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Flexible Algorithms Exclude Node
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Abstract

Flexible Algorithms provide mechanisms for creating constraint-based paths in IGP. This document introduces a routing constraint based on Node Admin-Tags, allowing for easy exclusion of device nodes from path computation.

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1. Introduction

[RFC9350] describes a method to define constraints based on link attributes, allowing path calculation in Flex-Algo using these constraints. However, in some cases, administrators may want to simply exclude entire nodes from the path. In such scenarios, defining constraints based on links is not very convenient. This document defines a method to directly and entirely exclude nodes based on certain characteristics.

2. Use Case

2.1. Use Case 1

As shown in the Figure 1, there are two ABRs in the network. The primary path for upstream traffic on R1 is R1->R2->ABR1->PE. For the backup path calculation, we want it to pass through ABR2. Therefore, device ABR1 needs to be excluded during the backup path calculation.

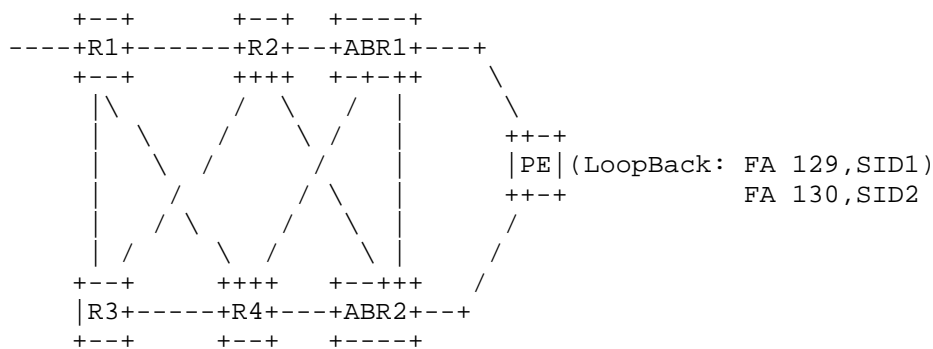


Figure 1 Use Case 1

2.2. Use Case 2

As shown in Figure 2, two VRRP devices are connected via VRRP interfaces. For certain security services, traffic must pass only through the VRRP master device, while other traffic is not subject to this restriction. Therefore, we want the remote end to respond to the VRRP master/backup switchover, restricting certain services to traverse only the VRRP master device. Hence, when calculating paths, routing for specific services should be based on the VRRP master/backup state, excluding the VRRP backup device.

When a VRRP device advertises routes for non-VRRP links, it sets different route tags based on the master/backup status. Remote devices, according to specified conditions, exclude the VRRP backup device in a specific Flex-Algo, ensuring that service traffic passes only through the VRRP master device.

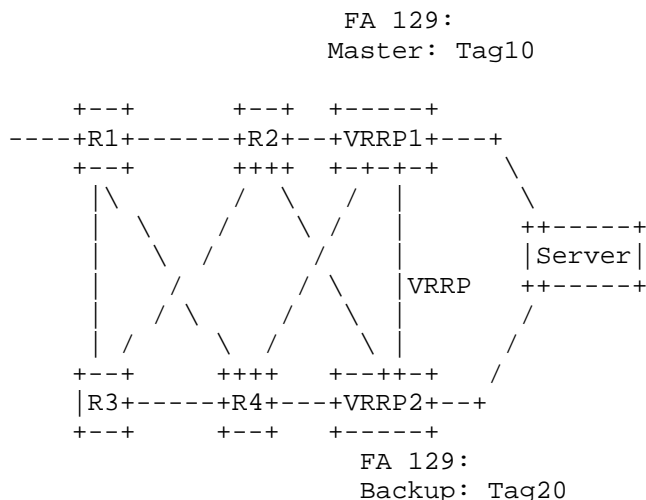


Figure 2 Use Case 2

3. Solution

In the above use case, one solution is to specify an algorithm for calculating the backup path. The main path can be an SR route within algorithm 128, and the backup path is specified using a separate algorithm, with constraints to calculate backup path. During backup path calculation, set the constraint to exclude ABR1. This constraint can be implemented by excluding the node tags advertised by ABR1. The specific steps are:

- 1) ABR1 advertises a node tag as Tag1.
- 2) PE device associates two specific SIDs in different FlexAlgo with the same loopback address Public FlexAlgo 128: SID1 as primary, advertised under algorithm 129, and SID2 as backup, advertised under algorithm 130. Separate constraints are specified for each algorithm. In algorithm 129, the constraint is set to exclude the adminTag specified by A. Thus, when device R1 calculates the route to the PE device's loopback address, it evaluates the constraints in both the primary and backup algorithms.
- 3) The administrator specifies Algorithm 129 for backup path calculation, with the constraint to exclude Node Tag1.
- 4) Algorithm 129 is used to compute the backup path, directly excluding nodes with Tag1, thereby excluding ABR1, resulting in the backup path R1->R4->ABR2.

[RFC7917] defines how the IS-IS protocol advertises node administrative tags, while [RFC7777] covers the OSPF protocol. Node administrative tags are primarily used to express and apply locally defined network policies, offering significant operational capabilities. This document describes how to define new constraints in Flex-Algo utilizing node administrative tags to enable flexible network planning.

3.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

4. Flexible Algorithm Definition constraints

To exclude specified nodes during Flex-Algo path computation, this document defines the "Flex-Algorithm Exclude Admin-Tag (FAEAT) Constraint" within the context of Flexible Algorithms. If a node advertises an Admin-Tag value that needs to be excluded, that node is removed from the Flex-Algo topology.

4.1. IS-IS Flex-Algorithm Exclude Admin-Tag sub-TLV

IS-IS Flex-Algorithm Exclude Admin-Tag sub-TLV (FAEAT) is a sub-TLV of the IS-IS FAD sub-TLV[RFC9350]. It has the following format.

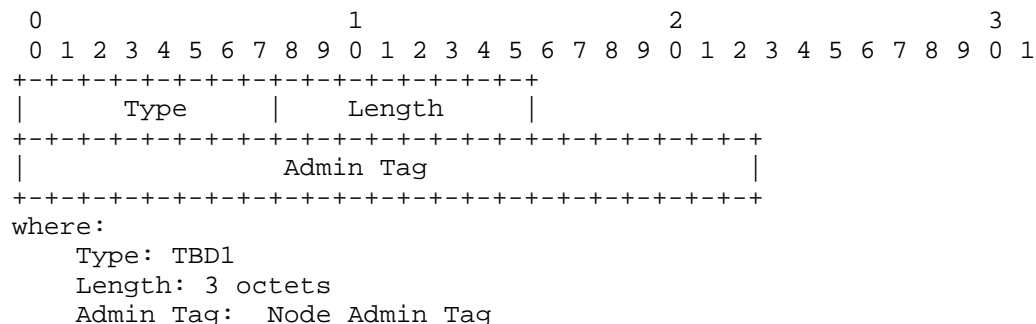


Figure 6: IS-IS FAEAT Sub-TLV

4.2. OSPF Exclude Admin-Tag sub-TLV

The OSPF Flex-Algorithm Exclude Admin-Tag sub-TLV (FAEAT) sub-TLV is a sub-TLV of the OSPF FAD TLV [RFC9350]. It has the following format.

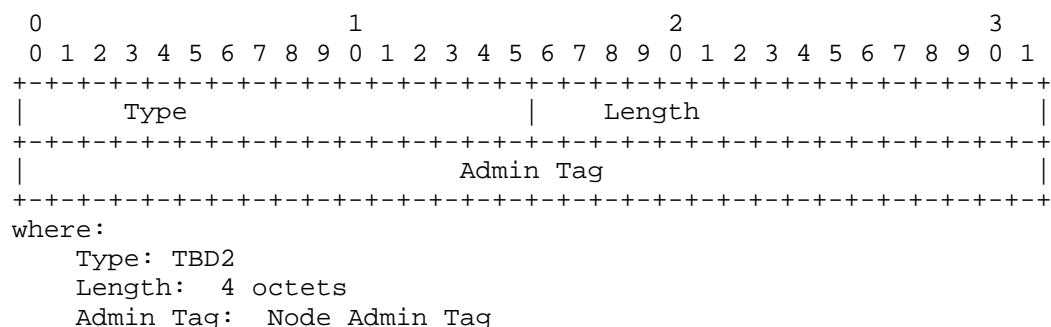


Figure 7: OSPF FAEAT Sub-TLV

4.3. Calculation of Flex-Algorithm paths

A new additional rules are added to the existing rules in the Flex-Algorithm calculations specified in sec 13 of [RFC9350].

6. Check if any exclude FAEAT rule is part of the Flex-Algorithm definition. If such a rule exists and the originating node of the link has advertised an Admin Tag, verify if the node's Admin Tag matches the one specified in the FAEAT rule. If they match, the node must be removed from the Flex-Algorithm computation.

5. Backward Compatibility

This extension brings no new backward-compatibility issues. This document defines new FAD constraints. As described in [RFC9350], any node that does not understand sub-TLVs in a FAD TLV, stops participation in the corresponding Flex-Algorithm. The new extensions can be deployed among the nodes that are upgraded to understand the new extensions without affecting the nodes that are not upgraded.

6. Security Considerations

TBD.

7. IANA Considerations

7.1. IS-IS Exclude Admin-Tag sub-TLV

A new IS-IS sub-TLV type is requested to be allocated from the "IS-IS Sub-Sub-TLVs for Flexible Algorithm Definition Sub-TLV" Registry to specify the use of admin-tag for path constraint selection.

Value	TBD1
Description	Exclude Admin Tag
Reference	[This Document]

7.2. OSPF Exclude Admin-Tag sub-TLV

A new OSPF sub-TLV type is requested to be allocated from the "OSPF Flexible Algorithm Definition TLV Sub-TLVs" Registry to specify the use of admin-tag for path constraint selection.

Value	TBD2
Description	Exclude admin tag
Reference	[This Document]

8. References

8.1. Normative References

TBD

8.2. Informational References

- [RFC7917] P. Sarkar, Individual Contributor, H. Gredler, RtBrick Inc., S. Hegde, Juniper Networks, Inc., S. Litkowski, B. Decraene, Orange, "Advertising Node Administrative Tags in IS-IS", RFC 7917, DOI 10.17487/RFC7917, July 2016, <<https://www.rfc-editor.org/info/rfc7917>>.
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- [RFC9350] P. Psenak, Ed., Cisco Systems, Inc., S. Hegde, Juniper Networks, Inc., C. Filsfils, Cisco Systems, Inc., K. Talaulikar, Cisco Systems, Inc, A. Gulko, Edward Jones, "IGP Flexible Algorithm", RFC 9350, DOI 10.17487/RFC9350, March 2016, <<https://www.rfc-editor.org/info/rfc9350>>.

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