3GPP TSG CN Plenary Meeting #18 **NP-020598**
4th – 6th December 2002 New Orleans, USA.

Source: TSG CN WG4

Title: Small Technical Enhancements and Improvements for GTP specification Rel-5

Agenda item: 8.8

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
29.060	333	1	N4-021140	Rel-5	Support of mandatory IPv6 on the Iu interface	F	5.3.0
29.060	350	1	N4-021265	Rel-5	Clarification on the inclusion of TEID II in SGSN Context Ack	D	5.3.0
29.060	354	1	N4-021262	Rel-5	Removal of limitation in the Create PDP Context Request message	F	5.3.0
29.060	348	4	N4-021266	Rel-5	Introduction of PCO IE in session management messages used in the MS Initiated PDP Context Deactivation procedure (direction MS to NW)	F	5.3.0
29.060	355		N4-021137	Rel-5	Introduction of PCO IE in session management messages used in the Network-Requested PDP Context Activation Procedure (direction NW to MS)	F	5.3.0
29.060	356	1	N4-021308	Rel-5	Introduction of PCO IE in session management messages used in the GGSN-Initiated PDP Context Modification procedure (direction NW to MS)	F	5.3.0
29.060	357	1	N4-021309	Rel-5	Introduction of PCO IE in session management messages used in the GGSN-Initiated PDP Context Deactivation Prodecure (direction NW to MS)	F	5.3.0
29.060	362	3	N4-021427	Rel-5	Clarification of the placement of the fields in the PDP Context IE	F	5.3.0

3GPP TSG CN WG4 Meeting #16 ***N4-021140***
Miami, USA, 23rd – 27th September 2002 **(Revision of N4-020907)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **333** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Support of mandatory IPv6 on the Iu interface
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	17.09.2002
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one 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 TR 21.900.

Use one 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)
Rel-6 (Release 6)

Reason for change:	⌘	This is an essential correction. In LS S2-022624 "Reply LS on Support of IPv6 on Iu" from SA2 it is stated: "1) when the ATM transport option is applied on the Iu interface, the support of IPv4 is mandatory and the support of IPv6 is optional. 2) when the IP transport option is applied on the Iu interface, dual stack is mandatory, meaning that each RNC or BSC shall support both IPv6 and IPv4"
Summary of change:	⌘	In chapter 13.1 it is added: "On the Gn and Gp interfaces the IPv4 (RFC 791) protocol shall be supported, IPv6 (RFC 2460) support is optional. This also applies to the Iu interface, when the ATM transport option is applied. When the IP transport option is applied on the Iu interface, both the IPv6 (RFC 2460) protocol and the IPv4 (RFC 791) protocol shall be supported."
Consequences if not approved:	⌘	Different definitions in 3GPP TS 23.060 and 3GPP TS 29.060

Clauses affected:	⌘	13.1

Other specs affected: ⌘	Y	N	
		X	Other core specifications
		X	Test specifications
		X	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/specs/CR.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.

13.1 IP Version

~~The IPv4 (RFC 791) protocol shall be supported, IPv6 (RFC 2460) support is optional.~~On the Gn and Gp interfaces the IPv4 (RFC 791) protocol shall be supported, IPv6 (RFC 2460) support is optional. This also applies to the Iu interface, when the ATM transport option is applied. When the IP transport option is applied on the Iu interface, both the IPv6 (RFC 2460) protocol and the IPv4 (RFC 791) protocol shall be supported.

3GPP TSG CN WG4 Meeting #16 ***N4-021266***
Miami Beach, USA, 23rd - 27th September 2002 **(revision of N4-021136)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **348** ⌘ **rev** **4** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Introduction of PCO IE in session management messages used in the MS Initiated PDP Context Deactivation procedure (direction MS to NW)
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	24/09/2002
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one 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)*
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Use one of the following releases:
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R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change: ⌘

CN1 and CN-plenary has approved the corresponding CR 668 to 24.008 and asked CN4 to update 29.060.

In several meetings, CN1 has discussed the issue how deployment of new services (like IMS) may be adopted with a limited updating in the network.

The following problems were identified:
- Updating of all SGSNs in the home network may cause considerably additional costs and prevent early deployment of services.
- Updating of SGSNs in visiting networks are out of the control of the home operator that provides services to the subscriber, thus services may not be available to subscribers roaming in visiting networks.

In addition, CN1 has not fully covered all error situations, thus IMS as such may find it beneficial to communicate error codes e.g. in case of PDP context deactivation.

The intension behind introducing the PCO IE in a number of session management messages is to provide a backward compatible, general purpose signalling mechanism between the MS and GGSN.

Thus, the PCO IE is proposed introduced in following GTP messages used in the MS Initiated PDP Context Deactivation procedure:
- Delete PDP context request (MS – NW)
- Delete PDP context response (NW – MS)

Even if the above solution would have been beneficial for earlier releases, CN1

		did not find it reasonable to include such a requirement in Rel-4 or Rel-99. The solution will be adopted from Rel-5.
Summary of change:	⌘	The PCO IE is proposed introduced in following GTP messages used in the MS Initiated PDP Context Deactivation procedure: - Delete PDP context request (MS – NW) - Delete PDP context response (NW – MS)
Consequences if not approved:	⌘	Inconsistency between specifications (as the corresponding CR on 24.008 has been approved by CN#17).

Clauses affected:	⌘	7.3.5, 7.3.6			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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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.

****** START OF MODIFICATION ******

7.3.5 Delete PDP Context Request

A Delete PDP Context Request shall be sent from a SGSN node to a GGSN node as part of the GPRS Detach procedure or the GPRS PDP Context Deactivation procedure or from a GGSN node to a SGSN node as part of the PDP Context Deactivation Initiated by GGSN procedure. A request shall be used to deactivate an activated PDP Context or an activated set of PDP contexts associated to a PDP address assigned to a single MS.

A GSN shall be prepared to receive a Delete PDP Context Request at any time and shall always reply regardless if the PDP context exists or not (as per the Delete PDP Context Response message description section), except in cases described below.

If any collision occurs, the Delete PDP Context Request takes precedence over any other Tunnel Management message.

The Teardown Ind is used to indicate whether all PDP contexts that share the PDP address with the PDP context identified in the request should also be deactivated. This may trigger the deletion of all the information kept for a MS at a GSN, if no other PDP contexts associated to other PDP addresses are active on the GSN. If the Teardown Ind information element value is set to '1', then all PDP contexts that share the same PDP address with the PDP context identified by the NSAPI included in the Delete PDP Context Request Message shall be torn down. Only the PDP context identified by the NSAPI included in the Delete PDP context Request shall be torn down if the value of this information element is '0' or this information is not included. The SGSN shall copy this IE to the Delete PDP Context Request from the associated Deactivate PDP Context Request initiated by MS, if it is included. This information element shall NOT be included by the SGSN if the Deactivate PDP Context Request message from the MS does NOT include the Tear down indicator at PDP Context Deactivation initiated by MS. However, exceptionly this information element shall be included and its value set to '1' by the sending GSN only when the last PDP context associated to a PDP address is torn down and there are no outstanding Create PDP context requests for other PDP context different from the one being torn down for that PDP address.

If a GSN receives a Delete PDP context without a Teardown Indicator or with a Teardown Indicator with value set to '0' and only that PDP context is active for a PDP address, then the GSN shall ignore the message. (Note: This is symptom of a race condition. The reliable delivery of signalling messages will eventually lead to a consistent situation, allowing the teardown of the PDP context.)

In the MS to GGSN direction, the SGSN includes the Protocol Configuration Options (PCO) information element in the request if the MS wishes to provide the GGSN with application specific parameters. The SGSN includes this IE in the Delete PDP Context Request message if the associated Deactivat~~ion~~e PDP Context Request message from the MS includes protocol configuration options. The SGSN shall copy the content of this IE transparently from the PCO IE in the Deactivat~~ion~~e PDP Context Request message.

The optional Private Extension contains vendor or operator specific information.

Table 11: Information Elements in a Delete PDP Context

Information element	Presence requirement	Reference
Teardown Ind	Conditional	7.7.16
NSAPI	Mandatory	7.7.17
Protocol Configuration Options	Optional	7.7.31
Private Extension	Optional	7.7.46

7.3.6 Delete PDP Context Response

The message shall be sent as a response of a Delete PDP Context Request.

A GSN shall ignore a Delete PDP Context Response for a non-existing PDP context.

If a GSN receives a Delete PDP Context Request message for a non existing PDP context, it will send back to the source of the message a Delete PDP Context Response message with cause value "Non existent". The TEID value used in the response message shall be zero.

Possible Cause values are:

- 'Request Accepted'
- 'Mandatory IE incorrect'
- 'Mandatory IE missing'
- 'Optional IE Incorrect'
- 'Invalid message format'.
- 'Non existent'

If the received Delete PDP Context Response contains a cause value other than 'Request accepted' and 'Non Existent', the PDP context shall be kept active.

In the GGSN to MS direction, the GGSN includes the Protocol Configuration Options (PCO) information element in the response if the GGSN wishes to provide the MS with application specific parameters. The SGSN includes this IE in the Deactivat~~ion~~e PDP Context Accept message if the associated Delete PDP Context Response message from the GGSN includes protocol configuration options. The SGSN shall copy the content of the IE transparently from the PCO IE in the Delete PDP Context Response message.

The optional Private Extension contains vendor or operator specific information.

Table 12: Information Elements in a Delete PDP Context

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Protocol Configuration Options	Optional	7.7.31
Private Extension	Optional	7.7.46

****** END OF MODIFICATION ******

3GPP TSG CN WG4 Meeting #16 **N4-021265**
Miami, USA, 23rd – 27th September 2002

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **350** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Clarification on the inclusion of TEID II in SGSN Context Ack
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	24/09/2002
Category:	⌘	**D**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one 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)
Rel-6 (Release 6)

Reason for change:	⌘	Currently in SGSN Context Ack, the text describing the inclusion of TEID II implies that there should be a TEID II passed for all PDP contexts for the subscriber being handed over. In the case where a PDP context has been established but no tunnel is yet established to support, there is no requirement for a TEID II parameter to be passed.
Summary of change:	⌘	Place a condition on the inclusion of TEID II for a context, based on whether there is a tunnel established for that context
Consequences if not approved:	⌘	Excessive and redundant occurrences of TEID II will be sent to the old SGSN for contexts with no established tunnel.

Clauses affected:	⌘	7.5.5

Other specs affected: ⌘	Y	N	
		X	Other core specifications
		X	Test specifications
		X	O&M Specifications

⌘

Other comments: ⌘

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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.

7.5.5 SGSN Context Acknowledge

The new SGSN shall send an SGSN Context Acknowledge message to the old SGSN as a response to the SGSN Context Response message. Only after receiving the SGSN Context Acknowledge message, shall the old SGSN start to forward user data packets. SGSN Context Acknowledge indicates to the old SGSN that the new SGSN has correctly received PDP Context information and is ready to receive user data packets identified by the corresponding Tunnel Endpoint Identifier values. This message shall not be sent if the SGSN Context Request was rejected.

Possible cause values are:

- 'Request accepted'.
- 'System failure'.
- 'Mandatory IE incorrect'.
- 'Mandatory IE missing'.
- 'Optional IE incorrect'.
- 'No resources available'.
- 'Invalid message format'.
- 'Authentication failure'.

Only the Cause information element shall be included in the acknowledgement if the Cause contains a value other than 'Request accepted'.

For each active PDP context (i.e. those which have a tunnel established between the old SGSN and the GGSN) the new SGSN shall include a Tunnel Endpoint Identifier Data II information element. The Tunnel Endpoint Identifier Data II field specifies a Tunnel Endpoint Identifier which is chosen by the new SGSN for a particular PDP context. The old SGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent G-PDUs which are sent from the old SGSN to the new SGSN and related to the particular PDP context. When active PDP context(s) exist, this information element shall be included if the Cause contains the value 'Request accepted'.

The new SGSN shall include an SGSN Address for user traffic, which may differ from that provided by the underlying network service (e.g. IP). The old SGSN shall store this SGSN Address and use it when sending G-PDUs to the new SGSN for the MS. When active PDP context(s) exist, this information element shall be included if the Cause contains the value 'Request accepted'.

The optional Private Extension contains vendor or operator specific information.

Table 28: Information Elements in a SGSN Context Acknowledge

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Tunnel Endpoint Identifier Data II	Conditional	7.7.15
SGSN Address for user traffic	Conditional	GSN Address 7.7.32
Private Extension	Optional	7.7.46

3GPP TSG CN WG4 Meeting #16 ***N4-021262***
Miami Beach, USA, 23rd - 27th September 2002 **(revision of N4-021135)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **354** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Removal of limitation in the Create PDP Context Request message
Source:	⌘	CN4
Work item code:	⌘	TEI5 ***Date:*** ⌘ 24/09/2002
Category:	⌘	**F** ***Release:*** ⌘ Rel-5

Use one 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 TR 21.900.

Use one 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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	There is a limitation in 29.060 re. when the PCO IE is applicable. In the Create PDP Context Request message the only valid case when the PCO IE can be included is when PDP type is set to IP. This limitation is to be removed.
Summary of change:	⌘	Removal of the restriction that the PCO IE is restricted to PDP Type IP only
Consequences if not approved:	⌘	The PCO IE cannot be used as intended, i.e. to: - transfer external network protocol options associated with a PDP context activation, and - transfer additional parameters and/or requests (such as, P-CSCF Address Request) that may serve any purpose other than defining network protocol options. when other types of PDP types than PDP type IP.
Clauses affected:	⌘	7.3.1

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘ There should not be any backward compability problem (see TS 29.060, 11.1.11)

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****** START OF MODIFICATION ******

7.3.1 Create PDP Context Request

A Create PDP Context Request shall be sent from a SGSN node to a GGSN node as a part of the GPRS PDP Context Activation procedure. After sending the Create PDP Context Request message, the SGSN marks the PDP context as 'waiting for response'. In this state the SGSN shall accept G-PDUs from the GGSN but shall not send these G-PDUs to the MS. A valid request initiates the creation of a tunnel between a PDP Context in a SGSN and a PDP Context in a GGSN. If the procedure is not successfully completed, the SGSN repeats the Create PDP Context Request message to the next GGSN address in the list of IP addresses, if there is one. If the list is exhausted the activation procedure fails.

The Tunnel Endpoint Identifier Data I 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 which are related to the requested PDP context.

The Tunnel Endpoint Identifier Control Plane field specifies a downlink Tunnel Endpoint Identifier for 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 which 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 the GGSN when it receives any message with its assigned Tunnel Endpoint Identifier Control Plane in the GTP header from the GGSN.

The MSISDN of the MS is passed to the GGSN inside the Create PDP Context Request; This additional information can be used when a secure access to a remote application residing on a server is needed. The GGSN would be in fact able to provide the user identity (i. e. the MSISDN) to the remote application server, providing it with the level of trust granted to users through successfully performing the GPRS authentication procedures, without having to re-authenticate the user at the application level.

If the MS requests a dynamic PDP address and a dynamic PDP address is allowed, then the PDP Address field in the End User Address information element shall be empty. If the MS requests a static PDP Address then the PDP Address field in the End User Address information element shall contain the static PDP Address. In case the PDP addresses carried in the End User Address and optionally in the Protocol Configuration Option information element contain contradicting information, the PDP address carried in the End User Address information element takes the higher precedence. The Quality of Service Profile information element shall be the QoS values to be negotiated between the MS and the SGSN at PDP Context activation.

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). The GGSN shall store these SGSN Addresses and use them when sending control plane on this GTP tunnel or G-PDUs to the SGSN for the MS.

The SGSN shall include a Recovery information element into the Create 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 Create PDP Context Request message element shall handle it in the same way as when receiving an Echo Response message. The Create PDP Context Request message shall be considered as a valid activation request for the PDP context included in the message.

The SGSN shall include either the MS provided APN, a subscribed APN or an SGSN selected APN in the message; the Access Point Name may be used by the GGSN to differentiate accesses to different external networks.
The Selection Mode information element shall indicate the origin of the APN in the message.

For contexts created by the Secondary PDP Context Activation Procedure the SGSN shall include the linked NSAPI. Linked NSAPI indicates the NSAPI assigned to any one of the already activated PDP contexts for this PDP address and APN.

The Secondary PDP Context Activation Procedure may be executed without providing a Traffic Flow Template (TFT) to the newly activated PDP context if all other active PDP contexts for this PDP address and APN already have an associated TFT, otherwise a TFT shall be provided. TFT is used for packet filtering in the GGSN.

When using the Secondary PDP Context Activation Procedure, the Selection mode, IMSI, MSISDN, End User Address and Access Point Name elements shall not be included in the message.

~~The Protocol Configuration Options information element is applicable for the PDP type IP only.~~ The Protocol Configuration Options (PCO) information element may be included in the request when the MS provides the GGSN with application specific parameters. The SGSN includes this IE in the Create PDP Context Request if the associated Activate PDP Context Request from the MS includes protocol configuration options. The SGSN shall copy the content of this IE transparently from the content of the PCO IE in the Activate PDP Context Request message.

The SGSN shall select one GGSN based on the user provided or SGSN selected APN. The GGSN may have a logical name that is converted to an address. The conversion may be performed with any name-to-address function. The converted address shall be stored in the "GGSN Address in Use" field in the PDP context and be used during the entire lifetime of the PDP context.

NOTE: A DNS query may be used as the name-to-IP address mapping of the GGSN. The IP address returned in the DNS response is then stored in the "GGSN Address in Use" field in the PDP context.

The IMSI information element together with the NSAPI information element uniquely identifies the PDP context to be created.

The SGSN shall not send a Create PDP Context Request for an already active context.

If a new Create PDP Context Request is incoming on TEID 0 for an already active PDP context, this Create PDP Context Request must be considered related to a new session. The existing PDP context shall be torn down locally, and the associated PDP contexts deleted locally, before the new session is created. If a new Create PDP Context Request is incoming on a TEID which is different from 0 and this TEID is already allocated to one or more activated PDP contexts, and the NSAPI IE value in this message matches the NSAPI value of an active PDP context, the GGSN shall send back a Create PDP Context Response with a rejection cause code. It is implementation dependent deciding whether to teardown or keep the existing PDP context.

If the GGSN uses the MNRG flag and the flag is set, the GGSN should treat the Create PDP Context Request as a Note MS Present Request and clear the MNRG flag.

The SGSN shall determine Charging Characteristics from the Subscribed Charging Characteristics and/or PDP Context Charging Characteristics depending on the presence of the information in the Packet Domain Subscription Data as defined in 3GPP TS 23.060 [4]. The requirements for the presence of the Charging Characteristics IE are defined in 3G TS 23.060 [4]. The contents of the Charging Characteristics IE are defined in 3G TS 32.215 [18].

The SGSN shall include Trace Reference, Trace Type, Trigger Id, and OMC Identity in the message if GGSN trace is activated. 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 5: Information Elements in a Create PDP Context Request

Information element	Presence requirement	Reference
IMSI	Conditional	7.7.2
Recovery	Optional	7.7.11
Selection mode	Conditional	7.7.12
Tunnel Endpoint Identifier Data I	Mandatory	7.7.13
Tunnel Endpoint Identifier Control Plane	Conditional	7.7.14
NSAPI	Mandatory	7.7.17
Linked NSAPI	Conditional	7.7.17
Charging Characteristics	Conditional	7.7.23
Trace Reference	Optional	7.7.24
Trace Type	Optional	7.7.25
End User Address	Conditional	7.7.27
Access Point Name	Conditional	7.7.30
Protocol Configuration Options	Conditional	7.7.31
SGSN Address for signalling	Mandatory	GSN Address 7.7.32
SGSN Address for user traffic	Mandatory	GSN Address 7.7.32
MSISDN	Conditional	7.7.33
Quality of Service Profile	Mandatory	7.7.34
TFT	Conditional	7.7.36
Trigger Id	Optional	7.7.41
OMC Identity	Optional	7.7.42
Private Extension	Optional	7.7.46

***** END OF MODIFICATION ******

3GPP TSG CN WG4 Meeting #16 ***N4-021137***
Miami Beach, USA, 23rd - 27th September 2002

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **355** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Introduction of PCO IE in session management messages used in the Network-Requested PDP Context Activation Procedure (direction NW to MS).
Source:	⌘	CN4
Work item code:	⌘	TEI5 ***Date:*** ⌘ 16/09/2002
Category:	⌘	**F** ***Release:*** ⌘ Rel-5

Use one 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 TR 21.900.

Use one 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)*
Rel-6	*(Release 6)*

Reason for change: ⌘

CN1 and CN-plenary has approved the corresponding CR 668 to 24.008 and asked CN4 to update 29.060.

In several meetings, CN1 has discussed the issue how deployment of new services (like IMS) may be adopted with a limited updating in the network.

The following problems were identified:
- Updating of all SGSNs in the home network may cause considerably additional costs and prevent early deployment of services.
- Updating of SGSNs in visiting networks are out of the control of the home operator that provides services to the subscriber, thus services may not be available to subscribers roaming in visiting networks.

In addition, CN1 has not fully covered all error situations, thus IMS as such may find it beneficial to communicate error codes e.g. in case of PDP context deactivation.

The intension behind introducing the PCO IE in a number of session management messages is to provide a backward compatible, general purpose signalling mechanism between the MS and GGSN.

Thus, the PCO IE is proposed introduced in following GTP messages used in the Network-Requested PDP Context Activation Procedure:
- PDU notification request (NW to MS)
- PDU notification reject request (MS to NW)

Even if the above solution would have been beneficial for earlier releases, CN1

		did not find it reasonable to include such a requirement in Rel-4 or Rel-99. The solution will be adopted from Rel-5.
Summary of change:	⌘	The PCO IE is proposed introduced in following GTP messages used in the Network-Requested PDP Context Activation Procedure: - PDU notification request (NW to MS) - PDU notification reject request (MS to NW)
Consequences if not approved:	⌘	Inconsistency between specifications (as the corresponding CR on 24.008 has been approved by CN#17).

Clauses affected:	⌘	7.3.8, 7.3.10			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	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/specs/CR.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.

****** START OF MODIFICATION ******

7.3.8 PDU Notification Request

When receiving a T-PDU the GGSN checks if a PDP context is established for that PDP address. If no PDP context has been previously established, the GGSN may try to deliver the T-PDU by initiating the Network-Requested PDP Context Activation procedure. The criteria, used by the GGSN to determine whether trying to deliver the T-PDU to the MS or not, may be based on subscription information in the GGSN and are outside the scope of GPRS standardisation.

As part of the Network-Requested PDP Context Activation procedure the GGSN sends a PDU Notification Request message to the SGSN indicated by the HLR. If the GGSN has an active PDP context with different SGSN from the one indicated by the HLR, then the SGSN information shall be obtained from an active PDP context. When receiving this message, the SGSN shall be responsible for requesting the MS to activate the indicated PDP Context.

The IMSI is inserted in the IMSI information element in the PDU Notification Request message.

The End User Address information element contains the PDP type and PDP address that the SGSN shall request the MS to activate.

The Access Point Name information element identifies the access point of packet data network that wishes to connect to the MS.

The GGSN shall include a GGSN Address for control plane. The SGSN shall store this GGSN Address and use it when sending control plane messages to the GGSN.

The Tunnel Endpoint Identifier Control Plane information element shall be a tunnel endpoint identifier Control Plane selected by the GGSN and shall be used by the SGSN in the GTP header of the corresponding PDU Notification Response or PDU Notification Request Reject message.

The GGSN includes the Protocol Configuration Options (PCO) information element in the request if the GGSN wishes to provide the MS with application specific parameters. The SGSN includes this IE in the Request PDP Context Activation message if the associated PDU Notification Request message from the GGSN includes protocol configuration options. The SGSN shall copy the content of the IE transparently from the PCO IE in the PDU Notification Request message.

If the GGSN receives a Create PDP Context Request before the PDU Notification Response, the GGSN shall handle the Create PDP Context Request as normal context activation and ignore the following PDU Notification Response.

If the SGSN receives a PDU Notification Request after a Create PDP Context Request has been sent but before a Create PDP Context Response has been received, the SGSN shall:

1. send a PDU Notification Response with Cause 'Request accepted' without any further processing and then
2. wait for the Create PDP Context Response.

The optional Private Extension contains vendor or operator specific information.

Table 14: Information Elements in a PDU Notification Request

Information element	Presence requirement	Reference
IMSI	Mandatory	7.7.2
Tunnel Endpoint Identifier Control Plane	Mandatory	7.7.14
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
GGSN Address for Control Plane	Mandatory	7.7.32
Protocol Configuration Options	Optional	7.7.31
Private Extension	Optional	7.7.46

****** END OF MODIFICATION ******

****** START OF MODIFICATION ******

7.3.10 PDU Notification Reject Request

If the PDP context activation proceeds after the PDU Notification Response, but the PDP context was not established, the SGSN sends a PDU Notification Reject Request message. The Cause value indicates the reason why the PDP Context could not be established:

- 'MS Not GPRS Responding'.
- 'MS Refuses'.

When receiving the PDU Notification Reject Request message the GGSN may reject or discard the stored T-PDU(s) depending on the PDP type.

After an unsuccessful activation attempt the GSNs may perform some actions to prevent unnecessary enquiries to the HLR as described in the section Unsuccessful Network-Requested PDP Context Activation procedure in 3GPP TS 23.060.

The Tunnel Endpoint Identifier in the GTP header of the PDU Notification Reject Request message shall be the same as the Tunnel Endpoint Identifier Control Plane information element of the PDU Notification Request that triggered the reject.

The Tunnel Endpoint Identifier Control Plane information element shall be a tunnel endpoint identifier Control Plane selected by the SGSN and shall be used by the GGSN in the GTP header of the corresponding PDU Notification Reject Response message.

The End User Address information element contains the PDP type and PDP address of the PDP context that could not be activated.

The Access Point Name shall be the same as the Access Point Name of the received PDU Notification Request message that triggered the reject.

The SGSN includes the Protocol Configuration Options (PCO) information element in the request if the MS wishes to provide the GGSN with application specific parameters. The SGSN includes this IE in the PDU Notification Reject Request message if the associated Request PDP Context Activation Reject message from the MS includes protocol configuration options. The SGSN shall copy the content of the IE transparently from the PCO IE in the Request PDP Context Activation Reject message.

The optional Private Extension contains vendor or operator specific information.

Table 16: Information Elements in a PDU Notification Reject Request

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Tunnel Endpoint Identifier Control Plane	Mandatory	7.7.14
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
Protocol Configuration Options	Optional	7.7.31
Private Extension	Optional	7.7.46

****** END OF MODIFICATION ******

3GPP TSG CN WG4 Meeting #16 ***N4-021308***
Miami Beach, USA, 23rd - 27th September 2002 **(revision of N4-021138)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **356** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Introduction of PCO IE in session management messages used in the GGSN-Initiated PDP Context Modification procedure (direction NW to MS).
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	26/09/2002
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one 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 TR 21.900.

Use one 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)*
Rel-6 *(Release 6)*

Reason for change: ⌘

CN1 and CN-plenary has approved the corresponding CR 668 to 24.008 and asked CN4 to update 29.060.

In several meetings, CN1 has discussed the issue how deployment of new services (like IMS) may be adopted with a limited updating in the network.

The following problems were identified:
- Updating of all SGSNs in the home network may cause considerably additional costs and prevent early deployment of services.
- Updating of SGSNs in visiting networks are out of the control of the home operator that provides services to the subscriber, thus services may not be available to subscribers roaming in visiting networks.

In addition, CN1 has not fully covered all error situations, thus IMS as such may find it beneficial to communicate error codes e.g. in case of PDP context deactivation.

The intension behind introducing the PCO IE in a number of session management messages is to provide a backward compatible, general purpose signalling mechanism between the MS and GGSN.

Thus, the PCO IE is proposed introduced in following GTP messages used in the GGSN-Initiated PDP Context Modification procedure:
- Update PDP context request (NW – MS)
- Update PDP context response (MS – NW)

Even if the above solution would have been beneficial for earlier releases, CN1

		did not find it reasonable to include such a requirement in Rel-4 or Rel-99. The solution will be adopted from Rel-5.
Summary of change:	⌘	The PCO IE is proposed introduced in following GTP messages (used in the GGSN-Initiated PDP Context Modification procedure): - Update PDP context request (NW – MS) - Update PDP context response (MS – NW)
Consequences if not approved:	⌘	Inconsistency between specifications (as the corresponding CR on 24.008 has been approved by CN#17).

Clauses affected:	⌘	7.3.3, 7.3.4			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:
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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.

****** START OF MODIFICATION ******

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 necessary 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, 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. 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.

The MS includes the Protocol Configuration Options (PCO) information element in the request if the MS wishes to provide the GGSN with application specific parameters. The SGSN includes this IE in the Update PDP Context Request if the associated Modify PDP Context Request from the MS includes protocol configuration options. The SGSN shall copy the content of this IE transparently from the content of the PCO IE in the Modify PDP Context Request message.

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
Protocol Configuration Options	Optional	7.7.31
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 GGSN includes the Protocol Configuration Options (PCO) information element in the request if the GGSN wishes to provide the MS with application specific parameters. The SGSN includes this IE in the Modify PDP Context Request message if the associated Update PDP Context Request message from the GGSN includes protocol configuration options. The SGSN shall copy the content of this IE transparently from the content of the PCO IE in the Update PDP Context Request message.

The optional Private Extension contains vendor or operator specific information.

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

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
Protocol Configuration Options	Optional	7.7.31
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 the GGSN Addresses and use 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 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.

The GGSN includes the Protocol Configuration Options (PCO) information element in the response if the GGSN wishes to provide the MS with application specific parameters.

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
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

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 SGSN includes the Protocol Configuration Options (PCO) information element in the response if the MS wishes to provide the GGSN with application specific parameters. The SGSN includes this IE in the Update PDP Context Response message if the associated Modify PDP Context Accept message from the MS includes protocol configuration options. The SGSN shall copy the content of this IE transparently from the content of the PCO IE in the Modify PDP Context Accept message.

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

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Recovery	Optional	7.7.11
Protocol Configuration Options	Optional	7.7.31
Quality of Service Profile	Conditional	7.7.34
Private Extension	Optional	7.7.46

****** END OF MODIFICATION ******

3GPP TSG CN WG4 Meeting #16 ***N4-021309***
Miami Beach, USA, 23rd - 27th September 2002 **(revision of N4-021139)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **357** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Introduction of PCO IE in session management messages used in the GGSN-Initiated PDP Context Deactivation Prodecure (direction NW to MS).
Source:	⌘	LM Ericsson
Work item code:	⌘	TEI5
Date:	⌘	26/09/2002
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one 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 TR 21.900.

Use one 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)*
Rel-6 *(Release 6)*

Reason for change: ⌘

CN1 and CN-plenary has approved the corresponding CR 668 to 24.008 and asked CN4 to update 29.060.

In several meetings, CN1 has discussed the issue how deployment of new services (like IMS) may be adopted with a limited updating in the network.

The following problems were identified:
- Updating of all SGSNs in the home network may cause considerably additional costs and prevent early deployment of services.
- Updating of SGSNs in visiting networks are out of the control of the home operator that provides services to the subscriber, thus services may not be available to subscribers roaming in visiting networks.

In addition, CN1 has not fully covered all error situations, thus IMS as such may find it beneficial to communicate error codes e.g. in case of PDP context deactivation.

The intension behind introducing the PCO IE in a number of session management messages is to provide a backward compatible, general purpose signalling mechanism between the MS and GGSN.

Thus, the PCO IE is proposed introduced in following GTP messages used in the GGSN-Initiated PDP Context Deactivation Prodecure:
- Delete PDP context request (NW – MS)
- Delete PDP context response (MS – NW)

Even if the above solution would have been beneficial for earlier releases, CN1

		did not find it reasonable to include such a requirement in Rel-4 or Rel-99. The solution will be adopted from Rel-5.
Summary of change:	⌘	The PCO IE is proposed introduced in following GTP messages used in the GGSN-Initiated PDP Context Deactivation Prodecure: - Delete PDP context request (NW – MS) - Delete PDP context response (MS – NW)
Consequences if not approved:	⌘	Inconsistency between specifications (as the corresponding CR on 24.008 has been approved by CN#17).

Clauses affected:	⌘	7.3.5, 7.3.6			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	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/specs/CR.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.

****** START OF MODIFICATION ******

7.3.5 Delete PDP Context Request

A Delete PDP Context Request shall be sent from a SGSN node to a GGSN node as part of the GPRS Detach procedure or the GPRS PDP Context Deactivation procedure or from a GGSN node to a SGSN node as part of the PDP Context Deactivation Initiated by GGSN procedure. A request shall be used to deactivate an activated PDP Context or an activated set of PDP contexts associated to a PDP address assigned to a single MS.

A GSN shall be prepared to receive a Delete PDP Context Request at any time and shall always reply regardless if the PDP context exists or not (as per the Delete PDP Context Response message description section), except in cases described below.

If any collision occurs, the Delete PDP Context Request takes precedence over any other Tunnel Management message.

The Teardown Ind is used to indicate whether all PDP contexts that share the PDP address with the PDP context identified in the request should also be deactivated. This may trigger the deletion of all the information kept for a MS at a GSN, if no other PDP contexts associated to other PDP addresses are active on the GSN. If the Teardown Ind information element value is set to '1', then all PDP contexts that share the same PDP address with the PDP context identified by the NSAPI included in the Delete PDP Context Request Message shall be torn down. Only the PDP context identified by the NSAPI included in the Delete PDP context Request shall be torn down if the value of this information element is '0' or this information is not included. The SGSN shall copy this IE to the Delete PDP Context Request from the associated Deactivate PDP Context Request initiated by MS, if it is included. This information element shall NOT be included by the SGSN if the Deactivate PDP Context Request message from the MS does NOT include the Tear down indicator at PDP Context Deactivation initiated by MS. However, exceptionly this information element shall be included and its value set to '1' by the sending GSN only when the last PDP context associated to a PDP address is torn down and there are no outstanding Create PDP context requests for other PDP context different from the one being torn down for that PDP address.

If a GSN receives a Delete PDP context without a Teardown Indicator or with a Teardown Indicator with value set to '0' and only that PDP context is active for a PDP address, then the GSN shall ignore the message. (Note: This is symptom of a race condition. The reliable delivery of signalling messages will eventually lead to a consistent situation, allowing the teardown of the PDP context.)

In the GGSN to MS direction, the GGSN includes the Protocol Configuration Options (PCO) information element in the request if the GGSN wishes to provide the MS with application specific parameters. The SGSN includes this IE in the Deactivat~~ione~~ PDP Context Request message if the associated Delete PDP Context Request message from the GGSN includes protocol configuration options. The SGSN shall copy the content of this IE transparently from the PCO IE in the Delete PDP Context Request message.

The optional Private Extension contains vendor or operator specific information.

Table 11: Information Elements in a Delete PDP Context

Information element	Presence requirement	Reference
Teardown Ind	Conditional	7.7.16
NSAPI	Mandatory	7.7.17
Protocol Configuration Options	Optional	7.7.31
Private Extension	Optional	7.7.46

7.3.6 Delete PDP Context Response

The message shall be sent as a response of a Delete PDP Context Request.

A GSN shall ignore a Delete PDP Context Response for a non-existing PDP context.

If a GSN receives a Delete PDP Context Request message for a non existing PDP context, it will send back to the source of the message a Delete PDP Context Response message with cause value "Non existent". The TEID value used in the response message shall be zero.

Possible Cause values are:

- 'Request Accepted'
- 'Mandatory IE incorrect'
- 'Mandatory IE missing'
- 'Optional IE Incorrect'
- 'Invalid message format'.
- 'Non existent'

If the received Delete PDP Context Response contains a cause value other than 'Request accepted' and 'Non Existent', the PDP context shall be kept active.

In the MS to GGSN direction, the SGSN includes the Protocol Configuration Options (PCO) information element in the response if the MS wishes to provide the GGSN with application specific parameters. The SGSN includes this IE in the Delete PDP Context Response message ~~o~~if the associated Deactivat~~ion~~e PDP Context Accept message from the MS includes protocol configuration options. The SGSN shall copy the content of the IE transparently from the PCO IE in the Deactivat~~ion~~e PDP Context Accept message.

The optional Private Extension contains vendor or operator specific information.

Table 12: Information Elements in a Delete PDP Context

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Protocol Configuration Options	Optional	7.7.31
Private Extension	Optional	7.7.46

****** END OF MODIFICATION ******

3GPP TSG CN WG4 Meeting #17 ***N4-021427***
Bangkok, THAILAND, 11th – 15th November 2002 **(revision of N4-021269)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **362** ⌘ **rev** **3** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Clarification of the placement of the fields in the PDP Context IE
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	31/10/2002
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one 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 TR 21.900.

Use one 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)
Rel-6 (Release 6)

Reason for change:	⌘	The placement of SAPI unclear as no reference to SAPI format is made from the sub clause 7.7.29. The placement of the field is indirectly stated in the figure 43 and which bits to use can only be decided by comparing to other multi-field octets in the same figure. Accordingly, when comparing to SAPI and PDP Type Organisation one will most likely come to the conclusion that SAPI shall be located in bits 1-4. This conclusion is correct (see 24.008 sub clause 10.5.6.9). However, when comparing SAPI and TI one can come to the conclusion that SAPI shall be located in bits 5-8 (According to TS 24.007 sub clause 11.2.3.1.3, the Transaction Identifier (the first part of the TI not the extension TI) should reside in bits 5-8 of an octet.). This conclusion is incorrect. Hence, to avoid misinterpretation, figure 43 in sub clause "PDP Context" shall include information about bit order (like other figures in the spec). Furthermore, mapping of the bits is to be clarified.
Summary of change:	⌘	Bit order added to figure 43 in sub clause "PDP Context". Mapping of bits is clarified.
Consequences if not approved:	⌘	Interoperability problems.

Clauses affected:	⌘	7.7.29			
Other specs	⌘	**Y** ☐	**N** **X**	Other core specifications	⌘

affected:	X	Test specifications
	X	O&M Specifications
Other comments: ⌘		

How to create CRs using this form:
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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.

****** START OF MODIFICATION ******

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. Note: Bit 5-8 of the first octet in the encoding defined in TS 24.007 is mapped into bit 1-4 of the first octet in this field.

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 SGSN shall set the value of PDP Context Identifier to binary (1111 1111) if after inter-SGSN RAU using GTPv0 the new SGSN is not able to assign a correct PDP Context Identifier to the existing PDP contexts.

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.

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.

Octets	Bits 8	7	6	5	4	3	2	1
1	Type = 130 (Decimal)							
2-3	Length							
4	Res-erved	VAA	Res-erved	Order	NSAPI			
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 [0..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

VPLMN Address Allowed	Value (Decimal)
No	0
Yes	1

****** END OF MODIFICATION ******