
Stream: Internet Engineering Task Force (IETF)
RFC: [9735](#)
Category: Standards Track
Published: February 2025
ISSN: 2070-1721
Authors: D. Farinacci L. Iannone, Ed.
lispers.net Huawei

RFC 9735

Locator/ID Separation Protocol (LISP) Distinguished Name Encoding

Abstract

This document defines how to use the "Distinguished Name" Address Family Identifier (AFI) in the Locator/ID Separation Protocol (LISP). Distinguished Names (DNs) can be used in either Endpoint Identifier (EID) records or Routing Locator (RLOC) records in LISP control messages to convey additional information.

Status of This Memo

This is an Internet Standards Track document.

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). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <https://www.rfc-editor.org/info/rfc9735>.

Copyright Notice

Copyright (c) 2025 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 (<https://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 Revised BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Revised BSD License.

Table of Contents

1. Introduction	2
2. Terminology	3
2.1. Definition	3
2.2. Requirements Language	3
3. Distinguished Name Format	3
4. Mapping System Lookups for Distinguished Name EIDs	4
5. Example Use Cases	4
6. Name-Collision Considerations	5
7. Security Considerations	5
8. IANA Considerations	5
9. Sample LISP Distinguished Name (DN) Deployment Experience	5
9.1. DNs to Advertise Specific Device Roles or Functions	5
9.2. DNs to Drive xTR Onboarding Procedures	6
9.3. DNs for NAT-Traversal	6
9.4. DNs for Self-Documenting RLOC Names	6
9.5. DNs used as EID Names	7
10. References	7
10.1. Normative References	7
10.2. Informative References	7
Acknowledgments	8
Authors' Addresses	8

1. Introduction

The LISP architecture and protocols (see [RFC9300] and [RFC9301]) introduce two new numbering spaces: Endpoint Identifiers (EIDs) and Routing Locators (RLOCs). To provide flexibility for current and future applications, these values can be encoded in LISP control messages using a general syntax that includes the Address Family Identifier (AFI).

The length of addresses encoded in EID and RLOC records can easily be determined by the AFI field, as the size of the address is implicit in its AFI value. For instance, for AFI = 1, which is "IP (IP version 4)", the address length is known to be 4 octets. However, AFI 17 "Distinguished Name", is a variable-length value, so the length cannot be determined solely from the AFI value 17 [[IANA-ADDRESS-FAMILY-REGISTRY](#)]. This document defines a termination character, an 8-bit value of 0, to be used as a string terminator so the length can be determined.

LISP Distinguished Names are useful when encoded either in EID-Records or RLOC-records in LISP control messages. As EIDs, they can be registered in the mapping system to find resources, services, or simply be used as a self-documenting feature that accompanies other address-specific EIDs. As RLOCs, Distinguished Names, along with RLOC-specific addresses and parameters, can be used as labels to identify equipment type, location, or any self-documenting string a registering device desires to convey.

The Distinguished Name field in this document has no relationship to the similarly named field in the Public-Key Infrastructure using X.509 (PKIX) specifications [[RFC5280](#)].

2. Terminology

2.1. Definition

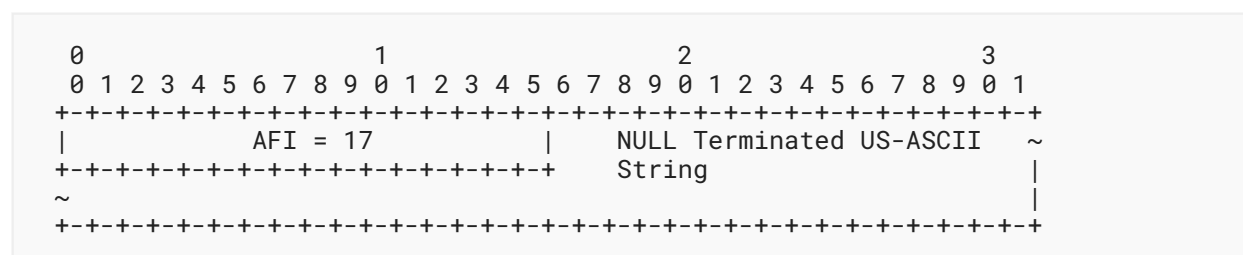
Address Family Identifier (AFI): a term used to describe an address encoding in a packet. An address family is currently defined for IPv4 or IPv6 addresses. See [[IANA-ADDRESS-FAMILY-REGISTRY](#)] for details on other types of information that can be AFI encoded.

2.2. Requirements Language

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 BCP 14 [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

3. Distinguished Name Format

An AFI=17 Distinguished Name is encoded as:



The variable-length string of characters are encoded as a NULL (0x00) terminated US-ASCII character set as defined in [RFC3629], where UTF-8 has the characteristic of preserving the full US-ASCII range. A NULL character **MUST** appear only once in the string and **MUST** be at the end of the string.

When Distinguished Names are encoded for EIDs, the EID Mask-Len length of the EIDs as they appear in EID-Records for all LISP control messages [RFC9301] is the length of the string in bits (including the terminating NULL 0x00 octet).

Where Distinguished Names are encoded anywhere else (i.e., nested in LISP Canonical Address Format (LCAF) encodings [RFC8060]), an explicit length field can be used to indicate the length of the ASCII string in octets. The length field **MUST** include the NULL 0 octet. The string **MUST** still be NULL terminated. If a NULL 0 octet appears before the end of the octet field, i.e., the NULL octet appears before the last position in the octet fields, then the string **MAY** be accepted and the octets after the NULL 0 octet **MUST NOT** be used as part of the octet string.

If the octet after the AFI field is the NULL 0 octet, the string is a NULL string and **MUST** be accepted. That is, an AFI=17 encoded string **MUST** be at least 1 octet in length.

4. Mapping System Lookups for Distinguished Name EIDs

Distinguished Name EID lookups **MUST** carry as an EID Mask-Len length equal to the length of the name string. This instructs the mapping system to do either an exact-match or a longest-match lookup.

If the Distinguished Name EID is registered with the same length as the length in a Map-Request, the Map-Server (when configured for proxy Map-Replying) returns an exact-match lookup with the same EID Mask-Len length. If a less specific name is registered, then the Map-Server returns the registered name with the registered EID Mask-Len length.

For example, if the registered EID name is "ietf" with an EID Mask-Len length of 40 bits (the length of the string "ietf" plus the null octet is 5 octets), and a Map-Request is received for EID name "ietf.lisp" with an EID Mask-Len length of 80 bits, the Map-Server will return EID "ietf" with a length of 40 bits.

5. Example Use Cases

This section identifies three specific use-case examples for the Distinguished Name format: two are used for an EID encoding and one for an RLOC-record encoding. When storing public keys in the mapping system, as in [LISP-ECDSA], a well-known format for a public-key hash can be encoded as a Distinguished Name. When street-location-to-GPS-coordinate mappings exist in the mapping system, as in [LISP-GEO], the street location can be a free-form UTF-8 ASCII representation (with whitespace characters) encoded as a Distinguished Name. An RLOC that describes an Ingress or Egress Tunnel Router (xTR) behind a NAT device can be identified by its router name, as in [LISP-NET-NAT]. In this case, Distinguished Name encoding is used in NAT Info-Request messages after the EID-prefix field of the message.

6. Name-Collision Considerations

When a Distinguished Name encoding is used to format an EID, the uniqueness and allocation concerns are no different than registering IPv4 or IPv6 EIDs to the mapping system. See [\[RFC9301\]](#) for more details. Also, the use cases documented in [Section 5](#) of this specification provide allocation recommendations for their specific uses.

It is **RECOMMENDED** that each use case register their Distinguished Names with a unique Instance-ID. Any use cases that require different uses for Distinguished Names within an Instance-ID **MUST** define their own Instance-ID and syntax structure for the name registered to the Mapping System. See the encoding procedures in [\[LISP-VPN\]](#) for an example.

7. Security Considerations

Distinguished Names are used in mappings that are part of the LISP control plane and may be encoded using LCAF; thus, the security considerations of [\[RFC9301\]](#) and [\[RFC8060\]](#) apply.

8. IANA Considerations

This document has no IANA actions.

9. Sample LISP Distinguished Name (DN) Deployment Experience

Practical implementations of the LISP Distinguished Name specification have been running in production networks for some time. The following sections provide some examples of its usage and lessons learned out of this experience.

9.1. DNs to Advertise Specific Device Roles or Functions

In a practical implementation of [\[LISP-EXT\]](#) on LISP deployments, routers running as Proxy Egress Tunnel Routers (Proxy-ETRs) register their role with the Mapping System in order to attract traffic destined for external networks. Practical implementations of this functionality make use of a Distinguished Name as an EID to identify the Proxy-ETR role in a Map-Registration.

In this case, all Proxy-ETRs supporting this function register a common Distinguished Name together with their own offered locator. The Mapping-System aggregates the locators received from all Proxy-ETRs as a common locator-set that is associated with this DN EID. In this scenario, the Distinguished Name serves as a common reference EID that can be requested (or subscribed as per [\[RFC9437\]](#)) to dynamically gather this Proxy-ETR list as specified in the LISP Site External Connectivity document.

The use of a Distinguished Name here provides descriptive information about the role being registered and allows the Mapping System to form locator-sets associated with a specific role. These locator-sets can be distributed on-demand based on using the shared DN as EID. It also allows the network admin and the Mapping System to selectively choose what roles and functions can be registered and distributed to the rest of the participants in the network.

9.2. DNs to Drive xTR Onboarding Procedures

Following the LISP reliable transport [[LISP-MAP](#)], ETRs that plan to switch to using reliable transport to hold registrations first need to start with traditional UDP registrations. The UDP registration allows the Map-Server to perform basic authentication of the ETR and to create the necessary state to permit the reliable transport session to be established (e.g., establish a passive open on TCP port 4342 and add the ETR RLOC to the list allowed to establish a session).

In the basic implementation of this process, the ETRs need to wait until local mappings are available and ready to be registered with the Mapping System. Furthermore, when the mapping system is distributed, the ETR requires having one specific mapping ready to be registered with each one of the relevant Map-Servers. This process may delay the onboarding of ETRs with the Mapping System so that they can switch to using reliable transport. This can also lead to generating unnecessary signaling as a reaction to certain triggers like local port flaps and device failures.

The use of dedicated name registrations allows driving this initial ETR onboarding on the Mapping System as a deterministic process that does not depend on the availability of other mappings. It also provides more stability to the reliable transport session to survive through transient events.

In practice, LISP deployments use dedicated Distinguished Names that are registered as soon as xTRs come online with all the necessary Map-Servers in the Mapping System. The mapping with the dedicated DN together with the RLOCs of each Egress Tunnel Router (ETR) in the locator-set is used to drive the initial UDP registration and also to keep the reliable transport state stable through network condition changes. On the Map-Server, these DN registrations facilitate setting up the necessary state to onboard new ETRs rapidly and in a more deterministic manner.

9.3. DNs for NAT-Traversal

The open source `lispers.net` NAT-Traversal implementation [[LISP-NET-NAT](#)] has had 10 years of deployment experience using Distinguished Names for documenting xTRs versus Re-encapsulating Tunnel Routers (RTRs) as they appear in a locator-set.

9.4. DNs for Self-Documenting RLOC Names

The open source `lispers.net` implementation has had 10 years of self-documenting RLOC names in production and pilot environments. The RLOC name is encoded with the RLOC address in Distinguished Name format.

9.5. DNs used as EID Names

The open source lispers.net implementation has had 10 years of deployment experience allowing xTRs to register EIDs as Distinguished Names. The LISP Mapping System can be used as a DNS proxy for Name-to-EID-address or Name-to-RLOC-address mappings. The implementation also supports Name-to-Public-Key mappings to provide key management features in [LISP-ECDSA].

10. References

10.1. Normative References

- [IANA-ADDRESS-FAMILY-REGISTRY] IANA, "Address Family Numbers", <<https://www.iana.org/assignments/address-family-numbers>>.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC3629] Yergeau, F., "UTF-8, a transformation format of ISO 10646", STD 63, RFC 3629, DOI 10.17487/RFC3629, November 2003, <<https://www.rfc-editor.org/info/rfc3629>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.
- [RFC9300] Farinacci, D., Fuller, V., Meyer, D., Lewis, D., and A. Cabellos, Ed., "The Locator/ID Separation Protocol (LISP)", RFC 9300, DOI 10.17487/RFC9300, October 2022, <<https://www.rfc-editor.org/info/rfc9300>>.
- [RFC9301] Farinacci, D., Maino, F., Fuller, V., and A. Cabellos, Ed., "Locator/ID Separation Protocol (LISP) Control Plane", RFC 9301, DOI 10.17487/RFC9301, October 2022, <<https://www.rfc-editor.org/info/rfc9301>>.
- [RFC9437] Rodriguez-Natal, A., Ermagan, V., Cabellos, A., Barkai, S., and M. Boucadair, "Publish/Subscribe Functionality for the Locator/ID Separation Protocol (LISP)", RFC 9437, DOI 10.17487/RFC9437, August 2023, <<https://www.rfc-editor.org/info/rfc9437>>.

10.2. Informative References

- [LISP-ECDSA] Farinacci, D. and E. Nordmark, "LISP Control-Plane ECDSA Authentication and Authorization", Work in Progress, Internet-Draft, draft-ietf-lisp-ecdsa-auth-13, 18 August 2024, <<https://datatracker.ietf.org/doc/html/draft-ietf-lisp-ecdsa-auth-13>>.

- [LISP-EXT]** Jain, P., Moreno, V., and S. Hooda, "LISP Site External Connectivity", Work in Progress, Internet-Draft, draft-ietf-lisp-site-external-connectivity-01, 24 September 2024, <<https://datatracker.ietf.org/doc/html/draft-ietf-lisp-site-external-connectivity-01>>.
- [LISP-GEO]** Farinacci, D., "LISP Geo-Coordinate Use-Cases", Work in Progress, Internet-Draft, draft-ietf-lisp-geo-09, 15 January 2025, <<https://datatracker.ietf.org/doc/html/draft-ietf-lisp-geo-09>>.
- [LISP-MAP]** Venkatachalapathy, B., Portoles-Comeras, M., Lewis, D., Kouvelas, I., and C. Cassar, "LISP Map Server Reliable Transport", Work in Progress, Internet-Draft, draft-ietf-lisp-map-server-reliable-transport-05, 4 November 2024, <<https://datatracker.ietf.org/doc/html/draft-ietf-lisp-map-server-reliable-transport-05>>.
- [LISP-NET-NAT]** Farinacci, D., "lispers.net LISP NAT-Traversal Implementation Report", Work in Progress, Internet-Draft, draft-farinacci-lisp-lispers-net-nat-09, 8 December 2024, <<https://datatracker.ietf.org/doc/html/draft-farinacci-lisp-lispers-net-nat-09>>.
- [LISP-VPN]** Moreno, V. and D. Farinacci, "LISP Virtual Private Networks (VPNs)", Work in Progress, Internet-Draft, draft-ietf-lisp-vpn-12, 19 September 2023, <<https://datatracker.ietf.org/doc/html/draft-ietf-lisp-vpn-12>>.
- [RFC5280]** Cooper, D., Santesson, S., Farrell, S., Boeyen, S., Housley, R., and W. Polk, "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", RFC 5280, DOI 10.17487/RFC5280, May 2008, <<https://www.rfc-editor.org/info/rfc5280>>.
- [RFC8060]** Farinacci, D., Meyer, D., and J. Snijders, "LISP Canonical Address Format (LCAF)", RFC 8060, DOI 10.17487/RFC8060, February 2017, <<https://www.rfc-editor.org/info/rfc8060>>.

Acknowledgments

The authors would like to thank the LISP WG for their review and acceptance of this document. A special thank you goes to Marc Portoles for moving this document through the process and providing deployment-experience samples.

Authors' Addresses

Dino Farinacci

lispers.net
San Jose, CA
United States of America
Email: farinacci@gmail.com

Luigi Iannone (EDITOR)

Huawei Technologies France S.A.S.U.

18, Quai du Point du Jour

92100 Boulogne-Billancourt

France

Email: luigi.iannone@huawei.com