VoNR Support

Feature Summary and Revision History

Summary Data

Table 1: Summary Data

Applicable Product(s) or Functional Area	AMF
Applicable Platform(s)	SMI
Feature Default Setting	Multiple PDU Sessions for VoNR: Enabled - Always-on PDN Creation, Modification, and Release: Enabled – Configuration required to disable
Related Documentation	Not Applicable

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	2021.04.0

Feature Description

Voice over New Radio (VoNR) feature supports the functionalities:

- Creating multiple Protocol Data Unit (PDU) sessions
- Creation, modification, and release of the Packet Data Network

Multiple PDU Sessions for VoNR

Feature Description

The AMF provides the IP Multimedia Subsystem (IMS) voice services over the Packet Switched (PS) or VoNR to the subscribers who are connected over the 3GPP Radio Access Network (RAN).

AMF receives the local configuration and capability parameters from UE or gNB. Based on this information, the AMF determines if the UE can support the IMS voice over PS sessions in the specified area. The AMF communicates the IMS support to the UE during the UE registration process.

With this feature, the AMF extends support for the following:

- PDU support for same or different SMF instances
- Discovery of the SMF instances using Tracking Area Identity (TAI as the query parameter
- Reuse of the discovered SMF instances within the cache expiry timeout period
- If used within the cache expiry time out period, the PDU release and update procedure can utilize the SMF instance discovered for the PDU creation procedure.

Note The NO_SUITABLE_CELLS_IN_TRACKING_AREA is used for rejecting the voice-centric cause.

How it Works

This section describes how this feature works.

Call Flows

This section describes the key call flows for this feature.

Initial/Mobility Registration - IMS VoNR Support Procedure Call Flow

This section describes the Initial/Mobility Registration - IMS VoNR Support procedure call flow.

Figure 1: Initial/Mobility Registration - IMS VoNR Support Procedure Call Flow

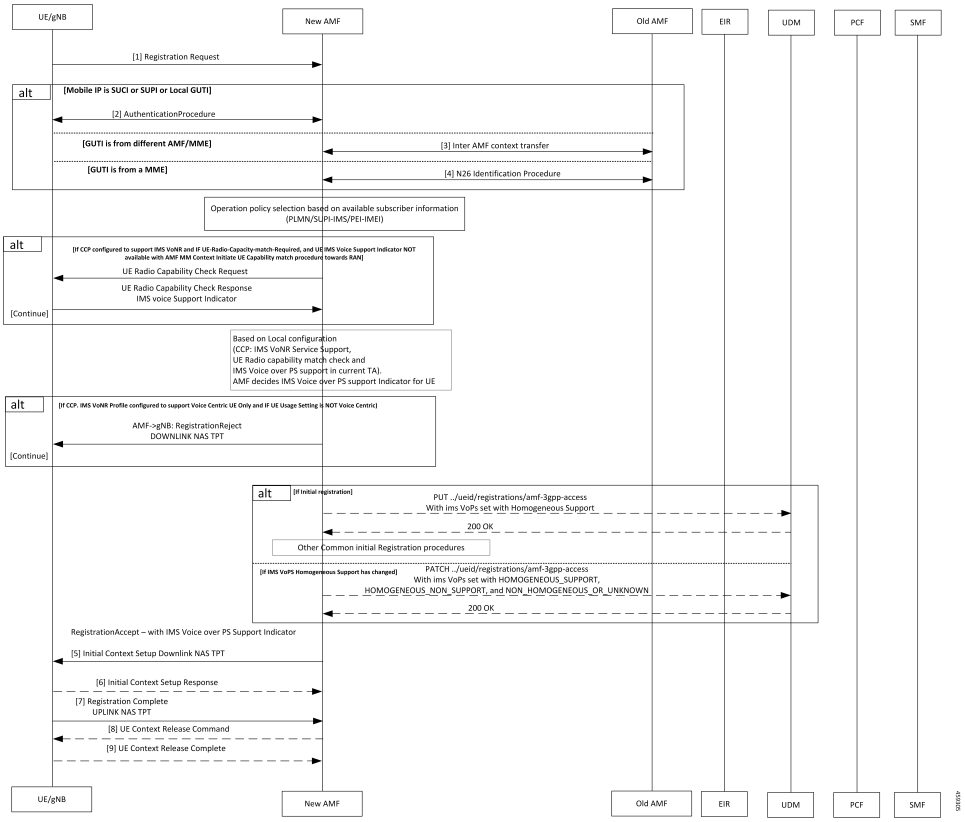

Table 3: Initial/Mobility Registration - IMS VoNR Support Procedure Call Flow Description

Step	Description
1	The UE or gNB initiates a Registration Request message to the new AMF instance. During the UE registration (initial, mobility update, and AMF change or EPC to 5GC handover) procedure, after the operator policy and Call Control Profiles are associated with the subscriber context, the AMF checks the following: • The IMS VoPS service for 3GPP access is supported under CCP. • The UE Radio Capability match is required or not.
2	The UE or gNB and the AMF completes the authentication procedure.
3	The new AMF and the old AMF process the inter-AMF Context Transfer procedure.

Step	Description
4	The new AMF and the old AMF complete the N26 Identification procedure. If the UE Radio Capability matching is required and the AMF has not received or discovered it yet, the AMF initiates the UE Radio Capability check procedure towards gNB. gNB provides the IMS VoPS capability information to AMF and confirms if it is supported or matching. The AMF considers the UE to provide the IMS VoPS services indicator as “supported". AMF checks if the IMS VoPS service is configured to be supported or enabled under the current TA of the subscriber and its support in TAI's list object under TAI DB. If the criteria is matched, AMF considers the IMS VoPS support for the subscriber to be supported for current TA. AMF also informs UDM about the IMS VoPS support for the subscriber in all the TAs that AMF serves or in the 3GPP Access Registration procedure to UDM. Based on CCP configuration, if the subscriber is eligible or capable of the IMS VoPS support, AMF provides the imsVoPS parameter to UDM in 3GPP Access Registration message as "HOMOGENEOUS_SUPPORT". This parameter indicates the subscriber about the AMF level support of IMS VoPS service and the TA level support. After UDM receives this information, if IMS service to the subscriber (e.g. local configuration change) is modified, the AMF updates UDM using the 3GPP Access Registration Modification procedure.
5	Therefore, AMF indicates IMS VoPS service support for the subscriber for current registration area (TA) in Registration Accept message in IMSVoPS-3GPP indicator under 5GS network feature support information element. The UE or gNB and new AMF processes the Initial Context Setup Downlink NAS TPT.
6	The gNB sends the Initial Context Setup Response to the new AMF.
7	The UE or gNB sends the Registration Complete Uplink NAS TPT to the new AMF.
8	The new AMF sends the UE Context Release Command to the gNB.
9	The gNB sends the UE Context Release Complete to the new AMF.

Provide UE Information for Terminating Domain Selection Call Flow

This section describes the Provide UE Information for Terminating Domain Selection call flow.

Figure 2: Provide UE Information for Terminating Domain Selection Call Flow

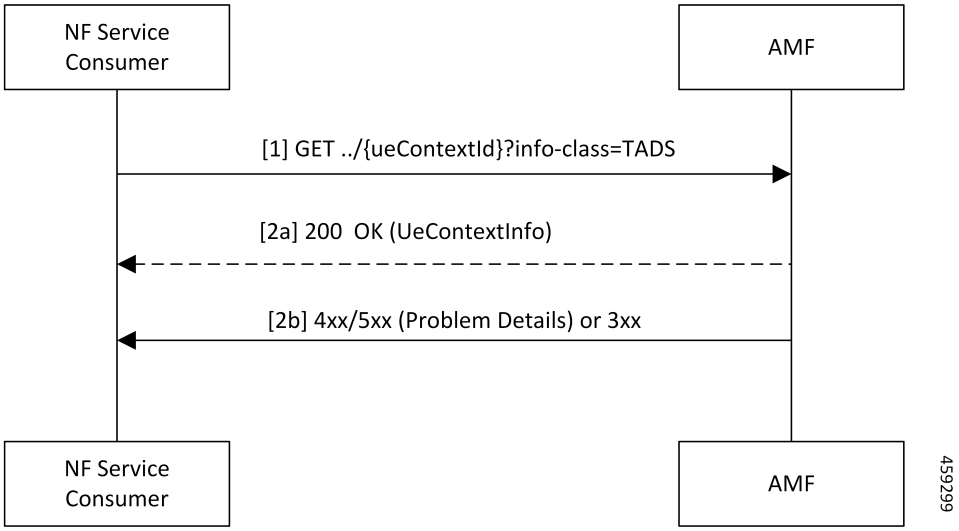

Table 4: Provide UE Information for Terminating Domain Selection Call Flow Description

Step	Description
1	The NF Service Consumer sends a GET request to the URI of the "UeContext" resource on the AMF with the "info-class" query parameter set to value "TADS".
2a	On success, the AMF returns the "200 OK" status code with the payload containing an "UeContextInfo" data structure that includes the UE information for terminating the domain selection for IMS voice.
2b	On failure, the AMF returns one of the HTTP status codes listed in *3GPP TS 29.518 Table 6.3.3.3.3.1-3*. The message body contains a ProblemDetails object with the "detail" set to application errors in *TS 29.518 Table 6.3.3.3.3.1-3*.

Limitations

This feature has the following limitations in this release:

- The AMF doesn't support IMS services over non-3GPP access.
- The IMS VoPS support indication is applicable only for the voice-centric UE usage setting type.

Feature Configuration

Configuring this feature involves the following steps:

1. Enable AMF to indicate if the UE is capable to handle IMS Voice over Packet-Switched (VoPS) sessions. For more information, refer to Configuring Support to Indicate IMS VoPS Support, on page 6.
2. Configure IMS VoPS service for the configured TALs. For more information, refer to Configuring the TAL-level IMS VoPS, on page 6.

Configuring Support to Indicate IMS VoPS Support

To configure the support that allows AMF to flag if UE supports the IMS VoPS, use the following configuration:

```
config
   amf-global
     call-control-policy policy_name
       feature-support-ie
         ims-vops-service-3gpp
            supported { false | true }
               ue-capability-match-required { false | true }
               reject-voice-centric-ue  { false | true }
               end
```

NOTES:

- **feature-support-ie**—Configure the AMF or 5GC features that are supported or unsupported.
- **ims-vops-service-3gpp**—Configure the UE support for the IMS VoPS service over 3GPP access.
- **supported { false | true }**—Enable the 5G VoPS 3GPP. If the UE capability is supported, the UE is configured with the UE Radio capability.
- **ue-capability-match-required { false | true }**—Configure the UE Radio capability based on the requirement match criteria.
- **reject-voice-centric-ue { false | true }**—Configure the UE capability to reject the “voice centric” UEs when the IMS VoPS service is not supported.

Configuring the TAL-level IMS VoPS

A TAI group consists of multiple Tracking Area Lists (TALs). Each TAL can contain one or more TAIs.

To configure TAL-level IMS VoPS, use the following configuration:

```
config
   amf-global
     call-control-policy policy_name
        tai-group tai_group_name
          tais tai_value
            ims-voice-over-ps-supported { false | true }
            end
```

NOTES:

- **call-control-policy** *policy_name*—Configure the Call Control Policy.
- **tai-group** *tai_group_name*—Specify the TAI group name.
- **tais** *tai_value*—Specify the TAL element name.
- **ims-voice-over-ps-supported { false | true }**—Configure support for the IMS VoPS service in the configured TAI list.

OAM Support

This section describes operations, administration, and maintenance support for this feature.

Statistics

The following statistic and counter are supported for the Multiple PDU Sessions for VoNR feature.

- The ims-vops-support counter captures the reject cause counter.
- amf_ngap_message_total—Captures the total number of inbound or outbound messages sent towards AMF. This metric supports the following message types:
  - N2UeRadioCapabilityCheckRsp
  - N2UeRadioCapabilityCheckReq

PDN Creation, Modification, and Release

Feature Description

The Packet Data Network (PDN) creation, modification, and release feature enable AMF to implement the following UDM services:

- Initiates the P-CSCF restoration procedure
- Sends a network-triggered PDU Session Update for IMS PDU sessions with the reactivation indication. Based on the indication, SMF takes the appropriate action on the PDU.

  During the UDM registration, the AMF sends the callback URL for the P-CSCF restoration and service name. The AMF handles the notification triggered for the Nudm_UECM_PCscfRestoration service operation received on the URI. This notification contains information about the restoration status as a failure or success.
- Selects a combined instance of SMF and PGW-C, if the UE sends a request to establish a PDU Session with a DNN and S-NSSAI when the following conditions are true:
  - The UE MM Core Network Capability indicates that the UE supports EPC NAS.
  - (Optional) The UE subscription symbolizes support for interworking with EPS for the specified DNN and S-NSSAI of the HPLMN.

Note If the conditions are not met, the AMF selects a standalone instance of SMF.

How it Works

This section describes how this feature works.

Call Flows

This section describes the key call flows for this feature.

SM Context Update Call Flow

This section describes the SM Context Update call flow.

Figure 3: SM Context Update Call Flow

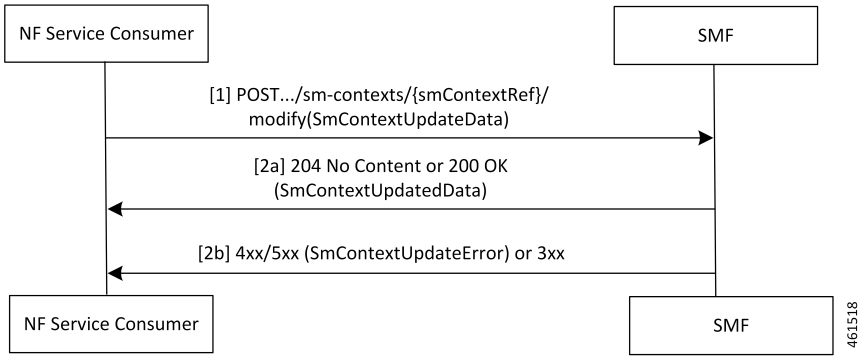

Table 5: SM Context Update Call Flow Description

Step	Description
1	The AMF service consumer updates a particular SM context and/or provides N1 or N2 SM information to the SMF through the HTTP POST method (modify custom operation). The POST request contains the following information: • The release IE is set to true • The cause IE is set to REL_DUE_TO_REACTIVATION
2a	SMF responds with the SmContextUpdatedData data type that contains the following response codes: • 204 No Content—The SM context is successfully updated when the SMF does not return information in the response. • 200 OK—The SM context is successfully updated when the SMF returns information in the response.
2b	On failure of SM Context Update, SMF reports an error. For a 4xx or 5xx response, the message body contains an SmContextUpdateError structure.

Feature Configuration

Configuring this feature involves the following steps:

1. Configure the UDM initiated PCSF restoration procedure at AMF. For more information, refer to Configuring the PCSF Restoration Feature, on page 9.

2. Configure the IMS for identifying the PDU session with DNN name. For more information, refer to Configuring the IMS for DNN, on page 9.
3. Configure the query selection parameter to select the SMF instance that supports SMF and PGW-C. For more information, refer to Configuring the Query Selection Parameter, on page 9.

Configuring the PCSF Restoration Feature

To configure the PCSF restoration feature, use the following configuration:

```
config
   amf-global
      call-control-policy call_control_policy_name
         feature-support-ie
            pcsf-restoration-supported { true | false }
            end
```

NOTES:

- **call-control-policy** *call_control_policy_name*—Specify the Call Control Policy name.
- **feature-support-ie**—Configure AMF or 5GC features that are supported.
- **pcsf-restoration-supported { true | false }**—Configure the PCSF restoration capability. After enabling this feature, the capability supports only the new calls that are established.

Configuring the IMS for DNN

To configure the IMS for the DNN, use the following configuration:

```
config
   amf-global
      amf-name amf_name
         dnn-policy policy_name
            network-element-profile-list smf
               ims-enabled { true | false }
               end
```

NOTES:

- **amf-name** *amf_name*—Specify AMF name.
- **network-element smf** *smf_instance*—Specify the NF instance name to establish the peer configuration.
- **dnn-policy** *policy_name*—Specify the DNN policy name.
- **ims-enabled { true | false }**—Enable or disable IMS for the configured DNN.

Configuring the Query Selection Parameter

To configure the query parameter, use the following configuration:

```
config
   profile
      network-element smf smf_instance
```

```
        query-params [ pgwind ]
        end
```

NOTES:

- **network-element smf** *smf_instance*—Specify the NF instance name to establish the peer configuration.
- **query-params [pgwind]**—Configure the query parameter that selects the specified SMF instance for SMF and PGW-C support.