Using DHCP to Manage Node and Ring SID Assignment

draft-kompella-spring-dhcp-00

Abstract

Node and ring segment identifiers (SIDs) assignments in a particular
domain (such as an IGP area) must follow certain rules: they must be
allocated from a configured set of SID blocks; they must be unique;
and the values should be sticky, i.e., the same value(s) should be
assigned to a node should its assignment expire (as might happen if
the node resets). This memo suggests the use of the Dynamic Host
Configuration Protocol to handle such assignments.

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].

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1. Introduction

Fundamental to SPRING forwarding is the notion of Segment Identifiers (SIDs) [RFC8402]. At a high level, there are two types of SIDs: those that are locally assigned by the advertising node, such as adjacency and binding SIDs; and those that are globally unique within a given SPRING domain, such as node and ring SIDs. Node SIDs are often manually configured on routers today; this is not only tedious, but error-prone as well; the addition of ring SIDs which must be managed per ring makes manual assignment even more fraught ([I-D.kompella-spring-rmr]).

This document describes the use of the Dynamic Host Configuration Protocol (DHCP [RFC2132]) for managing global SID allocation. The description is limited to the use of node and ring SIDs for MPLS ([I-D.ietf-spring-segment-routing-mpls]); other types of SID allocation, such as for SRv6+ ([I-D.bonica-spring-srv6-plus]) will be described in a future version.

2. Operational Requirements

Node SID assignments must satisfy the following properties:

A SID allocation is an index within a block. This block is defined by a base value (SRGB) and a range; the SID value MUST fall within the range.
SID assignments MUST be unique. Duplicate assignments can have serious forwarding consequences, such as loops and packet misdelivery.

and should have the following properties:

Assignments SHOULD have a long lease time.

Assignments SHOULD be "sticky", i.e., a node re-requesting a global SID of the same type that it had previously requested SHOULD be assigned the same SID (if possible).

An expired SID SHOULD NOT be re-assigned to another node until sufficient time has passed. This time SHOULD be configurable on the DHCP server.

3. Theory of Operation

A DHCP server to be used for global SID assignment SHOULD be told the following:

The type of SID (node, anycast, ring, ...)

The block or set of blocks for each type: SRGB and range.

The default lease time and hold time (before re-assigning a SID to a different node).

The DHCP server need know nothing about SID semantics; the only thing it needs to know is that ring SIDs are allocated in pairs, and all other SIDs are allocated singly.

A node taking part in a SPRING network MAY be configured to use DHCP to get node SIDs. This configuration should say whether to use DHCP for its loopback address, for anycast SIDs and/or for ring SIDs.

A node configured to use DHCP to obtain a SID for its loopback and/or any other prefix sends a request to the DHCP server including the following information:

the type of SID

the prefix

A node that participates in an RMR ring and is configured to use DHCP to obtain a pair of ring SIDs sends, once ring identification is complete ([I-D.ietf-mpls-rmr]), a DHCP request including:
the type of SID (ring SID)

the ring ID

The DHCP server replies to such requests by:

1. looking up the type of SID request;

2. checking if it has previously allocated a SID for this node and
   prefix (or pair of SIDs for this node and ring ID);

3. if so, checking if the same SID (or pair of SIDs) is available;
   if so, allocating that SID (or pair of SIDs) and returning.

4. Otherwise, allocating a new SID/pair of SIDs, noting this in its
   database, and returning.

4. Security Considerations

DHCP is a very widely used protocol, and thus ensuring its continuing
secure and robust operation is vital. When the requirements of DHCP
in this context are better understood, this section will be filled
out.

5. IANA Considerations

Should this document be deemed useful, relevant IANA code points
would be requested.

6. References

6.1. Normative References

[I-D.ietf-mpls-rmr]
Kompella, K. and L. Contreras, "Resilient MPLS Rings",

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Litkowski, S., and R. Shakir, "Segment Routing with MPLS
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[I-D.kompella-spring-rmr]
Kompella, K., Deshmukh, A., and R. Torvi, "Resilient MPLS
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6.2. Informative References


Authors’ Addresses

Kireeti Kompella
Juniper Networks
1194 N. Mathilda Ave.
Sunnyvale, CA  94089
US

Email: kireeti.kompella@gmail.com

Ron Bonica
Juniper Networks
1194 N. Mathilda Ave.
Sunnyvale, CA  94089
US

Email: rbonica@juniper.net