Technical Specification Group Services and System Aspects   *TSGS#5(99)381*

Meeting #5, Kyongju, Korea, 11-13 October 1999

Source: **TSG SA5**

Title: **CR to GSM 12.15 v7.2.1**

Document for: **Approval**

Agenda Item: **5.5.3**

This document contains R98 change requests to GSM 12.15 that were agreed at the September SA5 #6 meeting in Cork, Ireland.

S5 DOC	SPEC	CR	RV	PH	SUBJECT	CA	VERS
S5-99169	12.15	A015		R98	Correction of code-point for Packet Transfer Command	F	7.2.1
S5-99195	12.15	A016		R98	Inclusion of APN selection mode in CDRs	F	7.2.1

CHANGE REQUEST No :	**A015**	*Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification GSM / UMTS:	12.15	Version	7.2.1

Submitted to SMG **#30**	for approval	**X**	without presentation ("non-strategic")	**X**
list plenary meeting or STC here ↑	for information		with presentation ("strategic")	

PT SMG CR cover form. Filename: crf26_3.doc

Proposed change affects: SIM ☐ ME ☐ Network **X**
(at least one should be marked with an X)

Work item: GPRS Charging

Source: 3GPP SA5 **Date:** 1999-08-20

Subject: Typo fixing and a copy-paste fixing.

Category:

(one category and one release only shall be marked with an X)

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

Reason for change:

- In the SMG6 part of the SMG Plenary #29 (held in June 1999), modifications relating to 3 sentences in the chapters 7 and 7.1 of the GSM 12.15 were decided by the SMG. In one of the sentences added, there was a one-character typo ("send" instead of "sent"). That is corrected here.
- Additionally, in the figure 15 there is an already used code 250 (due to a minor copy-paste error from Figure 18) which is here corrected to be 126. The TV (Type, Value) type GTP' IE codes are in the range 117-127 and the numbers 239-254 are reserved for GTP' TLV (Type, Length, Value) types. The GTP' TV IE code allocation has earlier been defined to start from 127 (which is already used for another IE type) downwards.
- The code 126 is here mentioned also in the TV Information Element type list.

Clauses affected: 7.1, 7.3.1, 7.3.4.5.3 (Figure 15)

Other specs affected:

Other releases of same spec		→	List of CRs:
Other core specifications		→	List of CRs:
MS test specifications / TBRs		→	List of CRs:
BSS test specifications		→	List of CRs:
O&M specifications		→	List of CRs:

Other comments:

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

7   Charging Protocols

The GTP' charging protocol is optional. GPRS nodes generate CDRs. These CDRs are to be collected by the CGF. The protocol GTP' has been designed to provide this CDR collection.

The CGF-BS interface is also described in this chapter.

7.1   GPRS CDR Collection by GTP' Protocol

The GTP' protocol has been designed to deliver GPRS CDR's to the CGF(s) from those network elements or functional entities generating charging records. The GTP' protocol is required when the CGF resides in alternate nodes to those CDR generating nodes (e.g the SGSN and GGSN). The GTP' protocol designed for GPRS charging data collection has been derived from the GTP protocol (defined in GSM 09.60) which is used for packet data tunnelling in the GPRS backbone network.

GTP' is based on GTP with enhancements and additional message types. GTP' operates on the Ga interface. GTP' however does not imply the use of the GPRS backbone network, and may be implemented on alternate bearers.

The GTP' contains the following functions:

- CDR transfer mechanism between GPRS nodes generating CDRs and the Charging Gateway Functionality.

- Redirection of CDR transfer to another CGF.

- Ability to detect communication failures between the CDR handling GPRS network elements by echo messaging.

- Ability of a CDR handling node to advertise the peer CDR handling GPRS network elements about its CDR transfer capability (e.g. after a period of service downtime).

- Ability to prevent duplicate CDRs that might arise during redundancy operations. If so configured, the CDR duplication prevention function may also be carried out by marking potentially duplicated CDR packets and delegating the final duplicate deletion task to CGF or Billing System (instead of handling the possible duplicates solely by GTP' messaging).

- The aim of the duplication prevention support of GTP' is to reduce the number of duplicated CDRs sent towards the BS and to support the BS in keeping the efforts for duplictate CDR checking as small as possible.

7.3 GTP' Message Types

7.3.1 List of all GTP' message types

GTP defines a set of signalling messages between two associated GSN nodes. The signalling messages defined are shown in table 11. The enhancements introduced by GTP' are printed in this table in **boldface.** The messages modified due to the GPRS charging requirements are printed in *italics*.

Of the new signalling message types, Node Alive Request, Node Alive Response, Redirection Request and Redirection Response belong to the Path Management messages. The Data Record Transfer Request and Data Record Transfer Response form a new GTP signalling message type group: Record Transmission messages.

The reserved fields in the signalling messages shall be filled with ones, and are intended for future use.

GTP' shall reuse the GTP Cause values. The GTP' message type numbers needed for charging have been derived from the unallocated message type number space specified in GSM 09.60.

The number ranges allocated for GTP' are as follows:

For Information Elements : 117-127 (TV type fields) and 239-254 (for TLV type fields).

> TLV Information Element types introduced in this specification:
> 254 Address of Recommended Node
> 253 Requests Responded
> 252 Data Record Packet
> 251 Charging Gateway Address (this IE is also used in GSM 09.60)
> 250 Sequence Numbers of Cancelled Packets
> 249 Sequence Numbers of Released Packets

> TV Information Element types introduced in this specification:
> 127 Charging ID
> 126 Packet Transfer Command

For Cause Codes : Cause values used in requests: 49 to 63, Cause values used in responses indicating acceptance: 177 to 191, Cause values used in responses indicating rejection: 241 to 255.

Charging related Cause values introduced for this specification:

> In requests:
> 63 This node is about to go down
> 62 Another node is about to go down
> 61 The receive buffers are becoming full
> 60 The transmit buffers are becoming full
> 59 System failure

> In responses indicating acceptance:
> -

> In responses indicating rejection:
> 255 Request not fulfilled
> 254 Sequence numbers of released/cancelled packets IE incorrect
> 253 Request already fulfilled
> 252 Request related to possibly duplicated packets already fulfilled

The charging related message types are listed in the following signalling message table. If the Signalling Messages table defined in GSM 09.60 differs other than the boldfaced message types in table 11, then the defined signalling table in GSM 09.60 shall be considered as the latest version of the two tables.

7.3.4.5.3 Packet Transfer Command IE

The value of the Packet Transfer Command in its information element tells the nature of the message:

1 = 'Send Data Record Packet'

2 = 'Send possibly duplicated Data Record Packet'

3 = 'Cancel Data Record Packet'

4 = 'Release Data Record Packet'

The following describes the usage of each Packet Transfer Command.

1) Send Data Record Packet. This is used for the normal CDR sending, and it is the usual Packet Transfer Command, other commands being used only in error recovery cases. Of the conditional IE's, the "Data Record Packet" is present in the message.

2) Send possibly duplicated Data Record Packet. When the CDR packet is directed to a secondary CGF (by a CDR generating node) because the currently used CGF not working or the CDR transfer is not working properly, then this Packet Transfer Command is used instead of the normal 'Send Data Record Packet'. Of the conditional IEs, the Data Record Packet" is present in the message, when sending the message to a CGF acting as temporary storage, when the original primary CGF could not be contacted.

3) Cancel Data Record Packet. Of the conditional IE's, the "Sequence Numbers of Cancelled Packets" is present in the message.

4) Release Data Record Packet. Of the conditional IE's, the "Sequence Numbers of Released Packets" is present in the message.

			Bits				
Octets	8	7	6	5	4	3	2	1
1	Type = 250 126 (Decimal)							
2	Packet Transfer Command							

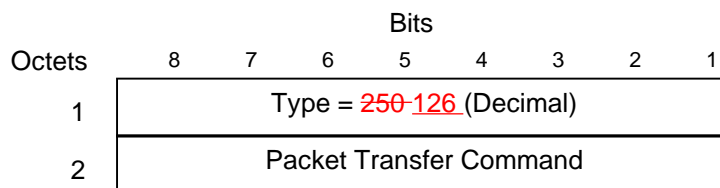**Figure 15: Packet Transfer Command information element**

After the CGF has received the Packet Transfer Command 'Release Data Record Packet' with the Sequence Number(s) for earlier sent 'Send possibly duplicated Data Record Packet' command(s), it can consider itself authorised to send the Data Record Packets previously marked as possibly duplicated towards the Billing System as normal (not duplicated) CDRs.

CHANGE REQUEST No :	**A016**	*Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification GSM / UMTS:	12.15	Version	7.2.1

Submitted to SMG		for approval	**X**	without presentation ("non-strategic")	**X**
List plenary meeting or STC here ↑		for information		with presentation ("strategic")	

PT SMG CR cover form. Filename: crf26_3.doc

Proposed change affects: SIM [ ]   ME [ ]   Network **X**
(at least one should be marked with an X)

Work item: GPRS Charging

Source: 3GPP TSG SA5   **Date:**   1999-08-25

Subject: Inclusion of APN selection mode in CDRs

Category: F   Correction   **X**   **Release:**   Phase 2 [ ]
                      A   Corresponds to a correction in an earlier release [ ]   Release 96 [ ]
(one category   B   Addition of feature [ ]   Release 97 [ ]
And one release   C   Functional modification of feature [ ]   Release 98   **X**
Only shall be   D   Editorial modification [ ]   Release 99 [ ]
Marked with an X)   UMTS [ ]

Reason for change:

This Change Request adds a <APN Selection Mode> parameter to the S-CDR and the G-CDRs. The recording of the <APN Selection Mode> in CDRs was overlooked in release '98

This change aligns this specification with changes present in GSM03.60 release '98 and GSM 09.60 release '98. These changes introduced an APN selection process, whereby the SGSN makes selection decisions based on a number of criteria. This can cause the APN used to be different from the APN selected by the customer.

It is important for the network service provider (in a customer care role) to be able to determine the reason an APN was chosen, as it may be different from what the customer believes it to be. An example is where a subscriber has roamed and a network provided APN was used because 'VPLMN Addresses Allowed' was not set for that subscriber. In this case the APN seen in the S-CDR will not be the APN selected by the user.

The relevant details in GSM 09.60 are: The <Create PDP Context Request> or <Create AA PDP Context Request> messages to the GGSN. The selection mode values: Value 0 = MS or network provided APN, subscription verified, Value 1 = MS provided APN, subscription not verified, Value 2 = Network provided APN, subscription not verified

The relevant sections in GSM 03.60 are: The APN selection mode procedure in Annex A3

Clauses affected: 6.1.1, 6.1.2, 6.1.6.32

Other specs Affected:
Other releases of same spec	[ ]	→ List of CRs:	
Other core specifications	[ ]	→ List of CRs:	
MS test specifications / TBRs	[ ]	→ List of CRs:	
BSS test specifications	[ ]	→ List of CRs:	
O&M specifications	[ ]	→ List of CRs:	

Other comments:

6.1.1 GPRS charging data in SGSN (S-CDR)

If the collection of SGSN data is enabled then the following GPRS SGSN data shall be available for each PDP context.

Table 5: GPRS SGSN PDP context data

Field		Description
Record Type	M	GPRS SGSN PDP context record.
Network Initiated PDP Context	C	Present if this is a network initiated PDP context.
Anonymous Access Indicator	C	Set to true to indicate anonymous access (and that the Served IMSI is not supplied)
Served IMSI	M	IMSI of the served party (if Anonymous Access Indicator is FALSE or not supplied).
Served IMEI	C	The IMEI of the ME, if available.
SGSN Address	M	The IP address of the current SGSN.
MS Network Capability	O	The mobile station Network Capability.
Routing Area	O	Routing Area at the time of the record creation.
Local Area Code	O	Location area code at the time of the record creation.
Cell Identity	O	Cell id at the time of the record creation.
Charging ID	M	PDP context identifier used to identify this PDP context in different records created by GSNs
GGSN Address Used	M	The IP address of the GGSN currently used. The GGSN address is always the same for an activated PDP.
Access Point Name	M	The logical name of the connected access point to the external packet data network.
APN Selection Mode	O	An index indicating how the APN was selected.
PDP Type	M	PDP type, e.g. X.25, IP, PPP, IHOSS:OSP
Served PDP Address	M	PDP address of the served IMSI, e.g. an IPv4, IPv6 or X.121.
List of Traffic Data Volumes	M	A list of changes in charging conditions for this PDP context, each time stamped. Charging conditions are used to categorise traffic volumes, such as per QoS/tariff period. Initial and subsequently changed QoS and corresponding data values are listed. Data volumes are in Octets above the SNDCP layer and are separated for uplink and downlink traffic.
Record Opening Time	M	Time stamp when PDP context activation is created in this SGSN or record opening time on following partial records
Duration	M	Duration of this record in the SGSN.
SGSN Change	C	Present if this is first record after SGSN change.
Cause for Record Closing	M	The reason for the release of record from this SGSN.
Diagnostics	O	A more detailed reason for the release of the connection.
Record Sequence Number	C	Partial record sequence number in this SGSN. Only present in case of partial records.
Node ID	O	Name of the recording entity
Record Extensions	O	A set of network/ manufacturer specific extensions to the record.
Local Record Sequence Number	O	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.

6.1.2   GPRS charging data in GGSN (G-CDR)

If the collection of GGSN data is enabled then the following GPRS GGSN data shall be available for each PDP context.

Table 6: GPRS GGSN PDP context data

Field		Description
Record Type	M	GPRS GGSN PDP context record.
Network initiated PDP context	C	Present if this is a network initiated PDP context.
Anonymous Access Indicator	C	Set to true to indicate anonymous access (and that the Served IMSI is not supplied).
Served IMSI	M	IMSI of the served party (if Anonymous Access Indicator is FALSE or not supplied).
GGSN Address	M	The IP address of the GGSN used.
Charging ID	M	PDP context identifier used to identify this PDP context in different records created by GSNs
SGSN Address	M	List of SGSN addresses used during this record.
Access Point Name	M	The logical name of the connected access point to the external packet data network.
APN Selection Mode	O	An index indicating how the APN was selected.
PDP Type	M	PDP type, e.g. X.25, IP, PPP, or IHOSS:OSP
Served PDP Address	M	PDP address, e.g. an IPv4, IPv6 or X.121.
Remote PDP Address	O	List of PDP addresses of the remote host or DTE e.g. an IPv4, IPv6, or X.121 (Included if the PDP type is X.25)
Dynamic Address Flag	C	Indicates whether served PDP address is dynamic, that is allocated during PDP context activation.
List of Traffic Data Volumes	M	A list of changes in charging conditions for this PDP context, each time stamped. Charging conditions are used to categorise traffic volumes, such as per tariff period. Initial and subsequently changed QoS and corresponding data values are listed. Data volumes are in octets above the GTP layer and are separated for uplink and downlink traffic.
Record Opening Time	M	Time stamp when this record was opened.
Duration	M	Duration of this record in the GGSN .
Cause for Record Closing	M	The reason for the release of record from this GGSN .
Diagnostics	O	A more detailed reason for the release of the connection.
Record Sequence Number	C	Partial record sequence number, only present in case of partial records.
Node ID	O	Name of the recording entity.
Record Extensions	O	A set of network/ manufacturer specific extensions to the record.
Local Record Sequence Number	O	Consecutive record number created by this node. The number is allocated sequentially including all CDR types.

....

6.1.6.31   Short Message Service Result

This field contains the result of an attempt to deliver a short message either to a service centre or to a mobile subscriber (see GSM 09.02). Note that this field is only provided if the attempted delivery was unsuccessful

6.1.6.32   APN Selection Mode

This field indicates how the SGSN selected the APN to be used. The values and their meaning are as specified in GSM 09.60 section 7.9 'Information elements'.

8 Charging Data Record Structure

8.1 ASN.1 definitions for CDR information

Within the current GSM 12-series of specifications the ASN.1 definitions are based on X.208 [40] which has been superseded by X.680. This newer version not only includes new features but also removes some that were present in X.208. It was agreed that where possible, the GPRS work would be based on those ASN.1 features that were common to both. However, where necessary, the new features in X.680 [41] be used in some places. X.208 feature that are no longer in X.680 will not be used.

```
Changes (enhancements) in GSM1205-DataTypes:

CallEventRecordType       ::= INTEGER
{
    moCallRecord          (0),
    mtCallRecord          (1),
    roamingRecord         (2),
    incGatewayRecord      (3),
    outGatewayRecord      (4),
    transitCallRecord     (5),
    moSMSRecord           (6),
    mtSMSRecord           (7),
    moSMSIWRecord         (8),
    mtSMSGWRecord         (9),
    ssActionRecord        (10),
    hlrIntRecord          (11),
    termCAMELIntRecord    (12),
    locUpdateHLRRecord    (13),
    locUpdateVLRRecord    (14),
    commonEquipRecord     (15),
    moTraceRecord         (16),
    mtTraceRecord         (17),
    sgsnPDPRecord         (18),
    ggsnPDPRecord         (19),
    sgsnMMRecord          (20),
    sgsnSMORecord         (21),
    sgsnSMTRecord         (22)
}
GPRS_Charging-DataTypes { ... }

DEFINITIONS IMPLICIT TAGS   ::=

BEGIN

-- EXPORTS everything

IMPORTS

CellId, Classmark, Diagnostics, CallDuration, ManagementExtensions, TimeStamp, MSISDN,
LocationAreaCode, MessageReference, RecordingEntity, SMSResult
FROM GSM1205-DataTypes{ ccitt (0) identified-organization (4) etsi(0) mobileDomain (0) gsmOperation-
Maintenance (3) moduleId (3) gsm-12-05 (5) InformationModel (0) asn1Module (2) 1 }


AddressString, ISDN-AddressString, IMSI, IMEI
FROM MAP-CommonDataTypes { ccitt identified-organization (4) etsi(0) mobileDomain (0) gsmNetworkId
(1) moduleId (3) map-CommonDataTypes (18) version2 (2) }


ObjectInstance
FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) version1 (1) protocol (3)}

ManagementExtension
FROM Attribute-ASN1Module {joint-iso-ccitt ms(9) smi(3) part2 (2) asn1Module(2) 1}

AE-title
FROM ACSE-1 {joint-iso-ccitt association-control(2) abstract-syntax(1) apdus(0) version(1) };
--
-- Note that the syntax of AE-title to be used is from
-- CCITT Rec. X.227 / ISO 8650 corrigendum and not "ANY"
--
----------------------------------------------------------------------------
```

```
--
--  CALL AND EVENT RECORDS
--
-------------------------------------------------------------------------------

CallEventRecord ::= CHOICE
{
    sgsnPDPRecord              [0] SGSNPDPRecord,
    ggsnPDPRecord              [1] GGSNPDPRecord,
    sgsnMMRecord               [2] SGSNMMRecord,
    sgsnSMORecord              [3]SGSNSMORecord,
    sgsnSMTRecord              [4]SGSNSMTRecord
}

GGSNPDPRecord    ::= SET
{
    recordType                 [0] CallEventRecordType,
    networkInitiation          [1] NetworkInitiatedPDPContext OPTIONAL,
    anonymousAccessIndicator   [2] BOOLEAN OPTIONAL,
    servedIMSI                 [3] IMSI,
    ggsnAddress                [4] GSNAddress,
    chargingID                 [5] ChargingID,
    sgsnAddress                [6] SEQUENCE OF GSNAddress,
    accessPointName            [7] AccessPointName,
    pdpType                    [8] PDPType,
    servedPDPAddress           [9] PDPAddress,
    remotePDPAddress           [10] SEQUENCE OF PDPAddress OPTIONAL,
    dynamicAddressFlag         [11] DynamicAddressFlag OPTIONAL,
    listOfTrafficVolumes       [12] SEQUENCE OF ChangeOfCharCondition,
    recordOpeningTime          [13] TimeStamp,
    duration                   [14] CallDuration,
    causeForRecClosing         [15] CauseForRecClosing,
    diagnostics                [16] Diagnostics OPTIONAL,
    recordSequenceNumber       [17] INTEGER OPTIONAL,
    nodeID                     [18] IA5 string OPTIONAL
    recordExtensions           [19] ManagementExtensions OPTIONAL,
    apnSelectionMode           [20] APNSelectionMode
}


SGSNMMRecord    ::= SET
{
    recordType                 [0] CallEventRecordType,
    servedIMSI                 [1] IMSI ,
    servedIMEI                 [2] IMEI OPTIONAL,
    sgsnAddress                [3] GSNAddress,
    msClassmark                [4] Classmark OPTIONAL,
    routingArea                [5] RoutingAreaCode OPTIONAL,
    locationAreaCode           [6] LocationAreaCode OPTIONAL,
    cellIdentity               [7] CellId OPTIONAL,
    changeLocation             [8] SEQUENCE OF ChangeLocation OPTIONAL,
    recordOpeningTime          [9] TimeStamp,
    duration                   [10] CallDuration OPTIONAL,
    sgsnChange                 [11] SGSNChange OPTIONAL,
    causeForRecClosing         [12] CauseForRecClosing,
    diagnostics                [13] Diagnostics OPTIONAL,
    recordSequenceNumber       [14] INTEGER OPTIONAL,
    nodeID                     [15] IA5 string OPTIONAL
    recordExtensions           [16] ManagementExtensions OPTIONAL
}

SGSNPDPRecord    ::= SET
{
    recordType                 [0] CallEventRecordType,
    networkInitiation          [1] NetworkInitiatedPDPContext OPTIONAL,
    anonymousAccessIndicator   [2] BOOLEAN OPTIONAL,
    servedIMSI                 [3] IMSI ,
    servedIMEI                 [4] IMEI OPTIONAL,
    sgsnAddress                [5] GSNAddress,
    msClassmark                [6] Classmark OPTIONAL,
    routingArea                [7] RoutingAreaCode OPTIONAL,
    locationAreaCode           [8] LocationAreaCode OPTIONAL,
    cellIdentity               [9] CellId OPTIONAL,
    chargingID                 [10] ChargingID,
    ggsnAddressUsed            [11] GSNAddress,
    accessPointName            [12] AccessPointName,
    pdpType                    [13] PDPType,
    servedPDPAddress           [14] PDPAddress,
```

```
    listOfTrafficVolumes    [15] SEQUENCE OF ChangeOfCharCondition,
    recordOpeningTime       [16] TimeStamp,
    duration                [17] CallDuration,
    sgsnChange              [18] SGSNChange OPTIONAL,
    causeForRecClosing      [19] CauseForRecClosing,
    diagnostics             [20] Diagnostics OPTIONAL,
    recordSequenceNumber    [21] INTEGER OPTIONAL,
    nodeID                  [22] IA5 string OPTIONAL
    recordExtensions        [23] ManagementExtensions OPTIONAL,
    apnSelectionMode        [24] APNSelectionMode
}

SGSNSMORecord   ::= SET
{
    recordType              [0] CallEventRecordType,
    servedIMSI              [1] IMSI,
    servedIMEI              [2] IMEI OPTIONAL,
    servedMSISDN            [3] MSISDN OPTIONAL,
    msClassmark             [4] Classmark,
    serviceCentre           [5] AddressString,
    recordingEntity         [6] RecordingEntity,
    locationArea            [7] LocationAreaCode OPTIONAL,
    routingArea             [8] RoutingAreaCode OPTIONAL,
    cellIdentity            [9] CellId OPTIONAL,
    messageReference        [10] MessageReference,
    originationTime         [11] TimeStamp,
    smsResult               [12] SMSResult OPTIONAL,
    recordExtensions        [13] ManagementExtensions OPTIONAL
}

SGSNSMTRecord   ::= SET
{
    recordType              [0] CallEventRecordType,
    servedIMSI              [1] IMSI,
    servedIMEI              [2] IMEI OPTIONAL,
    servedMSISDN            [3] MSISDN OPTIONAL,
    msClassmark             [4] Classmark,
    serviceCentre           [5] AddressString,
    recordingEntity         [6] RecordingEntity,
    locationArea            [7] LocationAreaCode OPTIONAL,
    routingArea             [8] RoutingAreaCode OPTIONAL,
    cellIdentity            [9] CellId OPTIONAL,
    originationTime         [10] TimeStamp,
    smsResult               [11] SMSResult OPTIONAL,
    recordExtensions        [12] ManagementExtensions OPTIONAL
}

-------------------------------------------------------------------------------
--
--  OBJECT IDENTIFIERS
--
-------------------------------------------------------------------------------

gsm1205InformationModel  OBJECT IDENTIFIER  ::=
    { ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Operation-Maintenance (3) gsm-12-05 (5) informationModel (0) }

gsm1205ASN1Module   OBJECT IDENTIFIER   ::=
    { gsm1205InformationModel asn1Module(2) }

gsm1205ManagedObjectClass OBJECT IDENTIFIER ::=
    { gsm1205InformationModel managedObjectClass(3) }

gsm1205Package OBJECT IDENTIFIER ::=
    { gsm1205InformationModel package(4) }

gsm1205NameBinding OBJECT IDENTIFIER ::=
    { gsm1205InformationModel nameBinding(6) }

gsm1205Attribute OBJECT IDENTIFIER ::=
    { gsm1205InformationModel attribute(7) }

gsm1205Action OBJECT IDENTIFIER ::=
    { gsm1205InformationModel action(9) }

gsm1205Notification OBJECT IDENTIFIER   ::=
    { gsm1205InformationModel notification(10) }
```

```
--------------------------------------------------------------------------------
--
--   COMMON DATA TYPES
--
--------------------------------------------------------------------------------

AccessPointName ::= IA5String (SIZE(1..63))
    --
    --logical (domain) name in "dot" representation
    -- see TS GSM 09.60
    --

APNSelectionMode ::= ENUMERATED
{
    --
    -- See Information Elements TS GSM 09.60
    --
    MSorNetworkProvidedSubscriptionVerified          (0),
    MSProvidedSubscriptionNotVerified                (1),
    NetworkProvidedSubscriptionNotVerified           (2),
}


CauseForRecClosing  ::= INTEGER
{
    --
    -- in GGSN the value sGSNChange should be used for partial record
    -- generation due to SGSN Address List Overflow
    --
    pDPContextRelease      (0),
    volumeLimit            (1),
    timeLimit              (2),
    sGSNChange             (3),
    maxChangeCond          (4),
    gPRSDetach             (5),
    managementIntervention (6),
    abnormalRelease        (7)
}

ChangeCondition ::= ENUMERATED
{
    qoSChange              (0),
    tariffTime             (1),
    recordClosure          (2)
}

ChangeOfCharCondition   ::= SEQUENCE
    --
    -- used in PDP context record only
    --
{
    qosRequested         [1] QoSInformation OPTIONAL,
    qosNegotiated        [2] QoSInformation OPTIONAL,
    dataVolumeGPRSUplink  [3] DataVolumeGPRS,
    dataVolumeGPRSDownlink [4] DataVolumeGPRS,
    changeCondition      [5] ChangeCondition,
    changeTime           [6] TimeStamp
}

ChangeLocation  ::= SEQUENCE
    --
    -- used in SGSNMMRecord only
    --
{
    locationAreaCode      [0] LocationAreaCode,
    routingAreaCode       [1] RoutingAreaCode,
    cellId                [2] CellID OPTIONAL,
    changeTime            [3] TimeStamp
}


ChargingID  ::= INTEGER (0..4294967295)
    --
    -- generated in GGSN, part of PDP context, see TS GSM 03.60
    -- 0..4294967295 is equivalent to 0..2**32-1

DataVolumeGPRS  ::= INTEGER
    --
```

```
    -- The volume of uncompressed data transferred in octets.
    --

DynamicAddressFlag  ::= BOOLEAN

ETSIAddress ::= AddressString
    --
    --first octet for nature of address, and numbering plan indicator (3 for X.121)
    --other octets TBCD
    -- See TS GSM 09.02
    --

GSNAddress  ::= IPAddress

IPAddress   ::= CHOICE
{
    iPBinaryAddress   IPBinaryAddress,
    iPTextRepresentedAddress      IPTextRepresentedAddress
}
IPBinaryAddress ::= CHOICE
{
    iPBinV4Address          [0] OCTET STRING (SIZE(4)),
    iPBinV6Address          [1] OCTET STRING (SIZE(16))
}
IPTextRepresentedAddress    ::= CHOICE
{   --
    -- IP address in the familiar "dot" notation
    --
    iPTextV4Address         [2] IA5String (SIZE(7..15)),
    iPTextV6Address         [3] IA5String (SIZE(15..45))
}

NetworkInitiatedPDPContext  ::= BOOLEAN
    --
    -- Set to true if PDP context was initiated from network side
    --

NodeID  ::= IA5 string (SIZE(1..20))

PDPAddress  ::= CHOICE
{
    iPAddress               [0] IPAddress,
    eTSIAddress             [1] ETSIAddress
}

PDPType     ::= OCTET STRING (SIZE(2))
    --
    --OCTET 1: PDP Type Organization
    --OCTET 2: PDP Type Number
    -- See TS GSM 09.60
    --

QoSDelay        ::= ENUMERATED
{
    --
    -- See Quality of service TS GSM 04.08
    --
    delayClass1             (0),
    delayClass2             (1),
    delayClass3             (2),
    delayClass4             (3)
}

QoSInformation  ::=SEQUENCE
{
    reliability             [0] QoSReliability,
    delay                   [1] QoSDelay,
    precedence              [2] QoSPrecedence,
    peakThroughput          [3] QoSPeakThroughput,
    meanThroughput          [4] QoSMeanThroughput
}

QoSMeanThroughput   ::= ENUMERATED
{
    --
    -- See Quality of service TS GSM 04.08
    --
    bestEffort              (0),
```

```
    mean100octetPh          (1),
    mean200octetPh          (2),
    mean500octetPh          (3),
    mean1000octetPh         (4),
    mean2000octetPh         (5),
    mean5000octetPh         (6),
    mean10000octetPh        (7),
    mean20000octetPh        (8),
    mean50000octetPh        (9),
    mean100000octetPh       (10),
    mean200000octetPh       (11),
    mean500000octetPh       (12),
    mean1000000octetPh      (13),
    mean2000000octetPh      (14),
    mean5000000octetPh      (15),
    mean10000000octetPh     (16),
    mean20000000octetPh     (17),
    mean50000000octetPh     (18)
}

QoSPeakThroughput    ::= ENUMERATED
{
    --
    -- See Quality of service TS GSM 04.08
    --
    unspecified             (0),
    upTo100OctetPs          (1),
    upTo200OctetPs          (2),
    upTo400OctetPs          (3),
    upTo800OctetPs          (4),
    upTo1600OctetPs         (5),
    upTo3200OctetPs         (6),
    upTo6400OctetPs         (7),
    upTo12800OctetPs        (8),
    upTo25600OctetPs        (9)
}

QoSPrecedence    ::= ENUMERATED
{
    --
    -- See Quality of service TS GSM 04.08
    --
    unspecified             (0),
    highPriority            (1),
    normalPriority          (2),
    lowPriority             (3)
}

QoSReliability  ::= ENUMERATED
{
    --
    -- See Quality of service TS GSM 04.08
    --
    unspecifiedReliability  (0),
    acknowledgedGTP         (1),
    unackGTPAcknowLLC       (2),
    unackGTPLLCAcknowRLC    (3),
    unackGTPLLCRLC          (4),
    unacknowUnprotectedData (5)
}

RoutingAreaCode ::= OCTET STRING (SIZE(1))
    --
    -- See TS GSM 04.08 --
    --

SGSNChange  ::= BOOLEAN
    --
    -- present if first record after inter SGSN routing area update
    -- in new SGSN
    --
```