Source:	**SA5 (Telecom Management)**
Title:	**2 Rel-4/5 CR 32.215 (Charging data description for PS domain)**
Document for:	**Decision**
Agenda Item:	**7.5.3**

Doc-1st-	Spec	CR	R	Phas	Subject	Cat	Ver	Doc-2nd-	Workitem
SP-040277	32.215	034	-	Rel-4	Correction to the selection and use of charging characteristics and profiles	F	4.7.0	S5-044350	OAM-CH
SP-040277	32.215	035	-	Rel-5	Correction to the selection and use of charging characteristics and profiles	A	5.5.0	S5-044351	OAM-CH

CR-Form-v7

CHANGE REQUEST

| ⌘ | **32.215** CR **034** | ⌘ **rev** | **-** | ⌘ | Current version: | **4.7.0** | ⌘ |

*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: ⌘	Correction to the selection and use of charging characteristics and profiles	
Source: ⌘	**SA5 SWG-B (gerald.goermer@siemens.com)**	
Work item code: ⌘	OAM-CH	***Date:*** ⌘ 14/05/04

Category: ⌘ **F**	***Release:*** ⌘ Rel-4

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

Use <u>one</u> of the following releases:
2   *(GSM Phase 2)*
R96   *(Release 1996)*
R97   *(Release 1997)*
R98   *(Release 1998)*
R99   *(Release 1999)*
Rel-4   *(Release 4)*
Rel-5   *(Release 5)*
Rel-6   *(Release 6)*

Reason for change: ⌘	Incomplete charging characteristics selection procedures.
Summary of change: ⌘	Procedures to resolve cases where GSN receives undefined charging characteristics are added. Description of charging characteristics profile and index are clarified.
Consequences if not approved: ⌘	Errors in GPRS Charging due to ambiguity in the selection and use of the charging characteristics profiles.

Clauses affected: ⌘	Annex A		

		Y	N		
Other specs affected: ⌘			X	Other core specifications ⌘	
			X	Test specifications	
		X		O&M Specifications	Rel-5 32.215

Other comments: ⌘	Rel-5 Mirror CR is provided in S5-044351

Annex A (normative):
Charging Characteristics

Charging Characteristics can be supplied by the HLR to the SGSN as part of the subscription information. A subscriber may have charging characteristics assigned to his subscription and/or his subscribed APNs. Charging Characteristics consists of a string of 16 bits designated as Profile (P) and Behaviour (B), shown in Figure 4. The first four bits (P – Profile bits) shall be used as profile index to select one of up to 16 charging characteristics profiles that may be configured on the GSN (i.e. the profile number corresponding to the decimal value represented by the P bits). The remaining 12 (B) bits can be freely assigned to particular charging behaviours that the GSNs support.

Examples of those behaviours are:

*   Selection of the applicable idle context purge timer, i.e. use global value or use special value. This feature could be used to distinguish between customers and/or APNs whose PDP contexts should be purged after short (e.g. 30 minutes) or long (e.g. 12 hours) periods of inactivity.

*   Use specific charging gateway address (override all other configured/selected CG addresses).

*   Deactivate SMS-MO-CDRs for customers of the own PLMN using preconfigured SMSC addresses.

*   Disable G-CDRs for roamers that use the HPLMN GGSN.

*   Allow or inhibit the use of own GGSNs by visitors.

*   Allow or inhibit network triggered QoS change (upgrade and/or downgrade).

Charging characteristics profile

The GSN shall support a minimum of one charging characteristic profile. The number of additional supported profiles (up to 15) is implementation specific.

Each profile consists of the following trigger sets:

*   **S-CDR:** activate/deactivate CDRs, time limit, volume limit, maximum number of charging conditions, tariff times;

*   **G-CDR:** same as SGSN, plus maximum number of SGSN changes;

*   **M-CDR:** activate/deactivate CDRs, time limit, and maximum number of mobility changes;

*   **SMS-MO-CDR:** activate/deactivate CDRs;

*   **SMS-MT-CDR:** active/deactivate CDRs.

In addition to these trigger sets, the profile may also specify an optional charging gateway address. If this CGF address is configured in the GGSN's selected trigger profile, the GGSN shall apply it for the G-CDRs and send this charging gateway address in its GTP message exchange with the SGSN (overriding any other GGSN configured CGF address). In the home or visiting case, the SGSN shall apply the received CGF address to the S-CDRs pertaining to this PDP context. In the roaming case, or if no address is received from the GGSN, then the SGSN shall use the CGF address from its own selected charging characteristics trigger profile, or, if it does not exist, use the default CGF address. For M-CDRs and SMS CDRs, the SGSN shall use the CGF address configured in the charging characteristics that it applies to the respective CDRs, or if no such address is configured then the default CGF shall be used.

The Table below is an informative example intended for clarification.

Table 15: Example of Charging Characteristics Profiles

| Profile Index bits 0 - 3 | CGF Address | Active | S-CDR | | | | | G-CDR | |
			Time limit	Volume limit	Change cond	Tariff times		Active	...
0	-	Yes	30 min	100 K	2	0-7, 7-12, ...			
1	100.128.35.20	No	-	-	-	-			
2	-	Yes	10 min	50 K	1	0-24			
..	..	..	..	..	..	..			

Charging characteristics selection in GSN

~~The SGSN applies a preconfigured default if no c~~Charging characteristics ~~can r~~be supplied by the HLR to the SGSN as part of the subscription information. A subscriber may have charging characteristics assigned to his subscription and/or his subscribed APNs. In case of no charging characteristics are supplied by the HLR t~~T~~he SGSN shall support ~~three~~ different ~~charging characteristics~~ default configurations:

* the home default profile for subscribers of the SGSN's PLMN;

* the visiting default profile for visitors using a GGSN belonging to the same PLMN as the SGSN;

* the roaming default profile for visitors using a GGSN belonging to their home PLMN.

The SGSN can determine the GGSN PLMN from the operator identifier part of the APN. Optionally the SGSN may support several visiting and roaming default profiles based on the MNC/MCC combination of the subscriber.

The default configurations are implementation specific.

In the case of a home subscriber, the charging characteristics are selected by the SGSN according to the following procedures.

For PDP context specific cases~~charging characteristics~~ (i.e. ~~those used~~ for the S-CDRs that are generated for this PDP context):

♦ If the MS requests a particular APN then

* If the SGSN accepts this request (i.e. it has been verified against the subscription) then

▪ If it has been matched against the wildcard APN then

- If charging characteristics for the wildcard APN are present in the subscription information then they shall be used;

- If no charging characteristics are present for the wildcard APN but subscription related charging characteristics are present, then they shall be chosen;

- If neither ~~of the two~~ are present then the SGSN home default shall be applied.

▪ If it has been matched against a specific subscribed APN then

- If charging characteristics for this APN are present in the subscription information then they shall be used;

- If no charging characteristics are present for the APN but subscription related charging characteristics are present, then they shall be chosen;

- If neither ~~of the two~~ are present then the SGSN home default shall be applied.

* If the SGSN rejects the request then charging characteristics selection does not apply.

♦ If the MS does not request an APN then

* If the SGSN chooses a subscribed APN then

- If charging characteristics for this APN are present in the subscription information then they shall be used;

- If no charging characteristics are present for the APN but subscription related charging characteristics are present, then they shall be chosen;

- If neither ~~of the two~~ are present then the SGSN home default shall be applied.

* If only the wildcard APN is present in the subscription, i.e. the SGSN applies its configured default APN then

  - If charging characteristics for the wildcard APN are present in the subscription information then they shall be used;

  - If no charging characteristics are present for the wildcard APN but subscription related charging characteristics are present, then they shall be chosen;

  - If neither ~~of the two~~ are present then the SGSN home default shall be applied.

For the non-PDP context specific CDR types, i.e. the M-CDRs and the SMS CDRs, the SGSN applies the subscription specific charging characteristics, or, if not supplied, it shall choose the home default profile as defined above.

In case of subscribers from other PLMNs, the SGSN may be configured to either apply the "home subscriber case" charging characteristics selection procedure defined above, or to ignore charging characteristics provided by the subscriber's HLR, and apply a default configuration instead. If default charging characteristics are selected for the foreign subscriber, then the SGSN shall choose either the visiting or roaming default profile for the PDP context specific charging characteristics, according to the roaming or visiting scenario, as described above. For M-CDRs and SMS CDRs, the operator can configure if the roaming or the visiting profile shall be applied, since no GGSN is involved.

Upon activation of a PDP context, the SGSN forwards the charging characteristics to the GGSN according to the following rules:

* if charging characteristics were received from the HLR, then they shall be sent as provided by the HLR, regardless of the home, visiting, or roaming case, and regardless of whether the SGSN applies the HLR supplied charging characteristics or chooses to ignore them;

* if no charging characteristics were received from the HLR, then the SGSN does not forward any charging characteristics to the GGSN.

The above procedure implies that no explicit transfer of the Charging Characteristics Selection Mode (see 3GPP TS 23.060) to the GGSN is necessary, because it is implicitly given as "subscribed" when the GGSN receives charging characteristics from the SGSN, and "non-subscribed" otherwise.

The GGSN shall also apply charging characteristics to its PDP contexts. It shall either apply the SGSN supplied parameters, or it may be configured to ignore the SGSN supplied charging characteristics in any combination of the following cases:

* visiting case, i.e. the subscriber belongs to a different PLMN;

* roaming case, i.e. the SGSN belongs to a different PLMN;

* home case, i.e. the subscriber belongs to the same PLMN as the GGSN; or

* unconditionally, i.e. it always ignores the SGSN supplied parameters.

If the GGSN ignores the parameters supplied by the SGSN, it shall nevertheless accept the PDP context request. It shall then apply its own preconfigured charging characteristics as appropriate, i.e. the home, visiting or roaming profile. The GGSN shall support the configuration of one set of default charging characteristics (i.e. home, visiting, roaming) for each of its supported APNs.

~~Charging Characteristics consists of a string of 16 bits designated as Profile (P) and Behaviour (B), shown in Figure 4. The first four bits (P) shall be used to select different charging trigger profiles, where each profile consists of the following trigger sets:~~

~~* **S-CDR:** activate/deactivate CDRs, time limit, volume limit, maximum number of charging conditions, tariff times;~~

* **G-CDR:** same as SGSN, plus maximum number of SGSN changes;

* **M-CDR:** activate/deactivate CDRs, time limit, and maximum number of mobility changes;

* **SMS-MO-CDR:** activate/deactivate CDRs;

* **SMS-MT-CDR:** active/deactivate CDRs.

In addition to these trigger sets, the profile may also specify an optional charging gateway address. If this CGF address is configured in the GGSN's selected trigger profile, the GGSN shall apply it for the G-CDRs and send this charging gateway address in its GTP message exchange with the SGSN (overriding any other GGSN configured CGF address). In the home or visiting case, the SGSN shall apply the received CGF address to the S-CDRs pertaining to this PDP context. In the roaming case, or if no address is received from the GGSN, then the SGSN shall use the CGF address from its own selected charging characteristics trigger profile, or, if it does not exist, use the default CGF address. For M-CDRs and SMS-CDRs, the SGSN shall use the CGF address configured in the charging characteristics that it applies to the respective CDRs, or if no such address is configured then the default CGF shall be used.

The Table below is an informative example intended for clarification.

Table 15: Example of Charging Characteristics Profiles

Profile Index bits 0 - 3	CGF Address	S-CDR					G-CDR	
		Active	Time limit	Volume limit	Change cond	Tariff times	Active	...
0	-	Yes	30 min	100 K	2	0-7, 7-12, ...		
1	100.128.35.20	No	-	-	-	-		
2	-	Yes	10 min	50 K	1	0-24		
..	..	..	..	..	..	..		

The remaining 12 (B) bits can be freely assigned to particular charging behaviours that the GSNs support. Examples of those behaviours are:

* Selection of the applicable idle context purge timer, i.e. use global value or use special value. This feature could be used to distinguish between customers and/or APNs whose PDP contexts should be purged after short (e.g. 30 minutes) or long (e.g. 12 hours) periods of inactivity.

* Use specific charging gateway address (override all other configured/selected CG addresses).

* Deactivate SMS-MO-CDRs for customers of the own PLMN using preconfigured SMSC addresses.

* Disable G-CDRs for roamers that use the HPLMN GGSN.

* Allow or inhibit the use of own GGSNs by visitors.

* Allow or inhibit network triggered QoS change (upgrade and/or downgrade).

The SGSN selects the applicable charging characteristics and associated charging characteristics profile for M-CDR generation upon the creation of a MM context. Both SGSN and GGSN select the applicable charging characteristics and associated charging characteristics profile for PDP context CDR generation (i.e. S-CDR and G-CDR, respectively) upon creation of a PDP context or secondary PDP context. Once selected, the charging characteristics and charging characteristics profile shall be maintained throughout the lifetime of the MM or PDP contexts on that SGSN and GGSN. If the SGSN receives modified subscriber information from the HLR (e.g. execution of a stand-alone Insert Subscriber Data procedure) which includes changes to the charging characteristics or if the charging characteristics profile is changed, thesey changes shall only be applied only to new MM, PDP and secondary PDP contexts. As a result, this implies that the SGSN shall not send PDP context modifications are triggert for the existing PDP contexts to the GGSN.

Upon inter-SGSN RAU, the new SGSN receives PDP context charging characteristics for every PDP context from the old SGSN as described in TS 29.060 [08]. If the new SGSN also receives charging characteristics for the existing PDP contexts from the HLR, then these (the ones coming from the HLR) shall be ignored.

Under certain circumstances it is possible that different charging characteristics are applied by the GSNs serving the same PDP contexts:

- If a GSN receives a charging characteristics profile index that is not configured or supported on that GSN, the GSN shall select one of the valid default configurations. This may be achieved by executing the selection procedure described in this annex, or by implementation specific mechanisms;

- for the same charging characteristics profile index, the new SGSN or the GGSN may have a different profile configured than the (old) SGSN. For example, charging characteristics profile corresponds to the charging characteristics profile index 1 on the old SGSN may have a different set of attributes compared to the charging characteristics profile corresponds to the charging characteristics profile index 1 on the new SGSN. This can only be avoided by careful alignment and configuration of charging characteristics profiles in the GSNs.

End of Change in Annex A
End of Document

Annex B (informative):
Change history

					Change history		
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Mar 2001	S_11	SP-010025	--	--	Replaces Release 99 of 3GPP 32.005, which will be discontinued from Release 4 onwards.	-	1.0.0
Jun 2001	S_12	SP-010236	--	--	Re-submitted to SA#12 for Information	1.1.0	1.1.1
Sep 2001	S_13	SP-010464	--	--	Submitted to TSG SA #13 for Approval	2.0.0	4.0.0
Mar 2002	S_15	SP-020022	001	--	Addition of CAMEL phase 3 extensions in SMS-MO CDR	4.0.0	4.1.0
Mar 2002	--	--	--	--	Cosmetics (title, styles, formatting, etc.)	4.1.0	4.1.1
Jun 2002	S_16	SP-020285	004	--	Corrections of parameter CallEventRecord	4.1.1	4.2.0
Dec 2002	S_18	SP-020734	006	--	Corrections on parameter Destination Number	4.2.0	4.3.0
Dec 2002	S_18	SP-020736	008	--	Alignment of LCS charging	4.2.0	4.3.0
Dec 2002	S_18	SP-020808	011	--	Corrections on MMS records ASN.1 definition	4.2.0	4.3.0
Mar 2003	S_19	SP-030054	013	--	CDR correction for data services over Iu-interface - alignment with SA1's 22.002	4.3.0	4.4.0
Sep 2003	S_21	SP-030407	019	--	Correction to positioning data in ASN.1.	4.4.0	4.5.0
Sep 2003	S_21	SP-030407	020	--	Correction of ASN.1 code errors in LCS definitions	4.4.0	4.5.0
Dec 2003	S_22	SP-030765	021	1	Add inter-network accounting in the GMSC (only if CN#22 approved CN3 CR 29.007)	4.5.0	4.6.0
Mar 2004	S_23	SP-040139	024	--	Correction to ASN.1 Charging Data Record (CDR) - Alignment with R99 32.005	4.6.0	4.7.0

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CHANGE REQUEST

⌘	**32.215** CR **035**	⌘**rev**	**-**	⌘	Current version:	**5.5.0**	⌘

*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:	⌘	Correction to the selection and use of charging characteristics and profiles

Source:	⌘	**SA5 SWG-B (gerald.goermer@siemens.com)**

Work item code:⌘	OAM-CH		***Date:*** ⌘	14/05/04

Category:	⌘	**A**	***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: ⌘		Incomplete charging characteristics selection procedures.

Summary of change:⌘		Procedures to resolve cases where GSN receives undefined charging characteristics are added. Description of charging characteristics profile and index are clarified.

Consequences if ⌘ ***not approved:***		Errors in GPRS Charging due to ambiguity in the selection and use of the charging characteristics profiles.

Clauses affected:	⌘	Annex A

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

Other comments:	⌘	Rel-5 Mirror CR of S5-044350.

Annex A (normative): Charging Characteristics

Charging Characteristics can be supplied by the HLR to the SGSN as part of the subscription information. A subscriber may have charging characteristics assigned to his subscription and/or his subscribed APNs. Charging Characteristics consists of a string of 16 bits designated as Profile (P) and Behaviour (B), shown in Figure 4. The first four bits (P – Profile bits) shall be used as profile index to select one of up to 16 charging characteristics profiles that may be configured on the GSN (i.e. the profile number corresponding to the decimal value represented by the P bits). The remaining 12 (B) bits can be freely assigned to particular charging behaviours that the GSNs support.

Examples of those behaviours are:

* Selection of the applicable idle context purge timer, i.e. use global value or use special value. This feature could be used to distinguish between customers and/or APNs whose PDP contexts should be purged after short (e.g. 30 minutes) or long (e.g. 12 hours) periods of inactivity.

* Use specific charging gateway address (override all other configured/selected CG addresses).

* Deactivate SMS-MO-CDRs for customers of the own PLMN using preconfigured SMSC addresses.

* Disable G-CDRs for roamers that use the HPLMN GGSN.

* Allow or inhibit the use of own GGSNs by visitors.

* Allow or inhibit network triggered QoS change (upgrade and/or downgrade).

Charging characteristics profile

The GSN shall support a minimum of one charging characteristic profile. The number of additional supported profiles (up to 15) is implementation specific.

Each profile consists of the following trigger sets:

* **S-CDR:** activate/deactivate CDRs, time limit, volume limit, maximum number of charging conditions, tariff times;

* **G-CDR:** same as SGSN, plus maximum number of SGSN changes;

* **M-CDR:** activate/deactivate CDRs, time limit, and maximum number of mobility changes;

* **SMS-MO-CDR:** activate/deactivate CDRs;

* **SMS-MT-CDR:** active/deactivate CDRs.

In addition to these trigger sets, the profile may also specify an optional charging gateway address. If this CGF address is configured in the GGSN's selected trigger profile, the GGSN shall apply it for the G-CDRs and send this charging gateway address in its GTP message exchange with the SGSN (overriding any other GGSN configured CGF address). In the home or visiting case, the SGSN shall apply the received CGF address to the S-CDRs pertaining to this PDP context. In the roaming case, or if no address is received from the GGSN, then the SGSN shall use the CGF address from its own selected charging characteristics trigger profile, or, if it does not exist, use the default CGF address. For M-CDRs and SMS CDRs, the SGSN shall use the CGF address configured in the charging characteristics that it applies to the respective CDRs, or if no such address is configured then the default CGF shall be used.

The Table below is an informative example intended for clarification.

Table 15: Example of Charging Characteristics Profiles

Profile Index bits 0 - 3	CGF Address	Active	S-CDR					G-CDR	
			Active	Time limit	Volume limit	Change cond	Tariff times	Active	...
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1	100.128.35.20	No		-	-	-	-		
2	-	Yes		10 min	50 K	1	0-24		
..	..	..		..	..	..	..		

Charging characteristics selection in GSN

~~The SGSN applies a preconfigured default if no c~~Charging characteristics ~~can r~~be supplied by the HLR to the SGSN as part of the subscription information. A subscriber may have charging characteristics assigned to his subscription and/or his subscribed APNs. In case of no charging characteristics are supplied by the HLR t~~T~~he SGSN shall support ~~three~~ different ~~charging characteristics~~ default configurations:

∗ the home default profile for subscribers of the SGSN's PLMN;

∗ the visiting default profile for visitors using a GGSN belonging to the same PLMN as the SGSN;

∗ the roaming default profile for visitors using a GGSN belonging to their home PLMN.

The SGSN can determine the GGSN PLMN from the operator identifier part of the APN. Optionally the SGSN may support several visiting and roaming default profiles based on the MNC/MCC combination of the subscriber.

The default configurations are implementation specific.

In the case of a home subscriber, the charging characteristics are selected by the SGSN according to the following procedures.

For PDP context specific cases~~charging characteristics~~ (i.e. ~~those used~~ for the S-CDRs that are generated for this PDP context):

♦ If the MS requests a particular APN then

  ∗ If the SGSN accepts this request (i.e. it has been verified against the subscription) then

    ▪ If it has been matched against the wildcard APN then

      - If charging characteristics for the wildcard APN are present in the subscription information then they shall be used;

      - If no charging characteristics are present for the wildcard APN but subscription related charging characteristics are present, then they shall be chosen;

      - If neither ~~of the two~~ are present then the SGSN home default shall be applied.

    ▪ If it has been matched against a specific subscribed APN then

      - If charging characteristics for this APN are present in the subscription information then they shall be used;

      - If no charging characteristics are present for the APN but subscription related charging characteristics are present, then they shall be chosen;

      - If neither ~~of the two~~ are present then the SGSN home default shall be applied.

  ∗ If the SGSN rejects the request then charging characteristics selection does not apply.

♦ If the MS does not request an APN then

  ∗ If the SGSN chooses a subscribed APN then

- If charging characteristics for this APN are present in the subscription information then they shall be used;

- If no charging characteristics are present for the APN but subscription related charging characteristics are present, then they shall be chosen;

- If neither ~~of the two are~~is present then the SGSN home default shall be applied.

* If only the wildcard APN is present in the subscription, i.e. the SGSN applies its configured default APN then

- If charging characteristics for the wildcard APN are present in the subscription information then they shall be used;

- If no charging characteristics are present for the wildcard APN but subscription related charging characteristics are present, then they shall be chosen;

- If neither ~~of the two are~~is present then the SGSN home default shall be applied.

For the non-PDP context specific CDR types, i.e. the M-CDRs and the SMS CDRs, the SGSN applies the subscription specific charging characteristics, or, if not supplied, it shall choose the home default profile as defined above.

In case of subscribers from other PLMNs, the SGSN may be configured to either apply the "home subscriber case" charging characteristics selection procedure defined above, or to ignore charging characteristics provided by the subscriber's HLR, and apply a default configuration instead. If default charging characteristics are selected for the foreign subscriber, then the SGSN shall choose either the visiting or roaming default profile for the PDP context specific charging characteristics, according to the roaming or visiting scenario, as described above. For M-CDRs and SMS CDRs, the operator can configure if the roaming or the visiting profile shall be applied, since no GGSN is involved.

Upon activation of a PDP context, the SGSN forwards the charging characteristics to the GGSN according to the following rules:

* if charging characteristics were received from the HLR, then they shall be sent as provided by the HLR, regardless of the home, visiting, or roaming case, and regardless of whether the SGSN applies the HLR supplied charging characteristics or chooses to ignore them;

* if no charging characteristics were received from the HLR, then the SGSN does not forward any charging characteristics to the GGSN.

The above procedure implies that no explicit transfer of the Charging Characteristics Selection Mode (see 3GPP TS 23.060) to the GGSN is necessary, because it is implicitly given as "subscribed" when the GGSN receives charging characteristics from the SGSN, and "non-subscribed" otherwise.

The GGSN shall also apply charging characteristics to its PDP contexts. It shall either apply the SGSN supplied parameters, or it may be configured to ignore the SGSN supplied charging characteristics in any combination of the following cases:

* visiting case, i.e. the subscriber belongs to a different PLMN;

* roaming case, i.e. the SGSN belongs to a different PLMN;

* home case, i.e. the subscriber belongs to the same PLMN as the GGSN; or

* unconditionally, i.e. it always ignores the SGSN supplied parameters.

If the GGSN ignores the parameters supplied by the SGSN, it shall nevertheless accept the PDP context request. It shall then apply its own preconfigured charging characteristics as appropriate, i.e. the home, visiting or roaming profile. The GGSN shall support the configuration of one set of default charging characteristics (i.e. home, visiting, roaming) for each of its supported APNs.

~~Charging Characteristics consists of a string of 16 bits designated as Profile (P) and Behaviour (B), shown in Figure 4. The first four bits (P) shall be used to select different charging trigger profiles, where each profile consists of the following trigger sets:~~

* ~~**S-CDR:** activate/deactivate CDRs, time limit, volume limit, maximum number of charging conditions, tariff times;~~

* **G-CDR:** same as SGSN, plus maximum number of SGSN changes;

* **M-CDR:** activate/deactivate CDRs, time limit, and maximum number of mobility changes;

* **SMS-MO-CDR:** activate/deactivate CDRs;

* **SMS-MT-CDR:** active/deactivate CDRs.

In addition to these trigger sets, the profile may also specify an optional charging gateway address. If this CGF address is configured in the GGSN's selected trigger profile, the GGSN shall apply it for the G-CDRs and send this charging gateway address in its GTP message exchange with the SGSN (overriding any other GGSN configured CGF address). In the home or visiting case, the SGSN shall apply the received CGF address to the S-CDRs pertaining to this PDP context. In the roaming case, or if no address is received from the GGSN, then the SGSN shall use the CGF address from its own selected charging characteristics trigger profile, or, if it does not exist, use the default CGF address. For M-CDRs and SMS-CDRs, the SGSN shall use the CGF address configured in the charging characteristics that it applies to the respective CDRs, or if no such address is configured then the default CGF shall be used.

The Table below is an informative example intended for clarification.

Table 15: Example of Charging Characteristics Profiles

Profile Index bits 0 - 3	CGF Address	S-CDR					G-CDR	
		Active	Time limit	Volume limit	Change cond	Tariff times	Active	...
0	-	Yes	30 min	100 K	2	0-7, 7-12, ...		
1	100.128.35.20	No	-	-	-	-		
2	-	Yes	10 min	50 K	1	0-24		
..	..	..	..	..	..	..		

The remaining 12 (B) bits can be freely assigned to particular charging behaviours that the GSNs support. Examples of those behaviours are:

* Selection of the applicable idle context purge timer, i.e. use global value or use special value. This feature could be used to distinguish between customers and/or APNs whose PDP contexts should be purged after short (e.g. 30 minutes) or long (e.g. 12 hours) periods of inactivity.

* Use specific charging gateway address (override all other configured/selected CG addresses).

* Deactivate SMS-MO-CDRs for customers of the own PLMN using preconfigured SMSC addresses.

* Disable G-CDRs for roamers that use the HPLMN GGSN.

* Allow or inhibit the use of own GGSNs by visitors.

* Allow or inhibit network triggered QoS change (upgrade and/or downgrade).

The SGSN selects the applicable charging characteristics and associated charging characteristics profile for M-CDR generation upon the creation of a MM context. Both SGSN and GGSN select the applicable charging characteristics and associated charging characteristics profile for PDP context CDR generation (i.e. S-CDR and G-CDR, respectively) upon creation of a PDP context or secondary PDP context. Once selected, the charging characteristics and charging characteristics profile shall be maintained throughout the lifetime of the MM or PDP contexts on that SGSN and GGSN. If the SGSN receives modified subscriber information from the HLR (e.g. execution of a stand-alone Insert Subscriber Data procedure) which includes changes to the charging characteristics or if the charging characteristics profile is changed, these changes shall only be applied only to new MM, PDP and secondary PDP contexts. As a result, this implies that the SGSN shall not send PDP context modifications are triggert for the existing PDP contexts to the GGSN.

Upon inter-SGSN RAU, the new SGSN receives PDP context charging characteristics for every PDP context from the old SGSN as described in TS 29.060 [08]. If the new SGSN also receives charging characteristics for the existing PDP contexts from the HLR, then these (the ones coming from the HLR) shall be ignored.

Under certain circumstances it is possible that different charging characteristics are applied by the GSNs serving the same PDP contexts:

- If a GSN receives a charging characteristics profile index that is not configured or supported on that GSN, the GSN shall select one of the valid default configurations. This may be achieved by executing the selection procedure described in this annex, or by implementation specific mechanisms;

- for the same charging characteristics profile index, the new SGSN or the GGSN may have a different profile configured than the (old) SGSN. For example, charging characteristics profile corresponds to the charging characteristics profile index 1 on the old SGSN may have a different set of attributes compared to the charging characteristics profile corresponds to the charging characteristics profile index 1 on the new SGSN. This can only be avoided by careful alignment and configuration of charging characteristics profiles in the GSNs.

**End of Change in Annex A
End of Document**

Annex B (informative):
Change history

Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
May 2001	--	--	--	--	Transferred from 3GPP 32.015 v3.5.0.	--	1.0.0
Jun 2001	S_12	SP-010236	--	--	Submitted to TSG SA #12 for Information	1.0.0	1.0.1
Sep 2001	S_13	SP-010464	--	--	Submitted to TSG SA #13 for Approval	2.0.0	4.0.0
Dec 2001	S_14	SP-010633	001	--	Specification of the "Data Record Format" and "Data Record Format Version"	4.0.0	4.1.0
Dec 2001	S_14	SP-010633	002	--	Correction of ASN.1 data item QosInformation	4.0.0	4.1.0
Dec 2001	S_14	SP-010634	003	--	Correction of ASN.1 statements for backwards compatibility reason	4.0.0	4.1.0
Mar 2002	S_15	SP-020022	004	--	Addition of CAMEL phase 3 extensions in SMS-MO CDR	4.1.0	4.2.0
Mar 2002	S_15	SP-020024	005	--	Addition of "QoSRequested" parameter into "traffic volume containers"	4.1.0	4.2.0
Mar 2002	S_15	SP-020025	006	--	Addition of CAMEL phase 4 extensions in SMS-MT CDRs	4.2.0	5.0.0
Jun 2002	S_16	SP-020289	007	--	Addition of real-time delivery of Charging Data Records (CDRs) to the Billing System	5.0.0	5.1.0
Jun 2002	S_16	SP-020289	008	--	Alignment of CDRs' IPv4 versus IPv6 address usage with architectural principles	5.0.0	5.1.0
Jun 2002	S_16	SP-020286	010	--	Correction of S-CDR triggers	5.0.0	5.1.0
Jun 2002	S_16	SP-020289	011	--	Addition of external charging identifier into G-CDR	5.0.0	5.1.0
Jun 2002	S_16	SP-020289	012	--	Addition of an "IMS signalling PDP context" flag into G-CDR	5.0.0	5.1.0
Jun 2002	S_16	SP-020288	014	--	Correcting definition of traffic data volume CDR field & Specify usage of the LRSN to avoid loss of billing data	5.0.0	5.1.0
Jun 2002	S_16	SP-020285	016	--	Alignment with 23.271 (LCS stage 2) of CDR definition for LCS in PS domain	5.0.0	5.1.0
Dec 2002	S_18	SP-020734	018	--	Corrections on parameter Destination Number	5.1.0	5.2.0
Dec 2002	S_18	SP-020736	021	--	Corrections on LCS error cause definitions	5.1.0	5.2.0
Dec 2002	S_18	SP-020738	022	--	IPv4-IPv6 co-existence in PS charging	5.1.0	5.2.0
Dec 2002	S_18	SP-020738	023	--	Correction of the list of parameters of the QoS profile (requested and negotiated)	5.1.0	5.2.0
Dec 2002	S_18	SP-020738	024	--	Extension of CDR encoding	5.1.0	5.2.0
Mar 2003	S_19	SP-030055	025	--	Addition of SGSN's Mobile Country Code (MCC) and Mobile Network Code (MNC) on G-CDR - alignment with CN4's 29.060	5.2.0	5.3.0
Jun 2003	S_20	SP-030270	026	--	Correction of "Cause Code"	5.3.0	5.4.0
Dec 2003	S_22	SP-030618	029	--	Correction of "Data Record Format Version"	5.4.0	5.5.0
Dec 2003	S_22	SP-030620	030	--	Correction to Level of CAMEL Service	5.4.0	5.5.0
Dec 2003	S_22	SP-030621	031	--	Correction on QoS Information (only if CN#22 approved CN4 CR 24.060)	5.4.0	5.5.0