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Data formats for multi-vendor plug and
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Foreword

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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project Technical Specification Group Services and System Aspects, Telecommunication management; as identified below:

TS 32.501: "Self-configuration of network elements; Concepts and requirements".

TS 32.508: "Procedure flows for multi-vendor plug and play eNB connection to the network".

TS 32.509: "Data formats for multi-vendor plug and play eNB connection to the network".

1 Scope

The present document describes the data formats used between network entities involved in the multi-vendor plug and play eNB connection to network.
These data formats are based on requirements and use cases specified in 3GPP TS 32.501 [4].
The procedure flows where these data exchanged are defined in 3GPP TS 32.508 [5].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

[3] 3GPP TS 32.102: "Telecommunication management; Architecture".

[4] 3GPP TS 32.501: "Telecommunication management; Self-configuration of network elements; Concepts and requirements".

[5] 3GPP TS 32.508: "Telecommunications management; Procedure flows for multi-vendor plug and play eNB connection to the network".

[6] 3GPP TS 23.003: "Numbering, addressing and identification".

[7] IETF RFC 1035: "Domain Names - Implementation and Specification".

[8] IETF RFC 2131: "Dynamic Host Configuration Protocol".

[9] IETF RFC 2132: "DHCP Options and BOOTP Vendor Extensions".

[10] IETF RFC 3396: "Encoding Long Options in the Dynamic Host Configuration Protocol (DHCPv4)".

[11] 3GPP TS 33.310: "Network Domain Security (NDS); Authentication Framework (AF)".

[12] IETF RFC 6712: "Internet X.509 Public Key Infrastructure -- HTTP Transfer for the Certificate Management Protocol (CMP)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1], TS 32.501 [4] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1] and in TS 32.501 [4].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], TS 32.501 [4] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1] and in TS 32.501 [4].

4 Data formats for Multi-Vendor Plug and Connect (MvPnC)

4.1 MvPnC client identification in DHCP requests

The eNB performing the Initial IP Autoconfiguration procedure specified in clause 5.2 of 3GPP TS 32.508 [5] identifies itself as MvPnC compatible DHCP client by using the Vendor Class Identifier DHCP option specified in clause 9.13 of RFC 2132 [9] in the following way:

- DHCP option code 60;
- Length 5 bytes;
- Vendor class identifier "MvPnC".

The use of Vendor Class Identifier DHCP option with specific value for MvPnC is illustrated in table 4.1.1.

Table 4.1.1: Use of Vendor Class Identifier

Code	Length	Vendor Class Identifier				
60	5	M	v	P	n	C

4.2 MvPnC entities information in DHCP replies

4.2.1 General

The information that eNB receives from the DHCP server while performing the Initial IP Autoconfiguration procedure specified in clause 5.2 of 3GPP TS 32.508 [5] may be classified in two categories: basic IP configuration and MvPnC specific configuration.

The basic IP configuration information is documented in RFC 2131 [8] and RFC 2132 [9] and may include the following:

- IP address ("yiaddr" field in [8]);
- Subnet Mask (option 1 in [9]);
- Router(s) (option 3 in [9]);
- IP address(es) of the DNS server(s) (option 6 in [9]);
- Domain Name (option 15 in [9]).

The MvPnC specific configuration information is described in detail in clauses 4.2.2, 4.2.3 and 4.2.4.

The DHCP option "Vendor Specific Information" specified in the clause 8.4 of RFC 2132 [9] is used as an opaque container carrying the MvPnC specific configuration from the DHCP server to the eNB performing the MvPnC procedure. The multiple pieces of MvPnC specific configuration within the Vendor Specific Information container are encoded as a sequence of code/length/value fields (also known as "Encapsulated vendor-specific options" specified in clause 8.4 of RFC 2132 [9]).

The use of Vendor Specific Information DHCP option container with encapsulated vendor-specific options encoding is illustrated in table 4.2.1.1.

Table 4.2.1.1: Use of the Vendor Specific Information

Code	**Length 1-255**	**Vendor Specific Information**						
		Configuration attribute 1			**Configuration attribute 2**			**...**
43	**n**	**Type1**	**Lenght1**	**Data**	**Type2**	**Length2**	**Data**	**...**
octet	octet	octet	octet	n octets	octet	octet	n octets	...

The content of the configuration attributes (specific type code value, valid length and data type) carried in the format illustrated in table 4.2.1.1 is specified in the clauses 4.2.2, 4.2.3 and 4.2.4 of the present document.

If the size of MvPnC configuration data contained in "Vendor Specific Information" option 43 is greater than 255 bytes, the RFC 3396 [10] encoding is used.

To avoid ambiguity in the interpretation of string MvPnC configuration attributes, the ASCII character encoding shall be used.

Standard network byte order shall be used with appropriate conversion function at the eNB (matching the local little-endian / big-endian byte order).

Some MvPnC configuration attributes may be missing (e.g. the SeGW FQDN attribute may be not present if the SeGW IP address is present) or just have zero length (type octet followed by length octet with value zero and no data octets).

The qualifiers identifying which attributes are mandatory, Optional (O), Conditional Mandatory (CM) or Conditional Optional (CO) and corresponding conditions are defined it the clauses 4.2.2, 4.2.3 and 4.2.4.

The order of MvPnC configuration attributes is not important (e.g. attribute of type "1" may appear after the attribute of type "5").

4.2.2 Certification Authority (CA/RA) server

This clause specifies the information about Certification Authority server that eNB receives from DHCP server in Initial IP Autoconfiguration procedure specified in clause 5.2 of 3GPP TS 32.508 [5] and uses for Certificate Enrolment procedure.

Table 4.2.2.1: CA/RA configuration attributes

Attribute name	Attribute tag (code)	Attribute length	Attribute qualifier	Attribute description
IP address of the CA/RA	01	Variable	CO	IP address of the CMP server. An IPv4 IP address is usually represented as 4 octets.
FQDN of the CA/RA	02	Variable	CO	ASCII string representing the Fully Qualified Domain Name of the CMP server. In case the FQDN is used, the IP address of the DNS server needs to be made available to the eNB before certificate enrolment.
Port number of the CA/RA	03	Variable	M	Integer representing the port number used by CMP server. The port for HTTP/HTTPSs transfer of CMP messages is not explicitly given in RFC 6712 [12], therefore this parameter is required. The port number is usually represented as 2 octets.
Path to the CA/RA directory	04	Variable	M	ASCII string representing the path to the CMP server directory. A CMP server may be located in an arbitrary path other than root.
Subject name of the CA/RA	05	Variable	M	ASCII string representing the subject name of the CA/RA. The use is described in 3GPP TS 33.310 [11] clause 9.5.3.
Protocol indication	06	Variable	CM	ASCII string representing the protocol (HTTP or HTTPS) to be used for certificate enrolment. The use is described in 3GPP TS 33.310 [11] clause 9.6.

Table 4.2.2.2: Attribute constraints

Name	Definition
IP address CO qualifier	The IP address is optional if the FQDN is present
FQDN CO qualifier	The FQDN is optional if the IP address is present
Protocol indication CM qualifier	The protocol indication is mandatory if HTTPS protocol is used

4.2.3 Security Gateway (SeGW)

This clause specifies the information about Security Gateway server that eNB receives from DHCP server in Initial IP Autoconfiguration procedure specified in clause 5.2 of 3GPP TS 32.508 [5] and uses for Establishing Secure Connection procedure.

Table 4.2.3.1: Security Gateway configuration attributes

Attribute name	Attribute tag (code)	Attribute length	Attribute qualifier	Attribute description
IP address of the SeGW	07	Variable	CO	IP address of the Security Gateway. An IPv4 IP address is usually represented as 4 octets.
FQDN of the SeGW	08	Variable	CO	ASCII string representing the Fully Qualified Domain Name of the Security Gateway. In case the FQDN is used, the IP address of the DNS server needs to be made available to the eNB before establishing secure connection.

Table 4.2.3.2: Attribute constraints

Name	Definition
IP address CO qualifier	The IP address is optional if the FQDN is present
FQDN CO qualifier	The FQDN is optional if the IP address is present

4.2.4 Element Manager (EM)

This clause specifies the information about Element Manager that eNB receives either from DHCP server in Initial IP Autoconfiguration procedure specified in clause 5.2 of 3GPP TS 32.508 [5] or from secure DHCP server in Establishing Connection to Element Manager procedure specified in clause 5.5 of 3GPP TS 32.508 [5] and uses for Establishing Connection to Element Manager procedure.

Table 4.2.4.1: Element Manager configuration attributes

Attribute name	Attribute tag (code)	Attribute length	Attribute qualifier	Attribute description
IP address of the EM	09	Variable	CO	IP address of the Element Manager. An IPv4 IP address is usually represented as 4 octets.
FQDN of the EM	10	Variable	CO	ASCII string representing the Fully Qualified Domain Name of the Element Manager. In case the FQDN is used, the IP address of the DNS server needs to be made available to the eNB before establishing connection to the Element Manager.

Table 4.2.4.2: Attribute constraints

Name	Definition
IP address CO qualifier	The IP address is optional if the FQDN is present
FQDN CO qualifier	The FQDN is optional if the IP address is present

4.3 MvPnC entities Fully Qualified Domain Names (FQDN)

4.3.1 General

This clause describes the Fully Qualified Domain Names (FQDNs) used in Multi Vendor Plug and Connect (MvPnC) procedures.

The FQDNs used in MvPnC are in the form of a domain name as specified in IETF RFC 1035 [7].

The sub-domains used in MvPnC are allocated within the ".3gppnetwork.org" domain.
The GSM Association is in charge of allocating the new sub-domains of ".3gppnetwork.org" domain name.
The procedure specified in Annex E of 3GPP TS 23.003 [6] is used for the sub-domain allocation.

The FQDNs used in MvPnC follow the general encoding rules specified in clause 19.4.2.1 of 3GPP TS 23.003 [6].

The format of FQDNs used in MvPnC follows the "<vendor ID>.<system>.<OAM realm>" pattern.

NOTE: Where "<vendor ID>.<system>.oam" represents the <service_id> shown in the first row of table E.1 of 3GPP TS 23.003 [6].

The <vendor ID> label is optional and is required in the operator deployments where multiple instances of a particular network entity type are not provided by the same vendor. If present, the <vendor ID> label is in the form "vendor<ViD>", where <ViD> field corresponds to the ID of the vendor. The specific deployment scenario (e.g. one network entity instance per vendor or one network entity instance for all vendors) is not known to the eNB when it connects to the network. Therefore, it should first try to resolve the FQDN containing the <vendor ID> label and if it fails, try to resolve the FQDN without the <vendor ID> label.

The details of the <system> label are described in clauses 4.3.2, 4.3.3 and 4.3.4.

The <OAM realm> label is the operator's OAM realm domain name in the form of "oam.mnc<MNC>.mcc<MCC>.3gppnetwork.org", where "<MNC>" and "<MCC>" fields correspond to the MNC and MCC of the operator's PLMN. Both the "<MNC>" and "<MCC>" fields are 3 digits long. If the MNC of the PLMN is 2 digits, then a zero shal be added at the beginning.

An example of an OAM realm domain name is:

```
MCC = 123;

MNC = 45;
```

Which gives the OAM realm domain name: "`oam.mnc045.mcc123.3gppnetwork.org`".

4.3.2 Certification Authority (CA/RA) server

The Certification Authority server (CA/RA) FQDN is derived as follows. The "`cara`" <system> label is added in front of the operator's OAM realm domain name:

```
cara.oam.mnc<MNC>.mcc<MCC>.3gppnetwork.org
```

If particular operator deployment scenario has multiple CA/RA servers (one per vendor), the <vendor ID> label is added in front of the "`cara`" label:

```
vendor<ViD>.cara.oam.mnc<MNC>.mcc<MCC>.3gppnetwork.org
```

An example of a CA/RA FQDN is:

```
MCC = 123;

MNC = 45;

ViD = abcd;
```

Which gives the CA/RA FQDN: "cara.oam.mnc045.mcc123.3gppnetwork.org" and "vendorabcd.cara.mnc045.mcc123.3gppnetwork.org".

4.3.3 Security Gateway (SeGW)

The Security Gateway (SeGW) FQDN is derived as follows.
The "segw" <system> label is added in front of the operator's OAM realm domain name:

segw.oam.mnc<MNC>.mcc<MCC>.3gppnetwork.org

If particular operator deployment scenario has multiple Security Gateways (one per vendor), the <vendor ID> label is added in front of the "segw" label:

vendor<ViD>.segw.oam.mnc<MNC>.mcc<MCC>.3gppnetwork.org

An example of a SeGW FQDN is:

MCC = 123;

MNC = 45;

ViD = abcd;

Which gives the SeGW FQDN: "segw.oam.mnc045.mcc123.3gppnetwork.org" and "vendorabcd.segw.mnc045.mcc123.3gppnetwork.org".

4.3.4 Element Manager (EM)

The Element Manager (EM) FQDN is derived as follows.
The "em" <system> label is added in front of the operator's OAM realm domain name:

em.oam.mnc<MNC>.mcc<MCC>.3gppnetwork.org

If particular operator deployment scenario has multiple Element Managers (one per vendor), the <vendor ID> label is added in front of the "em" label:

vendor<ViD>.em.oam.mnc<MNC>.mcc<MCC>.3gppnetwork.org

An example of a EM FQDN is:

MCC = 123;

MNC = 45;

ViD = abcd;

Which gives the EM FQDN: "em.oam.mnc045.mcc123.3gppnetwork.org" and "vendorabcd.em.mnc045.mcc123.3gppnetwork.org".

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2013-08	SA5#90	S5-131429			First draft skeleton		0.0.1
2013-10	SA5#91	S5-131833			FQDN formats and rapporteur clean-up	0.0.1	0.1.0
2013-11	SA5#92	S5-132163			DHCP formats	0.1.0	0.2.0
2013-12	SA#62	SP-130639			Submitted to SA#62 for information and approval	0.2.0	1.0.0
2013-12					Version after approval	1.0.0	12.0.0

History

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