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A Uniform Resource Name Namespace for the GSM Association (GSMA) and the International Mobile station Equipment Identity (IMEI)

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Abstract

This specification defines a Uniform Resource Name namespace for the GSMA and a sub namespace for the IMEI (International Mobile station Equipment Identity), and associated parameter for the IMEISV (International Mobile station Equipment Identity and Software Version number). The IMEI is 15 decimal digits long and the IMEISV is 16 decimal digits long and both are encoded using Binary Encoded Decimal (BCD). The IMEI and IMEISV were introduced as part of the specification for Global System for Mobile (GSM) and are also now incorporated by the 3rd Generation Partnership Project (3GPP) as part of the 3GPP specification for GSM, the Universal Mobile Telecommunications System (UMTS) and 3GPP LTE (Long Term Evolution). The IMEI and IMEISV are used to uniquely identify Mobile Equipment within these systems and are managed by the GSMA (GSM Association).

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

This specification defines a Uniform Resource Name namespace for the GSMA (GSM Association) and a sub namespace for the IMEI (International Mobile station Equipment Identity), and associated parameter for the Software Version number from the IMEISV (International Mobile station Equipment Identity and Software Version number) as per the namespace registration requirement found in [1]. GSMA is an identifier for a namespace for identities used by Mobile Equipment used in GSM, UMTS and LTE networks. The IMEI and the IMEISV are managed by the GSMA, so this namespace would be managed by the GSMA. Whilst this specification currently specifies only the IMEI sub namespace under the GSMA URN namespace additional sub namespaces under the GSMA namespace may be specified in the future by the GSMA through the publication of future informational RFCs.

The IMEI is 15 decimal digits long and includes a Type Allocation Code (TAC) of 8 decimal digits and the Serial Number (SNR) of 6 decimal digits plus a Spare decimal digit. The TAC identifies the type of the Mobile Equipment and is chosen from a range of values allocated to the Mobile Equipment manufacturer in order to uniquely identify the model of the Mobile Equipment. The SNR is an individual serial number that uniquely identifies each Mobile Equipment within the TAC. The Spare digit is used as a security check to combat potential spoofing and is always set to the value 0 when transmitted by the Mobile Equipment.

The IMEISV is 16 decimal digits long and includes the TAC and SNR same as for the IMEI but also a 2 decimal digit Software Version Number (SVN) which is allocated by the Mobile Equipment manufacturer to identify the software version of the Mobile Equipment.

The information here is meant to be a concise guide for those wishing to use the IMEI and IMEISV as URNs. Nothing in this document should be construed to override 3GPP TS 23.003 [2] that defines the IMEI and IMEISV.

The GSM Association (GSMA) is a global trade association representing more than 750 GSM mobile phone operators across 218 territories and countries of the world. The primary goals of the GSMA are to ensure mobile phones and wireless services work globally and are easily accessible. Further details about the GSMA role in allocating the IMEI and the IMEISV and the IMEI and IMEISV allocation guidelines can be found in GSMA TS 06 [3]

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [4].

3. Namespace Registration Template

3.1. GSMA

Namespace ID: "gsma" requested

Registration Information:

Registration version number: 1

Registration date: 2011-07-08

Declared registrant of the namespace: GSM Association, 1st Floor, Mid City Place, 71 High Holborn, London, England

Declaration of syntactic structure:
The identifier is expressed in ASCII characters and has a hierarchical structure expressed using the augmented Backus-Naur Form (ABNF) defined in [8] as follows:

```
gsma-urn = "urn:gsma:" gsma-specifier
           *(":" gsma-specifier-defined-substring)
           *(";" gsma-specifier-param)

gsma-specifier  = "imei" / gsma-specifier-defined-string
gsma-specifier-defined-string  = gsma-approved-nonempty-string
gsma-specifier-defined-substring  = gsma-approved-nonempty-string
gsma-specifier-defined-param-name  = gsma-approved-nonempty-string
gsma-specifier-defined-param-val = gsma-approved-string
gsma-specifier-param =
                "svn" "=" software-version-string /
                "vers" "=" gsma-format-version-string /
                gsma-specifier-defined-param-name "="
                gsma-specifier-defined-param-val
software-version-string = 2DIGIT
gsma-format-version-string = DIGIT
gsma-approved-string = *unreserved
gsma-approved-nonempty-string = 1*unreserved
unreserved  = ALPHA / DIGIT / "-" / "." / "_"
```

The GSMA namespace includes a predefined namespace for IMEI and may be in the future extended to include other identifiers used by Mobile Equipment used in GSM, UMTS or LTE networks or future networks deployed by members of the GSMA.

A IMEI is an identifier under the GSMA namespace that uniquely identifies Mobile Equipment used in GSM, UMTS and LTE networks.

The internal representation of a IMEI is a specific sequence of bits in memory, as described in 3GPP TS 23.003 [2]. To accurately represent a IMEI as a URN, it is necessary to convert the BCD bit sequence to a string representation. Each field BCD bit sequence has its value printed as a decimal digit string with the most significant digit first.

The following augmented Backus-Naur Form (ABNF) includes the set of core rules in RFC 5234 [8], and are not repeated here.

The formal definition of the IMEI string representation for the gsma-specifier-defined-substring for the "imei" gsma-specifier is provided by the following ABNF [8]:

```
IMEI =  tac "-" snr "-" spare
tac      = 8DIGIT
snr      = 6DIGIT
spare    = 1DIGIT
For example:
   urn:gsma:imei:90420156-025763-0;vers=0
```

The optional "vers" parameter is included for extensibility of the namespace, for example if the IMEI format is extended in the future (such as with additional digits or using hex digits). A value of "vers" equal to 0 or the absence of the "vers" parameter means the URN format is compliant with the format specified here. Any change to the format specified here requires the publication of a future informational RFC.

The IMEISV is an identifier that uniquely identifies Mobile Equipment and associated software versions used in GSM and UMTS networks. The internal representation of a IMEISV is a specific sequence of bits in memory, as described in 3GPP TS 23.003 [2] To represent the IMEISV the URN parameter "svn" is appended to the IMEI URN and set equal to the decimal string representation of the two software version number (svn) bits in the IMEISV and the spare digit in the IMEI gsma-specifier-defined-substring is set to zero.

For example:
urn:gsma:imei:90420156-025763-0;svn=42

The <gsma-specifier>, <gsma-specifier-defined-string>, <gsma-specifier-defined-substring>, <gsma-specifier-defined-param-name> and <gsma-specifier-defined-param-val> can comprise any ASCII characters compliant with URN syntax and must not contain the ":" character or ";" character or "=" character(see STD 66, RFC 2141 [5]). The exclusion of the colon from the list of other characters means that the colon can only occur as a delimiter between string values. The exclusion of the semicolon from the list of other characters means that the semicolon can only occur as a delimiter for parameter values. The exclusion of the "=" character from the list of other characters means that the "=" character can only occur as an operator for parameter values.

The GSMA will take responsibility for the gsma-specifier "imei" and manage the sub level.

Additional gsma-specifiers may be added in the future through informational RFCs.

Relevant ancillary documentation:
See IMEI Allocation and Approval Guidelines [3] and 3GPP TS 23.003 [2].

Identifier uniqueness considerations:
Identifiers in the "gsma" namespace are defined and assigned in the requested namespace by the GSMA after ensuring that the URNs to be assigned are unique. Uniqueness is achieved by checking against the registry of previously assigned names.

Procedures are in place to ensure that each IMEI is uniquely assigned by the Mobile Equipment manufacturer so that it is guaranteed to uniquely identify that particular Mobile Equipment. Procedures are in place to ensure that each IMEISV is uniquely assigned by the Mobile Equipment manufacturer so that it is guaranteed to uniquely identify that particular Mobile Equipment and the specific software version installed.

Identifier persistence considerations:
The GSMA is committed to maintaining uniqueness and persistence of all resources identified by assigned URNs.

As the NID sought is "gsma" and GSMA is the long standing acronym for the trade association that represents the mobile phone operators the URN should also persist indefinitely (at least as long as there is a need for its use). The assignment process guarantees that names are not reassigned. The binding between the name and its resource is permanent.

The TAC and SNR portions of IMEISVs are stored in the Mobile Equipment so they remain persistent. The SVN may be modified by software when new versions are installed but should be persistent for the duration of the installation of that specific version of software.

Process of identifier assignment:

GSMA will manage the <gsma-specifier> (including "imei"), <gsma-defined-string>, <gsma-specifier-defined-substring>, <gsma-specifier-param>, <gsma-specifier-defined-param-name> and <gsma-specifier-defined-param-val> identifier resources to maintain uniqueness.

The process for IMEI and IMEISV assignment is documented in GSMA TS 06[3]

Process for identifier resolution:

Since the GSMA namespace is not globally resolvable, this is not applicable.

Rules for Lexical Equivalence:

Consider each field of the IMEI gsma-defined substring to be a sequence of decimial digits. Then, to compare a pair of IMEIs, arithmetically compare the corresponding fields of the gsma-defined substring from each IMEI in order of significance and according to their data type. Two IMEIs are equal if and only if all the corresponding fields are equal.

The lexical equivalence of the GSMA namespace-specific strings (NSSs) is defined as an exact, but not case-sensitive, string match.

Any identifier in GSMA namespaces can be compared using the normal mechanisms for percent-encoded UTF-8 strings.

Conformance with URN Syntax:

The string representation of the GSMA URN and of the IMEI sub namespace is fully compatible with the URN syntax.

Validation Mechanism:
The IMEI can be validated using the mechanism defined in Annex B of 3GPP TS 23.003 [2]. There is no mechanism defined to validate the SVN field of the IMEISV.

Scope: GSMA URN is global in scope.

4. Specification

4.1. IMEI Format

The IMEI format is 15 decimal digits encoded in 8 octets using BCD as defined in 3GPP TS 24.008 [6]. The most significant digit is coded in the most significant bits of octet 1. The least significant digit is coded in the least significant bits of octet 8.

4.1.1. Type Allocation Code (TAC)

The TAC is a 8 decimal digit value. The TAC identifies the type of the Mobile Equipment and is chosen from a range of values allocated to the Mobile Equipment manufacturer in order to uniquely identify the model of the Mobile Equipment.

4.1.2. Serial Number (SNR)

The SNR is a 6 decimal digit value. The SNR is an individual serial number that uniquely identifies each Mobile Equipment within the TAC.

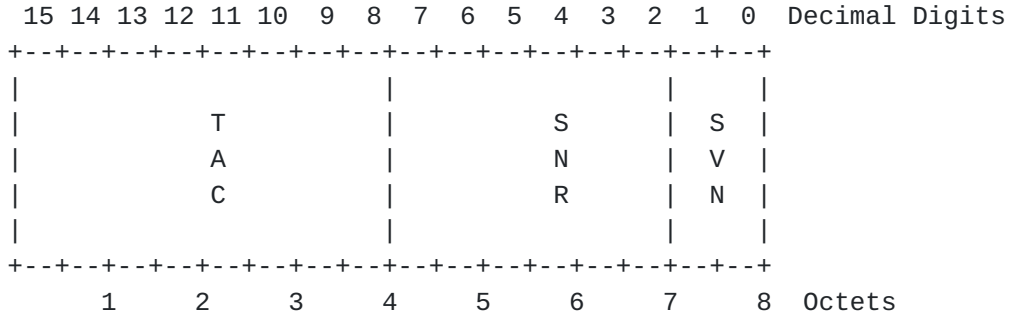
4.1.3. Spare

The Spare is a single decimal digit that is used as a security check digit to combat potential spoofing. The Spare is always set to zero

when transmitted by the Mobile Equipment. Annex B of 3GPP TS 23.003 [2] defines a mechanism for computing the actual check digit in order to validate the TAC and SNR.

4.2. IMEISV Format

The IMEISV format is 16 decimal digits encoded in 8 octets using BCD as defined in 3GPP TS 24.008 [6]. The most significant digit is coded in the most significant bits of octet 1. The least significant digit is coded in the least significant bits of octet 8.



4.2.1. Type Allocation Code (TAC)

The TAC is the same as for the IMEI in Section 5.1.1.

4.2.2. Serial Number (SNR)

The SNR is the same as for the IMEI in Section 5.1.2.

4.2.3. Software Version Number (SVN)

The Software Version Number is allocated by the Mobile Equipment manufacturer to identify the software version of the Mobile Equipment.

5. Community considerations

GSM, UMTS and LTE mobile devices will be interoperating with Internet devices for a variety of voice and data services. To do this, they need to make use of Internet protocols that will operate end to end between devices in GSM/UMTS/LTE networks and those in the general internet. Some of these protocols require the use of URN's as identifiers. Within the GSM/UMTS/LTE networks, mobile devices are identified by their IMEI and IMEISV. Internet users will need to be able to receive and include the GSMA URN in various Internet protocol elements to facilitate communication between pure internet based

devices and GSM/UMTS/LTE mobile devices. Thus the existence and syntax of these namespaces needs to be available to the general internet community and the namespace needs to be reserved with IANA in order to guarantee uniqueness and prevent potential namespace conflicts both within the internet and within GSM/UMTS/LTE networks. Conversely, Internet implementations will not generally posses IMEI identifiers. The identifiers generated by such implementations will typically be URNs within namespaces other than "gsma," and may, depending on context, even be non-URN URIs. Implementations are advised to be ready to process URIs other than "gsma"-namespaced URNs, so as to aid in interoperability.

6. Namespace considerations

A URN was considered the most appropriate URI to represent the IMEI and IMEISV as these identifiers may be used and transported similarly to the Universally Unique Identifier (UUID)which is defined as a URN in [9]. Since specifications for protocols that are used to transport device identifiers often require the device identifier to be globally unique and in the URN format it is necessary that the URN formats are defined to represent the IMEI and IMEISV.

7. IANA considerations

In accordance with BCP 66 [1], IANA is asked to register the Formal URN Namespace 'GSMA' in the Registry of URN Namespaces, using the registration template presented in Section 3 of this document.

8. Security considerations

IMEIs (with the Spare value set to zero) are displayable on most Mobile Equipment; therefore, they must not be used as security capabilities (identifiers whose mere possession grants access), for example.

Revealing the specific software version of the terminal might make the terminal more vulnerable to attacks against software that is known to contain security holes. Care therefore SHOULD be taken regarding use of the IMEISV as it could help a malicious device identify Mobile Equipment running software that is known to be vulnerable to certain attacks. This is a similar concern to the use of the User-Agent header in SIP as specified in RFC 3261 [10]. It is therefore RECOMMENDED that the IMEISV is not delivered to devices that are not trusted. Further, because IMEIs can be loosely correlated to a user, they need to be treated as any other personally

identifiable information. In particular, the IMEI MUST NOT be included in messages intended to convey any level of anonymity.

Additional security considerations are specified in 3GPP TS 22.016 [7]. Specifically the IMEI is to be incorporated in a module which is contained within the terminal. The IMEI SHALL NOT be changed after the terminal's production process. It SHALL resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software).

9. Acknowledgements

This document draws heavily on the 3GPP work on Numbering, Addressing and Identification in 3GPP TS 23.003 [2] and also on the style and structure used in RFC 4122 [9]. The authors would like to thank Cullen Jennings, Lisa Dusseault, Dale Worley, and Ivo Sedlacek for their help and comments.

10. References

10.1. Normative references

[1] Daigle, L., van Gulik, D., Iannella, R., and P. Faltstrom, "Uniform Resource Names (URN) Namespace Definition Mechanisms", BCP 66, RFC 3406, October 2002.

[2] 3GPP, "TS 23.003: Numbering, addressing and identification (Release 8)", 3GPP 23.003, September 2008, <ftp://ftp.3gpp.org/Specs/archive/23_series/23.003/>.

[3] GSMA Association, "IMEI Allocation and Approval Guidelines", PRD TS.06 (DG06) version 6.0, July 2011, <http://www.gsma.com/newsroom/wp-content/uploads/2012/06/ts0660tacallocationprocessapproved.pdf>.

[4] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[5] Moats, R., "URN Syntax", RFC 2141, May 1997.

[6] 3GPP, "TS 24.008: Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (Release 8)", 3GPP 24.008, September 2008, <ftp://ftp.3gpp.org/Specs/archive/24_series/24.008/>.

[7] 3GPP, "TS 22.016: International Mobile station Equipment

Identities (IMEI)(Release 7)", 3GPP 22.016, May 2007, <ftp://ftp.3gpp.org/Specs/archive/22_series/22.016/>.

10.2. Informative references

[8] Crocker, D. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, January 2008.

[9] Leach, P., Mealling, M., and R. Salz, "A Universally Unique IDentifier (UUID) URN Namespace", RFC 4122, July 2005.

[10] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol", RFC 3261, June 2002.

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