3GPP TSG CN Plenary Meeting #22 **NP-030499**
10th – 12th December 2003 Maui, USA.

Source: TSG CN WG4

Title: Corrections on TEI R99

Agenda item: 7.11

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
23.003	075		N4-031183	R99	On the length of the APN NI	F	3.13.0
23.003	076		N4-031184	Rel-4	On the length of the APN NI	A	4.7.0
23.003	077		N4-031185	Rel-5	On the length of the APN NI	A	5.7.0
23.003	078		N4-031186	Rel-6	On the length of the APN NI	A	6.0.0

3GPP TSG CN WG4 Meeting #21 **N4-031183**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.003** **CR** **075** ⌘ **rev** **-** ⌘ Current version: **3.d.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:	⌘	On the length of the APN NI
Source:	⌘	CN4
Work item code:	⌘	TEI
Date:	⌘	27/10/2003
Category:	⌘	**F**
Release:	⌘	R99

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: ⌘

In TS 23.003, it states:
"The APN Network Identifier shall contain at least one label and shall have a maximum length of 63 octets"

In RFC1035,
it states any legal label within a domain name might be up to 63 octets.

From RFC1035:

"Domain names in messages are expressed in terms of a sequence of labels. Each label is represented as a one octet length field followed by that number of octets. Since every domain name ends with the null label of the root, a domain name is terminated by a length byte of zero. The high order two bits of every length octet must be zero, and the remaining six bits of the length field limit the label to 63 octets or less."

From 23.003, a valid NI can be "Label" and this is limited to be at most 63 octets. So, by inference, the NI length in 23.003 is meant to be the length of the unencoded NI.
That is, for instance a NI in the form of:

"Label1.Label2.Label3"

has a limit of 63 octets when it is *unencoded*.

When we encode the 63 octets of the form of "Label1.Label2.Label3" we get a 64 octets encoding according to RFC1035 quoted above as each ASCII encoded label requires its length to be declared by one octet length field before it (and the

		dots disappear from the ASCII characters count). So the 63 octets of "Label1.Label2.Label3" when encoded becomes 64 octets [lengthlab1]"label1"[lengthlab2]"label2"[lengthlab3]"label3". If we inspect 29.002, the APN data type definition states that: APN ::= OCTET STRING (SIZE (2..63)) -- Octets are coded according to 3GPP TS 23.003 The problem is that if the limit of the unencoded NI is 63 octets then we cannot carry a 63 octets NI in MAP messages. **THIS IS AN ESSENTIAL CORRECTION**
Summary of change:	⌘	The Length of the APN NI is clarified to be 63 octets when it is encoded, and, for uniformity reasons,the length of the whole APN is 100 when encoded
Consequences if not approved:	⌘	MAP could not carry APN NI 63 Octets long before encoding

Clauses affected:	⌘	9.1			
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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; the APN has ~~it has,~~ after encoding as defined in the paragraph below, a maximum length of 100 octets.

The ~~syntax~~encoding 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, after encoding as defined in subclause 9.1 above, 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 GPRS PLMN(s), an APN Network Identifier containing more than one label corresponds to an Internet domain name. This name should only be allocated by the PLMN 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 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 operators.

9.1.2 Format of APN Operator Identifier

The APN Operator Identifier is composed of three labels. The last label 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 be coded in the DNS as mnc012.mcc345.gprs.

3GPP TSG CN WG4 Meeting #21 **N4-0311184**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.003** **CR** **076** ⌘ **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 ☒

Title:	⌘	On the length of the APN NI
Source:	⌘	CN4
Work item code:	⌘	TEI
Date:	⌘	27/10/2003
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
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Reason for change: ⌘

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From RFC1035:

"Domain names in messages are expressed in terms of a sequence of labels. Each label is represented as a one octet length field followed by that number of octets. Since every domain name ends with the null label of the root, a domain name is terminated by a length byte of zero. The high order two bits of every length octet must be zero, and the remaining six bits of the length field limit the label to 63 octets or less."

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That is, for instance a NI in the form of:

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		dots disappear from the ASCII characters count). So the 63 octets of "Label1.Label2.Label3" when encoded becomes 64 octets [lengthlab1]"label1"[lengthlab2]"label2"[lengthlab3]"label3". If we inspect 29.002, the APN data type definition states that: APN ::= OCTET STRING (SIZE (2..63)) -- Octets are coded according to 3GPP TS 23.003 The problem is that if the limit of the unencoded NI is 63 octets then we cannot carry a 63 octets NI in MAP messages. **THIS IS AN ESSENTIAL CORRECTION**
Summary of change:	⌘	The Length of the APN NI is clarified to be 63 octets when it is encoded, and, for uniformity reasons,the length of the whole APN is 100 when encoded
Consequences if not approved:	⌘	MAP could not carry APN NI 63 Octets long before encoding

Clauses affected:	⌘	9.1			
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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

3GPP TSG CN WG4 Meeting #21 ***N4-031185***
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.003** **CR** **077** ⌘ **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:	⌘	On the length of the APN NI
Source:	⌘	CN4
Work item code:	⌘	TEI
Date:	⌘	27/10/2003
Category:	⌘	**A**
Release:	⌘	Rel-5

Use one of the following categories:
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A *(corresponds to a correction in an earlier release)*
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Reason for change: ⌘

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Clauses affected:	⌘	9.1			
Other specs affected:	⌘	**Y**	**N**		⌘
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			X	O&M Specifications	
Other comments:	⌘				

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3GPP TSG CN WG4 Meeting #21 ***N4-031186***
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.003** **CR** **078** ⌘ **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:	⌘	On the length of the APN NI
Source:	⌘	CN4
Work item code:	⌘	TEI
Date:	⌘	27/10/2003
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
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it states any legal label within a domain name might be up to 63 octets.

From RFC1035:

"Domain names in messages are expressed in terms of a sequence of labels. Each label is represented as a one octet length field followed by that number of octets. Since every domain name ends with the null label of the root, a domain name is terminated by a length byte of zero. The high order two bits of every length octet must be zero, and the remaining six bits of the length field limit the label to 63 octets or less."

From 23.003, a valid NI can be "Label" and this is limited to be at most 63 octets. So, by inference, the NI length in 23.003 is meant to be the length of the unencoded NI.
That is, for instance a NI in the form of:

"Label1.Label2.Label3"

has a limit of 63 octets when it is *unencoded*.

When we encode the 63 octets of the form of "Label1.Label2.Label3" we get a 64 octets encoding according to RFC1035 quoted above as each ASCII encoded label requires its length to be declared by one octet length field before it (and the

		dots disappear from the ASCII characters count). So the 63 octets of "Label1.Label2.Label3" when encoded becomes 64 octets [lengthlab1]"label1"[lengthlab2]"label2"[lengthlab3]"label3". If we inspect 29.002, the APN data type definition states that: APN ::= OCTET STRING (SIZE (2..63)) -- Octets are coded according to 3GPP TS 23.003 The problem is that if the limit of the unencoded NI is 63 octets then we cannot carry a 63 octets NI in MAP messages. **THIS IS AN ESSENTIAL CORRECTION**
Summary of change:	⌘	The Length of the APN NI is clarified to be 63 octets when it is encoded, and, for uniformity reasons, the length of the whole APN is 100 when encoded
Consequences if not approved:	⌘	MAP could not carry APN NI 63 Octets long before encoding

Clauses affected:	⌘	9.1			
Other specs affected:	⌘	**Y**	**N**		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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~~the APN has, after encoding as defined in the paragraph below, a maximum length of 100 octets.

The encoding~~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, after encoding as defined in subclause 9.1 above, 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 GPRS PLMN(s), an APN Network Identifier containing more than one label corresponds to an Internet domain name. This name should only be allocated by the PLMN 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 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 operators.

9.1.2 Format of APN Operator Identifier

The APN Operator Identifier is composed of three labels. The last label 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 be coded in the DNS as mnc012.mcc345.gprs.