3GPP TSG CN Plenary Meeting #22 **NP-030504**
10th – 12th December 2003 Maui, USA.

Source: TSG CN WG4

Title: Corrections on small Technical Enhancements and Improvements

Agenda item: 8.8

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
23.003	080		N4-031348		Changes and corrections to DNS names	F	5.7.0
23.003	081		N4-031349		Changes and corrections to DNS names	A	6.0.0

3GPP TSG CN WG4 Meeting #21 **N4-031348**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.003** **CR** **080** ⌘ **rev** **-** ⌘ Current version: **5.7.0** ⌘

*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 ☒

Title:	⌘	Changes and corrections to DNS names
Source:	⌘	CN4
Work item code:	⌘	TEI_5
Date:	⌘	30/10/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

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

Reason for change: ⌘ **Essential Correction**

In an LS from the GSMA IREG working group (N4-030932) it was stated that a root DNS architecture for the ".gprs" top level domain is being set up by the GSMA for the private, inter-PLMN IP backbone known as the GRX. The LS identified some inconsistencies with definitions of the ".gprs" domain and asked that these be corrected.

Summary of change: ⌘

1. All occurences of the ".gprs" TLD are corrected to *consistently* specify domains to be of the form "mnc<MNC>.mcc<MCC>.gprs"; where MNC is 3 digits (with a zero added at the beginning for 2 digit MNCs) and MCC is 3 digits. For added consistency and ease of reading, they are also all now specified in lower case (although it is noted that the DNS is case insensitive).
2. A few miscellaneous errors in grammar and punctuation are corrected.
3. When referring to the content of DNS servers, the word "shall" has been replaced with the word "will" as the functionality should not be *mandated*, rather it should be *stated* (it is the job of the GSMA to *mandate* – or at least recommend – interworking configuration). This word change is in accordance with the drafting rules in TS 21.801; specifically Annex E (normative) "Verbal forms for the expression of provisions", table E.5.

Consequences if not approved: ⌘

1. Inconsistent definitions of the "mnc<MNC>.mcc<MCC>.gprs" domain will exist which will result in confusion for implementors and possibly additional, non-standardised entries in DNS servers having to be added to accommodate both 3 and 4 digit MNC & MCCs (even though they will point to the same PLMN!) to avoid interworking problems.

Clauses affected: ⌘ 9.1.1, 9.1.2, 13.2, 13.3, 13.4, Annex C (C.1, C.2, C.3)

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

****** First Modified Section ******

9 Definition of Access Point Name

In the GPRS backbone, an Access Point Name (APN) is a reference to a GGSN. To support inter-PLMN roaming, the internal GPRS DNS functionality is used to translate the APN into the IP address of the GGSN.

9.1 Structure of APN

The APN is composed of two parts as follows:

- The APN Network Identifier; this defines to which external network the GGSN is connected and optionally a requested service by the MS. This part of the APN is mandatory.
- The APN Operator Identifier; this defines in which PLMN GPRS backbone the GGSN is located. This part of the APN is optional.

The APN Operator Identifier is placed after the APN Network Identifier. An APN consisting of both the Network Identifier and Operator Identifier corresponds to a DNS name of a GGSN; it has a maximum length of 100 octets.

The syntax of the APN shall follow the Name Syntax defined in RFC 2181 [18], RFC 1035 [19] and RFC 1123 [20]. The APN consists of one or more labels. Each label is coded as a one octet length field followed by that number of octets coded as 8 bit ASCII characters. Following RFC 1035 [19] the labels shall consist only of the alphabetic characters (A-Z and a-z), digits (0-9) and the hyphen (-). Following RFC 1123 [20], the label shall begin and end with either an alphabetic character or a digit. The case of alphabetic characters is not significant. The APN is not terminated by a length byte of zero.

NOTE: A length byte of zero is added by the SGSN at the end of the APN before interrogating a DNS server.

For the purpose of presentation, an APN is usually displayed as a string in which the labels are separated by dots (e.g. "Label1.Label2.Label3").

9.1.1 Format of APN Network Identifier

The APN Network Identifier shall contain at least one label and shall have a maximum length of 63 octets. An APN Network Identifier shall not start with any of the strings "rac", "lac", "sgsn" or "rnc", and it shall not end in ".gprs". Further, it shall not take the value "*".

In order to guarantee uniqueness of APN Network Identifiers within or between GPRS PLMN~~(s)~~, an APN Network Identifier containing more than one label shall correspond~~s~~ to an Internet domain name. This name should only be allocated by the PLMN if that PLMN belongs to an organisation which has officially reserved this name in the Internet domain. Other types of APN Network Identifiers are not guaranteed to be unique within or between GPRS PLMN~~(s)~~.

An APN Network Identifier may be used to access a service associated with a GGSN. This may be achieved by defining:

- an APN which corresponds to a DNS name of a GGSN, and which is locally interpreted by the GGSN as a request for a specific service, or
- an APN Network Identifier consisting of 3 or more labels and starting with a Reserved Service Label, or an APN Network Identifier consisting of a Reserved Service Label alone, which indicates a GGSN by the nature of the requested service. Reserved Service Labels and the corresponding services they stand for shall be agreed ~~among~~ between operators who have GPRS roaming agreements.

9.1.2 Format of APN Operator Identifier

The APN Operator Identifier is composed of three labels. The last label (or domain) shall be ".gprs". The first and second labels together shall uniquely identify the GPRS PLMN ~~(e.g. "<operator-name>.<operator-group>.gprs")~~.

For each operator, there is a default APN Operator Identifier (i.e. domain name). This default APN Operator Identifier is derived from the IMSI as follows:

"mnc<MNC>.mcc<MCC>.gprs"

where:

"mnc" and "mcc" serve as invariable identifiers for the following digits.

<MNC> and <MCC> are derived from the components of the IMSI defined in subclause 2.2.

This default APN Operator Identifier is used in inter-PLMN roaming situations when attempting to translate an APN consisting only of a Network Identifier into the IP address of the GGSN in the HPLMN. The PLMN may provide DNS translations for other, more human-readable, APN Operator Identifiers in addition to the default Operator Identifier described above.

In order to guarantee inter-PLMN DNS translation ~~possibility~~, the <MNC> and <MCC> coding used in the "mnc<MNC>.mcc<MCC>.gprs" format of the APN OI shall be:

- <MNC> = 3 digits
- <MCC> = 3 digits
- If there are only 2 significant digits in the MNC, one "0" digit is inserted at the left side to fill the 3 digits coding of MNC in the APN OI.

As an example, the APN OI for MCC 345 and MNC 12 ~~shall~~ will be coded in the DNS as "mnc012.mcc345.gprs".

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

Annex C (normative): Naming convention

This normative annex defines ~~A~~a naming convention which will make it possible for DNS servers to translate logical names for GSNs and RAs to physical IP addresses ~~is described in this normative annex~~. The use of logical names is optional, but if the option is used, it shall comply with the naming convention described in this annex.

C.1 Routing Area Identities

This subclause describes a~~A~~ possible way to support inter-PLMN roaming ~~is discussed very briefly in this clause~~.

When an MS roams between two SGSNs within the same PLMN, the new SGSN finds the address of the old SGSN ~~by~~ from the identity of the ~~association~~ old RA ~~old SGSN~~. Thus, each SGSN ~~knows~~ can determine the address of every other SGSN in the PLMN.

When an MS roams from an SGSN in one PLMN to an SGSN in another PLMN, the new SGSN may ~~not~~ be ~~itself have access~~unable to determine the address of the old SGSN. Instead, the SGSN transforms the old RA information to a logical name of the form:

~~*RACxxxx.LACyyyy.MNCzzzz.MCCwwww.GPRS*~~*racAAAA.lacBBBB.mncYYY.mccZZZ.gprs*

A~~x~~ and B~~y~~ shall be Hex coded digits; ~~z~~Y and ~~w~~Z shall be encoded as single digits (in the range 0-9).~~.~~

If there are less than 4 significant digits in ~~xxxx~~AAAA~~,~~ or ~~yyyy~~BBBB~~, zzzz or wwww~~, one or more "0" digit(s) is/are inserted at the left side to fill the 4 digit coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digit coding.

As an example, the logical name for RAC 123A, LAC 234B, MCC 167 and MNC 92 ~~shall~~ will be coded in the DNS server as:

~~*RAC123A.LAC234B.MNC0092.MCC0167.GPRS.*~~*rac123A.lac234B.mnc092.mcc167.gprs*

The SGSN may then acquire the IP address of the old SGSN from a DNS server, using the logical address. Introducing the DNS concept in GPRS enables operators to use logical names instead of IP addresses when referring to nodes (e.g. GSNs), thus providing flexibility and transparency in addressing. Each PLMN should include at least one DNS server (which may optionally be connected via the DNS service provided by the GSM Association). Note that these DNS servers are GPRS internal entities, unknown outside the GPRS system.

The above implies that at least MCC || MNC || LAC || RAC (= RAI) is sent as the RA parameter over the radio interface when an MS roams to another RA.

If for any reason the new SGSN fails to obtain the address of the old SGSN, the new SGSN takes the same actions ~~are taken~~ as when the corresponding event occurs within one PLMN.

~~Introducing the DNS concept in GPRS gives a general possibility to use logical names instead of IP addresses when referring to (e.g.) GSNs, thus providing flexibility in addressing PLMN nodes.~~

Another way to support seamless inter-PLMN roaming is to store the SGSN IP addresses in the HLR and request them when necessary.

If Intra Domain Connection of RAN Nodes to Multiple CN Nodes (see 3GPP TS 23.236 [23]) is applied then the Network Resource Identifier (NRI) identifies uniquely a given SGSN node out of all the SGSNs serving the same pool area.

If the new SGSN is not able to extract the NRI from the old P-TMSI, it shall retrieve the address of the default SGSN (see 3GPP TS 23.236 [23]) serving the old RA, using the logical name described earlier in this section. The default SGSN in the old RA relays the GTP signalling to the old SGSN identified by the NRI in the old P-TMSI unless the default SGSN itself is the old SGSN.

If the new SGSN is able to extract the NRI from the old P-TMSI, then it shall attempt to derive the address of the old SGSN from the NRI and the old RAI. NRI-to-SGSN assignments may be either configured (by O&M) in the new SGSN, or retrieved from a DNS server. If a DNS server is used, it shall be queried using the following logical name, derived from the old RAI and NRI information:

~~*NRIxxxx.RACyyyy.LACzzzz.MNCvvvv.MCCwwww.GPRS*~~*nriCCCC.racDDDD.lacEEEE.mncYYY.mccZZZ.gprs*

~~x~~C, ~~y~~D and ~~z~~E shall be Hex coded digits, ~~v~~Y and ~~w~~Z shall be encoded as single digits (in the range 0-9). If there are less than 4 significant digits in ~~xxxx~~CCCC, ~~yyyy~~DDDD~~,~~ or ~~zzzz~~EEEE~~,~~ ~~vvvv or wwww,~~ one or more "0" digit(s) is/are inserted at the left side to fill the 4 digit coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digits coding.

As an example, the logical name for NRI 3A, RAC 123A, LAC 234B, MCC 167 and MNC 92 ~~shall~~ will be coded in the DNS server as:

~~*NRI003A.RAC123A.LAC234B.MNC0092.MCC0167.GPRS.*~~*nri003A.rac123A.lac234B.mnc092.mcc167.gprs*

If for any reason the new SGSN fails to obtain the address of the old SGSN using this method, then as a fallback method it shall retrieve the address of the default SGSN serving the old RA.

C.2 GPRS Support Nodes

~~In t~~This subclause defines a naming convention for GSNs ~~is described~~.

It shall be possible to refer to a GSN by a logical name which shall then be translated into a physical IP address. This clause proposes a GSN naming convention which would make it possible for an internal GPRS DNS server to make the translation.

An example of how a logical name of an SGSN could appear is:

~~*SGSNxxxx.MNCyyyy.MCCzzzz.GPRS*~~*sgsnXXXX.mncYYY.mccZZZ.gprs*

~~x~~X, ~~y and z~~ shall be Hex coded digits, Y~~y~~ and ~~z~~Z shall be encoded as single digits (in the range 0-9)..

If there are less than 4 significant digits in ~~xxxx~~XXXX, ~~yyyy, zzzz,~~ one or more "0" digit(s) is/are inserted at the left side to fill the 4 digits coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digit coding.

As an example, the logical name for SGSN 1B34, MCC 167 and MNC 92 ~~shall~~ will be coded in the DNS server as:

~~*SGSN1B34. MNC0092.MCC0167.GPRS.*~~*sgsn1B34. mnc092.mcc167.gprs*

C.3 Target ID

~~In t~~This subclause describes a possible way to support SRNS relocation ~~is described~~.

In UMTS, when ~~an~~ SRNS relocation is executed, a target ID which consists of MCC, MNC and RNC ID is used as routeing information to route to the target RNC via the new SGSN. An old SGSN shall resolve a new SGSN IP address by a target ID to send the Forward Relocation Request message to the new SGSN.

It shall be possible to refer to a target ID by a logical name which shall be translated into an SGSN IP address to take into account inter-PLMN handover ~~into account~~. The old SGSN transforms the target ID information into a logical name of the form:

~~*RNCxxxx.MNCyyyy.MCCzzzz.GPRS;*~~*rncXXXX.mncYYY.mccZZZ.gprs*

X~~x~~ shall be Hex coded digits; Y~~y~~ and ~~z~~Z shall be encoded as single digits (in the range 0-9). If there are less than 4 significant digits in XXXX, one or more "0" digit(s) is/are inserted at the left side to fill the 4 digits coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digit coding. Then, for example, a DNS server is used to translate the logical name to an SGSN IP address.

~~If there are less than 4 significant digits in xxxx, yyyy, zzzz, one or more "0" digit(s) is/are inserted at the left side to fill the 4 digits coding.~~

As an example, the logical name for RNC 1B34, MCC 167 and MNC 92 ~~shall~~will be coded in the DNS server as:

~~*RNC1B34. MNC0092.MCC0167.GPRS.*~~*rnc1B34.mnc092.mcc167.gprs*

****** End of document ******

3GPP TSG CN WG4 Meeting #21 **N4-031349**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.003** **CR** **081** ⌘ **rev** **-** ⌘ Current version: **6.0.0** ⌘

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

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

Title: ⌘	Changes and corrections to DNS names	
Source: ⌘	CN4	
Work item code: ⌘	TEI5	***Date:*** ⌘ 30/10/2003
Category: ⌘	**A**	***Release:*** ⌘ Rel-6

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: ⌘	**Essential Correction** In an LS from the GSMA IREG working group (N4-030932) it was stated that a root DNS architecture for the ".gprs" top level domain is being set up by the GSMA for the private, inter-PLMN IP backbone known as the GRX. The LS identified some inconsistencies with definitions of the ".gprs" domain and asked that these be corrected.
Summary of change: ⌘	1. All occurences of the ".gprs" TLD are corrected to *consistently* specify domains to be of the form "mnc<MNC>.mcc<MCC>.gprs"; where MNC is 3 digits (with a zero added at the beginning for 2 digit MNCs) and MCC is 3 digits. For added consistency and ease of reading, they are also all now specified in lower case (although it is noted that the DNS is case insensitive). 2. A few miscellaneous errors in grammar and punctuation are corrected. 3. When referring to the content of DNS servers, the word "shall" has been replaced with the word "will" as the functionality should not be *mandated*, rather it should be *stated* (it is the job of the GSMA to *mandate* – or at least recommend – interworking configuration). This word change is in accordance with the drafting rules in TS 21.801; specifically Annex E (normative) "Verbal forms for the expression of provisions", table E.5.
Consequences if not approved: ⌘	1. Inconsistent definitions of the "mnc<MNC>.mcc<MCC>.gprs" domain will exist which will result in confusion for implementors and possibly additional, non-standardised entries in DNS servers having to be added to accommodate both 3 and 4 digit MNC & MCCs (even though they will point to the same PLMN!) to avoid interworking problems.

Clauses affected: ⌘	9.1.1, 9.1.2, 13.2, 13.3, 13.4, Annex C (C.1, C.2, C.3)

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

****** First Modified Section ******

9 Definition of Access Point Name

In the GPRS backbone, an Access Point Name (APN) is a reference to a GGSN. To support inter-PLMN roaming, the internal GPRS DNS functionality is used to translate the APN into the IP address of the GGSN.

9.1 Structure of APN

The APN is composed of two parts as follows:

- The APN Network Identifier; this defines to which external network the GGSN is connected and optionally a requested service by the MS. This part of the APN is mandatory.
- The APN Operator Identifier; this defines in which PLMN GPRS backbone the GGSN is located. This part of the APN is optional.

The APN Operator Identifier is placed after the APN Network Identifier. An APN consisting of both the Network Identifier and Operator Identifier corresponds to a DNS name of a GGSN; it has a maximum length of 100 octets.

The syntax of the APN shall follow the Name Syntax defined in RFC 2181 [18], RFC 1035 [19] and RFC 1123 [20]. The APN consists of one or more labels. Each label is coded as a one octet length field followed by that number of octets coded as 8 bit ASCII characters. Following RFC 1035 [19] the labels shall consist only of the alphabetic characters (A-Z and a-z), digits (0-9) and the hyphen (-). Following RFC 1123 [20], the label shall begin and end with either an alphabetic character or a digit. The case of alphabetic characters is not significant. The APN is not terminated by a length byte of zero.

NOTE: A length byte of zero is added by the SGSN at the end of the APN before interrogating a DNS server.

For the purpose of presentation, an APN is usually displayed as a string in which the labels are separated by dots (e.g. "Label1.Label2.Label3").

9.1.1 Format of APN Network Identifier

The APN Network Identifier shall contain at least one label and shall have a maximum length of 63 octets. An APN Network Identifier shall not start with any of the strings "rac", "lac", "sgsn" or "rnc", and it shall not end in ".gprs". Further, it shall not take the value "*".

In order to guarantee uniqueness of APN Network Identifiers within or between GPRS PLMN~~(s)~~, an APN Network Identifier containing more than one label shall correspond~~s~~ to an Internet domain name. This name should only be allocated by the PLMN if that PLMN belongs to an organisation which has officially reserved this name in the Internet domain. Other types of APN Network Identifiers are not guaranteed to be unique within or between GPRS PLMN~~(s)~~.

An APN Network Identifier may be used to access a service associated with a GGSN. This may be achieved by defining:

- an APN which corresponds to a DNS name of a GGSN, and which is locally interpreted by the GGSN as a request for a specific service, or
- an APN Network Identifier consisting of 3 or more labels and starting with a Reserved Service Label, or an APN Network Identifier consisting of a Reserved Service Label alone, which indicates a GGSN by the nature of the requested service. Reserved Service Labels and the corresponding services they stand for shall be agreed ~~among~~ between operators who have GPRS roaming agreements.

9.1.2 Format of APN Operator Identifier

The APN Operator Identifier is composed of three labels. The last label (or domain) shall be ".gprs". The first and second labels together shall uniquely identify the GPRS PLMN ~~(e.g. "<operator-name>.<operator-group>.gprs")~~.

For each operator, there is a default APN Operator Identifier (i.e. domain name). This default APN Operator Identifier is derived from the IMSI as follows:

"mnc<MNC>.mcc<MCC>.gprs"

where:

"mnc" and "mcc" serve as invariable identifiers for the following digits.

<MNC> and <MCC> are derived from the components of the IMSI defined in subclause 2.2.

This default APN Operator Identifier is used in inter-PLMN roaming situations when attempting to translate an APN consisting only of a Network Identifier into the IP address of the GGSN in the HPLMN. The PLMN may provide DNS translations for other, more human-readable, APN Operator Identifiers in addition to the default Operator Identifier described above.

In order to guarantee inter-PLMN DNS translation ~~possibility~~, the <MNC> and <MCC> coding used in the "mnc<MNC>.mcc<MCC>.gprs" format of the APN OI shall be:

- <MNC> = 3 digits
- <MCC> = 3 digits
- If there are only 2 significant digits in the MNC, one "0" digit is inserted at the left side to fill the 3 digits coding of MNC in the APN OI.

As an example, the APN OI for MCC 345 and MNC 12 ~~shall~~ will be coded in the DNS as "mnc012.mcc345.gprs".

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

Annex C (normative): Naming convention

This normative annex defines ~~A~~a naming convention which will make it possible for DNS servers to translate logical names for GSNs and RAs to physical IP addresses ~~is described in this normative annex~~. The use of logical names is optional, but if the option is used, it shall comply with the naming convention described in this annex.

C.1 Routing Area Identities

This subclause describes a~~A~~ possible way to support inter-PLMN roaming ~~is discussed very briefly in this clause~~.

When an MS roams between two SGSNs within the same PLMN, the new SGSN finds the address of the old SGSN ~~by~~ from the identity of the ~~association~~ old RA ~~old SGSN~~. Thus, each SGSN ~~knows~~ can determine the address of every other SGSN in the PLMN.

When an MS roams from an SGSN in one PLMN to an SGSN in another PLMN, the new SGSN may ~~not~~ be ~~itself have access~~unable to determine the address of the old SGSN. Instead, the SGSN transforms the old RA information to a logical name of the form:

~~*RACxxxx.LACyyyy.MNCzzzz.MCCwwww.GPRS*~~*racAAAA.lacBBBB.mncYYY.mccZZZ.gprs*

A~~x~~ and B~~y~~ shall be Hex coded digits; ~~z~~Y and ~~w~~Z shall be encoded as single digits (in the range 0-9).~~.~~

If there are less than 4 significant digits in ~~xxxx~~AAAA~~,~~ or ~~yyyy~~BBBB~~, zzzz or wwww~~, one or more "0" digit(s) is/are inserted at the left side to fill the 4 digit coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digit coding.

As an example, the logical name for RAC 123A, LAC 234B, MCC 167 and MNC 92 ~~shall~~ will be coded in the DNS server as:

~~*RAC123A.LAC234B.MNC0092.MCC0167.GPRS.*~~*rac123A.lac234B.mnc092.mcc167.gprs*

The SGSN may then acquire the IP address of the old SGSN from a DNS server, using the logical address. Introducing the DNS concept in GPRS enables operators to use logical names instead of IP addresses when referring to nodes (e.g. GSNs), thus providing flexibility and transparency in addressing. Each PLMN should include at least one DNS server (which may optionally be connected via the DNS service provided by the GSM Association). Note that these DNS servers are GPRS internal entities, unknown outside the GPRS system.

The above implies that at least MCC || MNC || LAC || RAC (= RAI) is sent as the RA parameter over the radio interface when an MS roams to another RA.

If for any reason the new SGSN fails to obtain the address of the old SGSN, the new SGSN takes the same actions ~~are taken~~ as when the corresponding event occurs within one PLMN.

~~Introducing the DNS concept in GPRS gives a general possibility to use logical names instead of IP addresses when referring to (e.g.) GSNs, thus providing flexibility in addressing PLMN nodes.~~

Another way to support seamless inter-PLMN roaming is to store the SGSN IP addresses in the HLR and request them when necessary.

If Intra Domain Connection of RAN Nodes to Multiple CN Nodes (see 3GPP TS 23.236 [23]) is applied then the Network Resource Identifier (NRI) identifies uniquely a given SGSN node out of all the SGSNs serving the same pool area.

If the new SGSN is not able to extract the NRI from the old P-TMSI, it shall retrieve the address of the default SGSN (see 3GPP TS 23.236 [23]) serving the old RA, using the logical name described earlier in this section. The default SGSN in the old RA relays the GTP signalling to the old SGSN identified by the NRI in the old P-TMSI unless the default SGSN itself is the old SGSN.

If the new SGSN is able to extract the NRI from the old P-TMSI, then it shall attempt to derive the address of the old SGSN from the NRI and the old RAI. NRI-to-SGSN assignments may be either configured (by O&M) in the new SGSN, or retrieved from a DNS server. If a DNS server is used, it shall be queried using the following logical name, derived from the old RAI and NRI information:

~~*NRIxxxx.RACyyyy.LACzzzz.MNCvvvv.MCCwwww.GPRS*~~*nriCCCC.racDDDD.lacEEEE.mncYYY.mccZZZ.gprs*

~~x~~C, ~~y~~D and ~~z~~E shall be Hex coded digits, ~~v~~Y and ~~w~~Z shall be encoded as single digits (in the range 0-9). If there are less than 4 significant digits in ~~xxxx~~CCCC, ~~yyyy~~DDDD~~,~~ or ~~zzzz~~EEEE~~,~~ ~~vvvv or wwww,~~ one or more "0" digit(s) is/are inserted at the left side to fill the 4 digit coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digits coding.

As an example, the logical name for NRI 3A, RAC 123A, LAC 234B, MCC 167 and MNC 92 ~~shall~~ will be coded in the DNS server as:

~~*NRI003A.RAC123A.LAC234B.MNC0092.MCC0167.GPRS.*~~*nri003A.rac123A.lac234B.mnc092.mcc167.gprs*

If for any reason the new SGSN fails to obtain the address of the old SGSN using this method, then as a fallback method it shall retrieve the address of the default SGSN serving the old RA.

C.2 GPRS Support Nodes

~~In t~~This subclause defines a naming convention for GSNs ~~is described~~.

It shall be possible to refer to a GSN by a logical name which shall then be translated into a physical IP address. This clause proposes a GSN naming convention which would make it possible for an internal GPRS DNS server to make the translation.

An example of how a logical name of an SGSN could appear is:

~~*SGSNxxxx.MNCyyyy.MCCzzzz.GPRS*~~*sgsnXXXX.mncYYY.mccZZZ.gprs*

~~x~~X, ~~y and z~~ shall be Hex coded digits, Y~~y~~ and ~~z~~Z shall be encoded as single digits (in the range 0-9)..

If there are less than 4 significant digits in ~~xxxx~~XXXX, ~~yyyy, zzzz,~~ one or more "0" digit(s) is/are inserted at the left side to fill the 4 digits coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digit coding.

As an example, the logical name for SGSN 1B34, MCC 167 and MNC 92 ~~shall~~ will be coded in the DNS server as:

~~*SGSN1B34. MNC0092.MCC0167.GPRS.*~~*sgsn1B34. mnc092.mcc167.gprs*

C.3 Target ID

~~In t~~This subclause describes a possible way to support SRNS relocation ~~is described~~.

In UMTS, when ~~an~~ SRNS relocation is executed, a target ID which consists of MCC, MNC and RNC ID is used as routeing information to route to the target RNC via the new SGSN. An old SGSN shall resolve a new SGSN IP address by a target ID to send the Forward Relocation Request message to the new SGSN.

It shall be possible to refer to a target ID by a logical name which shall be translated into an SGSN IP address to take into account inter-PLMN handover ~~into account~~. The old SGSN transforms the target ID information into a logical name of the form:

~~*RNCxxxx.MNCyyyy.MCCzzzz.GPRS;*~~*rncXXXX.mncYYY.mccZZZ.gprs*

X~~x~~ shall be Hex coded digits; Y~~y~~ and ~~z~~Z shall be encoded as single digits (in the range 0-9). If there are less than 4 significant digits in XXXX, one or more "0" digit(s) is/are inserted at the left side to fill the 4 digits coding. If there are only 2 significant digits in YYY, a "0" digit is inserted at the left side to fill the 3 digit coding. Then, for example, a DNS server is used to translate the logical name to an SGSN IP address.

~~If there are less than 4 significant digits in xxxx, yyyy, zzzz, one or more "0" digit(s) is/are inserted at the left side to fill the 4 digits coding.~~

As an example, the logical name for RNC 1B34, MCC 167 and MNC 92 ~~shall~~will be coded in the DNS server as:

~~*RNC1B34. MNC0092.MCC0167.GPRS.*~~*rnc1B34.mnc092.mcc167.gprs*

****** End of document ******