

Cause Code #66

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Feature Description

This feature is developed to achieve compliance with Release 11 3GPP Technical Specifications. The Release 11 3GPP Technical Specification introduced a new ESM/SM cause code "Requested APN not supported in current RAT and PLMN combination (cause code 66). This ESM/SM cause is used by the network to indicate that the procedure requested by the UE is rejected as the requested APN is not supported in the current RAT and PLMN. A UE which receives this cause will stop accessing the APN in the current RAT, but as soon as it enters another RAT type it will retry the APN.

In earlier releases only cause code 27 and cause code 33 were supported, these codes were not very effective in restricting APN in a particular RAT. For example, UE which has received cause 27 (with timer = 24hrs) will stop retrying a PDN connection in every RAT for 24 hrs. This is not the desired behavior in some cases APN cannot be restricted in a particular RAT. If the SGSN sends cause code 33 to the UE for an IMS APN, the UE/MS stops retrying the PDN connection for some time, but UE/MS will not automatically retry this APN in 4G, even though the APN is available there. The introduction of cause code 66 resolves this issue as the operator can block access to IMS APN in 2G/3G and can allow access in 4G.

Important This feature is applicable for both SGSN and MME.

Important This is a 3GPP Release 11 compliance feature, and will be applicable only to UEs capable of decoding ESM/SM cause code 66.

How It Works

This feature is developed for both SGSN and MME. In the SGSN, activation restriction of PDP context on the basis of access type can be configured using the restrict access-type command under the APN profile configuration mode. This command is now extended to MME; a new keyword "eps" is introduced to configure the APN profile to restrict the PDP context activation from EPS network access. If this CLI is enabled access to APN's associated with this APN profile are not allowed on MME/SGSN. By default, any activation on SGSN for this APN is rejected with cause code 'Requested APN not supported in current RAT and PLMN combination66'. During mobility scenarios the PDPs related to this APN are deactivated on the SGSN and the PDPs are also deactivated up to the GGSN/PGW.

On the MME attach is rejected if the default bearer related APN is not supported under the APN profile. By default the EMM cause and the ESM cause in attach reject are 'ESM failure19' and 66 respectively.

If the first default bearer APN is allowed, after a successful attach if the subsequent second default bearer APN is not supported, activation is rejected with cause 'Requested APN not supported in current RAT and PLMN combination66'. This is default MME behavior.

During mobility procedures on MME, if APN is not supported for bundle, bearers will deactivated all the way up to PGW and as well on MME for that particular bundle.

If the APN is not supported for all the bundles received from a peer node for a Tracking Area Update procedure at a new MME, Tracking Area Update is rejected with EMM cause 'No Suitable Cells In tracking area 15'.

If the APN is not supported for all the bundles received from a peer node for SRNS relocation procedure at the new MME, SRNS is rejected with GTPV2 cause 'Denied in RAT82' in Forward relocation response (if the peer node is MME/S4 SGSN). SRNS is rejected with GTPV1 cause 'Relocation failure213' in Forward relocation response if the peer node is a Gn Gp SGSN.

The operator can configure different cause values other than the default cause values mentioned in the scenarios described above. For SGSN/MME cause code remapping is done by configuring various options of the local-cause-code-mapping command under the Call Control Profile configuration mode (for both SGSN and MME) and MME Service Configuration mode (for MME only).

Standards Compliance

This feature is developed to comply with the following standards:

- 3GPP TS 24.301, Release 11 (version 11.14.0)
- 3GPP TS 23.401,Release 11 (version 11.11.0)
- 3GPP TS 24.008,Release 11 (version 11.15.0)
- 3GPP TS 23.060,Release 11 (version 11.12.0)

Configuring PDP Activation Restriction and Cause Code Values

The following configuration procedures are used to configure this feature. The access type restriction, cause code mapping for SGSN and MME can be configured using following procedures.

Configuring PDP Activation Restriction

The restrict access-type command under the APN profile configuration mode is used to configure PDP activation restriction on the basis of access type, a new command option for EPS networks is introduced for this feature. In earlier releases this command was supported only for GPRS and UMTS networks to perform QoS related restrictions. Now this command is also used to configure the APN not supported in particular RAT and PLMN combination. If this command is enabled, new PDP activations to an APN with which this APN profile is associated are rejected. During handovers PDPs/PDNs are deactivated if the APN name matches with this APN profile.

```
configure
   apn-profile profile_name
      [ no ] restrict access-type { eps |  { { gprs | umts } [ qos-class
{ background | conversational | interactive | streaming } ] } }
      default restrict access-type {  eps | gprs | umts }
      end
```

Notes:

- This command is disabled by default.
- In earlier releases this command was applicable only for SGSN. It is now supported by MME also.
- If the operator does not include the optional **qos-class** keyword option, then complete APN restriction is enabled and QoS related restrictions have no impact as QoS restriction is a subset of a complete APN restriction.

Configuring SM Cause Code Mapping for SGSN

The following command is used remap the cause code 66 to an operator desired cause code. This cause code is sent in activate rejection.

```
config
   call-control-profile profile_name
      [remove] local-cause-code-mapping apn-not-supported-in-plmn-rat
sm-cause-code cause_number
      exit
```

Notes:

- This mapping is not done by default.
- The keyword **apn-not-supported-in-plmn-rat** specifies the cause code for Requested APN not supported in current RAT and PLMN combination.
- The keyword **sm-cause-code** specifies the SM cause code to be used towards the UE. The value can be integer with range 1 up to 255.

Configuring ESM Cause Code Mapping for ESM Procedures (for MME)

The following command is used remap the ESM cause code sent in activate rejections (due to APN not supported) to an operator desired ESM cause code.

```
config
   call-control-profile profile_name
      [remove] local-cause-code-mapping apn-not-supported-in-plmn-rat
```

```
esm-cause-code cause_number esm-proc
     exit
```

Notes:

- This mapping is not done by default.
- The keyword **apn-not-supported-in-plmn-rat** specifies the cause code for Requested APN not supported in current RAT and PLMN combination.
- The keyword **esm-cause-code** specifies the ESM cause code to be used if a bearer management request is rejected due to this configuration. The value can be integer with range 1 up to 255.
- The specified esm-cause-code is used if an ESM procedure is rejected under the error condition **esm-proc**. This is specified as a keyword in the command.

Configuring EMM and ESM Cause Code Mapping for EMM Procedures (for MME)

The following command under the Call Control Profile configuration mode is used remap the EMM and ESM cause codes sent in activate rejections (due to APN not supported) to an operator desired ESM and EMM cause codes.

```
config
  call-control-profile profile_name
     [remove] local-cause-code-mapping apn-not-supported-in-plmn-rat
emm-cause-code cause_number esm-cause-code cause_number [ attach [ tau ] | tau
 [attach ] ]
     exit
```

Notes:

- This mapping is not done by default.
- The keyword **apn-not-supported-in-plmn-rat** specifies the cause code for Requested APN not supported in the current RAT and PLMN combination.
- The keyword **emm-cause-code** specifies the EMM cause code to be used if a NAS request is rejected due to this configuration. A valid EMM cause value is an integer from 2 through 111.
- The keyword **esm-cause-code** specifies the ESM cause code to be used if a NAS request is rejected due to this configuration. A valid ESM cause value is an integer from 8 through 112.
- The keyword **attach** specifies the cause code to be used if an attach procedure is rejected under the error conditions.
- The keyword **tau** specifies the cause code to be used if TAU procedure is rejected under the error conditions.

Configuring ESM Cause Code Mapping for ESM Procedures (MME Service Configuration Mode)

The following command under the MME Service Configuration mode is used remap the ESM cause code sent in activate rejections (due to APN not supported) to an operator desired ESM cause code.

```
config
  context <context_name>
   mme-service <service_name>
    local-cause-code-mapping apn-not-supported-in-plmn-rat esm-cause-code
```

```
  <cause_number> esm-proc
     default local-cause-code-mapping apn-not-supported-in-plmn-rat
esm-cause-code esm-proc
     exit
```

Notes:

- The default cause code for esm-proc is 66.
- The keyword **apn-not-supported-in-plmn-rat** is used to specify the cause code for Requested APN not supported in current RAT and PLMN combination.
- The keyword **esm-cause-code** is used to specify the ESM cause code to be used if a bearer management request is rejected due to this configuration. The ESM cause value is an integer with range 8 up to 112.
- The specified esm-cause-code is used if an ESM procedure is rejected under the error condition **esm-proc**. This is specified as a keyword in the command.

Configuring EMM and ESM Cause Code Mapping for EMM Procedures (MME Service Configuration Mode)

The following command under the MME Service configuration mode is used remap the EMM and ESM cause codes sent in activate rejections (due to APN not supported) to an operator desired ESM and EMM cause codes.

```
config
   context context_name
      mme-service service_name
         local-cause-code-mapping apn-not-supported-in-plmn-rat
emm-cause-code cause_number esm-cause-code cause_number  [ attach [ tau ] | tau
 [ attach ] ]
         default local-cause-code-mapping apn-not-supported-in-plmn-rat [
attach | tau ]
         exit
```

Notes:

- The default cause code values for Attach procedure are emm-cause-code 19 and esm-cause-code 66. The default cause code values for TAU procedure are emm-cause-code 15 and esm-cause-code 66.
- The keyword **apn-not-supported-in-plmn-rat** specifies the cause code for Requested APN not supported in current RAT and PLMN combination.
- The keyword **emm-cause-code** specifies the EMM cause code to be used if a NAS request is rejected due to this configuration. The EMM cause value is an integer with range 2 up to 111.
- The keyword **esm-cause-code** specifies the ESM cause code to be used if a NAS request is rejected due to this configuration. The ESM cause value is an integer with range 8 up to 112.
- The keyword **attach** specifies the cause code to be used if an attach procedure is rejected under the error conditions.
- The keyword **tau** specifies the cause code to be used if TAU procedure is rejected under the error conditions.

Verifying the Feature Configuration

The configuration of this feature can be verified using the following show commands.

Execute the **show configuration** command to verify the configuration, the output displays the following parameters based on the configuration:

- restrict access-type umts/gprs/eps
- local-cause-code-mapping apn-not-supported-in-plmn-rat sm-cause-code *cause_number*
- local-cause-code-mapping apn-not-supported-in-plmn-rat esm-cause-code *cause_number* esm-proc
- local-cause-code-mapping apn-not-supported-in-plmn-rat emm-cause-code 19 esm-cause-code 66 attach
- local-cause-code-mapping apn-not-supported-in-plmn-rat emm-cause-code 19 esm-cause-code 66 tau
- local-cause-code-mapping apn-not-supported-in-plmn-rat esm-cause-code 32 esm-proc
- local-cause-code-mapping apn-not-supported-in-plmn-rat emm-cause-code 15 esm-cause-code 66 attach
- local-cause-code-mapping apn-not-supported-in-plmn-rat emm-cause-code 19 esm-cause-code 66 tau

Execute the **show apn-profile full** *profile_name* command to verify the configuration, the output displays the following parameters based on the configuration:

- Service Restriction for Access Type UMTS:
- Complete APN restricted : Enabled
- Service Restriction for Access Type GPRS:
- Complete APN restricted : Enabled
- Service Restriction for Access Type EPS:
- Complete APN restricted : Enabled

Execute the **show call-control-profile full** *profile_name* command to verify the configuration, the output displays the following parameters based on the configuration:

- Mapped SM Cause For Req APN not sup in current RAT and PLMN combination: Not Configured
- Mapped SM Cause For Req APN not sup in current RAT and PLMN combination: Requested service option not subscribed (33)
- Cause Code Mapping
- APN not supported PLMN-RAT esm-proc : Operator Determined Barring (esm-8)
- APN not supported PLMN-RAT Attach : ESM failure (emm-19), Requested APN not supported in current RAT and PLMN combination (esm-66)
- APN not supported PLMN-RAT TAU : ESM failure (emm-19), Requested APN not supported in current RAT and PLMN combination (esm-66)

Execute the **show mme-service name** *mme_service* command to verify the configuration, the output displays the following parameters based on the configuration:

- APN not supported PLMN-RAT esm-proc : Requested APN not supported in current RAT and PLMN combination (esm-66)
- APN not supported PLMN-RAT Attach : ESM failure (emm-19), Requested APN not supported in current RAT and PLMN combination (esm-66)
- APN not supported PLMN-RAT TAU : No Suitable Cells In tracking area (emm-15)

Monitoring and Troubleshooting the Cause Code Configuration

This section provides information on the show commands and bulk statistics available to support this feature.

Show Command(s) and/or Outputs

This section provides information regarding show commands and/or their outputs in support of this feature.

show gmm-sm statistics verbose

The following new parameters are added to this show command to display the statistics for this feature:

- 3G-Pri-Actv-APN-Not-Sup-Rej
- 2G-Pri-Actv-APN-Not-Sup-Rej
- 3G-APN-Not-Supported-in-PLMN-RAT
- 2G-APN-Not-Supported-in-PLMN-RAT
- APN Not Supported in PLMN RAT combination Statistics
- 3G-Pdp-Dropped-During-New-SGSN-RAU
- 2G-Pdp-Dropped-During-New-SGSN-RAU
- 3G-Pdp-Dropped-During-New-SGSN-SRNS
- Pdp-Dropped-During-3G-To-2G-IRAT
- 3G-Actv-NRPCA-Reject
- Pdp-Dropped-During-2G-To-3G-IRAT

The following statistics are MME specific:

- APN not sup PLMN-RAT
- Inbound Inter node SRNS failure
- APN not sup in PLMN/RAT

Bulk Statistics

The following statistics are included in the MME and SGSN Schemas in support of the feature.

MME Schema

- inter-node-srns-proc-fail-apn-not-supported
- inter-node-tau-proc-fail-apn-not-supported
- tai-esm-msgtx-pdncon-rej-apn-not-sup-in-plmn-rat
- tai-emm-msgtx-attach-rej-apn-not-sup-in-plmn-rat
- attach-proc-fail-apn-not-sup-in-plmn-rat
- esm-msgtx-pdncon-rej-apn-not-sup-in-plmn-rat
- emm-msgtx-attach-rej-apn-not-sup-in-plmn-rat
- emmdisc-apnnotsupinplmnrat

SGSN Schema

- 3G-actv-rej-apn-not-supported-in-plmn-rat
- 2G-actv-rej-apn-not-supported-in-plmn-rat
- 3G-actv-rej-apn-not-supported-in-plmn-rat-cum
- 2G-actv-rej-apn-not-supported-in-plmn-rat-cum
- 2G-3G-irat-pdp-drop-apn-not-supported-in-plmn-rat
- 2G-israu-pdp-drop-apn-not-supported-in-plmn-rat
- 3G-israu-pdp-drop-apn-not-supported-in-plmn-rat

- 3G-srns-pdp-drop-apn-not-supported-in-plmn-rat
- 3G-nrpca-pdp-drop-apn-not-supported-in-plmn-rat
- 3G-2G-irat-pdp-drop-apn-not-supported-in-plmn-rat
- 2G-inter-svc-rau-pdp-drop-apn-not-supported-in-plmn-rat

For descriptions of these variables, see the information for the SGSN and MME schema in the *Statistics and Counters Reference*.