3GPP TSG CN Plenary Meeting #21   **NP-030440**
17th - 19th September 2003. Frankfurt, Germany

Title:	**[DRAFT]** LS on DNS domains used in 3GPP TS 23.003
Response to:	LS (N4-030876) on Changes to enable the GSMA root DNS architecture.
Release:	Rel-5 onwards.

Source:	3GPP TSG CN
To:	GSMA IREG
Cc:	3GPP TSG CN WG4, 3GPP TSG CN WG1

Contact Person:
    Name: Ian Park
    Tel. Number: +44 (0)1635 673 527
    E-mail Address: Ian.Park@gb.vodafone.co.uk

Attachments: NP-030370

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1. Overall Description:

3GPP TSG CN thanks the GSMA IREG WG for their LS (originally addressed to 3GPP TSG CN WG4) identifying inconsistencies within the "Numbering, Addressing and Identification" document, 3GPP TS 23.003, pertaining to the definitions of the ".gprs" domain and the specification of the domain "3gppnetwork.org".

3GPP TSG CN informs GSMA IREG WG that the attached change request to 3GPP TS 23.003 was presented to CN as a company contribution, but concerns were raised which led CN to decide to refer the CR back to CN WG4 for further analysis. This CR aims to address, and hopefully resolve, the issues which GSMA IREG identified in their LS; it also aims to implement the modifications that were agreed during the IETF/GSMA/3GPP conference call held on 8th September 2003 for the use of the ".3gppnetwork.org" domain.

Given that the conference call was not a formal meeting of GSMA IREG, 3GPP ask GSMA IREG to review the attached draft CR and confirm whether it reflects GSMA IREG's requirements.

3GPP TSG CN would also welcome active participation by GSMA IREG experts in the process of detailed review of the CR, both by email correspondence before the next CN WG4 meeting and by attendance at the next CN WG4 meeting. The aim is to reach agreement in the CN WG4 meeting on the content of the necessary CR to TS 23.003.

2. Actions:

To GSMA IREG group.

ACTION: 3GPP TSG CN asks GSMA IREG to review and provide comments on the attached change request to the Rel-5 version of 3GPP TS 23.003.

3. Date of Next CN WG4 Meeting:

CN4 #21   27th – 31st October 2003

⌘   *CR-Form-v7*

CHANGE REQUEST

⌘ **23.003 CR 074** ⌘**rev 2** ⌘ Current version: **5.6.0** ⌘

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: ⌘	Changes to enable the GSMA root DNS architecture	
Source: ⌘	Vodafone	
Work item code:⌘	TEI_5	**Date:** ⌘ 8/09/2003
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 is stated that a root DNS architecture for the ".gprs" top level domain is being set up by the GSMA. The LS identifies some inconsistencies with definitions of the ".gprs" domain and also asks that these be corrected. GSMA also asked 3GPP to consistently use the ".gprs" domain in all addressing so that GSM/UMTS operators only have to use **one** DNS service for inter-connection; however, after a conference call between the GSMA and the IETF on the use of TLDs, it was agreed that the domain "3gppnetwork.org" (which was registered by ETSI but will be handed over to the GSMA) should be used instead of ".gprs".
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. All occurences of the ".gprs" TLD have been supplemented with text describing that the alternative domain of ".3gppnetwork.org" can also be used and that it is an operator configurable option as to which domain should be used by each and every node which is capable of doing a DNS lookup. 3. All occurences of ".IMSI.3gppnetwork.org" have been replaced with "ims.mnc<MNC>.mcc<MCC>.3gppnetwork.org"; where MNC is 3 digits (with a zero added at the beginning for 2 digit MNCs) and MCC is 3 digits. 4. The label "ims" is added as a reserved string for an APN network identifier. 5. A few miscellaneous errors in grammar and punctuation are corrected. 6. 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. 2. IETF concerns over the abuse of the ".gprs" domain will be justified. 3. If only Rel-6 and onwards is changed, there will be backward compatibility issues for SIP clients in UEs which do not have access to an ISIM (which is defined from Rel-5 onwards).

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

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

Other comments:	⌘	Please note that the change to the IMS section **does not** mandate that all private identities and public identities ("SIP URIs") must use the "ims.mnc<MNC>.mcc<MCC>.3gppnetwork.org" domain; section 13 applies only to the method by which SIP clients which do not have access to an ISIM application create a private and a public identity to perform a registration. Changes since the previous revision include changes required to address the concerns from the IETF (as discussed in the conference call between GSMA and IETF on the 8th September 2003) on the use of the ".gprs" domain, and to provide operators with a smooth transition to using the "3gppnetwork.org" domain instead of the ".gprs" TLD on inter-PLMN backbone networks.

**** 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" or "ims", and it shall not end in ".gprs" or ".3gppnetwork.org". Further, it shall not take the value "*".

In order to guarantee uniqueness of APN Network Identifiers within or between GPRS PLMN(s)~~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)~~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" or "3gppnetwork.org" (it shall be an operator configurable option which domain is used in each GPRS network node). 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"

Or

"mnc<MNC>.mcc<MCC>.3gppnetwork.org"

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" and the "mnc<MNC>.mcc<MCC>.3gppnetwork.org" formats 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 both:
"mnc012.mcc345.gprs"
And
"mnc012.mcc345.3gppnetwork.org".

**** Next Modified Section ****

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13 Numbering, addressing and identification within the IP multimedia core network subsystem

13.1 Introduction

This clause describes the format of the parameters needed to access the IP multimedia core network subsystem. For further information on the use of the parameters see 3GPP TS 23.228 [24].

13.2 Home network domain name

The home network domain name shall be in the form of an Internet domain name, e.g. operator.com, as specified in RFC 1035 [19].

If there is no ISIM application, the UE shall derive the home network domain name from the IMSI as described in the following steps:

1. take the first 5 or 6 digits, depending on whether a 2 or 3 digit MNC is used (see 3GPP TS 31.102 [27]) and separate them into MCC and MNC ~~with "."~~;

2. use the MCC and MNC derived in step 1 to create the "mnc<MNC>.mcc<MCC>.3gppnetwork.org" domain name as described in subclause 9.1.2;

~~3~~2. ~~reverse the order of the MCC and MNC. Append to the result: ".IMSI.3gppnetwork.org"~~add the label "ims." to the beginning of the domain.

An example of a home network domain name is:

─   IMSI in use: 234150999999999;

Where:

MCC = 234;

MNC = 15;

MSIN = 0999999999~~, which gives~~.

Which gives the home network domain name: ims.mnc015.mcc234.~~IMSI.~~3gppnetwork.org~~.~~

13.3   Private user identity

The private user identity shall take the form of an NAI, and shall have the form username@realm as specified in clause 3 of RFC 2486 [25].

NOTE: It is possible for a representation of the IMSI to be contained within the NAI for the private identity.

If there is no ISIM application, the private user identity is not known. In this case, the private user identity is derived from the IMSI.

The following steps show how to build the private user identity out of the IMSI:

1. use the whole string of digits as the username part of the private user identity;

2. convert the leading digits of the IMSI, i.e. MNC and MCC, into a domain name, as described in subclause 13.2.

The result will be a private user identity of the form "imsi@ims.mnc<MNC>.mcc<MCC>."~~IMSI.~~3gppnetwork.org". For example: If the IMSI is 234150999999999 (MCC = 234, MNC = 15), the private user identity then takes the form 234150999999999@ims.mnc015.mcc234.~~IMSI.~~3gppnetwork.org

13.4   Public user identity

The public user identity shall take the form of either a SIP URI (see RFC 3261 [26]) or a tel URL (see RFC 2806 [45]). A SIP URI shall take the form "sip:user@domain".

If there is no ISIM application to host the public user identity, a temporary public user identity shall be derived, based on the IMSI. The temporary public user identity shall be of the form "user@domain" and shall therefore be equal to the private user identity. The private user identity is derived as described in subclause 13.2. That is, the private user identity will be appended to the string "sip:"

EXAMPLE: "sip:234150999999999@ims.mnc015.mcc234.~~IMSI.~~3gppnetwork.org".

**** 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*

Or

   racAAAA.lacBBBB.mncYYY.mccZZZ.3gppnetwork.org

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). ~~.~~ It shall be an operator configurable option in each associated node which of the two forms is used by that node.

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 both:
   ~~*RAC123A.LAC234B.MNC0092.MCC0167.GPRS*~~*rac123A.lac234B.mnc092.mcc167.gprs*
   And:
   rac123A.lac234B.mnc092.mcc167.3gppnetwork.org

The SGSN may then acquire the IP address of the old SGSN from a DNS server, using either of the two logical address~~es~~. 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 either of the following logical names, derived from the old RAI and NRI information:

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

nriCCCC.racDDDD.lacEEEE.mncYYY.mccZZZ.3gppnetwork.org

xC, yD and zE shall be Hex coded digits, vY and wZ shall be encoded as single digits (in the range 0-9). If there are less than 4 significant digits in xxxxCCCC, yyyyDDDD, or zzzzEEEE, 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 both:
*NRI003A.RAC123A.LAC234B.MNC0092.MCC0167.GPRS.*nri003A.rac123A.lac234B.mnc092.mcc167.gprs
And:
nri003A.rac123A.lac234B.mnc092.mcc167.3gppnetwork.org

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 tThis 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
or
sgsnXXXX.mncYYY.mccZZZ.3gppnetwork.org

xX, y and z shall be Hex coded digits, Yy and zZ shall be encoded as single digits (in the range 0-9)..

If there are less than 4 significant digits in xxxxXXXX, 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 both:
*SGSN1B34. MNC0092.MCC0167.GPRS.*sgsn1B34. mnc092.mcc167.gprs
And:
sgsn1B34. mnc092.mcc167.3gppnetwork.org

C.3 Target ID

In tThis 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*

Or:
> *rncXXXX.mncYYY.mccZZZ.3gppnetwork.org*

Xx shall be Hex coded digits; Yy and zZ 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 shallwill be coded in the DNS server as both:
> *RNC1B34. MNC0092.MCC0167.GPRS.rnc1B34.mnc092.mcc167.gprs*
> And:
> *rnc1B34.mnc092.mcc167.3gppnetwork.org*

**** New Section ****

Annex D (Informative): Use of the ".gprs" and ".3gppnetwork.org" domains

This section gives a brief background to the use of the different domains ".gprs" and ".3gppnetwork.org"

The ".gprs" domain was originally conceived as the only domain to be used to enable DNS servers to translate logical names for network nodes to IP addresses. This was made possible by the DNS servers being connected only to (inter-)PLMN backbone networks and specifically isolated from the public internet. However, after feedback from the Internet Engineering Task Force (IETF) it was identified that this approach has the following drawbacks:

1. There would inevitably be leakage of DNS requests for the ".gprs" TLD into the public Internet, and in the worst case situation of faulty clients, this could overload the Internet's root DNS servers and degrade their performance.

2. It would be very difficult for network operators to detect if/when DNS requests for the ".gprs" domain were leaked to the public Internet (and therefore the security policies of the (inter-)PLMN backbone network were breached), because the Internet's root DNS servers would simply send an error message back to the sender of the request.

The IETF recommended using a domain that is routable in the pubic domain for the (inter-)PLMN backbone network. They advised that requests to the ".3gppnetwork.org" authoritative DNS server(s) from the public internet should be denied and that only requests from the (inter-)PLMN backbone network should be properly served. This would enable the confidential data (e.g. a subscriber's IMSI) for the ".3gppnetwork.org" authoritative DNS server(s) to remain confidential to the entities connected to the (inter-)PLMN backbone network. Also, the ".3gppnetwork.org" authoritative DNS server(s) could be configured to log requests for the ".3gppnetwork.org" domain from the public Internet for further investigation of their origin and possible identification of a breach of the security policies of the (inter-)PLMN backbone network.

The GSM Association, the body responsible for the ".gprs" domain as used on the (inter-)PLMN backbone network, has agreed to *phase in* the use of the domain ".3gppnetwork.org" to eventually replace the ".gprs" domain. However, it is assumed that parallel running of both domains will need to be supported for some time to come while network operators upgrade their networks to accommodate the use of the new domain.

Annex ED (informative):
Change history

**** End of document ****