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Locator/ID Separation Protocol (LISP) Endpoint Identifier (EID) Block

Abstract

This document directs IANA to allocate a /32 IPv6 prefix for use with the Locator/ID Separation Protocol (LISP). The prefix will be used for local intra-domain routing and global endpoint identification, by sites deploying LISP as Endpoint Identifier (EID) addressing space.

Status of This Memo

This document is not an Internet Standards Track specification; it is published for examination, experimental implementation, and evaluation.

This document defines an Experimental Protocol for the Internet community. 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 7841.

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/rfc7954.

Table of Contents

1. Introduction

This document directs the IANA to allocate a /32 IPv6 prefix for use with the Locator/ID Separation Protocol (LISP [RFC6830]), LISP Map-Server ([RFC6833]), LISP Alternative Topology (LISP+ALT [RFC6836]) (or other) mapping systems, and LISP Interworking ([RFC6832]).

This block will be used as global Endpoint Identifier (EID) space.

2. Definition of Terms

The present document does not introduce any new terms with respect to the set of LISP Specifications ([RFC6830], [RFC6831], [RFC6832], [RFC6833], [RFC6834], [RFC6835], [RFC6836], [RFC6837]), but it assumes that the reader is familiar with the LISP terminology. [LISP-INTRO] provides an introduction to the LISP technology, including its terminology.

3. Rationale and Intent

Discussion within the LISP working group led to the identification of several scenarios in which the existence of a LISP-specific address block brings technical benefits. The most relevant scenarios are described below:

Early LISP destination detection: With the current specifications, there is no direct way to detect whether or not a certain destination is in a LISP domain without performing a LISP mapping lookup. For instance, if an Ingress Tunnel Router (ITR) is sending packets to all types of destinations (i.e., non-LISP destinations, LISP destinations not in the IPv6 EID block, and LISP destinations in the IPv6 EID block), the only way to understand whether or not to encapsulate the traffic is to perform a cache lookup and, in case of a LISP cache miss, send a Map-Request to the mapping system. In the meanwhile (while waiting for the Map-Reply), packets may be dropped to avoid excessive buffering.

Avoid penalizing non-LISP traffic: In certain circumstances, it might be desirable to configure a router using LISP features to natively forward all packets that do not have a destination address in the block and, hence, no lookup whatsoever is performed and packets destined to non-LISP sites are not penalized in any manner.

Traffic Engineering: In some deployment scenarios, it might be desirable to apply different traffic-engineering policies for LISP and non-LISP traffic. A LISP-specific EID block would allow improved traffic-engineering capabilities with respect to LISP vs. non-LISP traffic. In particular, LISP traffic might be identified without having to use Deep Packet Inspection (DPI) techniques in order to parse the encapsulated packet. Instead, performing a simple inspection of the outer header is sufficient.

Transition Mechanism: The existence of a LISP-specific EID block may prove useful in transition scenarios. A non-LISP domain would ask for an allocation in the LISP EID block and use it to deploy LISP in its network. Such allocation would not be announced in the BGP routing infrastructure (cf. Section 4). This approach will allow non-LISP domains to avoid fragmenting their already allocated non-LISP addressing space, which may lead to BGP routing table inflation since it may (rightfully) be announced in the BGP routing infrastructure.

Limit the impact on the BGP routing infrastructure: As described in the previous scenario, LISP adopters will avoid fragmenting their addressing space, since fragmentation would negatively impact the BGP routing infrastructure. Adopters will use addressing space from the EID block, which might be announced in large aggregates and in a tightly controlled manner only by Proxy Tunnel Routers (PxTRs).

It is worth mentioning that new use cases may arise in the future, due to new and unforeseen scenarios.

Furthermore, the use of a dedicated address block allows for tighter control over the traffic in the initial experimental phase (especially filtering), while facilitating its large-scale deployment.

[RFC3692] considers assigning experimental and testing numbers useful; having a reserved IPv6 prefix enables this practice. The present document follows the guidelines provided in [RFC3692], with one exception. [RFC3692] suggests the use of values similar to those called "Private Use" in [RFC5226], which by definition are not unique. One purpose of the present request to IANA is to guarantee uniqueness to the EID block. The lack thereof would result in a lack of real utility of a reserved IPv6 prefix.

4. Expected Use

Sites planning to deploy LISP may request a prefix in the IPv6 EID block. Such prefixes will be used for routing and endpoint identification inside the site requesting it. Mappings related to such a prefix, or part of it, will be made available through the mapping system in use and registered to one or more Map-Server(s).

The EID block must be used for LISP experimentation and must not be advertised in the form of more specific route advertisements in the non-LISP inter-domain routing environment. Interworking between the EID block sub-prefixes and the non-LISP Internet is done according to the techniques described in [RFC6832] and [RFC7215].

As the LISP adoption progresses, the EID block may potentially have a reduced impact on the BGP routing infrastructure, compared to the case of having the same number of adopters using global unicast space allocated by Regional Internet Registries (RIRs) ([MobiArch2007]). From a short-term perspective, the EID block offers potentially large aggregation capabilities since it is announced by Proxy Tunnel Routers (PxTRs), possibly concentrating several contiguous prefixes. This trend should continue with even lower impact from a long-term perspective, because more aggressive aggregation can be used, potentially leading to using fewer PxTRs announcing the whole EID block ([FIABook2010]).

The EID block will be used only at the configuration level, so it is recommended not to hard-code the IPv6 EID block in the router hardware in any way. This prevents locking out sites that may want to switch to LISP while keeping their own IPv6 prefix, which is not in the IPv6 EID block. Furthermore, in the case of a future permanent allocation, the allocated prefix may differ from the experimental temporary prefix allocated during the experimentation phase.

With the exception of the Proxy Ingress Tunnel Router (PITR) case (described in Section 8), prefixes out of the EID block must not be announced in the BGP routing infrastructure.

5. Block Dimension

The working group reached consensus on an initial allocation of a /32 prefix. The reason of such consensus is manifold:

- The working group agreed that the /32 prefix is sufficiently large to cover initial allocation and requests for prefixes in the EID space in the next few years for very large-scale experimentation and deployment.

- As a comparison, it is worth mentioning that the current LISP Beta Network ([BETA]) is using a /32 prefix, with more than 250 sites using a /48 sub-prefix. Hence, a /32 prefix appears sufficiently large to allow the current deployment to scale up and be open for interoperation with independent deployments using the EIDs in the new /32 prefix.

- A /32 prefix is sufficiently large to allow deployment of independent (commercial) LISP-enabled networks by third parties, but may as well boost LISP experimentation and deployment.

- The use of a /32 prefix is in line with previous similar prefix allocation for tunneling protocols ([RFC3056]).

6. 3+3 Allocation Plan

Per this document, IANA has initially assigned a /32 prefix out of the IPv6 addressing space for use as EID in LISP.

IANA allocated the requested address space in September 2016 for a duration of 3 (three) years (through September 2019), with an option to extend this period by 3 (three) more years (until September 2022). By the end of the first period, the IETF will provide a decision on whether to transform the prefix into a permanent assignment or to put it back in the free pool (see Section 7 for more information).

In the first case, i.e., if the IETF decides to transform the block into a permanent allocation, the EID block allocation period will be extended for three years (until September 2022) to give the IETF time to define the final size of the EID block and create a transition plan. The transition of the EID block into a permanent allocation might pose policy issues (as recognized in [RFC2860], Section 4.3); therefore, discussion with the IANA, the RIR communities, and the IETF community will be necessary to determine the appropriate policy for permanent EID-block allocation and management. Note as well that the final permanent allocation may differ from the initial experimental assignment; hence, it is recommended not to hard-code the experimental EID block on LISP-capable devices in any way.

In the latter case, i.e., if the IETF decides to terminate the experimental-use EID block, all temporary prefix allocations in this address range must expire and be released by September 2019, so that the entire /32 is returned to the free pool.

The allocation and management of the EID block for the initial 3-year period (and the optional 3 more years) is detailed in [RFC7955].

7. Allocation Lifetime

If no explicit action is carried out by the end of the experiment (by September 2019), it is automatically considered that there was not sufficient interest in having a permanent allocation; therefore, the address block will be returned to the free pool.

Otherwise, if the LISP working group recognizes that there is value in having a permanent allocation, then explicit action is needed.

In order to trigger the process for a permanent allocation, a document is required. Such a document has to articulate the rationale for why a permanent allocation would be beneficial. More specifically, the document has to detail the experience gained during experimentation and all of the technical benefits provided by the use of a LISP-specific prefix. Such technical benefits are expected to lay in the scenarios described in Section 3. However, new and unforeseen benefits may appear during experimentation. The description should be sufficiently articulate that the needed size of the permanent allocation can be estimated. However, note that, as explained in Section 6, it is up to IANA to decide which address block will be used as a permanent allocation and that such a block may be different from the temporary experimental allocation.

8. Routing Considerations

In order to provide connectivity between the Legacy Internet and LISP sites, PITRs announcing large aggregates (ideally one single, large aggregate) of the IPv6 EID block could be deployed. By doing so, PITRs will attract traffic destined for LISP sites in order to encapsulate and forward it toward the specific destination LISP site. Routers in the Legacy Internet must treat announcements of prefixes from the IPv6 EID block as normal announcements, applying best current practices for traffic engineering and security.

Even in a LISP site, not all routers need to run LISP elements. In particular, routers that are not at the border of the local domain, used only for intra-domain routing, do not need to provide any specific LISP functionality but must be able to route traffic using addresses in the IPv6 EID block.

For the above-mentioned reasons, routers that do not run any LISP element must not include any special handling code or hardware for addresses in the IPv6 EID block. In particular, it is recommended that the default router configuration not handle such addresses in any special way. Doing differently could prevent communication between the Legacy Internet and LISP sites or even break local intra-domain connectivity.

9. Security Considerations

This document does not introduce new security threats in the LISP architecture nor in the legacy Internet architecture.

10. IANA Considerations

IANA has assigned a /32 IPv6 prefix for use as the global EID space for LISP using a hierarchical allocation as outlined in [RFC5226] and summarized in Table 1. The assigned block is from the 2001:5 global unicast space.

IANA is not requested to issue an AS0 Route Origin Attestation (ROA [RFC6491]), because the global EID space is be used for routing purposes.

Attribute	Value
Address Block	2001:5::/32
Name	EID Space for LISP
RFC	RFC 7954
Allocation Date	September 2016
Termination Date	September 2019 [1]
Source	True [2]
Destination	True
Forwardable	True
Global	True
Reserved-by-protocol	True [3]

[1] According to the 3+3 Plan outlined in this document, the termination date can be postponed to September 2022.
[2] Can be used as a multicast source as well.
[3] To be used as EID space by routers enabled by LISP [RFC6830].

Table 1: Global EID Space

The reserved address space is requested for an initial 3-year period starting in September 2016 (until September 2019), with an option to extend it by three years (until September 2022) upon the decision of the IETF (see Sections 6 and 7). Following the policies outlined in [RFC5226], upon IETF Review, the decision should be made on whether to have a permanent EID block assignment by September 2019. If no explicit action is taken or, if the IETF Review outcome is that it is not worth having a reserved prefix as a global EID space, the whole /32 will be taken out from the "IANA IPv6 Special-Purpose Address Registry" and put back in the free pool managed by IANA.

Allocation and management of the global EID space is detailed in [RFC7955]. Nevertheless, all prefix allocations out of this space must be temporary and no allocation must go beyond September 2019 unless the IETF Review decides for a permanent global EID space assignment.

11. References

11.1. Normative References

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11.2. Informative References

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