



# SMS over the Non-Access Stratum Procedures

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## 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	Disabled – Configuration required to enable
Related Documentation	<a href="#">UE Configuration Management Procedures</a>

### Revision History

*Table 2: Revision History*

Revision Details	Release
First introduced.	2022.01.0

## Feature Description

In 5G, the AMF sends and receives the SMS payloads from the UE over the NAS messages. The AMF and SMSF entities within the 5G core provide and utilize services provided by each other to enable the delivery of SMS over Non-Access Stratum (NAS).

For more information, refer to the [UCC 5G AMF Configuration and Administration Guide > SMS over the Non-Access Stratum Procedures](#) chapter.

## How it Works

This section describes how this feature works.

The SMS over NAS feature supports the following procedures:

- **Registration procedures for SMS over NAS**—This procedure involves the following steps:
  - During registration, if the UE requests for SMS support and the feature are enabled at AMF, the AMF fetches the SMS subscription data and UE context in the SMSF data along with the AM and SMF selection data. The AMF also subscribes to the UDM notifications.
  - If the UE has the SMS subscriptions enabled, the AMF sends the Activate Request to the SMSF.
  - The AMF supports the target PLMN and instance ID-based SMSF selection based on the NRF discovery. The instance ID received from the UDM is preferred over the instance ID received from the peer AMF.

Depending on these steps, the AMF notifies the SMS status as allowed or not allowed to the UE as part of the Registration Accept message.
- **Deregistration procedures for SMS over NAS**—The AMF triggers the SMS Deactivation Request towards SMSF during the following scenarios:
  - UE-initiated deregistration
  - Network-initiated deregistration
  - The SMS was activated in the previous Registration Requests and the UE did not request for the SMS support in the subsequent Registration Request.
  - Whenever the SMS state at AMF changes from allowed to not allowed, and if the SMS was previously activated, the AMF sends the Deactivation Request to SMSF.
- **MO SMS over NAS in CM-IDLE or CM-CONNECTED**
- **MT SMS over NAS in CM-IDLE or CM-CONNECTED state through 3GPP access**—This procedure involves the following steps:
  - As part of MT SMS, the AMF supports handling of the EnableReachability Requests from the SMSF.
  - If the UE is in the CONNECTED state, the AMF immediately responds with the UE as REACHABLE.
  - If the UE is in the IDLE state and the PPF flag is set, the AMF triggers the paging procedure and updates the SMSF based on the paging response.

## Notifications using the UE Configuration Update Command

The UE Configuration Update Command is responsible for communicating the modification in the SMS state to the UE. The SMS state, such as allowed and not allowed is modified when the AMF CLI is modified or the AMF receives the subscription change notification through the UDM data change notification.

When the AMF detects changes in the SMS state for a UE, and the UE requested in the previously sent Registration Request for the SMS, the AMF notifies the new SMS state through the UE Configuration Update Command.

If the UE had requested the SMS based on CLI configuration or SMS subscription, the AMF marks the SMS as allowed or not allowed and informs the UE through the Registration Accept message. Later, when the SMS state changes at AMF; for example, the UDM subscriptions change the SMS state from allowed to not allowed. In that case, the UE Configuration Update Command notifies the UE with the SMS IE indication as not allowed.

For the UDM notifications, when the UE is in the CONNECTED state, the UE Configuration Update Command is triggered instantly. However, paging is triggered based on the AMF configuration if the UE is in the IDLE state.

Whenever the SMS state at AMF changes from allowed to not allowed, and if the SMS was previously activated, the AMF sends the Deactivation Request to SMSF.

## Paging

The AMF starts a paging procedure when the SMSF sends the UE Reachability event for the MT SMS, and the UE is in the IDLE state. The AMF determines the paging profile specific to the SMS based on the configured trigger type. AMF uses the default paging profile when the paging profile is not configured.

When AMF receives the UDM notification containing the new data, and the UE is in the IDLE state, the AMF pages the UE to send the UE configuration update.

## Failure Handling

The AMF has implemented strategies to handle the following failure scenarios:

- When the SMSF activation process fails, the AMF sets the SMS Allowed value to false in the Registration Accept message.
- If the failure is observed during the deactivation or when sending uplink SMS, the AMF does not perform any action.
- When the SMSF is deactivated, the AMF marks the SMS state as not allowed irrespective of the deactivation result from SMSF.
- On the incoming response messages, the AMF does not perform any validations, such as when the mandatory IE missing.



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**Note** The failure handling profile configuration determines the retry and retransmission of messages. For the SMSF failures, the AMF supports only retry and ignore as the failure actions.

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## Standards Compliance

This feature complies with the following standards specifications:

- *3GPP TS 23.501 "System architecture for the 5G System (5GS)"*
- *3GPP TS 23.502 "Procedures for the 5G System (5GS)"*
- *3GPP TS 24.501 "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3"*
- *3GPP TS 29.503 "5G System; Unified Data Management Services; Stage 3"*
- *3GPP TS 29.518 "5G System; Access and Mobility Management Services; Stage 3"*
- *3GPP TS 29.540 "5G System; SMS Services; Stage 3"*

## Limitations

This feature has the following limitations in this release:

When the SMS over NAS CLI is enabled, the AMF always fetches the SMS subscriptions data from UDM along with AM and SMF selection data. If the feature CLI is not enabled during initial registration, the SMS subscription data is not fetched for the UE. Later, when the UE requests for the SMS support in the subsequent Periodic or Mobility Registration message, AMF does not have the SMS subscription data, and the SMS is not activated.

## Feature Configuration

Configuring this feature involves the following steps:

- Configure AMF to support the SMS messaging over NAS. For more information, refer to [Configuring AMF to send SMS over NAS, on page 5](#).
- Configure AMF to perform SMSF selection based on data from the NRF-based discovery. For more information, refer to [Configuring NRF Discovery for SMSF, on page 5](#).
- Configure AMF to follow appropriate failure handling techniques. For more information, refer to [Configuring Failure Handling, on page 6](#).
- Configure AMF to initiate paging when the SMSF sends an Enable UE Reachability message for MT SMS and if the UE is in the IDLE state. For more information, refer to [Configuring the Paging Profile, on page 7](#).
- Configure the AMF to page the UE when it sends a UE Configuration Update message. The AMF sends this update message on receiving a UDM notification that contains the new data and if the UE is in the IDLE state. For more information, refer to [Configuring Paging for the UDM Notifications, on page 7](#).
- Configure the time zones parameters for the Tai-group or Tai-list. When configured, the AMF uses this time zone information in the ueTimeZone IE messages sent to SMSF. For more information, refer to [Configuring the Time Zone, on page 7](#).

## Configuring AMF to send SMS over NAS

To enable the transfer of SMS over NAS, use the following configuration:

```
config
  amf-global
    call-control-policy policy_name
      policy sms-over-nas { true | false }
    end
```

### NOTES:

- **call-control-policy** *policy\_name*—Specify the Call Control Policy name.
- **policy sms-over-nas { true | false }**—Configure the capability that is responsible to send the SMS over the NAS protocol.

## Configuring NRF Discovery for SMSF

To configure the NRF discovery, use the following configuration:

```
config
  amf-global
    operator-policy policy_name
      ccp-name ccp_name
      network-element-profile-list [ smsf ]
    end
  profile
    network-element [ smsf ]
      nf-client-profile nf_profile_name
      failure-handling-profile failure_handling_profile_name
      query-params [ target-plmn | instance-id ]
    end
    nf-client nf-type [ smsf ]
      smsf-profile smsf_profile_name
        locality locality
        priority profile_priority
        service name type [ nsmsf-sms ]
          endpoint-profile endpoint_profile_name
            capacity profile_capacity
            priority endpoint_priority
            uri-scheme [ http ]
            version
              uri-version version
            endpoint-name endpoint_name
            priority endpoint_priority
            primary ip-address primary_ip_address
            primary ip-address port primary_port_number
            secondary ip-address secondary_ip_address
            secondary ip-address port secondary_port_number
          end
        end
      end
    nf-pair nf-type [ smsf ]
```

```

nrf-discovery-group
  locality
    client client_locality
  preferred-server server_name
  geo-server geo_server_name
end

```

**NOTES:**

- **operator-policy** *policy\_name*—Specify the operator policy name.
- **ccp-name** *ccp\_name*—Specify and configure the Call Control Policy name.
- **capacity** *profile\_capacity*—Specify the endpoint profile capacity.
- **nrf-discovery-group**—Specify the NRF discovery group name.
- **priority** *endpoint\_priority*—Specify the node priority for endpoint.
- **client** *client\_locality*—Specify the client locality information.
- **preferred-server** *server\_name*—Specify the Geo service locality information.
- **geo-server** *geo\_server\_name*—Specify the preferred server locality information.

## Configuring Failure Handling

To configure the failure handling profile, use the following configuration:

```

config
  profile
    nf-client-failure nf-type [ smsf ]
    profile failure-handling profile_name
    service
      name type [ nsmsf-sms ]
      responsetimeout timeout_interval
      message type
        SmsfActivationReq { status-code [ httpv2 ] | action [
retry-and-ignore ] | retry retry_count }
        SmsfDeactivationReq { status-code [ httpv2 ] | action [
retry-and-ignore ] | retransmit retransmit_count | retransmit-interval
retransmit_interval }
        SmsfSendSms { status-code [ httpv2 ] | action [
retry-and-ignore ] | retransmit retransmit_count | retransmit-interval
retransmit_interval }
      end
    end
end

```

**NOTES:**

- **failure-handling-profile** *failure\_handling\_profile\_name*—Specify the failure handling profile.
- **responsetimeout** *timeout\_interval*—Specify the timeout interval in milliseconds. The default value is 2000.
- **range** *range*—Specify the range value. Must be an integer in the range of 0–599.

- **retransmit** *retransmit\_count*—Specify the retransmit interval in milliseconds.

## Configuring the Paging Profile

To configure the paging profile, use the following configuration:

```
config
  amf-global
    paging-map paging_map_name
      precedence paging_precedence
      paging-profile-name paging_profile_name
      trigger-type [ sms ]
    end
```

### NOTES:

- **paging-map** *paging\_map\_name*—Specify the paging map name. Must be string in the range of 1–64.
- **precedence** *paging\_precedence*—Specify the precedence level. Must be an integer in the range of 1–255 with 1 indicating the highest and 255 the lowest.
- **paging-profile-name** *paging\_profile\_name*—Specify the paging profile name. Must be a character string in the range of 1–64.
- **trigger-type** [ sms ]—Specify the type of paging trigger.

## Configuring Paging for the UDM Notifications

To configure the paging feature, use the following configuration:

```
config
  amf-global
    call-control-policy ccp_name
      policy idle-mode udm-notification initiate-paging [ SMS ]
    end
```

### NOTES:

- **policy idle-mode**—Configure the UE configuration for the idle mode paging parameters.
- **udm-notification initiate-paging** [ SMS ]—Configure the paging for the UDM notification.
- By default, the paging feature is disable for the UDM notifications.

## Configuring the Time Zone

To configure this feature, use the following configuration:

```
config
  tai-group name { name tai_group_name | range range }
    timezone { + | - } hours value [ minutes { 0 | 15 | 30 | 45 } |
  daylight-savings-time-increment { 0 | 1 | 2 } ]
    tais { name tai_list_name | range range | preference preference }
```

```

    timezone { + | - } hours value [ minutes { 0 | 15 | 30 | 45 } |
daylight-savings-time-increment { 0 | 1 | 2 } ]
end

```

**NOTES:**

- To modify or update the time zone entry, use the following configuration:
  1. Configure no time zone using the **no timezone** command.  
For example:  
**amf(config-tai-group-xxx)# no timezone**
  2. Configure the new time zone values.
- The AMF uses the configured time zone in the messages that are sent to the SMSF as part of ueTimeZone IE. When the time zone is configured at both tai-group and tai-list levels, the preference is configured under the tai-list.
- **preference preference**—Specify the preference. The time zone configured within the TAI list gets the preference.
- **timezone { + | - } hours value [ minutes { 0 | 15 | 30 | 45 } | daylight-savings-time-increment { 0 | 1 | 2 } ]**—Specify the time zone for the TAI list. The variables included the following:
  - { + | - }—Specify the offset direction from the Universal Time (UTC).
  - **hours value**—Specify the offset from UTC in hours. Accepted value must be an integer 0—14.
  - [ **minutes { 0 | 15 | 30 | 45 }** ]—(Optional) Specify the offset minutes that are added to the hours value.
  - **daylight-savings-time-increment { 0 | 1 | 2 }**—Specify the number of hours during which the time zone should be offset due to daylight savings time.

## Configuration Example

The following is an example of the time zone configuration.

```

config
  tai-group name test1
    timezone offset + hours 11 minutes 45 daylight 2
    tais name tailist2
    timezone offset - hours 14 minutes 45 daylight 1
    mcc 123 mnc 456
    tac list [ 21 22 ]
    exit
  exit
exit

```

## Configuration Example

The following is an example configuration.

```

config
  amf-global
    operator-policy local
    ccp-name local

```



```
network-element-profile-list smsf smsf1
end
profile
network-element [ smsf ]
  nf-client-profile SMSF1
  failure-handling-profile FH1
  query-params [ target-plmn instance-id ]
end
nf-client nf-type smsf
  smsf-profile SMSF1
    locality LOC1
    priority 56
    service name type nsmsf-sms
      endpoint-profile EP1
        capacity 30
        priority 30
        uri-scheme http
        version
          uri-version v2
        end
      endpoint-name EP1
        priority 30
        primary ip-address ipv4 209.165.201.1
        primary ip-address port 5182
        secondary ip-address ipv4 209.165.201.2
        secondary ip-address port 5084
      end
    end
  end
nf-pair nf-type SMSF
  nrf-discovery-group udmdiscovery
    locality client LOC1
    locality preferred-server LOC1
    locality geo-server GEO
  end
```

