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LISP EID Block
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Abstract

This is a direction to 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 EID (Endpoint IDentifier) addressing space.

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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 term with respect to the set of LISP Specifications ([RFC6830], [RFC6831], [RFC6832], [RFC6833], [RFC6834], [RFC6835], [RFC6836], [RFC6837]). To help the reading of the present document the terminology introduced by LISP is summarized in Appendix A.

3. Rationale and Intent

Discussion within the LISP Working Group led to identify several scenarios in which the existence of a LISP specific address block brings technical benefits. Hereafter the most relevant scenarios are described:

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 or not without performing a LISP mapping lookup. For instance, if an ITR is sending 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 (waiting the Map-Reply), packets may be dropped in order to avoid excessive buffering.

Avoid penalize non-LISP traffic: In certain circumstances it might be desirable to configure a router using LISP features to natively forward all packets that have not a destination address in the block, 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 DPI techniques in order to parse the encapsulated packet, performing instead 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 an allocation in the LISP EID block and use it to deploy LISP in its network. Such allocation will not be announced in the BGP routing infrastructure (cf., Section 4). This approach will avoid non-LISP domains to fragment 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 BGP routing infrastructure: As described in the previous scenario, LISP adopters will avoid fragmenting their addressing space, which 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 xTRs.

Is worth to mention that new use cases can arise in the future, due to new and unforeseen scenarios.

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

[RFC3692] considers assigning experimental and testing numbers useful, and the request of a reserved IPv6 prefix is a perfect match of such 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 of the purposes 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 prefix will be used for routing and endpoint

identification inside the site requesting it. Mappings related to such 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 [RFC6832] and [RFC7215].

As the LISP adoption progress, the EID block will potentially help in reducing the impact on the BGP routing infrastructure with respect to the case of the same number of adopters using global unicast space allocated by RIRs ([MobiArch2007]). From a short-term perspective, the EID block offers potentially large aggregation capabilities since it is announced by PxTRs possibly concentrating several contiguous prefixes. Such trend should continue with even lower impact from a long-term perspective, since more aggressive aggregation can be used, potentially leading at using few PxTRs announcing the whole EID block ([FIABook2010]).

The EID block will be used only at configuration level, it is recommended not to hard-code in any way the IPv6 EID block in the router hardware. This allows avoiding 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 PITR case (described above) 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 /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 looks as sufficiently large to allow the current deployment to scale up and be open for

interoperation with independent deployments using EIDs in the new /32 prefix.

- o 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.

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

6. 3+3 Allocation Plan

This document requests IANA to initially assign a /32 prefix out of the IPv6 addressing space for use as EID in LISP (Locator/ID Separation Protocol).

IANA should assign the requested address space by beginning 2015 for a duration of 3 (three) initial years (through December 2018), with an option to extend this period by 3 (three) more years (until December 2021). By the end of the first period, the IETF will provide a decision on whether to transform the prefix in a permanent assignment or to put it back in the free pool.

In the first case, i.e., if the IETF decides to transform the block in a permanent allocation, the EID block allocation period will be extended for three years (until December 2021) so to give time to the IETF to define the final size of the EID block and create a transition plan. The transition of the EID block into a permanent allocation has the potential to pose policy issues (as recognized in [RFC2860], section 4.3) and hence discussion with the IANA, the RIR communities, and the IETF community will be necessary to determine 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 in any way the experimental EID block on LISP-capable devices.

In the latter case, i.e., if the IETF decides to stop the EID block experimental use, by December 2018 all temporary prefix allocations in such address range must expire and be released, so that by January 2018 the entire /32 is returned to the free pool.

The allocation and management of the EID block for the initial 3 years period (and the optional 3 more years) is detailed in [I-D.ietf-lisp-eid-block-mgmnt].

7. 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 to 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 practice 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 does 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.

8. Security Considerations

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

9. IANA Considerations

This document instructs the IANA to assign a /32 IPv6 prefix for use as the global LISP EID space using a hierarchical allocation as outlined in [RFC5226] and summarized in Table 1.

Attribute	Value
Address Block	XXXX:YYYY::/32 [1]
Name	EID Space for LISP
RFC	[This Document]
Allocation Date	2015 [2]
Termination Date	December 2018 [3]
Source	True [4]
Destination	True
Forwardable	True
Global	True
Reserved-by-protocol	True [5]

[1] XXXX and YYYY values to be provided by IANA before published as RFC. [2] The actual allocation date to be provided by IANA. [3] According to the 3+3 Plan outlined in this document termination date can be postponed to December 2021. [4] Can be used as a multicast source as well. [5] To be used as EID space by LISP [RFC6830] enabled routers.

Table 1: Global EID Space

This document does not specify any specific value for the requested address block but suggests that should come from the 2000::/3 Global Unicast Space. IANA is not requested to issue an AS0 ROA, since the Global EID Space will be used for routing purposes.

The reserved address space is requested for a period of time of three initial years starting in beginning 2015 (until December 2018), with an option to extend it by three years (until December 2021) up on decision of the IETF (see Section 6). Following the policies outlined in [RFC5226], upon IETF Review, by December 2018 decision should be made on whether to have a permanent EID block assignment. If the IETF review outcome will be that is not worth to have a reserved prefix as global EID space, the whole /32 will be taken out from the IPv6 Special Purpose Address Registry and put back in the free pool managed by IANA by end of January 2018.

Allocation and management of the Global EID Space is detailed in a different document. Nevertheless, all prefix allocations out of this space must be temporary and no allocation must go beyond December 2018 unless the IETF Review decides for a permanent Global EID Space assignment.

10. Acknowledgments

Special thanks to Roque Gagliano for his suggestions and pointers. Thanks to Ron Bonica, Damien Saucez, David Conrad, Scott Bradner, John Curran, Paul Wilson, Geoff Huston, Wes George, Arturo Servin, Sander Steffann, Brian Carpenter, Roger Jorgensen, Terry Manderson, Brian Haberman, Adrian Farrel, Job Snijders, Marla Azinger, Chris Morrow, and Peter Schoenmaker, for their insightful comments. Thanks as well to all participants to the fruitful discussions on the IETF mailing list.

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11. References

11.1. Normative References

[I-D.ietf-lisp-eid-block-mgmnt]
Iannone, L., Jorgensen, R., Conrad, D., and G. Huston, "LISP EID Block Management Guidelines", draft-ietf-lisp-eid-block-mgmnt-04 (work in progress), December 2014.

[RFC2860] Carpenter, B., Baker, F., and M. Roberts, "Memorandum of Understanding Concerning the Technical Work of the Internet Assigned Numbers Authority", RFC 2860, June 2000.

[RFC3692] Narten, T., "Assigning Experimental and Testing Numbers Considered Useful", BCP 82, RFC 3692, January 2004.

[RFC4632] Fuller, V. and T. Li, "Classless Inter-domain Routing (CIDR): The Internet Address Assignment and Aggregation Plan", BCP 122, RFC 4632, August 2006.

[RFC5226] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 5226, May 2008.

[RFC6830] Farinacci, D., Fuller, V., Meyer, D., and D. Lewis, "The Locator/ID Separation Protocol (LISP)", RFC 6830, January 2013.

[RFC6831] Farinacci, D., Meyer, D., Zwiebel, J., and S. Venaas, "The Locator/ID Separation Protocol (LISP) for Multicast Environments", RFC 6831, January 2013.

[RFC6832] Lewis, D., Meyer, D., Farinacci, D., and V. Fuller, "Interworking between Locator/ID Separation Protocol (LISP) and Non-LISP Sites", RFC 6832, January 2013.

[RFC6833] Fuller, V. and D. Farinacci, "Locator/ID Separation Protocol (LISP) Map-Server Interface", RFC 6833, January 2013.

[RFC6834] Iannone, L., Saucez, D., and O. Bonaventure, "Locator/ID Separation Protocol (LISP) Map-Versioning", RFC 6834, January 2013.

[RFC6835] Farinacci, D. and D. Meyer, "The Locator/ID Separation Protocol Internet Groper (LIG)", RFC 6835, January 2013.

[RFC6836] Fuller, V., Farinacci, D., Meyer, D., and D. Lewis, "Locator/ID Separation Protocol Alternative Logical Topology (LISP+ALT)", RFC 6836, January 2013.

[RFC6837] Lear, E., "NERD: A Not-so-novel Endpoint ID (EID) to Routing Locator (RLOC) Database", RFC 6837, January 2013.

11.2. Informative References

[BETA] LISP Beta Network, "http://www.lisp4.net".

[FIABook2010] L. Iannone, T. Leva, "Modeling the economics of Loc/ID Separation for the Future Internet.", Towards the Future Internet - Emerging Trends from the European Research, Pages 11-20, ISBN: 9781607505389, IOS Press , May 2010.

[MobiArch2007] B. Quoitin, L. Iannone, C. de Launois, O. Bonaventure, "Evaluating the Benefits of the Locator/Identifier Separation", The 2nd ACM-SIGCOMM International Workshop on Mobility in the Evolving Internet Architecture (MobiArch'07) , August 2007.

[RFC3056] Carpenter, B. and K. Moore, "Connection of IPv6 Domains via IPv4 Clouds", RFC 3056, February 2001.

[RFC7215] Jakab, L., Cabellos-Aparicio, A., Coras, F., Domingo-Pascual, J., and D. Lewis, "Locator/Identifier Separation Protocol (LISP) Network Element Deployment Considerations", RFC 7215, April 2014.

Appendix A. LISP Terminology

LISP operates on two name spaces and introduces several new network elements. To facilitate the reading, this section provides high-level definitions of the LISP name spaces and network elements and, as such, it must not be considered as an authoritative source. The reference to the authoritative document for each term is included in every term description.

Legacy Internet: The portion of the Internet that does not run LISP and does not participate in LISP+ALT or any other mapping system.

LISP site: A LISP site is a set of routers in an edge network that are under a single technical administration. LISP routers that reside in the edge network are the demarcation points to separate the edge network from the core network. See [RFC6830] for more details.

Endpoint ID (EID): An EID is a 32-bit (for IPv4) or 128-bit (for IPv6) value used in the source and destination address fields of the first (most inner) LISP header of a packet. A packet that is emitted by a system contains EIDs in its headers and LISP headers are prepended only when the packet reaches an Ingress Tunnel Router (ITR) on the data path to the destination EID. The source EID is obtained via existing mechanisms used to set a host's "local" IP address. An EID is allocated to a host from an EID-prefix block associated with the site where the host is located. See [RFC6830] for more details.

EID-prefix: A power-of-two block of EIDs that are allocated to a site by an address allocation authority. See [RFC6830] for more details.

EID-Prefix Aggregate: A set of EID-prefixes said to be aggregatable in the [RFC4632] sense. That is, an EID-Prefix aggregate is defined to be a single contiguous power-of-two EID-prefix block. A prefix and a length characterize such a block. See [RFC6830] for more details.

Routing LOCator (RLOC): A RLOC is an IPv4 or IPv6 address of an egress tunnel router (ETR). A RLOC is the output of an EID-to-RLOC mapping lookup. An EID maps to one or more RLOCs. Typically, RLOCs are numbered from topologically aggregatable blocks that are assigned to a site at each point to which it attaches to the global Internet; where the topology is defined by the connectivity of provider networks, RLOCs can be thought of as Provider Aggregatable (PA) addresses. See [RFC6830] for more details.

EID-to-RLOC Mapping: A binding between an EID-Prefix and the RLOC-set that can be used to reach the EID-Prefix. The general term "mapping" always refers to an EID-to-RLOC mapping. See [RFC6830] for more details.

Ingress Tunnel Router (ITR): An Ingress Tunnel Router (ITR) is a router that accepts receives IP packets from site end-systems on one side and sends LISP-encapsulated IP packets toward the Internet on the other side. The router treats the "inner" IP destination address as an EID and performs an EID-to-RLOC mapping lookup. The router then prepends an "outer" IP header with one of its globally routable RLOCs in the source address field and the result of the mapping lookup in the destination address field. See [RFC6830] for more details.

Egress Tunnel Router (ETR): An Egress Tunnel Router (ETR) receives LISP-encapsulated IP packets from the Internet on one side and sends decapsulated IP packets to site end-systems on the other side. An ETR router accepts an IP packet where the destination address in the "outer" IP header is one of its own RLOCs. The router strips the "outer" header and forwards the packet based on the next IP header found. See [RFC6830] for more details.

Proxy ITR (PITR): A Proxy-ITR (PITR) acts like an ITR but does so on behalf of non-LISP sites which send packets to destinations at LISP sites. See [RFC6832] for more details.

Proxy ETR (PETR): A Proxy-ETR (PETR) acts like an ETR but does so on behalf of LISP sites which send packets to destinations at non-LISP sites. See [RFC6832] for more details.

Map Server (MS): A network infrastructure component that learns EID-to-RLOC mapping entries from an authoritative source (typically an ETR). A Map Server publishes these mappings in the distributed mapping system. See [RFC6833] for more details.

Map Resolver (MR): A network infrastructure component that accepts LISP Encapsulated Map-Requests, typically from an ITR, quickly determines whether or not the destination IP address is part of the EID namespace; if it is not, a Negative Map-Reply is immediately returned. Otherwise, the Map Resolver finds the appropriate EID-to-RLOC mapping by consulting the distributed mapping database system. See [RFC6833] for more details.

The LISP Alternative Logical Topology (ALT): The virtual overlay network made up of tunnels between LISP+ALT Routers. The Border Gateway Protocol (BGP) runs between ALT Routers and is used to carry reachability information for EID-prefixes. The ALT provides

a way to forward Map-Requests toward the ETR that "owns" an EID-prefix. See [RFC6836] for more details.

ALT Router: The device on which runs the ALT. The ALT is a static network built using tunnels between ALT Routers. These routers are deployed in a roughly-hierarchical mesh in which routers at each level in the topology are responsible for aggregating EID-Prefixes learned from those logically "below" them and advertising summary prefixes to those logically "above" them. Prefix learning and propagation between ALT Routers is done using BGP. When an ALT Router receives an ALT Datagram, it looks up the destination EID in its forwarding table (composed of EID-Prefix routes it learned from neighboring ALT Routers) and forwards it to the logical next-hop on the overlay network. The primary function of LISP+ALT routers is to provide a lightweight forwarding infrastructure for LISP control-plane messages (Map-Request and Map-Reply), and to transport data packets when the packet has the same destination address in both the inner (encapsulating) destination and outer destination addresses ((i.e., a Data Probe packet). See [RFC6836] for more details.

Appendix B. Document Change Log

Version 12 Posted May 2015.

- Fixed typos and references as suggested by the Gen-ART and OPS-DIR review.

Version 11 Posted April 2015.

- In Section 4, deleted contradictory text on EID prefix advertisement in non-LISP inter-domain routing environments.

- In Section 3 deleted the "Avoid excessive strech" bullet, because confusing.

- Deleted last bullet of the list in Section 3 because retundant w.r.t. global content of the document.

Version 10 Posted January 2015.

- Keep alive version

Version 09 Posted July 2014.

- Few Editorial modifications as requested by D. Saucez, as shepherd, during the write up of the document.

- Allocation date postponed to beginning 2015, as suggested by D. Saucez.

Version 08 Posted January 2014.

- Modified Section 4 as suggested by G. Houston.

Version 07 Posted November 2013.

- Modified the document so to request a /32 allocation, as for the consensus reached during IETF 88th.

Version 06 Posted October 2013.

- Clarified the rationale and intent of the EID block request with respect to [RFC3692], as suggested by S. Bradner and J. Curran.

- Extended Section 3 by adding the transion scenario (as suggested by J. Curran) and the TE scenario. The other scenarios have been also edited.

- Section 6 has been re-written to introduce the 3+3 allocation plan as suggested by B. Haberman and discussed during 86th IETF.

- Section 9 has also been updated to the 3+3 years allocation plan.

- Moved Section 10 at the end of the document.

- Changed the original Definition of terms to an appendix.

Version 05 Posted September 2013.

- No changes.

Version 04 Posted February 2013.

- Added Table 1 as requested by IANA.

- Transformed the prefix request in a temporary request as suggested by various comments during IETF Last Call.

- Added discussion about short/long term impact on BGP in Section 4 as requested by B. Carpenter.

Version 03 Posted November 2012.

- General review of Section 5 as requested by T. Manderson and B. Haberman.

- Dropped RFC 2119 Notation, as requested by A. Farrel and B. Haberman.

- Changed "IETF Consensus" to "IETF Review" as pointed out by Roque Gagliano.

- Changed every occurrence of "Map-Server" and "Map-Resolver" with "Map Server" and "Map Resolver" to make the document consistent with [RFC6833]. Thanks to Job Snijders for pointing out the issue.

Version 02 Posted April 2012.

- Fixed typos, nits, references.

- Deleted reference to IANA allocation policies.

Version 01 Posted October 2011.

- Added Section 5.

Version 00 Posted July 2011.

- Updated section "IANA Considerations"

- Added section "Rationale and Intent" explaining why the EID block allocation is useful.

- Added section "Expected Use" explaining how sites can request and use a prefix in the IPv6 EID Block.

- Added section "Action Plan" suggesting IANA to avoid allocating address space adjacent the allocated EID block in order to accommodate future EID space requests.

- Added section "Routing Consideration" describing how routers not running LISP deal with the requested address block.

- Added the present section to keep track of changes.

- Rename of draft-meyer-lisp-eid-block-02.txt.

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