

Internet Engineering Task Force (IETF)
Request for Comments: 7043
Category: Informational
ISSN: 2070-1721

J. Abley
Dyn, Inc.
October 2013

Resource Records for EUI-48 and EUI-64 Addresses in the DNS

Abstract

48-bit Extended Unique Identifier (EUI-48) and 64-bit Extended Unique Identifier (EUI-64) are address formats specified by the IEEE for use in various layer-2 networks, e.g., Ethernet.

This document describes two new DNS resource record types, EUI48 and EUI64, for encoding Ethernet addresses in the DNS.

This document describes potentially severe privacy implications resulting from indiscriminate publication of link-layer addresses in the DNS. EUI-48 or EUI-64 addresses SHOULD NOT be published in the public DNS. This document specifies an interoperable encoding of these address types for use in private DNS namespaces, where the privacy concerns can be constrained and mitigated.

Status of This Memo

This document is not an Internet Standards Track specification; it is published for informational purposes.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Not all documents approved by the IESG are a candidate for any level of Internet Standard; see Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <http://www.rfc-editor.org/info/rfc7043>.

Copyright Notice

Copyright (c) 2013 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 3
- 2. Terminology 3
- 3. The EUI48 Resource Record 3
 - 3.1. EUI48 RDATA Wire Format 4
 - 3.2. EUI48 RR Presentation Format 4
 - 3.3. Example 4
- 4. The EUI64 Resource Record 4
 - 4.1. EUI64 RDATA Wire Format 4
 - 4.2. EUI64 RR Presentation Format 5
 - 4.3. Example 5
- 5. Example Use Case: IP Address Tracking in DOCSIS Networks . . 5
- 6. DNS Protocol Considerations 6
- 7. IANA Considerations 6
- 8. Security Considerations 6
- 9. Acknowledgements 7
- 10. References 7
 - 10.1. Normative References 7
 - 10.2. Informative References 8

1. Introduction

The Domain Name System (DNS) is described in [RFC1034] and [RFC1035]. This base specification defines many resource record (RR) types, and subsequent specifications have defined others. Each defined RR type provides a means of encoding particular data in the DNS.

48-bit Extended Unique Identifier (EUI-48) [EUI48] and 64-bit Extended Unique Identifier (EUI-64) [EUI64] are address formats specified by the IEEE for use in various layer-2 networks, e.g., Ethernet.

This document defines two new RR types, EUI48 and EUI64, for encoding EUI-48 and EUI-64 addresses in the DNS.

There are potentially severe privacy implications resulting from the indiscriminate publication of link-layer addresses in the DNS (see Section 8). This document recommends that EUI-48 or EUI-64 addresses SHOULD NOT be published in the public DNS. This document specifies an interoperable encoding of these address types for use in private DNS namespaces, where the privacy implications can be constrained and mitigated.

2. Terminology

This document uses capitalized keywords such as MUST and MAY to describe the requirements for using the registered RR types. The intended meaning of those keywords in this document are the same as those described in [RFC2119]. Although these keywords are often used to specify normative requirements in IETF Standards, their use in this document does not imply that this document is a standard of any kind.

3. The EUI48 Resource Record

The EUI48 resource record (RR) is used to store a single EUI-48 address in the DNS.

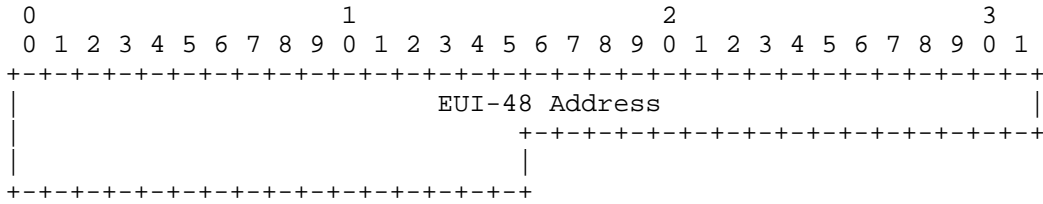
The Type value for the EUI48 RR is 108 (decimal).

The EUI48 RR is class independent.

The EUI48 RR has no special Time-to-Live (TTL) requirements.

3.1. EUI48 RDATA Wire Format

The RDATA for an EUI48 RR consists of a single, 6-octet Address field, encoded in network (big-endian) order.



3.2. EUI48 RR Presentation Format

The Address field MUST be represented as six two-digit hexadecimal numbers separated by hyphens. The hexadecimal digits "A" through "F" MAY be represented in either upper or lower case.

3.3. Example

The following EUI48 RR stores the EUI-48 unicast address 00-00-5e-00-53-2a.

host.example. 86400 IN EUI48 00-00-5e-00-53-2a

4. The EUI64 Resource Record

The EUI64 RR is used to store a single EUI-64 address in the DNS.

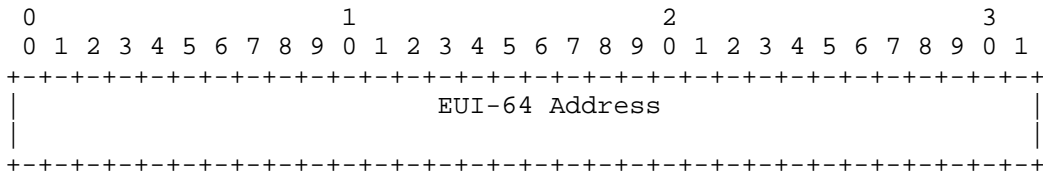
The Type value for the EUI64 RR is 109 (decimal).

The EUI64 RR is class independent.

The EUI64 RR has no special TTL requirements.

4.1. EUI64 RDATA Wire Format

The RDATA for an EUI64 RR consists of a single, 8-octet Address field, encoded in network (big-endian) order.



4.2. EUI64 RR Presentation Format

The Address field MUST be represented as eight two-digit hexadecimal numbers separated by hyphens. The hexadecimal digits "A" through "F" MAY be represented in either upper or lower case.

4.3. Example

The following EUI64 RR stores the EUI-64 unicast address 00-00-5e-ef-10-00-00-2a.

```
host.example. 86400 IN EUI64 00-00-5e-ef-10-00-00-2a
```

5. Example Use Case: IP Address Tracking in DOCSIS Networks

Canadian cable Internet subscribers are assigned IP addresses using DHCP, using a DHCP server operated by a cable company. In the case where a cable company provides last-mile connectivity to a subscriber on behalf of a third-party company (reseller), the DHCP server assigns addresses from a pool supplied by the reseller. The reseller retains knowledge of the EUI-48 address of the DOCSIS modem supplied to the subscriber but has no direct knowledge of the IP addresses assigned. In order for the reseller to be able to map the IP address assigned to a subscriber to that EUI-48 address (and hence to the subscriber identity), the cable company can make available information from the DHCP server that provides (EUI-48, IP) address mapping.

Cable companies in Canada are required [NTRE038D] to make this address mapping available using the DNS. Zones containing the relevant information are published on DNS servers, access to which is restricted to the resellers corresponding to particular sets of subscribers. Subscriber address information is not published in the public DNS.

Existing DNS schemas for the representation of (EUI-48, IP) mapping used by Canadian cable companies are varied and inefficient; in the absence of an RR type for direct encoding of EUI-48 addresses, addresses are variously encoded into owner names or are published in TXT records.

The specification in this document facilitates a more efficient, consistent, and reliable representation of (EUI-48, IP) mapping than was previously available.

6. DNS Protocol Considerations

The specification of the new RR types in this document has no effect on the address resolution behavior of any previously existing network processes or protocols. Proposals or specifications to modify or augment address resolution processes or protocols by making use of these RR types should specify how any address conflicts or use of multiple EUI48/EUI64 RRs are handled.

7. IANA Considerations

IANA has assigned the RR type value 108 (decimal) for EUI48 and 109 (decimal) for EUI64. The corresponding entries in the "Resource Record (RR) TYPES" subregistry (<http://www.iana.org/assignments/dns-parameters/>) match the following data:

| Type | Value | Meaning | Reference |
|-------|-------|-------------------|---------------|
| EUI48 | 108 | an EUI-48 address | this document |
| EUI64 | 109 | an EUI-64 address | this document |

8. Security Considerations

There are privacy concerns with the publication of link-layer addresses in the DNS. EUI-48 and EUI-64 addresses with the Local/Global bit zero [RFC7042] (referred to in [RFC4291] as the universal/local bit) are intended to represent unique identifiers for network connected equipment, notwithstanding many observed cases of duplication due to manufacturing errors, unauthorized use of Organizationally Unique Identifiers (OUIs), and address spoofing through configuration of network interfaces. Publication of EUI-48 or EUI-64 addresses in the DNS may result in privacy issues in the form of unique trackable identities that in some cases may be permanent.

For example, although IP addresses and DNS names for network devices typically change over time, EUI-48 and EUI-64 addresses configured on the same devices are normally far more stable (in many cases, effectively invariant). Publication of EUI-48 addresses associated with user devices in a way that could be mapped to assigned IP addresses would allow the behavior of those users to be tracked by third parties, regardless of where and how the user's device is connected to the Internet. This might well result in a loss of privacy for the user.

The publication of EUI-48 or EUI-64 addresses associated with deployed equipment, using the mechanism described in this document or any other mechanism, has the potential to facilitate Media Access Control (MAC) cloning -- that is, facilitate link-layer attacks against deployed devices, e.g., to disrupt service or intercept data.

These concerns can be mitigated by restricting access to DNS zones containing EUI48 or EUI64 RRs to specific, authorized clients and by provisioning them in DNS zones that exist in private namespaces only.

This document recommends that EUI-48 or EUI-64 addresses SHOULD NOT be published in the public DNS.

9. Acknowledgements

The author acknowledges the contributions of Olafur Gudmundsson, Mark Smith, Andrew Sullivan, Roy Arends, Michael StJohns, Donald Eastlake III, Randy Bush, and John Klensin.

10. References

10.1. Normative References

- [EUI48] IEEE, "Guidelines for use of a 48-bit Extended Unique Identifier (EUI-48)",
<<http://standards.ieee.org/develop/regauth/tut/eui48.pdf>>.
- [EUI64] IEEE, "Guidelines for 64-bit Global Identifier (EUI-64)",
November 2012,
<<http://standards.ieee.org/develop/regauth/tut/eui64.pdf>>.
- [RFC1034] Mockapetris, P., "Domain names - concepts and facilities",
STD 13, RFC 1034, November 1987.
- [RFC1035] Mockapetris, P., "Domain names - implementation and
specification", STD 13, RFC 1035, November 1987.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC7042] Eastlake 3rd, D. and J. Abley, "IANA Considerations and
IETF Protocol and Documentation Usage for IEEE 802
Parameters", BCP 141, RFC 7042, October 2013.

10.2. Informative References

[NTRE038D]

CRTC Interconnection Steering Committee (CISC) Network Working Group, "Implementation of IP Address Tracking in DOCSIS Networks (TIF18)", NTRE038D Consensus Report, October 2006, <<http://www.crtc.gc.ca/public/cisc/nt/NTRE038D.doc>>.

[RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, February 2006.

Author's Address

Joe Abley
Dyn, Inc.
470 Moore Street
London, ON N6C 2C2
Canada

Phone: +1 519 670 9327
EMail: jabley@dyn.com

