Agenda item:

Source: **TSG_N WG2**

Title: **CRs to 3G TS 29.002, 29.060 (Work Item QoS Enhancements)**

Introduction:

This document contains **2** CRs on **Work Item QoS Enhancements** agreed by **TSG_N WG2** and forwarded to **TSG_N Plenary** meeting #6 for approval.

TDoc	Spec	CR	Rev	Ph.	Cat	Old v.	New v.	Subject
N2-99K60	29.002	050	5	R99	C	3.2.0	3.3.0	QoS-Subscribed field modification
N2-99G24	29.060	017	4	R99	C	3.2.0		QoS Profile IE modification

CHANGE REQUEST

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29.002	CR	**050r5**	Current Version:	**3.2.0**

GSM (AA.BB) or 3G (AA.BBB) specification number ↑　　　　　*↑ CR number as allocated by MCC support team*

For submission to:	**CN #06**	for approval	**X**	strategic		*(for SMG*
list expected approval meeting # here ↑		for information		non-strategic	**X**	*use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG　　The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

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Proposed change affects:
(at least one should be marked with an X)

(U)SIM [ ]　　ME [ ]　　UTRAN / Radio [ ]　　Core Network [**X**]

Source:	TSG N2		**Date:**	18 Nov 1999

Subject:	QoS-Subscribed field modification

Work item:	QoS enhancements

Category:

(only one category shall be marked with an X)

				Release:		
F	Correction				Phase 2	
A	Corresponds to a correction in an earlier release				Release 96	
B	Addition of feature				Release 97	
C	Functional modification of feature		**X**		Release 98	
D	Editorial modification				Release 99	**X**
					Release 00	

| **Reason for change:** | Since Quality of Service IE in SM was changed to variable length (CR 04.08-A515r4, approved by SMG#29 for R'97, and it is taken over to the subsequent release), we also have to change QoS-Subscribed field in MAP into variable length for R'99.

However, Quality of Service IE in SM should be changed according to 23.060. Therefore, we have to change maximum length according to the result of N1 (current maximum length is 15 octet). |
|---|---|

Clauses affected:	

Other specs affected:

Other 3G core specifications	**X**	→ List of CRs:	29.060-017
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:	

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<--------- double-click here for help and instructions on how to create a CR.

7.6 Definition of parameters

Following is an alphabetic list of parameters used in the common MAP-services in subclause 7.3:

Application context name	7.3.1	Refuse reason	7.3.1
Destination address	7.3.1	Release method	7.3.2
Destination reference	7.3.1	Responding address	7.3.1
Diagnostic information	7.3.4	Result	7.3.1
Originating address	7.3.1	Source	7.3.5
Originating reference	7.3.1	Specific information	7.3.1/7.3.2/7.3.4
Problem diagnostic	7.3.6	User reason	7.3.4
Provider reason	7.3.5		

Following is an alphabetic list of parameters contained in this clause:

7.6.3.X   GPRS enhancements support indicator

This parameter indicates to the HLR that the SGSN supports GPRS enhancements.

7.6.3.Y   Extensible QoS-Subscribed

This parameter indicates the enhanced QoS subscribed for a certain service. It is defined in 3G TS 23.060.

8.1.7   MAP_UPDATE_GPRS_LOCATION service

8.1.7.1   Definition

This service is used by the SGSN to update the location information stored in the HLR.

The MAP_UPDATE_GPRS_LOCATION service is a confirmed service using the service primitives given in table 8.1/7.

8.1.7.2   Service primitives

Table 8.1/7: MAP_UPDATE_GPRS_LOCATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
SGSN number	M	M(=)		
SGSN address	M	M(=)		
SoLSA Support Indicator	C	C(=)		
GPRS enhancements support indicator	C	C(=)		
HLR number			C	C(=)
User error			C	C(=)
Provider error				O

8.1.7.3 Parameter definitions and use

<u>Invoke Id</u>

See definition in subclause 7.6.1.

<u>IMSI</u>

See definition in subclause 7.6.2.

<u>SGSN number</u>

See definition in subclause 7.6.2.

<u>SGSN address</u>

See definition in subclause 7.6.2.

<u>SoLSA Support Indicator</u>

This parameter is used by the SGSN to indicate to the HLR in the Update GPRS Location indication that SoLSA is supported. If this parameter is not included in the Update GPRS Location indication and the Subscriber is marked as only allowed to roam in Subscribed LSAs, then the HLR shall reject the roaming and indicate to the SGSN that roaming is not allowed to that Subscriber in the SGSN.

This SoLSA Support Indicator shall be stored by the HLR per SGSN where there are Subscribers roaming. If a Subscriber is marked as only allowed to roam in Subscribed LSAs while roaming in a SGSN and no SoLSA Support indicator is stored for that SGSN, the location status of that Subscriber has to be set to Restricted.

<u>GPRS enhancements support indicator</u>

<u>This parameter is used by the SGSN to indicate to the HLR in the Update GPRS Location indication that GPRS enhancements are supported. If this parameter is included in the Update GPRS Location indication the HLR may send the extensible QoS in the PDP contexts to the SGSN.</u>

<u>HLR number</u>

See definition in subclause 7.6.2. The presence of this parameter is mandatory in case of successful HLR updating.

<u>User error</u>

In case of unsuccessful updating, an error cause shall be returned by the HLR. The following error causes defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- unknown subscriber;

- roaming not allowed;

    This cause will be sent if the MS is not allowed to roam into the PLMN indicated by the SGSN number. The cause is qualified by the roaming restriction reason "PLMN Not Allowed" or "Operator Determined Barring".

- system failure;

- unexpected data value.

    The diagnostic in the Unknown Subscriber may indicate "Imsi Unknown" or "Gprs Subscription Unknown".

<u>Provider error</u>

For definition of provider errors see subclause 7.6.1.

17.7.1 Mobile Service data types

```
.....

-- gprs location registration types
```

```
UpdateGprsLocationArg ::= SEQUENCE {
    imsi                            IMSI,
    sgsn-Number                     ISDN-AddressString,
    sgsn-Address                    GSN-Address,
    extensionContainer              ExtensionContainer          OPTIONAL,
    ... ,
    sgsn-Capability                 [0] SGSN-Capability         OPTIONAL }
```

```
SGSN-Capability ::= SEQUENCE{
    solsaSupportIndicator           NULL                        OPTIONAL,
    extensionContainer              [1] ExtensionContainer      OPTIONAL,
    ...,
    gprsEnhancementsSupportIndicator [2]NULL                    OPTIONAL }
```

```
.....
```

```
PDP-Context ::= SEQUENCE {
    pdp-ContextId                   ContextId,
    pdp-Type                        [16] PDP-Type,
    pdp-Address                     [17] PDP-Address            OPTIONAL,
    qos-Subscribed                  [18] QoS-Subscribed,
    vplmnAddressAllowed             [19] NULL OPTIONAL,
    apn                             [20] APN ,
    extensionContainer              [21] ExtensionContainer     OPTIONAL,
    ...,
    ext-QoS-Subscribed              [0] Ext-QoS-Subscribed      OPTIONAL}
    -- qos-Subscribed shall be discarded if ext-QoS-Subscribed is received and supported
```

```
.....
```

```
QoS-Subscribed ::= OCTET STRING (SIZE (3))
    -- Octets are coded according to TS GSM 04.08.
```

```
Ext-QoS-Subscribed ::= OCTET STRING (SIZE (3..15))
    -- Octets are coded according to 3G TS 24.008.
```

```
.....
```

CHANGE REQUEST

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29.060	**CR**	**017r4**		Current Version:	**3.2.0**

GSM (AA.BB) or 3G (AA.BBB) specification number ↑   *↑ CR number as allocated by MCC support team*

For submission to:	CN#06	for approval	**X**	strategic		*(for SMG*
list expected approval meeting # here ↑		for information		non-strategic	**X**	*use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG   *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects:
(at least one should be marked with an X)

(U)SIM ☐   ME ☐   UTRAN / Radio ☐   Core Network **X**

Source:	TSG N2	**Date:**	20/10/1999

Subject:	QoS Profile IE modification

Work item:	QoS enhancements

Category:

(only one category shall be marked with an X)

			Release:	
F	Correction		Phase 2	
A	Corresponds to a correction in an earlier release		Release 96	
B	Addition of feature		Release 97	
C	Functional modification of feature	**X**	Release 98	
D	Editorial modification		Release 99	**X**
			Release 00	

Reason for change:

Since Quality of Service IE in SM was changed to variable length (CR 04.08-A515r4, approved by SMG#29 for R'97, and it is taken over to the subsequent release). Therefore, we also have to change QoS Profile IE in GTP to variable length for R'99.

However, Quality of Service IE in SM should be changed according to 23.907 ver.1.6.0. Therefore, we have to change maximum length according to the result of N1 (current maximum length is 15 octets).

Clauses affected: 7.5.1; 7.5.2; 7.5.3; 7.5.4; 7.5.7; 7.5.8; 7.9; 7.9.6; 7.9.8; 7.9.22; 7.9.26; 7.9.27; 7.9.28

Other specs affected:

Other 3G core specifications	**X**	→ List of CRs:	CR# 29.002-050
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

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6   GTP header

The GTP header shall be a fixed format 20-octet header used for all GTP messages.

- Version bits: If the PT bit is '1' (indicating a GTP message), the Version shall be set to 1~~0~~ to indicate this, the ~~first~~ second version of GTP. For the treatment of other versions, see section 10.1.1, "Different GTP versions".

- PT (Protocol Type) bit indicates whether the message is a GTP message (when PT is '1') or a GTP' message (when PT is '0'). GTP is described in this document and the GTP' protocol in GSM 12.15. Note that the interpretation of the header fields may be different in GTP' than in GTP.

- Spare '1': These unused bits shall be set to '1' by the sending side and shall not be evaluated by the receiving side.

- SNN is a flag indicating if SNDCP N-PDU Number is included or not.

- Message Type indicates the type of GTP message.

- Length indicates the length in octets of the GTP message (G-PDU), excluding the GTP header. Bit 8 of octet 3 is the most significant bit and bit 1 of octet 4 is the least significant bit of the length field.

- Sequence Number is a transaction identity for signalling messages and an increasing sequence number for tunnelled T-PDUs.

- SNDCP N-PDU Number is used at the Inter SGSN Routeing Area Update procedure to co-ordinate the data transmission between the MS and SGSN.

- TID is the tunnel identifier that points out MM and PDP contexts (see Figure 3: Tunnel ID (TID) format).

- The flow label identifies unambiguously a GTP flow.

All fields in the GTP header shall always be present but the content of the fields differs depending on if the header is used for signalling messages (see the sub-section Usage of the GTP Header in the section Signalling Plane) or T-PDUs (see the sub-section Usage of the GTP Header in the section Transmission Plane).

**** Next Modified Section ****

7.5.1   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. The GGSN IP address where the SGSN sends the Create PDP Context Request is the first IP address in the list of IP addresses provided by the DNS server. 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 Flow Label Data I field specifies a downlink flow label for G-PDUs which is chosen by the SGSN. The GGSN shall include this flow label in the GTP header of all subsequent downlink G-PDUs which are related to the requested PDP context.

The Flow Label Signalling field specifies a downlink flow label for signalling messages which is chosen by the SGSN. The GGSN shall include this flow label in the GTP header of all subsequent downlink signalling messages which are related to the requested PDP context.

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 signalling 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 signalling 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.

The optional Protocol Configuration Options information element is applicable for the end user protocol 'IP' only.

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 SGSN may send a Create PDP Context Request even if the PDP context is already active.

The GGSN shall check if a PDP context already exists for the TID. The existing parameters in the PDP context shall then be replaced with the parameters in the Create PDP Context Request message. If a dynamic PDP address has already been allocated for the existing context, this address should be used and copied to the Create PDP Context Response message.

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 optional Private Extension contains vendor or operator specific information.

Table 4: Information elements in a Create PDP Context Request

Information element	Presence requirement	Reference
~~Quality of Service Profile~~	~~Mandatory~~	~~7.9.6~~
Recovery	Optional	7.9.14
Selection mode	Mandatory	7.9.15
Flow Label Data I	Mandatory	7.9.16
Flow Label Signalling	Mandatory	7.9.17
MSISDN	Mandatory	
End User Address	Mandatory	7.9.20
Access Point Name	Mandatory	7.9.23
Protocol Configuration Options	Optional	7.9.24
SGSN Address for signalling	Mandatory	GSN Address 7.9.25
SGSN Address for user traffic	Mandatory	GSN Address 7.9.25
Quality of Service Profile	Mandatory	7.9.27
Private Extension	Optional	7.9.28~~7~~

7.5.2   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'

- 'Service not supported'

- 'User authentication failed'

- 'System failure'

- 'Mandatory IE incorrect'

- 'Mandatory IE missing'

- 'Optional IE incorrect'

- 'Invalid message format'

- 'Version not supported'

'No resources available' indicates e.g. that all dynamic PDP addresses occupied or no memory available'Service not supported' indicates e.g. when the GGSN does not support the PDP type, PDP address or Access Point Name. '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, and Private Extension, are mandatory if the Cause contains the value 'Request accepted'.

The Flow Label Data I field specifies an uplink flow label for G-PDUs which is chosen by the GGSN. The SGSN shall include this flow label in the GTP header of all subsequent uplink G-PDUs which are related to the requested PDP context.

The Flow Label Signalling field specifies an uplink flow label for signalling messages which is chosen by the GGSN. The SGSN shall include this flow label in the GTP header of all subsequent uplink signalling messages which are related to the requested PDP context.

The GGSN shall include a GGSN Address for signalling and a GGSN address for user traffic, which may differ from that provided by the underlying network service (e.g. IP). The SGSN shall store these GGSN Addresses and use them when sending signalling on this GTP tunnel or G-PDUs to the GGSN for the MS.

If the MS requests a dynamic PDP address 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. 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 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.

If a connection-less path is to be used to tunnel T-PDUs for the given PDP context or a reliable connection-oriented path is to be used and a connection already exists, the GGSN may start to forward T-PDUs after the Create PDP Context Response has been sent and 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.

If a reliable connection-oriented path is to be used to tunnel T-PDUs for the given PDP context and a connection does not exist between the GSN pair, the SGSN shall establish a connection and the GGSN shall wait for the connection before forwarding of T-PDUs may start.

Only one connection shall be used between any given GSN-pair, and this connection shall be used to tunnel end user traffic in both directions.

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, i.e. if reordering is required by the GGSN the SGSN and the GGSN shall perform reordering of incoming T-PDUs on this path.

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 a 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.

Table 5: Information elements in a Create PDP Context Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.9.1
~~Quality of Service Profile~~	~~Conditional~~	~~7.9.6~~
Reordering required	Conditional	7.9.8
Recovery	Optional	7.9.14
Flow Label Data I	Conditional	7.9.16
Flow Label Signalling	Conditional	7.9.17
Charging ID	Conditional	7.9.19
End user address	Conditional	7.9.20
Protocol Configuration Options	Optional	7.9.24
GGSN Address for signalling	Conditional	GSN Address 7.9.25
GGSN Address for user traffic	Conditional	GSN Address 7.9.25
Charging Gateway Address	Optional	7.9.26
Quality of Service Profile	Conditional	7.9.27
Private Extension	Optional	7.9.28~~7~~

7.5.3   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. The message shall be sent by the new SGSN at the Inter SGSN Routeing Update procedure.

The Flow Label Data I field specifies a downlink flow label for G-PDUs which is chosen by the SGSN. The GGSN shall include this flow label in the GTP header of all subsequent downlink G-PDUs which are related to the requested PDP context.

The Flow Label Signalling field specifies a downlink flow label for signalling messages which is chosen by the SGSN. The GGSN shall include this flow label in the GTP header of all subsequent downlink signalling messages which are related to the requested PDP context.

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 signalling 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 subsequent signalling 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 optional Private Extension contains vendor or operator specific information.

Table 6: Information elements in an Update PDP Context Request

Information element	Presence requirement	Reference
~~Quality of Service Profile~~	~~Mandatory~~	~~7.9.6~~
Recovery	Optional	7.9.14
Flow Label Data I	Mandatory	7.9.16
Flow Label Signalling	Mandatory	7.9.17
SGSN Address for signalling	Mandatory	GSN Address 7.9.25
SGSN Address for user traffic	Mandatory	GSN Address 7.9.25
Quality of Service Profile	Mandatory	7.9.27
Private Extension	Optional	7.9.28~~7~~

7.5.4   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 deactivate 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'

- 'Mandatory IE incorrect'

- 'Mandatory IE missing'

- 'Optional IE incorrect'

- 'Invalid message format'

- 'Version not supported'

The Flow Label Data I field specifies an uplink flow label for G-PDUs which is chosen by the GGSN. The SGSN shall include this flow label in the GTP header of all subsequent uplink G-PDUs which are related to the requested PDP context.

The Flow Label Signalling field specifies an uplink flow label for signalling messages which is chosen by the GGSN. The SGSN shall include this flow label in the GTP header of all subsequent uplink signalling messages which are related to the requested PDP context.

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'.

If a connection-less path is to be used to tunnel T-PDUs for the given PDP context or a reliable connection-oriented path is to be used and a connection already exists, the GGSN may start to forward T-PDUs after the Update PDP Context Response has been sent and 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 a Update PDP Context Request but before an Update PDP Context Response has been received.

If a reliable connection-oriented path is to be used to tunnel T-PDUs for the given PDP context and a connection does not exist between the GSN pair, the SGSN shall establish a connection and the GGSN shall wait for the connection before forwarding of T-PDUs may start.

Only one connection shall be used between any given GSN-pair, and this connection shall be used to tunnel end user traffic in both directions.

The GGSN shall include a GGSN Address for signalling and an GGSN address for user traffic, which may differ from that provided by the underlying network service (e.g. IP). The SGSN shall store these GGSN Addresses and use them when sending subsequent signalling on this GTP tunnel or 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 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.

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 7: Information elements in an Update PDP Context Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.9.1
~~Quality of Service Profile~~	~~Conditional~~	~~7.9.6~~
Recovery	Optional	7.9.14
Flow Label Data I	Conditional	7.9.16
Flow Label Signalling	Conditional	7.9.17
Charging ID	Conditional	7.9.19
GGSN Address for signalling	Conditional	GSN Address 7.9.25
GGSN Address for user traffic	Conditional	GSN Address 7.9.25
Charging Gateway Address	Optional	7.9.26
Quality of Service Profile	Conditional	7.9.27
Private Extension	Optional	7.9.28~~7~~

****** Next Modified Section ******

7.5.7   Create AA PDP Context Request

A Create AA PDP Context Request shall be sent from a SGSN node to a GGSN node as a part of the GPRS Anonymous Access PDP Context Activation procedure. It shall be used to create a tunnel between a PDP Context in a SGSN and a PDP Context in a GGSN. The GGSN IP address where the SGSN sends the Create AA PDP Context Request is the first IP address in the list of IP addresses provided by the DNS server. After sending the Create AA 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. If the procedure is not successfully completed, the SGSN repeats the Create AA 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 Flow Label Data I field specifies a downlink flow label for G-PDUs which is chosen by the SGSN. The GGSN shall include this flow label in the GTP header of all subsequent downlink G-PDUs which are related to the requested PDP context.

The Flow Label Signalling field specifies a downlink flow label for signalling messages which is chosen by the SGSN. The GGSN shall include this flow label in the GTP header of all subsequent downlink signalling messages which are related to the requested PDP context.

The Quality of Service Profile information element shall be the QoS values to be negotiated by the MS and SGSN at Anonymous Access PDP Context activation.

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

The Selection mode IE shall be set to either 'MS provided APN, subscription not verified' or 'Network provided APN, subscription not verified' depending on the origin of the APN which is included in the message.

The SGSN shall include an SGSN Address for signalling 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 signalling on this GTP tunnel or G-PDUs to the SGSN for the MS.

The End User Address contains the requested PDP Type with the PDP Address field left empty. 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 optional Protocol Configuration Options information element is applicable for the end user protocol 'IP' only. The GGSN may discard the Protocol Configuration Options information element or may use it for user authentication and configuration, depending on configuration data.

The optional Private Extension contains vendor or operator specific information.

Table 10: Information elements in a Create AA PDP Context Request

Information element	Presence requirement	Reference
~~Quality of Service Profile~~	~~Mandatory~~	~~7.9.6~~
Recovery	Optional	7.9.14
Selection mode	Mandatory	7.9.15
Flow Label Data I	Mandatory	7.9.16
Flow Label Signalling	Mandatory	7.9.17
End User Address	Mandatory	7.9.20
Access Point Name	Mandatory	7.9.23
Protocol Configuration Options	Optional	7.9.24
SGSN Address for signalling	Mandatory	GSN Address 7.9.25
SGSN Address for user traffic	Mandatory	GSN Address 7.9.25
Quality of Service Profile	Mandatory	7.9.27
Private Extension	Optional	7.9.28~~7~~

7.5.8   Create AA PDP Context Response

The message shall be sent from a GGSN node to a SGSN node as a response of a Create AA PDP Context Request. When the SGSN receives a Create AA 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.

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 and Private Extension, are mandatory if the Cause contains the value 'Request accepted'.

Possible Cause values are:

- 'Request Accepted'

- 'No resources available'

- 'Service not supported'

- 'User authentication failed'

- 'System failure'

- 'Mandatory IE incorrect'

- 'Mandatory IE missing'

- 'Optional IE incorrect'

- 'Invalid message format'

- 'Version not supported'

The Flow Label Data I field specifies an uplink flow label for G-PDUs which is chosen by the GGSN. The SGSN shall include this flow label in the GTP header of all subsequent uplink G-PDUs which are related to the requested PDP context.

The Flow Label Signalling field specifies an uplink flow label for signalling messages which is chosen by the GGSN. The SGSN shall include this flow label in the GTP header of all subsequent uplink signalling messages which are related to the requested PDP context.

The GGSN shall include a GGSN Address for signalling and a GGSN address for user traffic, which may differ from that provided by the underlying network service (e.g. IP). The SGSN shall store these GGSN Addresses and use them when sending signalling on this tunnel or G-PDUs to the GGSN for the MS.

The QoS values supplied in the Create AA 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.

If a connection-less path is to be used to tunnel T-PDUs for the given PDP context or a reliable connection-oriented path is to be used and a connection already exists, the GGSN may start to forward T-PDUs after the Create AA PDP Context Response has been sent and the SGSN may start to forward T-PDUs when the Create AA 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 AA PDP Context Request but before a Create AA PDP Context Response has been received.

If a reliable connection-oriented path is to be used to tunnel T-PDUs for the given PDP context and a connection does not exist between the GSN pair, the SGSN shall establish a connection and the GGSN shall wait for the connection before forwarding of T-PDUs may start.

Only one connection shall be used between any given GSN-pair, and this connection shall be used to tunnel end user traffic in both directions.

The Reordering Required value supplied in the Create AA 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.

The GGSN shall include the Recovery information element into the Create AA 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 AA PDP context being created as active if the response indicates a successful AA 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 PDP Address field in the End User Address information element contains the dynamic PDP Address allocated by the GGSN. 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 optional Private Extension contains vendor or operator specific information.

Table 11: Information elements in a Create AA PDP Context Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.9.1
~~Quality of Service Profile~~	~~Conditional~~	~~7.9.6~~
Reordering Required	Conditional	7.9.8
Recovery	Optional	7.9.14
Flow Label Data I	Conditional	7.9.16
Flow Label Signalling	Conditional	7.9.17
Charging ID	Conditional	7.9.19
End User Address	Conditional	7.9.20
Protocol Configuration Options	Optional	7.9.24
GGSN Address for signalling	Conditional	GSN Address 7.9.25
GGSN Address for user traffic	Conditional	GSN Address 7.9.25
Charging Gateway Address	Optional	7.9.26
Quality of Service Profile	Conditional	7.9.27
Private Extension	Optional	7.9.28~~7~~

**** Next Modified Section ****

7.9   Information elements

A signalling message may contain several information elements. The TLV (Type, Length, Value) or TV (Type, Value) encoding format shall be used for the GTP information elements. The information elements shall be sorted, with the Type fields in ascending order, in the signalling messages. The Length field contains the length of the information element excluding the Type and Length field.

For all the length fields, bit 8 of the lowest numbered octet is the most significant bit and bit 1 of the highest numbered octet is the least significant bit.

Within information elements, certain fields may be described as spare. These bits shall be transmitted with the value defined for them. To allow for future features, the receiver shall not evaluate these bits.

The most significant bit in the Type field is set to 0 when the TV format is used and set to 1 for the TLV format.
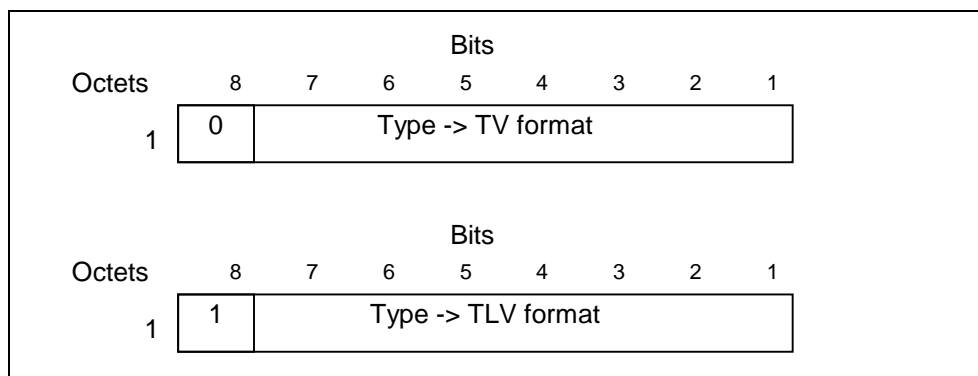

Figure 7: Type field for TV and TLV format

   NOTE: Type values 6, 7and 10 (Decimal) is are currently not used.

The following TLV Information Element type number ranges are reserved for GPRS charging protocol use (see GTP' in GSM 12.15): 239-250; 252-254.

The following TV Information Element type number range is reserved for GPRS charging protocol use (see GTP' in GSM 12.15): 117-127.

**** Next Modified Section ****

7.9.6   Quality of Service (QoS) ProfileSpare

The Quality of Service (QoS) Profile shall include the values of the defined QoS parameters. The content and the coding of the QoS Profile is defined in GSM 04.08.
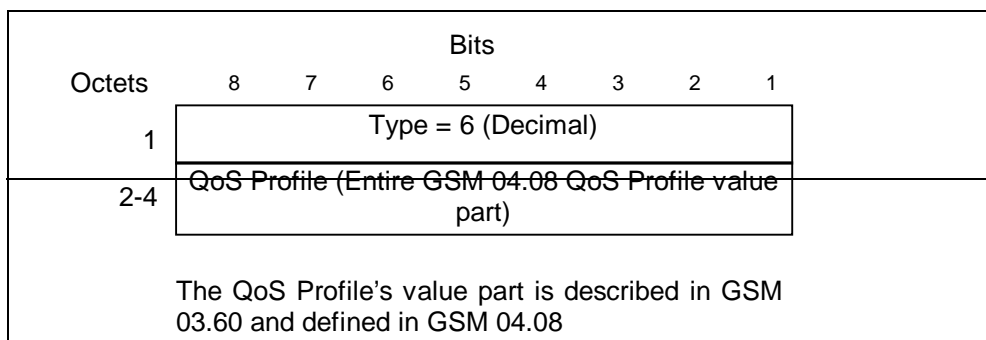

Figure 13: Quality of Service (QoS) Profile information element

**** Next Modified Section ****

7.9.22   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 which is associated with the NSAPI.

Transaction Identifier is the 4 bit Transaction Identifier used in the GSM 04.08 Session Management messages which control this PDP Context.

Reordering Required (Order) indicates whether the SGSN shall reorder T-PDUs before delivering the T-PDUs to the MS.

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.

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.

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'.

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 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 Send N-PDU Number is used only when acknowledged peer-to-peer LLC operation is used for the PDP context. The Send N-PDU Number is the N-PDU number to be assigned by SNDCP to the next downlink 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 uplink 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 Flow Label Signalling is the Flow Label used between the old SGSN and the GGSN in uplink direction for signalling purpose. It shall be used by the new SGSN within the GTP header of the Update PDP Context Request message.

The PDP Type Organization 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, IPv6 or X.25.

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

The old SGSN includes the GGSN Address for signalling that it has received from GGSN at PDP context activation or update.

The APN is the APN in use in the old SGSN. I.e. the APN sent in the Create PDP Context request message.

The spare bits x indicate unused bits which 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-rved	AA	Res-rved	rder	NSAPI
4	Res-rved	AA	Res-rved	rder	NSAPI
5	X	X	X	X	SAPI

6	QoS Sub Length
7 - (q+6) 8	QoS Sub [3..15]
q+7	QoS Req Length
9 (q+8)-(2q+7) 11	QoS Req [3..15]
2q+8	QoS Neg Length
(2q+9)-(3q+8) 14	QoS Neg [3..15]
15 (3q+9)-(3q+10) 16	Sequence Number Down (SND)
(3q+11) 7-(3q+12) 8	Sequence Number Up (SNU)
3q+13 9	Send N-PDU Number
3q+14 20	Receive N-PDU Number
2 (3q+15)-(3q+16) 22	Uplink Flow Label Signalling

3q+17 23	Spare 1 1 1 1	PDP Type Organization

3q+18 24	PDP Type Number
3q+19 25	PDP Address Length
(3q+20) 6-m	PDP Address [1..63]
m+1	GGSN Address for signalling Length
(m+2)-n	GGSN Address for signalling [4..16]
n+1	APN length
(n+2)-o	APN

o+1	Spare (sent as 0 0 0 0)	Transaction Identifier

Figure 34: PDP Context information element

**** Next Modified Section ****

7.9.27   Quality of Service (QoS) Profile

The Quality of Service (QoS) Profile shall include the values of the defined QoS parameters. The content of the QoS profile is described in GSMTS 023.060. Octets 4 – n carry the value part (i.e. excluding the IEI and length) of the Quality of Service profile IE which is specified in GSMTS 024.008. The minimum length of the QoS profile (i.e. octets 4 – n) is 3 octets; the maximum length is 15 octets.
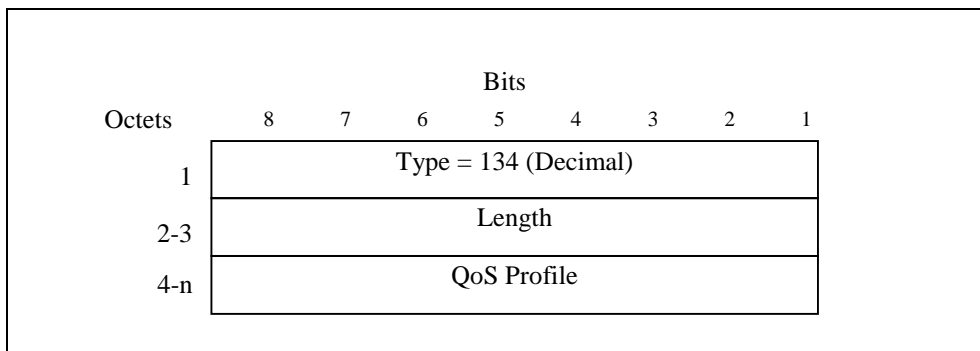
```
                         Bits
        Octets    8   7   6   5   4   3   2   1
                 ┌──────────────────────────────┐
          1      │      Type = 134 (Decimal)     │
                 ├──────────────────────────────┤
         2-3     │            Length             │
                 ├──────────────────────────────┤
         4-n     │          QoS Profile          │
                 └──────────────────────────────┘
```

Figure 38: Quality of Service (QoS) Profile information element

7.9.28̲7̶   Private Extension

The Private Extension information element contains vendor specific information. The Extension Identifier is a value defined in the Private Enterprise number list in the most recent "Assigned Numbers" RFC (RFC 1700 or later).

This is an optional information element that may be included in any signalling message. A signalling message may include more than one information element of the Private Extension type.

```
                         Bits
        Octets    8   7   6   5   4   3   2   1
                 ┌──────────────────────────────┐
          1      │      Type = 255 (Decimal)     │
                 ├──────────────────────────────┤
         2-3     │            Length             │
                 ├──────────────────────────────┤
         4-5     │      Extension Identifier     │
                 ├──────────────────────────────┤
         6-m     │        Extension Value        │
                 └──────────────────────────────┘
```
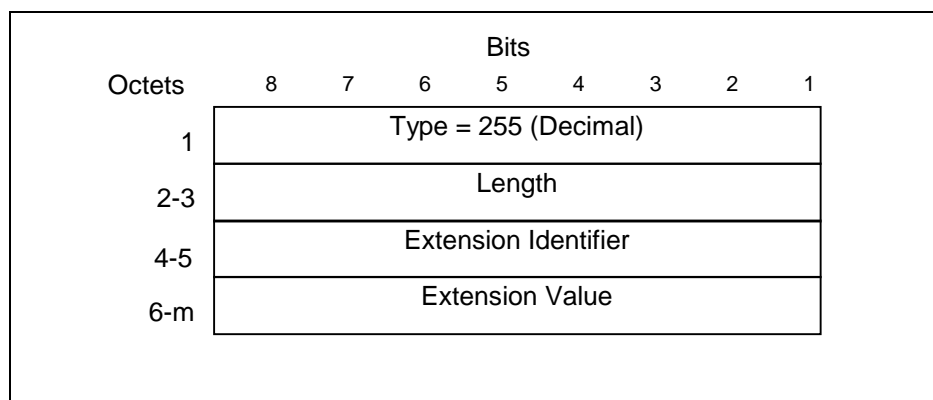
Figure 39: Private Extension information element