Distributed Mobility Management [dmm]
Internet-Draft
Intended status: Standards Track
Expires: January 21, 2018

C. Perkins
Futurewei
V. Devarapalli
Vasona Networks

July 20, 2017

# MN Identifier Types for RFC 4283 Mobile Node Identifier Option
# draft-ietf-dmm-4283mnids-05.txt

Abstract

Additional Identifier Type Numbers are defined for use with the Mobile Node Identifier Option for MIPv6 (RFC 4283).

Status of This Memo

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

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at http://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on January 21, 2018.

Copyright Notice

Copyright (c) 2017 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (http://trustee.ietf.org/license-info) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1. Introduction . . . . . 2
2. Terminology . . . . . 3
3. New Mobile Node Identifier Types . . . . . 3
4. Descriptions of MNID types . . . . . 5
4.1. Description of the IPv6 address type . . . . . 5
4.2. Description of the IMSI MNID type . . . . . 5
4.3. Description of the EUI-48 address type . . . . . 5
4.4. Description of the EUI-64 address type . . . . . 5
4.5. Description of the DUID type . . . . . 6
4.6. Description of the RFID types . . . . . 6
4.6.1. Description of the RFID-SGTIN-64 type . . . . . 7
4.6.2. Description of the RFID-SGTIN-96 type . . . . . 7
4.6.3. Description of the RFID-SSCC-64 type . . . . . 7
4.6.4. Description of the RFID-SSCC-96 type . . . . . 7
4.6.5. Description of the RFID-SGLN-64 type . . . . . 7
4.6.6. Description of the RFID-SGLN-96 type . . . . . 8
4.6.7. Description of the RFID-GRAI-64 type . . . . . 8
4.6.8. Description of the RFID-GRAI-96 type . . . . . 8
4.6.9. Description of the RFID-GIAI-64 type . . . . . 8
4.6.10. Description of the RFID-GIAI-96 type . . . . . 8
4.6.11. Description of the RFID-DoD-64 type . . . . . 8
4.6.12. Description of the RFID-DoD-96 type . . . . . 8
4.6.13. Description of the RFID URI types . . . . . 8
5. Security Considerations . . . . . 9
6. IANA Considerations . . . . . 9
7. Acknowledgements . . . . . 11
8. References . . . . . 11
8.1. Normative References . . . . . 11
8.2. Informative References . . . . . 12
Authors' Addresses . . . . . 13

## 1. Introduction

The Mobile Node Identifier Option for MIPv6 [RFC4283] has proved to be a popular design tool for providing identifiers for mobile nodes during authentication procedures with AAA protocols such as Diameter [RFC3588]. To date, only a single type of identifier has been specified, namely the MN NAI. Other types of identifiers are in common use, and even referenced in RFC 4283. In this document, we propose adding some basic types that are defined in various telecommunications standards, including types for IMSI [ThreeGPP-IDS], P-TMSI [ThreeGPP-IDS], IMEI [ThreeGPP-IDS], and GUTI [ThreeGPP-IDS]. In addition, we specify the IPv6 address itself and IEEE MAC-layer addresses as mobile node identifiers. Defining identifiers that are tied to the physical elements of the device (RFID, MAC address etc.) help in deployment of Mobile IP because in

many cases such identifiers are the most natural means for uniquely identifying the device, and will avoid additional look-up steps that might be needed if other identifiers were used.

## 2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

## 3. New Mobile Node Identifier Types

The following types of identifiers are commonly used to identify mobile nodes. For each type, references are provided with full details on the format of the type of identifer.

The Tag Data standard promoted by Electronic Product Code(TM) (abbreviated EPC) [EPC-Tag-Data] supports several encoding systems or schemes, which are commonly used in RFID (radio-frequency identification) applications, including

- RFID-GID (Global Identifier),
- RFID-SGTIN (Serialized Global Trade Item Number),
- RFID-SSCC (Serial Shipping Container),
- RFID-SGLN (Global Location Number),
- RFID-GRAI (Global Returnable Asset Identifier),
- RFID-DOD (Department of Defense ID), and
- RFID-GIAI (Global Individual Asset Identifier).

For each RFID scheme except GID, there are three representations:

- a 64-bit binary representation (for example, SGLN-64) (except for GID)
- a 96-bit binary representation (SGLN-96)
- a representation as a URI

The URI representation for the RFID is actually a URN. The EPC document has the following language:

> All categories of URIs are represented as Uniform Reference Names (URNs) as defined by [RFC2141], where the URN Namespace is epc.

The following list includes the above RFID types as well as various other common identifiers.

Mobile Node Identifier Description

| Identifier Type | Description | Reference |
|---|---|---|
| IPv6 Address | | [RFC4291] |
| IMSI | International Mobile Subscriber Identity | [ThreeGPP-IDS] |
| P-TMSI | Packet-Temporary Mobile Subscriber Identity | [ThreeGPP-IDS] |
| GUTI | Globally Unique Temporary ID | [ThreeGPP-IDS] |
| EUI-48 address | 48-bit Extended Unique Identifier | [IEEE802] |
| EUI-64 address | 64-bit Extended Unique Identifier-64 bit | [IEEE802] |
| DUID | DHCPv6 Unique Identifier | [RFC3315] |
| RFID-SGTIN-64 | 64-bit Serialized Global Trade Item Number | [EPC-Tag-Data] |
| RFID-SSCC-64 | 64-bit Serial Shipping Container | [EPC-Tag-Data] |
| RFID-SGLN-64 | 64-bit Serialized Global Location Number | [EPC-Tag-Data] |
| RFID-GRAI-64 | 64-bit Global Returnable Asset Identifier | [EPC-Tag-Data] |
| RFID-DOD-64 | 64-bit Department of Defense ID | [RFID-DoD-spec] |
| RFID-GIAI-64 | 64-bit Global Individual Asset Identifier | [EPC-Tag-Data] |
| RFID-GID-96 | 96-bit Global Identifier | [EPC-Tag-Data] |
| RFID-SGTIN-96 | 96-bit Serialized Global Trade Item Number | [EPC-Tag-Data] |
| RFID-SSCC-96 | 96-bit Serial Shipping Container | [EPC-Tag-Data] |
| RFID-SGLN-96 | 96-bit Serialized Global Location Number | [EPC-Tag-Data] |
| RFID-GRAI-96 | 96-bit Global Returnable Asset Identifier | [EPC-Tag-Data] |
| RFID-DOD-96 | 96-bit Department of Defense ID | [RFID-DoD-spec] |
| RFID-GIAI-96 | 96-bit Global Individual Asset Identifier | [EPC-Tag-Data] |
| RFID-GID-URI | Global Identifier represented as URI | [EPC-Tag-Data] |
| RFID-SGTIN-URI | Serialized Global Trade Item Number represented as URI | [EPC-Tag-Data] |
| RFID-SSCC-URI | Serial Shipping Container represented as URI | [EPC-Tag-Data] |
| RFID-SGLN-URI | Global Location Number represented as URI | [EPC-Tag-Data] |

| | | | |
|---|---|---|---|
| RFID-GRAI-URI | Global Returnable Asset Identifier represented as URI | [EPC-Tag-Data] | |
| RFID-DOD-URI | Department of Defense ID represented as URI | [RFID-DoD-spec] | |
| RFID-GIAI-URI | Global Individual Asset Identifier represented as URI | [EPC-Tag-Data] | |

Table 1

## 4. Descriptions of MNID types

In this section descriptions for the various MNID types are provided.

### 4.1. Description of the IPv6 address type

The IPv6 address [RFC4291] is encoded as a 16 octet string containing a full IPv6 address which has been assigned to the mobile node. The IPv6 address MUST be a unicast routable IPv6 address. Multicast addresses, link-local addresses, and the unspecified IPv6 address MUST NOT be used. IPv6 Unique Local Addresses (ULAs) MAY be used, as long as any security operations making use of the ULA also take into account the domain in which the ULA is guaranteed to be unique.

### 4.2. Description of the IMSI MNID type

The International Mobile Subscriber Identity (IMSI) [ThreeGPP-IDS] is at most 15 decimal digits (i.e., digits from 0 through 9). The IMSI MUST be encoded as a string of octets in network order (i.e., high-to-low for all digits), where each digit occupies 4 bits. If needed for full octet size, the last digit MUST be padded with 0xf. For example an example IMSI 123456123456789 would be encoded as follows:

0x12, 0x34, 0x56, 0x12, 0x34, 0x56, 0x78, 0x9f

### 4.3. Description of the EUI-48 address type

The IEEE EUI-48 address [IEEE802-eui48] is encoded as 6 octets containing the IEEE EUI-48 address.

### 4.4. Description of the EUI-64 address type

The IEEE EUI-64 address [IEEE802-eui64] is encoded as 8 octets containing the full IEEE EUI-64 address.

### 4.5. Description of the DUID type

The DUID is the DHCPv6 Unique Identifier (DUID) [RFC3315]. There are various types of DUID, which are distinguished by an initial two-octet type field. Clients and servers MUST treat DUIDs as opaque values and MUST only compare DUIDs for equality.

### 4.6. Description of the RFID types

The General Identifier (GID) that is used with RFID is composed of three fields - the General Manager Number, Object Class and Serial Number. The General Manager Number identifies an organizational entity that is responsible for maintaining the numbers in subsequent fields. GID encodings include a fourth field, the header, to guarantee uniqueness in the namespace defined by EPC.

Some of the RFID types depend on the Global Trade Item Number (GTIN) code defined in the General EAN.UCC Specifications [EANUCCGS]. A GTIN identifies a particular class of object, such as a particular kind of product or SKU.

The EPC encoding scheme for SGTIN permits the direct embedding of EAN.UCC System standard GTIN and Serial Number codes on EPC tags. In all cases, the check digit is not encoded. Two encoding schemes are specified, SGTIN-64 (64 bits) and SGTIN-96 (96 bits).

The Serial Shipping Container Code (SSCC) is defined by the EAN.UCC Specifications. Unlike the GTIN, the SSCC is already intended for assignment to individual objects and therefore does not require additional fields to serve as an EPC pure identity. Two encoding schemes are specified, SSCC-64 (64 bits) and SSCC-96 (96 bits).

The Global Location Number (GLN) is defined by the EAN.UCC Specifications. A GLN can represent either a discrete, unique physical location such as a warehouse slot, or an aggregate physical location such as an entire warehouse. In addition, a GLN can represent a logical entity that performs a business function such as placing an order. The Serialized Global Location Number (SGLN) includes the Company Prefix, Location Reference, and Serial Number.

The Global Returnable Asset Identifier (GRAI) is defined by the General EAN.UCC Specifications. Unlike the GTIN, the GRAI is already intended for assignment to individual objects and therefore does not require any additional fields to serve as an EPC pure identity. The GRAI includes the Company Prefix, Asset Type, and Serial Number.

The Global Individual Asset Identifier (GIAI) is defined by the General EAN.UCC Specifications. Unlike the GTIN, the GIAI is already

intended for assignment to individual objects and therefore does not require any additional fields to serve as an EPC pure identity. The GRAI includes the Company Prefix, and Individual Asset Reference.

The DoD Construct identifier is defined by the United States Department of Defense (DoD). This tag data construct may be used to encode tags for shipping goods to the DoD by a supplier who has already been assigned a CAGE (Commercial and Government Entity) code.

### 4.6.1. Description of the RFID-SGTIN-64 type

The RFID-SGTIN-64 is encoded as specified in [EPC-Tag-Data]. The SGTIN-64 includes five fields: Header, Filter Value (additional data that is used for fast filtering and pre-selection), Company Prefix Index, Item Reference, and Serial Number. Only a limited number of Company Prefixes can be represented in the 64-bit tag.

### 4.6.2. Description of the RFID-SGTIN-96 type

The RFID-SGTIN-96 is encoded as specified in [EPC-Tag-Data]. The SGTIN-96 includes six fields: Header, Filter Value, Partition (an indication of where the subsequent Company Prefix and Item Reference numbers are divided), Company Prefix Index, Item Reference, and Serial Number.

### 4.6.3. Description of the RFID-SSCC-64 type

The RFID-SSCC-64 is encoded as specified in [EPC-Tag-Data]. The SSCC-64 includes four fields: Header, Filter Value, Company Prefix Index, and Serial Reference. Only a limited number of Company Prefixes can be represented in the 64-bit tag.

### 4.6.4. Description of the RFID-SSCC-96 type

The RFID-SSCC-96 is encoded as specified in [EPC-Tag-Data]. The SSCC-96 includes six fields: Header, Filter Value, Partition, Company Prefix, and Serial Reference, as well as 24 bits that remain Unallocated and must be zero.

### 4.6.5. Description of the RFID-SGLN-64 type

The RFID-SGLN-64 type is encoded as specified in [EPC-Tag-Data]. The SGLN-64 includes five fields: Header, Filter Value, Company Prefix Index, Location Reference, and Serial Number.

#### 4.6.6. Description of the RFID-SGLN-96 type

The RFID-SGLN-96 type is encoded as specified in [EPC-Tag-Data]. The SGLN-96 includes six fields: Header, Filter Value, Partition, Company Prefix, Location Reference, and Serial Number.

#### 4.6.7. Description of the RFID-GRAI-64 type

The RFID-GRAI-64 type is encoded as specified in [EPC-Tag-Data]. The GRAI-64 includes five fields: Header, Filter Value, Company Prefix Index, Asset Type, and Serial Number.

#### 4.6.8. Description of the RFID-GRAI-96 type

The RFID-GRAI-96 type is encoded as specified in [EPC-Tag-Data]. The GRAI-96 includes six fields: Header, Filter Value, Partition, Company Prefix, Asset Type, and Serial Number.

#### 4.6.9. Description of the RFID-GIAI-64 type

The RFID-GIAI-64 type is encoded as specified in [EPC-Tag-Data]. The GIAI-64 includes four fields: Header, Filter Value, Company Prefix Index, and Individual Asset Reference.

#### 4.6.10. Description of the RFID-GIAI-96 type

The RFID-GIAI-96 type is encoded as specified in [EPC-Tag-Data]. The GIAI-96 includes five fields: Header, Filter Value, Partition, Company Prefix, and Individual Asset Reference.

#### 4.6.11. Description of the RFID-DoD-64 type

The RFID-DoD-64 type is encoded as specified in [RFID-DoD-spec]. The DoD-64 type includes four fields: Header, Filter Value, Government Managed Identifier, and Serial Number.

#### 4.6.12. Description of the RFID-DoD-96 type

The RFID-DoD-96 type is encoded as specified in [RFID-DoD-spec]. The DoD-96 type includes four fields: Header, Filter Value, Government Managed Identifier, and Serial Number.

#### 4.6.13. Description of the RFID URI types

In some cases, it is desirable to encode in URI form a specific encoding of an RFID tag. For example, an application may prefer a URI representation for report preparation. Applications that wish to

manipulate any additional data fields on tags may need some representation other than the pure identity forms.

For this purpose, the fields as represented the previous sections are associated with specified fields in the various URI types. For instance, the URI may have fields such as CompanyPrefix, ItemReference, or SerialNumber. For details and encoding specifics, consult [EPC-Tag-Data].

## 5. Security Considerations

This document does not introduce any security mechanisms, and does not have any impact on existing security mechanisms.

Mobile Node Identifiers such as those described in this document are considered to be private information. If used in the MNID extension as defined in [RFC4283], the packet including the MNID extension MUST be encrypted so that no personal information or trackable identifiers is inadvertently disclosed to passive observers. Operators can potentially apply IPsec Encapsulating Security Payload (ESP) [RFC4303], with confidentiality and integrity protection for protecting the identity and location information.

Some MNIDs contain sensitive identifiers which, as used in protocols specified by other SDOs, are only used for signaling during initial network entry. In such protocols, subsequent exchanges then rely on a temporary identifier allocated during the initial network entry. Managing the association between long-lived and temporary identifiers is outside the scope of this document.

## 6. IANA Considerations

The new mobile node identifier types defined in the document should be assigned values from the "Mobile Node Identifier Option Subtypes" registry. The following values should be assigned.

New Mobile Node Identifier Types

| Identifier Type | Identifier Type Number |
|---|---|
| IPv6 Address | 2 |
| IMSI | 3 |
| P-TMSI | 4 |
| EUI-48 address | 5 |
| EUI-64 address | 6 |
| GUTI | 7 |
| DUID-LLT | 8 |
| DUID-EN | 9 |
| DUID-LL | 10 |
| DUID-UUID | 11 |
| | 12-15 reserved |
| | 16 reserved |
| RFID-SGTIN-64 | 17 |
| RFID-SSCC-64 | 18 |
| RFID-SGLN-64 | 19 |
| RFID-GRAI-64 | 20 |
| RFID-DOD-64 | 21 |
| RFID-GIAI-64 | 22 |
| | 23 reserved |
| RFID-GID-96 | 24 |
| RFID-SGTIN-96 | 25 |
| RFID-SSCC-96 | 26 |
| RFID-SGLN-96 | 27 |
| RFID-GRAI-96 | 28 |
| RFID-DOD-96 | 29 |
| RFID-GIAI-96 | 30 |
| | 31 reserved |
| RFID-GID-URI | 32 |
| RFID-SGTIN-URI | 33 |
| RFID-SSCC-URI | 34 |
| RFID-SGLN-URI | 35 |
| RFID-GRAI-URI | 36 |
| RFID-DOD-URI | 37 |
| RFID-GIAI-URI | 38 |
| | 39-255 unassigned |

Table 2

See Section 4 for additional information about the identifier types. Future new assignments are to be made only after Expert Review [RFC8126]. The expert must ascertain that the identifier type allows unique identification of the mobile device; since all MNIDs require

encryption there is no additional privacy exposure attendent to the use of new types.

## 7. Acknowledgements

The authors wish to acknowledge Hakima Chaouchi, Tatuya Jinmei, Jouni Korhonen, Sri Gundavelli, Suresh Krishnan, Dapeng Liu, Dale Worley, Joseph Salowey, Linda Dunbar, and Mirja Kuehlewind for their helpful comments.

## 8. References

### 8.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <http://www.rfc-editor.org/info/rfc2119>.

[RFC3315] Droms, R., Ed., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", RFC 3315, DOI 10.17487/RFC3315, July 2003, <http://www.rfc-editor.org/info/rfc3315>.

[RFC4122] Leach, P., Mealling, M., and R. Salz, "A Universally Unique IDentifier (UUID) URN Namespace", RFC 4122, DOI 10.17487/RFC4122, July 2005, <http://www.rfc-editor.org/info/rfc4122>.

[RFC4283] Patel, A., Leung, K., Khalil, M., Akhtar, H., and K. Chowdhury, "Mobile Node Identifier Option for Mobile IPv6 (MIPv6)", RFC 4283, DOI 10.17487/RFC4283, November 2005, <http://www.rfc-editor.org/info/rfc4283>.

[RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, DOI 10.17487/RFC4291, February 2006, <http://www.rfc-editor.org/info/rfc4291>.

[RFC4303] Kent, S., "IP Encapsulating Security Payload (ESP)", RFC 4303, DOI 10.17487/RFC4303, December 2005, <http://www.rfc-editor.org/info/rfc4303>.

[RFC6355] Narten, T. and J. Johnson, "Definition of the UUID-Based DHCPv6 Unique Identifier (DUID-UUID)", RFC 6355, DOI 10.17487/RFC6355, August 2011, <http://www.rfc-editor.org/info/rfc6355>.

[RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <http://www.rfc-editor.org/info/rfc8126>.

## 8.2. Informative References

[EANUCCGS]
EAN International and the Uniform Code Council, "General EAN.UCC Specifications Version 5.0", Jan 2004.

[EPC-Tag-Data]
EPCglobal Inc., "EPC(TM) Generation 1 Tag Data Standards Version 1.1 Rev.1.27 http://www.gs1.org/gsmp/kc/epcglobal/tds/tds_1_1_rev_1_27-standard-20050510.pdf", January 2005.

[IEEE802] IEEE, "IEEE Std 802: IEEE Standards for Local and Metropolitan Networks: Overview and Architecture", 2001.

[IEEE802-eui48]
IEEE, "Guidelines for 48-Bit Global Identifier (EUI-48) https://standards.ieee.org/develop/regauth/tut/eui48.pdf", 2001.

[IEEE802-eui64]
IEEE, "Guidelines for 64-Bit Global Identifier (EUI-64) https://standards.ieee.org/develop/regauth/tut/eui.pdf64", 2001.

[RFC3588] Calhoun, P., Loughney, J., Guttman, E., Zorn, G., and J. Arkko, "Diameter Base Protocol", RFC 3588, DOI 10.17487/RFC3588, September 2003, <http://www.rfc-editor.org/info/rfc3588>.

[RFID-DoD-spec]
Department of Defense, "United States Department of Defense Suppliers Passive RFID Information Guide (Version 15.0)", January 2010.

[ThreeGPP-IDS]
3rd Generation Partnership Project, "3GPP Technical Specification 23.003 V8.4.0: Technical Specification Group Core Network and Terminals; Numbering, addressing and identification (Release 8)", March 2009.

Authors' Addresses

Charles E. Perkins
Futurewei Inc.
2330 Central Expressway
Santa Clara, CA 95050
USA

Phone: +1-408-330-4586
Email: charliep@computer.org

Vijay Devarapalli
Vasona Networks
2900 Lakeside Drive, Suite 180
Santa Clara, CA 95054
USA