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SR Replication Segment for Multi-point Service Delivery
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Abstract

This document describes the SR Replication segment for Multi-point service delivery. A SR Replication segment allows a packet to be replicated from a Replication node to downstream nodes.

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 [RFC 2119](#) [[RFC2119](#)].

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[1.](#) Introduction

We define a new type of segment for Segment Routing [[RFC8402](#)], called Replication segment, which allows a node (henceforth called as Replication node) to replicate packets to a set of other nodes (called Downstream nodes) in a Segment Routing Domain. Replication segments provide building blocks for Point-to-Multi-point Service delivery. A Replication segment at ingress node of Multi-point service could replicates packets directly to each egress node of the service (without need for any state on the internal routers), or it could be stitched to other Replication segments to build a tree in SR domain for Multi-point service. The latter is outside the scope of this document but specified in [[I-D.voyer-pim-sr-p2mp-policy](#)].

[2.](#) Replication segment

In a Segment Routing Domain, a Replication segment is a logical segment which connects a Replication node to a set of Downstream nodes. A Replication segment can be either provisioned locally on a

node or programmed by a PCE. Replication segments apply equally to both SR-MPLS and SRv6 instantiations of Segment Routing.

A Replication segment is identified by the tuple <Replication-ID, Node-ID>, where:

- o Replication-ID: An identifier for a Replication segment that is unique in context of the Replication node. This is an unsigned 32-bit number.
- o Node-ID: The address of a node at which a Replication segment is instantiated. Replication segment is instantiated at Downstream nodes and at the replication nodes. Note that the root of a Multi-point service is also a replication node.

The Replication-ID can be extended or modified as required based on specific use of a Replication segment.

A Replication segment is defined by following elements:

- o Replication SID: The Segment Identifier of a Replication Segment. This is a SR-MPLS label or a SRv6 SID [[RFC8402](#)].
- o Downstream Nodes: Set of nodes in Segment Routing domain to which a packet is replicated by the Replication segment.
- o Replication State: See below.

Replication state is a list of Replication branches to the Downstream nodes. In this document, each branch is abstracted to a <Downstream Node, Downstream Replication-SID> tuple. A Replication branch to a particular Downstream Node could be represented by the node's Node SID (i.e. it does not matter how traffic gets to the Downstream node, whether it's directly connected or not), or in case of a directly connected node it could be represented by the Adjacency SID (for the interface connecting to the directly connected Leaf Node).

Alternatively, the Downstream Node could also be expanded to a SID-list that partially/fully specifies the explicit path to it. A Replication branch can also use a Segment Routing Policy [[I-D.ietf-spring-segment-routing-policy](#)], if available, from the Replication node to the Downstream node.

Replication SID identifies the Replication Segment in the forwarding plane. The Replication SID SHOULD be considered to be the equivalent of Binding SID [[I-D.ietf-spring-segment-routing-policy](#)] of a Segment Routing Policy, when Replication Segment is instantiated at Ingress node of a Multi-point service. At Downstream nodes, the Replication SID MAY be used to identify the Multi-point service.

A packet steered into a Replication Segment at a node is replicated to each Downstream node with the Downstream Replication SID that is relevant at that node. A packet is steered into a Replication Segment in two ways:

- o When the Active Segment [[RFC8402](#)] is the Replication SID. In this case, the operation for a replicated copy is CONTINUE.
- o On the root of a Multi-point service, based on local policy-based routing. In this case, the operation for a replicated copy is PUSH.

Replication segments are instantiated for both a replication node itself and the downstream nodes of the Replication segment. If a downstream node is an egress (aka leaf) of the Multi-point service, i.e. no further replication is needed, then that leaf node's replication segment will not have any replication state and the operation is NEXT. Notice that the segment on the leaf node is still referred to as a Replication segment for the purpose of generalization.

[3.](#) Use Cases

In the simplest use case, a replication segment is instantiated on the root node of a Multi-point service, with all the downstream nodes being the egress/leaf nodes of the the service. This achieves Ingress Replication [[RFC7988](#)] that has been widely used for MVPN [[RFC6513](#)] and EVPN [[RFC7432](#)] BUM (Broadcast, Unknown and Multicast) traffic.

Replication segments can also be used as building blocks for replication trees when replication segments on the root, intermediate replication nodes and leaf nodes are stitched together to achieve efficient replciation. That is outside the scope of this document but specified in [[I-D.voyer-pim-sr-p2mp-policy](#)].

[4.](#) IANA Considerations

This document makes no request of IANA.

[5.](#) Security Considerations

There are no additional security risks introduced by this design.

6. Acknowledgements

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