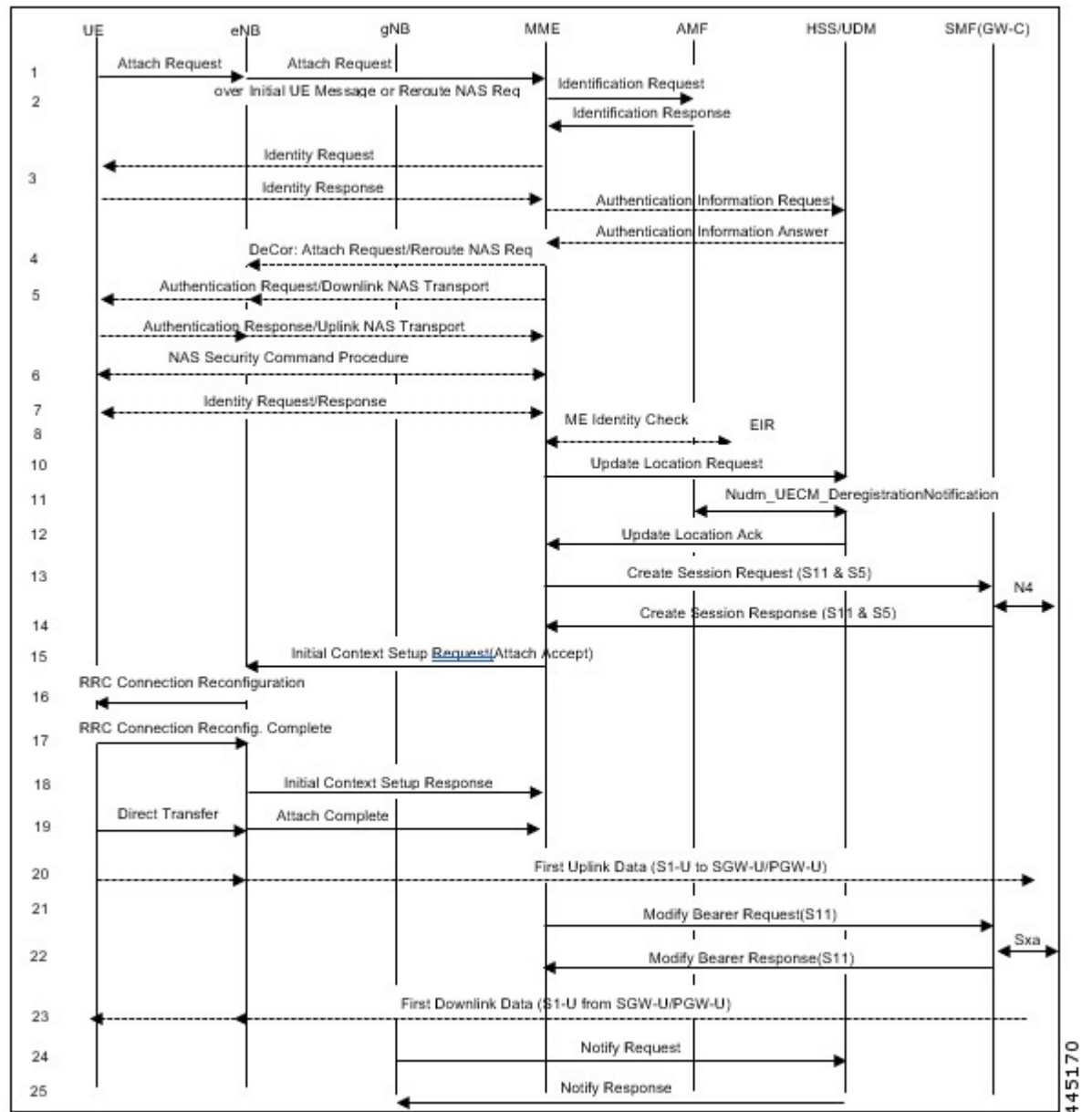
EPS Attach Procedure

The following table describes 5GS to EPS attach procedure.

Table 1: EPS Attach Procedure

Step	Description
1	Sends Attach Request over initial UE messages or reroutes NAS request as a subsequent procedure on dedicated Core selection based on the following conditions: • If the UE was previously registered in N1 mode, the UE includes GUMMEI in the S1-AP message. Also, indicates that GUMMEI is Mapped from 5G-GUTI. • If the UE was previously registered in N1 mode, the UE includes a GUTI, mapped from 5G-GUTI into the EPS mobile identity IE, include Old GUTI type IE with GUTI type set to "native GUTI" and include the UE status IE with a 5GMM registration status set to "UE is in 5GMM-DEREGISTERED state". • If the UE does not hold a valid 5G-GUTI, the UE includes the IMSI in the EPS mobile identity IE.
2	MME finds whether UE supports N1 mode using UE Network Capability IE in the Attach Request based on the following conditions: • If the UE supports N1 mode, MME uses the GUTI to select the peer-AMF based on the peer-AMF local configuration. MME sends the Identification Request message to the selected peer-AMF. • AMF responds with Identification Response.
3	If the UE is unknown in both the old AMF and new MME, the new MME sends an Identity Request to the UE to request the IMSI. The UE responds with Identity Response (IMSI).
4	MME triggers the décor procedure when the UUT received from HSS is not supported by MME. .
5	MME sends Update Location Request to HSS. MME shall not set the Dual-registration 5G-indication in ULR-Flag.
6	MME processes and handles the below AVP in the ULA from HSS. MME selects GW based on the following conditions: • Interworking-5GS-Indicator, AVP, Core-Network-Restriction, and Access-Restriction-Data (NR in 5GS Not Allowed) AVP.
7	If the UE supports N1 mode and the PDN connection is not restricted from interworking with GS by user subscription ("5GC" bit within Core-Network-Restrictions AVP and Interworking-5GS-Indicator AVP), MME sets 5GS Interworking Indication in Indication Flags in the Create Session Request. Otherwise, MME does not set 5GS Interworking Indication in Indication Flags in Create Session Request.
8	If UE supports N1 mode in UE network capability(N1, DCNR), and the Interworking-5GS-Indicator is set to subscribe, MME shall set IWKN26 bit to "Interworking without N26 interface not supported" in the Attach Accept.

Limitations

This section describes the known limitations for N26 interface functionality:

- Gateway Selection is not supported .

- Extended Trace Information IE in Identification Response is not supported.

Supported Standards

The N26 feature support is in compliance 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 24.301 version 15.8.0 - Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS).

- 3GPP 24.501 version 15.6.0 - Non-Access Stratum (NAS) protocol for 5G System (5GS)

- 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 36.413 version 15.8.0 - S1 Application Protocol (S1AP)

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
    [ no | remove] n1-mode 5gs-interworking-with-n26
    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 | remove**: Disables the Interworking with 5GS support.

• **remove**: Removes the configuration from the Call Control profile and the MME Service configuration.

Configuring 5GS Interworking using N26 Interface in MME Service

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

```
configure
  context context_name
    mme service  service_name
      [no] n1-mode 5gs-interworking-with-n26
        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 the 5Gs-EPS interworking with N26 interface.

Peer AMF Configuration

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.

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**