5GSM Cause Handling

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Feature Summary and Revision History

Feature Summary

Feature Summary

Applicable Product(s) or Functional Area	SMF
Applicable Platform(s)	SMI
Feature Default Setting	Enabled - Always-on
Related Changes in this Release	Not Applicable
Related Documentation	Not Applicable

Revision History

Table 1: Revision History

Revision Details	Release
First introduced.	2020.02.0

Feature Description

The SMF supports 5GSM cause handling for the UE and Network initiated procedures.

The procedures include:

- PDU-Session-Establishment
- PDU-Session-Modification
- PDU-Session-Release

PDU Session Establishment Reject

If the connectivity with the requested DN is rejected by the network, SMF sets the 5GSM cause IE of the PDU Session Establishment Reject message to indicate the reason for rejecting the PDU Session Establishment procedure.

The SMF supports the following causes in the PDU Session Establishment Reject message.

Reject Cause / 5GSM Cause	SMF Behavior
Cause #26 – insufficient resources	The SMF includes this cause when it receives N2SmInfoType with "PDU_RES_SETUP_FAIL" along with any of the following N2 causes: • RadioNetwork/Radio_resources_not_available • RadioNetwork/Failure_in_the_radio_interface_procedure • Misc/Not_enough_user_plane_processing_resources
Cause #27 – missing or unknown DNN	The SMF includes this cause when DNN is not present in SmContextCreateData even though it is required and not configured in SMF.
Cause #28 – unknown PDU session type	The SMF includes this cause when the PDU Session Establishment Request message includes a PDU session type that is not supported by SMF.
Cause #29 – user authentication or authorization failed	The SMF includes this cause when DN authentication of the UE was performed and completed unsuccessfully (Radius Authentication Timeout).
Cause #32 – service option not supported	The SMF supports this cause when the validation of received S-NSSAI fails against the allowed list of S-NSSAI.
Cause #33 – requested service option not subscribed	The SMF supports this cause when the UE requests a service option for which it has no subscription.
Cause #38 – network failure	The SMF supports this cause when the requested service was rejected due to an error in the network. This includes any internal failures or no response from any external NF during the PDN-setup procedure.
Cause #54 – PDU session does not exist	The SMF supports this cause when it does not have any information about the PDU session which is requested by the UE to transfer between 3GPP access and non-3GPP access or from the EPS to the 5GS.

Reject Cause / 5GSM Cause	SMF Behavior
Cause #70 – missing or unknown DNN in a slice	The SMF supports this cause when the slice configuration is present but the requested DNN is not configured under the slice in the SMF.
Protocol errors	
Cause #95 – Semantically incorrect message	This 5GSM cause reports receipt of a message with semantically incorrect content. **Important** For mandatory parameters (PDU Session Identity and Procedure Transaction Identity) with non-semantical error also, the SMF sends this cause.

PDU Session Modification Reject

If the SMF does not accept the request to modify the PDU session, it sets the 5GSM cause IE of the PDU Session Modification Reject message to indicate the reason for rejecting the PDU session modification procedure.

The SMF supports the following causes in the PDU Session Modification Reject message.

Reject Cause / 5GSM Cause	SMF Behavior
Cause #43 – Invalid PDU session identity	The SMF sends this cause when SMF does not have the session.
Protocol errors	
Cause #95 – Semantically incorrect message	This 5GSM cause reports receipt of a message with semantically incorrect content. **Important** For mandatory parameters (PDU Session Identity and Procedure Transaction Identity) with non-semantical error also, the SMF sends this cause.

PDU Session Release Reject

If the SMF does not accept the request to release the PDU session, SMF sets the 5GSM Cause IE of the PDU Session Release Reject message to indicate the reason for rejecting the PDU session release.

The SMF supports the following causes in the PDU Session Release Reject message.

Reject Cause / 5GSM Cause	SMF Behavior
Cause #43 – Invalid PDU session identity	The SMF supports this cause when SMF does not have the session.
Protocol errors	

Reject Cause / 5GSM Cause	SMF Behavior
Cause #95 – Semantically incorrect message	This 5GSM cause reports receipt of a message with semantically incorrect content. **Important** For mandatory parameters (PDU Session Identity and Procedure Transaction Identity) with non-semantical error also, the SMF sends this cause.

PDU Session Release Request

To initiate the UE-requested PDU Session Release procedure, UE sends the PDU Session Release Request message with the 5GSM Cause IE to indicate the reason for releasing the PDU session.

The SMF supports the following causes in the PDU Session Release Request message.

Reject Cause / 5GSM Cause	SMF Behavior
Cause #36 – regular deactivation	The SMF retains the statistics based on the cause and continues with the Release procedure.
Cause #41 – Semantic error in the TFT operation	The SMF retains the statistics based on the cause and continues with the Release procedure.
Cause #42 – Syntactical error in the TFT operation	The SMF retains the statistics based on the cause and continues with the Release procedure.
Cause #44 – Semantic errors in packet filter(s)	The SMF retains the statistics based on the cause and continues with the Release procedure.
Cause #45 – Syntactical errors in packet filter(s)	The SMF retains the statistics based on the cause and continues with the Release procedure.

PDU Session Modification Command Reject

If the UE rejects the PDU-Session-Modification-Command, it sets the 5GSM cause IE of the PDU Session Modification Reject message to indicate the reason for rejecting the PDU session modification.

The SMF supports the following 5GSM causes.

5GSM Cause	SMF Behavior
Cause #26 – insufficient resources	The SMF retains the statistics based on the cause.
Cause #43 – Invalid PDU session identity	The SMF retains the statistics based on the cause and releases the existing PDU session.
Cause #44 – Semantic error in packet filter(s)	The SMF retains the statistics based on the cause.
Cause #45 – Syntactical error in packet filter(s)	The SMF retains the statistics based on the cause.

5GSM Cause	SMF Behavior
Cause #83 – Semantic error in the QoS operation	The SMF retains the statistics based on the cause.
Cause #85 – Syntactical error in the QoS operation	The SMF retains the statistics based on the cause.

How it Works

The SMF supports 5GSM cause handling for the PDU-Session-Establishment, PDU-Session-Modification and PDU-Session-Release procedures. An appropriate SM cause will be sent over the N1 message to the UE.

Standards Compliance

The 5GSM Cause Handling feature complies with the *3GPP TS 24.501, version 15.4.0, Release 15* (Non-Access-Stratum (NAS) protocol for 5G System (5GS)).

Configuring the 5GSM Cause Handling Feature

5GSM Cause Handling OAM Support

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

Statistics

The 5GSM Cause Handling feature supports the following statistics to track the number of failures based on the 5GSM cause.

SMF N1 Message Stats

PDU-Session-Establishment-Reject:

- NETWORK_FAILURE: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "NETWORK_FAILURE".
- UNKNOWN_PDU_SESSION_TYPE: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "UNKNOWN_PDU_SESSION_TYPE".
- USER_AUTHENTICATION_OR_AUTHORIZATION_FAILED: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "USER_AUTHENTICATION_OR_AUTHORIZATION_FAILED".
- REQUESTED_SERVICE_OPTION_NOT_SUBSCRIBED: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "REQUESTED_SERVICE_OPTION_NOT_SUBSCRIBED".
- MISSING_OR_UNKNOWN_DNN: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "MISSING_OR_UNKNOWN_DNN".
- SERVICE_OPTION_NOT_SUPPORTED: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "SERVICE_OPTION_NOT_SUPPORTED".

- INSUFFICIENT_RESOURCES: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "INSUFFICIENT_RESOURCES".
- MISSING_OR_UNKNOWN_DNN_IN_A_SLICE: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "MISSING_OR_UNKNOWN_DNN_IN_A_SLICE".
- PDU_SESSION_DOES_NOT_EXIST: The number of PDU-Session-Establishment-Reject messages sent from SMF with N1 Cause "PDU_SESSION_DOES_NOT_EXIST".

PDU-Session-Modification-Reject:

- INVALID_PDU_SESSION_IDENTITY: The number of PDU-Session-Modification-Reject messages sent from SMF with N1 Cause "INVALID_PDU_SESSION_IDENTITY".

PDU-Session-Release-Reject:

- INVALID_PDU_SESSION_IDENTITY: The number of PDU-Session-Release-Reject messages sent from SMF with N1 Cause "INVALID_PDU_SESSION_IDENTITY".

PDU-Session-Release-Request:

- REGULAR_DEACTIVATION: The number of PDU-Session-Release-Request messages received in SMF with N1 Cause "REGULAR_DEACTIVATION".
- SEMANTIC_ERRORS_IN_PACKET_FILTER: The number of PDU-Session-Release-Request messages received in SMF with N1 Cause "SEMANTIC_ERRORS_IN_PACKET_FILTER".
- SYNTACTICAL_ERROR_IN_PACKET_FILTER: The number of PDU-Session-Release-Request messages received in SMF with N1 Cause "SYNTACTICAL_ERROR_IN_PACKET_FILTER".
- SEMANTIC_ERROR_IN_THE_TFT_OPERATION: The number of PDU-Session-Release-Request messages received in SMF with N1 Cause "SEMANTIC_ERROR_IN_THE_TFT_OPERATION".
- SYNTACTICAL_ERROR_IN_THE_TFT_OPERATION: The number of PDU-Session-Release-Request messages received in SMF with N1 Cause "SYNTACTICAL_ERROR_IN_THE_TFT_OPERATION".

PDU-Session-Modification-Command-Reject:

- INSUFFICIENT_RESOURCES: The number of PDU-Session-Modification-Command-Reject messages received in SMF with N1 Cause "INSUFFICIENT_RESOURCES".
- INVALID_PDU_SESSION_IDENTITY: The number of PDU-Session-Modification-Command-Reject messages received in SMF with N1 Cause "INVALID_PDU_SESSION_IDENTITY".
- SEMANTIC_ERRORS_IN_PACKET_FILTER: The number of PDU-Session-Modification-Command-Reject messages received in SMF with N1 Cause "SEMANTIC_ERRORS_IN_PACKET_FILTER".
- SYNTACTICAL_ERROR_IN_PACKET_FILTER: The number of PDU-Session-Modification-Command-Reject messages received in SMF with N1 Cause "SYNTACTICAL_ERROR_IN_PACKET_FILTER".
- SEMANTIC_ERROR_IN_THE_QOS_OPERATION: The number of PDU-Session-Modification-Command-Reject messages received in SMF with N1 Cause "SEMANTIC_ERROR_IN_THE_QOS_OPERATION".

- SYNTACTICAL_ERROR_IN_THE_TFT_OPERATION: The number of PDU-Session-Modification-Command-Reject messages received in SMF with N1 Cause "SYNTACTICAL_ERROR_IN_THE_TFT_OPERATION".