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Publish/Subscribe Functionality for LISP
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Abstract

This document specifies an extension to the use of Map-Request to enable Publish/Subscribe (PubSub) operation for LISP.

Status of This Memo

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1. Introduction

The Locator/ID Separation Protocol (LISP) [RFC6830] splits current IP addresses in two different namespaces, Endpoint Identifiers (EIDs) and Routing Locators (RLOCs). LISP uses a map-and-encap approach that relies on (1) a Mapping System (basically a distributed database) that stores and disseminates EID-RLOC mappings and on (2) LISP tunnel routers (xTRs) that encapsulate and decapsulate data packets based on the content of those mappings.

ITRs/RTRs/PITRs pull EID-to-RLOC mapping information from the Mapping System by means of an explicit request message. [RFC6830] indicates how ETRs can tell ITRs/RTRs/PITRs about mapping changes. This document presents a Publish/Subscribe (PubSub) extension in which the

Mapping System can notify ITRs/RTRs/PITRs about mapping changes. When this mechanism is used, mapping changes can be notified faster and can be managed in the Mapping System versus the LISP sites.

In general, when an ITR/RTR/PITR wants to be notified for mapping changes for a given EID-prefix, the following steps occur:

(1) The ITR/RTR/PITR sends a Map-Request for that EID-prefix.

(2) The ITR/RTR/PITR sets the Notification-Requested bit (N-bit) on the Map-Request and includes its xTR-ID.

(3) The Map-Request is forwarded to one of the Map-Servers that the EID-prefix is registered to.

(4) The Map-Server creates subscription state for the ITR/RTR/PITR on the EID-prefix.

(5) The Map-Server sends a Map-Notify to the ITR/RTR/PITR to acknowledge the successful subscription.

(6) When there is an RLOC-set change for the EID-prefix, the Map-Server sends a Map-Notify message to each ITR/RTR/PITR in the subscription list.

(7) Each ITR/RTR/PITR sends a Map-Notify-Ack to acknowledge the received Map-Notify.

This operation is repeated for all EID-prefixes for which ITR/RTR/PITR want to be notified. The ITR/RTR/PITR can set the N-bit for several EID-prefixes within a single Map-Request

2. Requirements Language

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

3. Deployment Assumptions

The specification described in this document makes the following deployment assumptions:

(1) A unique 128-bit xTR-ID identifier is assigned to each xTR.

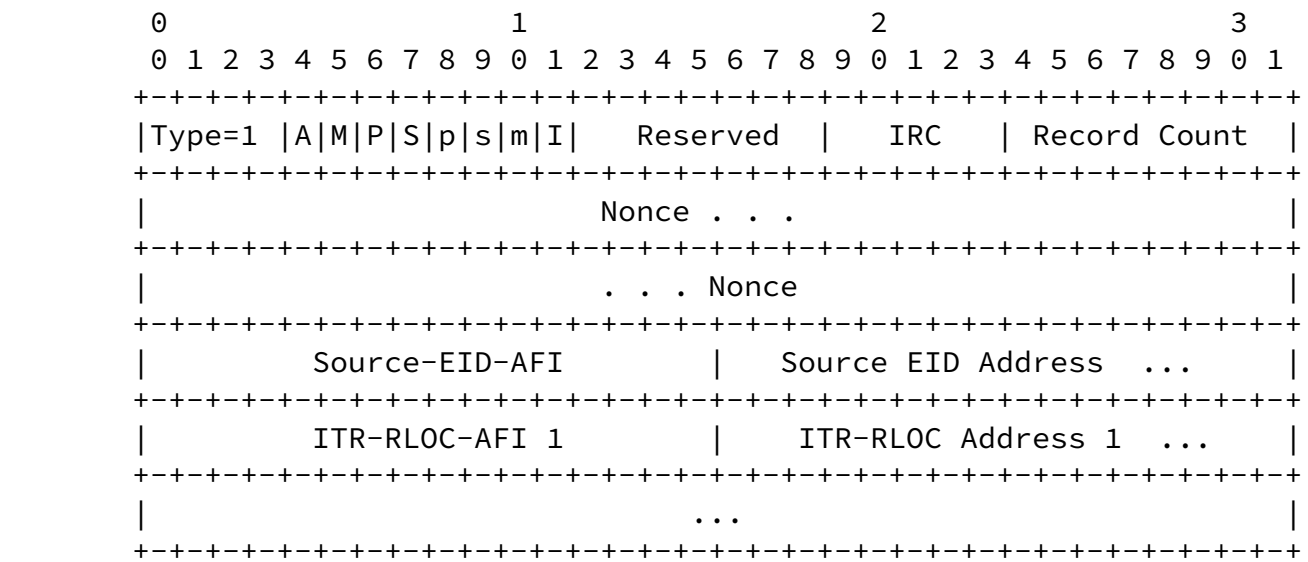
(2) Map-Servers are configured in proxy-reply mode, i.e., they are solicited to generate and send Map-Reply messages for the mappings they are serving.

(3) There can be either a soft-state or hard-state security association between the xTRs and the Map-Servers.

The distribution of xTR-IDs and the management of security associations are out of the scope of this document.

4. Map-Request Additions

Figure 1 shows the format of the updated Map-Request [I-D.ietf-lisp-rfc6833bis] to support the PubSub functionality.



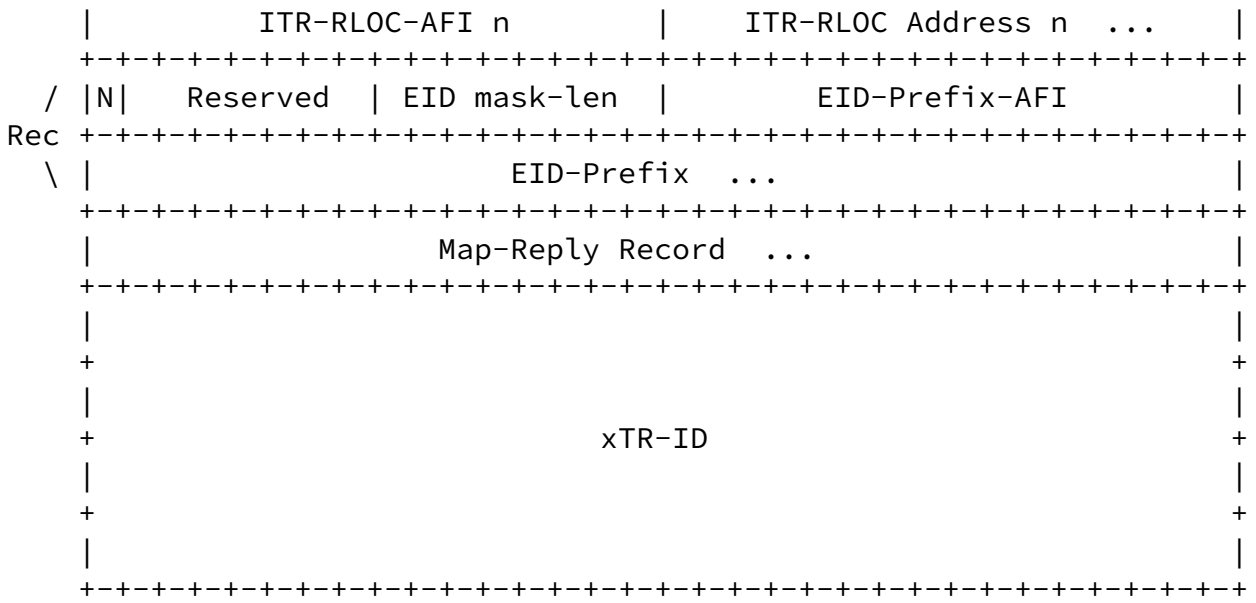


Figure 1: Map-Request with N-bit and xTR-ID

The meaning of the fields is exactly the same as defined in [I-D.ietf-lisp-rfc6833bis]. The only addition is a flag bit in the EID-Record field. The meaning of this flag bit is as follows:

> Notification-Requested bit (N-bit): the first bit in the EID-Record section of a Map-Request message. The N-bit of an EID-record is set to 1 to specify that the xTR wants to be notified of updates for that mapping record.

The PubSub functionality requires to include an xTR-ID in the Map-Request. This is done by setting the xTR-ID bit (I-bit) defined in [I-D.ietf-lisp-rfc6833bis]. When the I-bit of a Map-Request message is set, a 128-bit xTR-ID field is appended to the end of the Map-Request, immediately following the last EID-Record (or the Map-Reply Record, if present). The xTR-ID field uniquely identifies each xTR of a given LISP deployment. Provisioning of unique xTR-IDs is out of the scope of this document.

5. Mapping Request Subscribe Procedures

The xTR subscribes for RLOC-set changes for a given EID-prefix by sending a Map-Request to the Mapping System with the N-bit set on the

EID-Record. The xTR builds a Map-Request according to [RFC6830] but also does the following:

(1) The xTR MUST set the I-bit of the Map-Request message to 1, to specify the presence of an xTR-ID field that uniquely identifies the xTR.

(2) The xTR MUST set the N-bit to 1 for each EID-Record to which the xTR wants to subscribe.

The Map-Request is forwarded to the appropriate Map-Server through the Mapping System. This document does not assume that a Map-Server is pre-assigned to handle the subscription state for a given xTR. The Map-Server that receives the Map-Request will be the Map-Server responsible to notify that specific xTR about future mapping changes for the subscribed mapping records.

Upon reception of the Map-Request, the Map-Server processes it as described in [RFC6830]. Upon processing, for each EID-Record that has the N-bit set to 1, the Map-Server proceeds adding the xTR-ID contained in the Map-Request to the list of xTR that have requested to be subscribed to that mapping record.

If the xTR-ID is added to the list, the Map-Server MUST send a Map-Notify message back to the xTR to acknowledge the successful subscription. The Map-Server MUST follow the specification in

Section 6.1.7 of [RFC6830] to build the Map-Notify with the following considerations.

(1) The Map-Server MUST use the nonce from the Map-Request as the nonce for the Map-Notify.

(2) The Map-Server MUST use its security association with the xTR (see Section 3) to compute the authentication data of the Map-Notify.

(3) The Map-Server MUST send the Map-Notify to one of the ITR-RLOCs received in the Map-Request.

When the xTR receives a Map-Notify with a nonce that matches one in the list of outstanding Map-Request messages sent with an N-bit set,

it knows that the Map-Notify is to acknowledge a successful subscription. The xTR processes this Map-Notify as described in [RFC6830] with the following considerations. The xTR MUST use its security association with the Map-Server (see Section 3) to validate the authentication data on the Map-Notify. The xTR MUST use the Map-Notify to populate its map-cache with the returned EID-prefix and RLOC-set.

The subscription of an xTR-ID to the list of subscribers for the EID-Record may fail for a number of reasons. For example, because of local configuration policies (such as white/black lists of subscribers), or because the Map-Server has exhausted the resources to dedicate to the subscription of that EID-Record (e.g., the number of subscribers excess the capacity of the Map-Server).

If the subscription fails, the Map-Server MUST send a Map-Reply to the originator of the Map-Request, as described in [RFC6830]. This is also the case when the Map-Server does not support PubSub operation. The xTR processes the Map-Reply as specified in [RFC6830].

If an xTR-ID is successfully added to the list of subscribers for an EID-Record, the Map-Server MUST extract the ITR-RLOCs present in the Map-Request, and store the association between the xTR-ID and those RLOCs. Any already present state regarding ITR-RLOCs for the same xTR-ID MUST be overwritten.

If the Map-Request only has one ITR-RLOC with AFI = 0 (i.e. Unknown Address), the Map-Server MUST remove the subscription state for that xTR-ID. In this case, the Map-Server MUST send the Map-Notify to the source RLOC of the Map-Request. When the TTL for the EID-record expires, the EID-prefix is removed from the Map-Server's subscription

cache. On EID-Record removal, the Map-Server notifies the subscribers via a Map-Notify with TTL equal 0.

6. Mapping Notification Publish Procedures

The publish procedure is implemented via Map-Notify messages that the Map-Server sends to xTRs. The xTRs acknowledge the reception of Map-Notifies via sending Map-Notify-Ack messages back to the Map-Server.

The complete mechanism works as follows.

When a mapping stored in a Map-Server is updated (e.g. via a Map-Register from an ETR), the Map-Server MUST notify the subscribers of that mapping via sending Map-Notify messages with the most updated mapping information. The Map-Notify message sent to each of the subscribers as a result of an update event MUST follow the exact encoding and logic defined in [RFC6830] for Map-Notify, except for the following:

(1) The Map-Notify MUST be sent to one of the ITR-RLOCs associated with the xTR-ID of the subscriber.

(2) The nonce of the Map-Notify MUST be the one the subscriber sent in the Map-Request. If the subscriber sent no Map-Request (e.g. was subscribed via configuration at the Map-Server) the nonce MUST be randomly generated by the Map-Server.

(3) The Map-Server MUST use its security association with the xTR to compute the authentication data of the Map-Notify.

When the xTR receives a Map-Notify with a nonce sent previously in a Map-Request, or with a nonce not present in any list of previously sent nonces but with an EID not local to the xTR, the xTR knows that the Map-Notify has been received to update an entry on its map-cache. Processing of unsolicited Map-Notify messages MUST be explicitly enabled via configuration at the xTR.

The xTR processes the received Map-Notify as specified in [RFC6830], with the following considerations. The xTR MUST use its security association with the Map-Server (see Section 3) to validate the authentication data on the Map-Notify. The xTR MUST use the mapping information carried in the Map-Notify to update its internal map-cache. The xTR MUST acknowledge the Map-Notify by sending back a Map-Notify-Ack (specified in [I-D.ietf-lisp-rfc6833bis]), with the nonce from the Map-Notify, to the Map-Server. If after a configurable timeout, the Map-Server has not received back the Map-Notify-Ack, it CAN try to send the Map-Notify to a different ITR-RLOC for that xTR-ID.

7. Security Considerations

The way to provide a security association between the ITRs and the Map-Servers must be evaluated according to the size of the deployment. For small deployments, it is possible to have a shared key (or set of keys) between the ITRs and the Map-Servers. For larger and Internet-scale deployments, scalability is a concern and further study is needed.

8. Acknowledgments

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9. IANA Considerations

This document makes no request to IANA.

10. Normative References

[I-D.ietf-lisp-rfc6833bis]
Fuller, V., Farinacci, D., and A. Cabellos-Aparicio, "Locator/ID Separation Protocol (LISP) Control-Plane", draft-ietf-lisp-rfc6833bis-10 (work in progress), March 2018.

[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>.

[RFC6830] Farinacci, D., Fuller, V., Meyer, D., and D. Lewis, "The Locator/ID Separation Protocol (LISP)", RFC 6830, DOI 10.17487/RFC6830, January 2013, <https://www.rfc-editor.org/info/rfc6830>.

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