*CR-Form-v5*

# CHANGE REQUEST

|  | ⌘ | **29.060** CR **318** | ⌘**rev** | **1** | ⌘ | Current version: | **5.1.0** | ⌘ |
|---|---|---|---|---|---|---|---|---|

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

---

***Proposed change affects:*** ⌘   (U)SIM ☐   ME/UE ☐   Radio Access Network ☐   Core Network **X**

---

| ***Title:*** | ⌘ | Support of IPv4 and IPv6 node addresses in Core Network |
|---|---|---|

| ***Source:*** | ⌘ | CN Drafting Group |
|---|---|---|

| ***Work item code:*** ⌘ | TEI5 | | ***Date:*** ⌘ | 7.6.2002 |
|---|---|---|---|---|

| ***Category:*** | ⌘ | **C** | | ***Release:*** ⌘ | Rel-5 |
|---|---|---|---|---|---|

Use <u>one</u> of the following categories:  
   ***F*** *(correction)*  
   ***A*** *(corresponds to a correction in an earlier release)*  
   ***B*** *(addition of feature),*  
   ***C*** *(functional modification of feature)*  
   ***D*** *(editorial modification)*  
Detailed explanations of the above categories can  
be found in 3GPP <u>TR 21.900</u>.

Use <u>one</u> of the following releases:  
  *2*     *(GSM Phase 2)*  
  *R96*  *(Release 1996)*  
  *R97*  *(Release 1997)*  
  *R98*  *(Release 1998)*  
  *R99*  *(Release 1999)*  
  *REL-4* *(Release 4)*  
  *REL-5* *(Release 5)*

---

| ***Reason for change:*** ⌘ | Current GTP specification does not correctly support using IPv6 in network plane because session will be lost each time MS moves to an SGSN not supporting IPv6 (because SGSN cannot use GGSN IPv6 address received). |
|---|---|

| ***Summary of change:*** ⌘ | IPv4/IPv6 GGSN needs to include its IPv4 and IPv6 addresses in the Create PDP Context Response and Update PDP Context Response. Both GGSN addresses are stored in SGSN. SGSN will only use preferred set of GGSN addresses (either IPv6 or IPv4 addresses) for communicating with GGSN. IPv4/IPv6 GGSN is always ready to receive GTP packet (signalling or user data) on either IPv4 or IPv6 address. <br><br> In inter SGSN handover, either IPv4 or IPv6 GGSN addresses are given to the new SGSN according to the IP version capability of the new SGSN in a backward compatible way in PDP Context IE (in SGSN Context Response and Forward Relocation Request). If the new SGSN does not support IPv6, it receives IPv4 GGSN addresses and uses those to communicate with GGSN. <br><br> If the new SGSN received only IPv4 GGSN address from the old SGSN, in Update PDP Context Request a new IPv4/IPv6 SGSN shall include its IPv4 and IPv6 addresses. This way GGSN receives the information that the new SGSN is also IPv6 capable even if the old SGSN was not and did not forward the IPv6 GGSN addresses to the new SGSN. <br><br> These changes will enable to improve the service in such a way that unnecessary drop of sessions will be avoided. |
|---|---|

| ***Consequences if*** <br> ***not approved:*** | ⌘ | |
|---|---|---|

---

| ***Clauses affected:*** | ⌘ | 7.3.2, 7.3.3, 7.3.4, 7.7.29 |
|---|---|---|

| ***Other specs*** <br> ***affected:*** | ⌘ | ☐ Other core specifications | ⌘ | 32.015 |
|---|---|---|---|---|
| | | ☐ Test specifications | | |

| | O&M Specifications | |
|---|---|---|
| ***Other comments:*** ⌘ | | |

## How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text.  Delete those parts of the specification which are not relevant to the change request.

## 7.3.2    Create PDP Context Response

The message shall be sent from a GGSN node to a SGSN node as a response of a Create PDP Context Request. When the SGSN receives a Create PDP Context Response with the Cause value indicating 'Request Accepted', the SGSN activates the PDP context and may start to forward T-PDUs to/from the MS from/to the external data network.

The Cause value indicates if a PDP context has been created in the GGSN or not. A PDP context has not been created in the GGSN if the Cause differs from 'Request accepted'. Possible Cause values are:

- "Request Accepted".

- "No resources available".

- "All dynamic PDP addresses are occupied".

- "No memory is available".

- "Missing or unknown APN".

- "Unknown PDP address or PDP type".

- "User authentication failed".

- "System failure".

- "Semantic error in the TFT operation".

- "Syntactic error in the TFT operation".

- "Semantic errors in packet filter(s)".

- "Syntactic errors in packet filters(s)".

- "Mandatory IE incorrect".

- "Mandatory IE missing".

- "Optional IE incorrect".

- "Invalid message format".

'No resources available' indicates e.g. that all dynamic PDP addresses are occupied or no memory is available. 'Missing or unknown APN' indicates e.g. when the GGSN does not support the Access Point Name. 'Unknown PDP address or PDP type' indicates e.g. when the GGSN does not support the PDP type or the PDP address.
'User authentication failed' indicates that the external packet network has rejected the service requested by the user.

Only the Cause information element, optionally Protocol Configuration Options and optionally the Recovery information element shall be included in the response if the Cause contains another value than 'Request accepted'.

All information elements, except Recovery, Protocol Configuration Options, Charging Gateway Address, Tunnel Endpoint Identifier Control Plane and Private Extension, are mandatory if the Cause contains the value 'Request accepted'.

The Tunnel Endpoint Identifier for Data (I) field specifies an uplink Tunnel Endpoint Identifier for G-PDUs that is chosen by the GGSN. The SGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent uplink G-PDUs which are related to the requested PDP context.

The Tunnel Endpoint Identifier Control Plane field specifies an uplink Tunnel Endpoint Identifier for control plane messages, which is chosen by the GGSN. The SGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent uplink-control plane messages, which are related to the requested PDP context. If the GGSN has already confirmed successful assignment of its Tunnel Endpoint Identifier Control Plane to the peer SGSN, this field shall not be present. The GGSN confirms successful assignment of its Tunnel Endpoint Identifier Control Plane to the SGSN when it receives any message with its assigned Tunnel Endpoint Identifier Control Plane in the GTP header from the SGSN.

The GGSN shall include a GGSN Address for control plane and a GGSN address for user traffic, which may differ from that provided by the underlying network service (e.g. IP).

~~If the GGSN supports IPv6 below GTP, it shall include both its IPv6 and IPv4 addresses.~~ If the Create PDP Context Request received from the SGSN included IPv6 SGSN address, an IPv4/IPv6 capable GGSN shall include IPv6 addresses in the fields GGSN Address for Control Plane and GGSN Address for user traffic, and IPv4 addresses in the fields Alternative GGSN Address for Control Plane and Alternative GGSN Address for user traffic. If SGSN included only an IPv4 SGSN address in the request, IPv4/IPv6 capable GGSN shall include IPv4 addresses in the fields GGSN Address for Control Plane and GGSN Address for user traffic, and IPv6 addresses in the fields Alternative GGSN Address for Control Plane and Alternative GGSN Address for user traffic. The SGSN shall store these GGSN Addresses and use one set of them when sending control plane on this GTP tunnel or G-PDUs to the GGSN for the MS.

If the MS requests a dynamic PDP address with the PDP Type IPv4 or IPv6 and a dynamic PDP address is allowed, then the End User Address information element shall be included and the PDP Address field in the End User Address information element shall contain the dynamic PDP Address allocated by the GGSN.

If the MS requests a static PDP address with the PDP Type IPv4 or IPv6, or a PDP address is specified with PDP Type PPP, then the End User Address information element shall be included and the PDP Address field shall not be included.

The PDP address in End User Address IE and in the Protocol configuration options IE shall be the same, if both IEs are present in the create PDP context response.

The QoS values supplied in the Create PDP Context Request may be negotiated downwards by the GGSN. The negotiated values or the original values from SGSN are inserted in the Quality of Service Profile information element of the Create PDP Context Response message.

The GGSN may start to forward T-PDUs after the Create PDP Context Response has been sent. The SGSN may start to forward T-PDUs when the Create PDP Context Response has been received. In this case the SGSN shall also be prepared to receive T-PDUs from the GGSN after it has sent a Create PDP Context Request but before a Create PDP Context Response has been received.

The Reordering Required value supplied in the Create PDP Context Response indicates whether the end user protocol benefits from packet in sequence delivery and whether the SGSN and the GGSN therefore shall perform reordering or not. In other words, if reordering is required by the GGSN, the SGSN and the GGSN shall perform reordering of incoming T-PDUs on this path. When the Quality of Service (QoS) Profile is Release 99 the receiving entity shall ignore the Reordering Required.

The GGSN shall include the Recovery information element into the Create PDP Context Response if the GGSN is in contact with the SGSN for the first time or the GGSN has restarted recently and the new Restart Counter value has not yet been indicated to the SGSN. The SGSN receiving the Recovery information element shall handle it as when an Echo Response message is received but shall consider the PDP context being created as active if the response indicates successful context activation at the GGSN.

The Charging ID is used to identify all charging records produced in SGSN(s) and the GGSN for this PDP context. The Charging ID is generated by the GGSN and shall be unique within the GGSN.

The Charging Gateway Address is the IP address of the recommended Charging Gateway Functionality to which the SGSN should transfer the Charging Detail Records (CDR) for this PDP Context.

The optional Private Extension contains vendor or operator specific information.

The Protocol Configuration Options (PCO) information element may be included in the response when the GGSN provides the MS with application specific parameters.

**Table 6: Information Elements in a Create PDP Context Response**

| Information element | Presence requirement | Reference |
|---|---|---|
| Cause | Mandatory | 7.7.1 |
| Reordering required | Conditional | 7.7.6 |
| Recovery | Optional | 7.7.11 |
| Tunnel Endpoint Identifier Data I | Conditional | 7.7.13 |
| Tunnel Endpoint Identifier Control Plane | Conditional | 7.7.14 |
| Charging ID | Conditional | 7.7.26 |
| End User Address | Conditional | 7.7.27 |
| Protocol Configuration Options | Optional | 7.7.31 |
| GGSN Address for Control Plane | Conditional | GSN Address 7.7.32 |
| GGSN Address for user traffic | Conditional | GSN Address 7.7.32 |
| Alternative GGSN Address for Control Plane | Conditional | GSN Address 7.7.32 |
| Alternative GGSN Address for user traffic | Conditional | GSN Address 7.7.32 |
| Quality of Service Profile | Conditional | 7.7.34 |
| Charging Gateway Address | Optional | 7.7.44 |
| Private Extension | Optional | 7.7.46 |

## 7.3.3    Update PDP Context Request

An Update PDP Context Request message shall be sent from a SGSN to a GGSN as part of the GPRS Inter SGSN Routeing Update procedure or the PDP Context Modification procedure or to redistribute contexts due to load sharing. It shall be used to change the QoS and the path. In addition it shall be used if it is neccessarynecessary to change the GTP version of a tunnel to a GGSN from GTP v0 to GTP v1. The message shall be sent by the new SGSN at the Inter SGSN Routeing Update procedure.

The NSAPI information element together with the Tunnel Endpoint Identifier in the GTP header unambiguously identifies a PDP Context in the GGSN.

The IMSI shall be included if the message is sent during an Inter SGSN change when changing the GTP version from GTP v0 to GTP v1; this is required, as the TEID in the header of the message is set to all zeros in this case.

The Tunnel Endpoint Identifier Data field specifies a downlink Tunnel Endpoint Identifier for G-PDUs which is chosen by the SGSN. The GGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent downlink G-PDUs that are related to the requested PDP context.

The Tunnel Endpoint Identifier Control Plane field specifies a downlink Tunnel Endpoint Identifier Control Plane messages which is chosen by the SGSN. The GGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent downlink control plane messages that are related to the requested PDP context.  If the SGSN has already confirmed successful assignment of its Tunnel Endpoint Identifier Control Plane to the peer GGSN, this field shall not be present. The SGSN confirms successful assignment of its Tunnel Endpoint Identifier Control Plane to the GGSN when it receives any message with its assigned Tunnel Endpoint Identifier Control Plane in the GTP header from the GGSN.

The Quality of Service Profile information element shall include the QoS negotiated between the MS and SGSN at PDP Context activation or the new QoS negotiated in the PDP Context Modification procedure.

The SGSN shall include an SGSN Address for control plane and an SGSN address for user traffic, which may differ from that provided by the underlying network service (e.g. IP).

 If an IPv4/IPv6 capable SGSN received IPv4 GGSN addresses from the old SGSN (Inter SGSN Routing Area Update case), it shall include IPv4 addresses in the fields SGSN Address for Control Plane and SGSN Address for User Traffic and IPv6 addresses in the fields Alternative SGSN Address for Control Plane and Alternative SGSN Address for User Traffic. Otherwise, an IPv4/IPv6 capable SGSN shall use only SGSN IPv6 addresses if it has GGSN IPv6 addresses available. If the GGSN supports IPv6 below GTP, it shall store and use the IPv6 SGSN addresses for communication with the SGSN and ignore the IPv4 SGSN addresses. If the GGSN supports only IPv4 below GTP, it shall store and use the IPv4  SGSN addresses for communication with the  SGSN and ignore the IPv6 SGSN addresses. The GGSN shall store these SGSN Addresses and use them when sending subsequent control plane on this GTP tunnel or G-PDUs to the

~~SGSN for the MS.~~ When active contexts are being redistributed due to load sharing, G-PDUs that are in transit across the Gn-interface are in an undetermined state and may be lost.

The SGSN shall include a Recovery information element into the Update PDP Context Request if the SGSN is in contact with the GGSN for the very first time or if the SGSN has restarted recently and the new Restart Counter value has not yet been indicated to the GGSN. The GGSN that receives a Recovery information element in the Update PDP Context Request message element shall handle it in the same way as when receiving an Echo Response message. The Update PDP Context Request message shall be considered as a valid update request for the PDP context indicated in the message.

The Traffic Flow Template (TFT) is used to distinguish between different user traffic flows.

The SGSN shall include Trace Reference, Trace Type, Trigger Id, and OMC Identity in the message if GGSN trace is activated while the PDP context is active. The SGSN shall copy Trace Reference, Trace Type, and OMC Identity from the trace request received from the HLR or OMC.

The optional Private Extension contains vendor or operator specific information.

**Table 7: Information Elements in an SGSN-Initiated Update PDP Context Request**

| Information element | Presence requirement | Reference |
|---|---|---|
| IMSI | Conditional | 7.7.2 |
| Recovery | Optional | 7.7.11 |
| Tunnel Endpoint Identifier Data I | Mandatory | 7.7.13 |
| Tunnel Endpoint Identifier Control Plane | Conditional | 7.7.14 |
| NSAPI | Mandatory | 7.7.17 |
| Trace Reference | Optional | 7.7.24 |
| Trace Type | Optional | 7.7.25 |
| SGSN Address for Control Plane | Mandatory | GSN Address 7.7.32 |
| SGSN Address for User Traffic | Mandatory | GSN Address 7.7.32 |
| Alternative SGSN Address for Control Plane | Conditional | GSN Address 7.7.32 |
| Alternative SGSN Address for User Traffic | Conditional | GSN Address 7.7.32 |
| Quality of Service Profile | Mandatory | 7.7.34 |
| TFT | Optional | 7.7.36 |
| Trigger Id | Optional | 7.7.41 |
| OMC Identity | Optional | 7.7.42 |
| Private Extension | Optional | 7.7.46 |

An Update PDP Context Request may also be sent from a GGSN to a SGSN to re-negotiate the QoS of a PDP context. The GGSN-initiated Update PDP Context Request can also be used to provide a PDP address to the SGSN (and MS). The latter shall be used by GGSN when it acts as a DHCP Relay Agent or Mobil IP Foreign Agent. A GGSN may send an update PDP context to a SGSN to check that the PDP context is still active at the SGSN. In such a case, the GGSN shall include the optional IMSI IE, to add robustness against the case the SGSN has re-assigned the TEID to another PDP context (this may happen when the PDP context is dangling at the GGSN). Also, the "Quality of service profile" IE and the "End user Address" IE shall not be included in this case.

The Quality of Service Profile information element shall include the GGSN requested QoS.

The End User Address information element shall contain a valid IPv4 or IPv6 address.

The GGSN shall include a Recovery information element into the Update PDP Context Request if the GGSN has restarted recently and the new Restart Counter value has not yet been indicated to the SGSN. The SGSN that receives a Recovery information element in the Update PDP Context Request message element shall handle it in the same way as when receiving an Echo Response message. The Update PDP Context Request message shall be considered as a valid update request for the PDP context indicated in the message.

The NSAPI information element together with the Tunnel Endpoint Identifier in the GTP header unambiguously identifies a PDP Context in the SGSN.

The optional Private Extension contains vendor or operator specific information.

**Table 8: Information Elements in a GGSN-Initiated Update PDP Context Request**

| Information element | Presence requirement | Reference |
|---|---|---|
| IMSI | optional | 7.7.2 |
| Recovery | Optional | 7.7.11 |
| NSAPI | Mandatory | 7.7.17 |
| End User Address | Optional | 7.7.27 |
| Quality of Service Profile | Optional | 7.7.34 |
| Private Extension | Optional | 7.7.46 |

## 7.3.4 Update PDP Context Response

The message shall be sent from a GGSN node to a SGSN node as a response of an Update PDP Context Request.

If the SGSN receives an Update PDP Context Response with a Cause value other than 'Request accepted', it shall abort the update of the PDP context.

Only the Cause information element and optionally the Recovery information element shall be included in the response if the Cause contains another value than 'Request accepted'.

Possible Cause values are:

- 'Request Accepted'.

- 'Non-existent'.

- 'Service not supported'.

- 'System failure'.

- 'Semantic error in the TFT operation'.

- 'Syntactic error in the TFT operation'.

- 'Semantic errors in packet filter(s)'.

- 'Syntactic errors in packet filters(s)'.

- 'Mandatory IE incorrect'.

- 'Mandatory IE missing'.

- 'Optional IE incorrect'.

- 'Invalid message format'.

The Tunnel Endpoint Identifier Data field specifies an uplink Tunnel Endpoint Identifier for G-PDUs that is chosen by the GGSN. The SGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent uplink G-PDUs that are related to the requested PDP context. This information element shall be included if the Cause contains the value 'Request accepted'.

The Tunnel Endpoint Identifier Control Plane field specifies an uplink Tunnel Endpoint Identifier Control Plane messages which is chosen by the GGSN. The SGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent uplink control plane messages which are related to the requested PDP context. If the GGSN has already confirmed successful assignment of its Tunnel Endpoint Identifier Control Plane to the peer SGSN, this field shall not be present. The GGSN confirms successful assignment of its Tunnel Endpoint Identifier Control Plane to the SGSN when it receives any message with its assigned Tunnel Endpoint Identifier Control Plane in the GTP header from the SGSN.

The QoS values supplied in the Update PDP Context Request may be negotiated downwards by the GGSN. The negotiated values or the original value from SGSN is inserted in the Quality of Service Profile information element. This information element shall be included if the Cause contains the value 'Request accepted'.

The GGSN may start to forward T-PDUs after the Update PDP Context Response has been sent. The SGSN may start to forward T-PDUs when the Update PDP Context Response has been received. In this case the SGSN shall also be

prepared to receive T-PDUs from the GGSN after it has sent an Update PDP Context Request but before an Update PDP Context Response has been received.

The GGSN shall include a GGSN address for user traffic, which may differ from that provided by the underlying network service (e.g. IP). IPv4/IPv6 capable GGSN shall include both its IP version addresses. If the Update PDP Context Request received from the SGSN included IPv6 SGSN addresses, an IPv4/IPv6 capable GGSN shall include an IPv6 address in the field GGSN Address for User Traffic and a corresponding IPv4 address in the field Alternative GGSN Address for User Traffic. If SGSN included only an IPv4 SGSN address in the request, IPv4/IPv6 capable GGSN shall include IPv4 address for user traffic in the field GGSN Address for User Traffic and IPv6 address in the field Alternative GGSN Address for User Traffic. The SGSN shall store this the GGSN Addresses and use it one of them when sending G-PDUs to the GGSN for the MS. When active contexts are being redistributed due to load sharing, G-PDUs that are in transit across the Gn-interface are in an undetermined state and may be lost.

The GGSN shall also include a GGSN address for control plane, which shall not differ from that provided at PDP context setup time and shall remain unchanged for the lifetime of the PDP context. If the Update PDP Context Request received from the SGSN included IPv6 SGSN addresses, an IPv4/IPv6 capable GGSN shall include an IPv6 address in the field GGSN Address for Control Plane and a corresponding IPv4 address in the field Alternative GGSN Address for Control Plane. If SGSN included only an IPv4 SGSN address in the request, IPv4/IPv6 capable GGSN shall include IPv4 address for Control plane in the field GGSN Address for Control Plane and IPv6 address for Control plane in the field Alternative GGSN Address for Control Plane. The GGSN address shall be interpreted to remain unchanged if only the presentation form (IP version) of the address is changing.

The GGSN Address for control plane and the GGSN Address for user traffic shall be included if the Cause contains the value 'Request accepted'. The Alternative GGSN Addresses shall be included if the GGSN supports IPv6 below GTP and the Cause contains the value 'Request accepted'

The GGSN shall include the Recovery information element into the Update PDP Context Response if the GGSN is in contact with the SGSN for the first time or if the GGSN has restarted recently and the new Restart Counter value has not yet been indicated to the SGSN. The SGSN receiving the Recovery information element shall handle it as when an Echo Response message is received but shall consider the PDP context as updated and active if the response cause indicates a successful operation at the GGSN.

The Charging ID is used to identify all charging records produced in SGSN(s) and the GGSN for this PDP context. The Charging ID has been previously generated by the GGSN and is unique for this PDP context. If an inter-SGSN routing area update occurs, it is transferred to the new SGSN as part of each active PDP context. This information element shall be included if the Cause contains the value 'Request accepted'.

The Charging Gateway Address is the IP address of the recommended Charging Gateway Functionality to which the SGSN should transfer the Charging Detail Records (CDR) for this PDP Context.

The optional Private Extension contains vendor or operator specific information.

**Table 9: Information Elements in an Update PDP Context Response sent by a GGSN**

| Information element | Presence requirement | Reference |
|---|---|---|
| Cause | Mandatory | 7.7.1 |
| Recovery | Optional | 7.7.11 |
| Tunnel Endpoint Identifier Data I | Conditional | 7.7.13 |
| Tunnel Endpoint Identifier Control Plane | Conditional | 7.7.14 |
| Charging ID | Conditional | 7.7.26 |
| GGSN Address for Control Plane | Conditional | GSN Address 7.7.32 |
| GGSN Address for User Traffic | Conditional | GSN Address 7.7.32 |
| Alternative GGSN Address for Control Plane | Conditional | GSN Address 7.7.32 |
| Alternative GGSN Address for User Traffic | Conditional | GSN Address 7.7.32 |
| Quality of Service Profile | Conditional | 7.7.34 |
| Charging Gateway Address | Optional | 7.7.44 |
| Private Extension | Optional | 7.7.46 |

The message can also be sent from a SGSN node to a GGSN node as a response of a GGSN-initiated Update PDP Context Request.

If the GGSN receives an Update PDP Context Response with a Cause value other than 'Request accepted', it shall abort the update of the PDP context if the associated Update PDP Context Request was sent only to re-negotiate the QoS of a PDP context. Furthermore if the associated Update PDP Context Request included an 'End User Address' information element the GGSN shall delete the PDP context using the Delete PDP Context procedure and may notify the Operation and Maintenance network element.

Only the Cause information element and optionally the Recovery information element shall be included in the response if the Cause contains another value than 'Request accepted'.

Possible Cause values are the same as for the Update PDP Context Response sent by a GGSN. When the optional IMSI IE value differs from the IMSI IE value associated to the PDP context, the SGSN shall respond using the cause value 'Non-existent'.

The QoS values supplied in the Update PDP Context Request may be negotiated downwards by the SGSN. The negotiated values or the original value from GGSN is inserted in the Quality of Service Profile information element. This information element shall be included if the Cause contains the value 'Request accepted' and a QoS information element was supplied in the corresponding request message.

The SGSN shall include the Recovery information element into the Update PDP Context Response if the SGSN has restarted recently and the new Restart Counter value has not yet been indicated to the GGSN. The GGSN receiving the Recovery information element shall handle it as when an Echo Response message is received but shall consider the PDP context as updated and active if the response cause indicates a successful operation at the SGSN.

**Table 10: Information Elements in an Update PDP Context Response sent by a SGSN**

| Information element | Presence requirement | Reference |
|---|---|---|
| Cause | Mandatory | 7.7.1 |
| Recovery | Optional | 7.7.11 |
| Quality of Service Profile | Conditional | 7.7.34 |
| Private Extension | Optional | 7.7.46 |

====NEXT MODIFIED SECTION====

# 7.7.29   PDP Context

The PDP Context information element contains the Session Management parameters, defined for an external packet data network address, that are necessary to transfer between SGSNs at the Inter SGSN Routeing Area Update procedure.

NSAPI is an integer value in the range [0; 15].

The NSAPI points out the affected PDP context.

The SAPI indicates the LLC SAPI that is associated with the NSAPI.

The Transaction Identifier is the 4 or 12 bit Transaction Identifier used in the 3GPP TS 24.008 Session Management messages which control this PDP Context. If the length of the Transaction Identifier is 4 bit, the second octet shall be set to all zeros. The encoding is defined in 3GPP TS 24.007. The latest Transaction Identifier sent from SGSN to MS is stored in the PDP context IE.

Reordering Required (Order) indicates whether the SGSN shall reorder T-PDUs before delivering the T-PDUs to the MS. When the Quality of Service Negotiated (QoS Neg) is Release 99, the Reordering Required (Order) shall be ignored by receiving entity.

The VPLMN Address Allowed (VAA) indicates whether the MS is allowed to use the APN in the domain of the HPLMN only or additionally the APN in the domain of the VPLMN.

The QoS Sub Length, QoS Req Length and QoS Neg Length represent respectively the lengths of the QoS Sub, QoS Req and QoS Neg fields, excluding the QoS Length octet.

The Quality of Service Subscribed (QoS Sub), Quality of Service Requested (QoS Req) and Quality of Service Negotiated (QoS Neg) are encoded as described in section 'Quality of Service (QoS) Profile'. Their minimum length is 4 octets; their maximum length may be 255 octets.

The Sequence Number Down is the number of the next T-PDU that shall be sent from the new SGSN to the MS. The number is associated to the Sequence Number from the GTP Header of an encapsulated T-PDU. The new SGSN shall ignore Sequence Number Down when the PDP context QoS profile does not require transmission order to be preserved. In this case the new SGSN shall not include Sequence number field in the G-PDUs of the PDP context.

The Sequence Number Up is the number that new SGSN shall use as the Sequence Number in the GTP Header for the next encapsulated T-PDU from the MS to the GGSN. The new SGSN shall ignore Sequence Number Up when the PDP context QoS profile does not require transmission order to be preserved. In this case, the old SGSN shall not include Sequence number field in the G-PDUs of the PDP context.

The Send N-PDU Number is used only when acknowledged peer-to-peer LLC operation is used for the PDP context. Send N-PDU Number is the N-PDU number to be assigned by SNDCP to the next down link N-PDU received from the GGSN. It shall be set to 255 if unacknowledged peer-to-peer LLC operation is used for the PDP context.

The Receive N-PDU Number is used only when acknowledged peer-to-peer LLC operation is used for the PDP context. The Receive N-PDU Number is the N-PDU number expected by SNDCP from the next up link N-PDU to be received from the MS. It shall be set to 255 if unacknowledged peer-to-peer LLC operation is used for the PDP context.

The Uplink Tunnel Endpoint Identifier Control Plane is the Tunnel Endpoint Identifier used between the old SGSN and the GGSN in up link direction for control plane purpose. It shall be used by the new SGSN within the GTP header of the Update PDP Context Request message.

The GGSN Address for User Traffic and the UplinkTunnel Endpoint Identifier Data I are the GGSN address and  the Tunnel Endpoint Identifier used between the old SGSN and the GGSN in uplink direction for user plane traffic on a PDP context. They shall be used by the new SGSN to send uplink user plane PDU to the GGSN until new GGSN address for User Traffic is possibly received from GGSN (in Update PDP Context Response).

The PDP Context Identifier is used to identify a PDP context for the subscriber.

The PDP Type Organisation and PDP Type Number are encoded as in the End User Address information element.

The PDP Address Length represents the length of the PDP Address field, excluding the PDP Address Length octet.

The PDP Address is an octet array with a format dependent on the PDP Type. The PDP Address is encoded as in the End User Address information element if the PDP Type is IPv4 or IPv6.

The GGSN Address Length represents the length of the GGSN Address field, excluding the GGSN Address Length octet.

When forwarding the GGSN addresses to another SGSN (in PDP Context IE in Forward Relocation Request or SGSN Context Response message), the IPv4/IPv6 capable SGSN shall include GGSN addresses according to the IP version capability of the receiving SGSN.

The old SGSN includes the GGSN Address for control plane that it has received from GGSN at PDP context activation or update. If the new SGSN is IPv6 capable and the old SGSN has IPv6 control plane address of the GGSN available, the old IPv4/IPv6 capable SGSN includes the IPv6 GGSN control plane address in the field GGSN Address for control plane. If the new SGSN is IPv4 only capable or the old SGSN does not have any IPv6 GGSN address for control plane, the old SGSN includes the IPv4 GGSN Address in the field GGSN Address for control plane.

The use of Ipv6 addressing in pre-Release 5 nodes can cause interoperability problems and as such the use of IPv6 GSN addressing is not recommended in pre-Release 5.

> NOTE:     There is still  the need for further study of  the included addresses on SRNS relocation.

> NOTE:     Interoperability problems can arise if a pre-Release-5 GSN uses IPv6 transport.

The APN is the Access Point Name in use in the old SGSN. This APN field shall be composed of the APN Network Identifier part and the APN Operator Identifier part.

The spare bits x indicate unused bits that shall be set to 0 by the sending side and which shall not be evaluated by the receiving side.

| | |
|---|---|
| 1 | Type = 130 (Decimal) |
| 2-3 | Length |

| | Res-erved | VAA | Res-erve d | Ord er | NSAPI |
|---|---|---|---|---|---|
| 4 | | | | | |
| 5 | X | X | X | X | SAPI |

| | |
|---|---|
| 6 | QoS Sub Length |
| 7 - (q+6) | QoS Sub [4..255] |
| q+7 | QoS Req Length |
| (q+8)-(2q+7) | QoS Req [4..255] |
| 2q+8 | QoS Neg. Length |
| (2q+9)-(3q+8) | QoS Neg [4..255] |
| (3q+9)-(3q+10) | Sequence Number Down (SND) [1] |
| (3q+11)-(3q+12) | Sequence Number Up (SNU) [1] |
| 3q+13 | Send N-PDU Number [1] |
| 3q+14 | Receive N-PDU Number [1] |
| (3q+15)-(3q+18) | Uplink Tunnel Endpoint Identifier Control Plane |
| (3q+19)-(3q+22) | UplinkTunnel Endpoint Identifier Data I |
| 3q+23 | PDP Context Identifier |
| 3q+24 | Spare 1 1 1 1 · PDP Type Organisation |
| 3q+25 | PDP Type Number |
| 3q+26 | PDP Address Length |
| (3q+27)-m | PDP Address [1..63] |
| m+1 | GGSN Address for control plane Length |
| (m+2)-n | GGSN Address for control plane [4..16] |
| n+1 | GGSN Address for User Traffic Length |
| (n+2)-o | GGSN Address for User Traffic [4..16] |
| o+1 | APN length |
| (o+2)-p | APN |
| p+1 | Spare (sent as 0 0 0 0) · Transaction Identifier |
| p+2 | Transaction Identifier |

**Figure 43: PDP Context Information Element**

NOTE    1)  This field shall not be evaluated when the PDP context is received during UMTS intra system handover/relocation.

**Table 48: Reordering Required Values**

| Reordering Required | Value (Decimal) |
|---|---|
| No | 0 |
| Yes | 1 |

**Table 49: VPLMN Address Allowed Values**

| VPLMN Address Allowed | Value (Decimal) |
|---|---|
| No | 0 |
| Yes | 1 |