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OSPF Stub Router Advertisement

Abstract

This document describes a backward-compatible technique that may be used by OSPF (Open Shortest Path First) implementations to advertise a router's unavailability to forward transit traffic or to lower the preference level for the paths through such a router.

This document obsoletes RFC 3137.

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1. Introduction

In some situations, it may be advantageous to inform routers in a network not to use a specific router as a transit point but to still route to it. Possible situations include the following:

- o The router is in a critical condition (for example, has a very high CPU load or does not have enough memory to store all Link State Advertisements (LSAs) or build the routing table).
- o Graceful introduction and removal of the router to/from the network.
- o Other (administrative or traffic engineering) reasons.

Note that the solution introduced in this document does not remove the router from the topology view of the network (as could be done by just flushing that router's router-LSA) but discourages other routers from using it for transit routing, while still routing packets to the router's own IP addresses, i.e., the router is announced as a stub.

It must be emphasized that the solution provides real benefits in networks designed with at least some level of redundancy, so that traffic can be routed around the stub router. Otherwise, traffic destined for the networks and reachable through such a stub router may still be routed through it.

2. Solutions

The solution introduced in this document solves two challenges associated with the outlined problem. In the description below, router X is the router announcing itself as a stub. The challenges are

1) Making other routers prefer routes around router X while performing the Dijkstra calculation.

2) Allowing other routers to reach IP prefixes directly connected to router X.

Note that it would be easy to address issue 1) alone by just flushing router X's router-LSA from the domain. However, it does not solve problem 2), since other routers will not be able to use links to router X in Dijkstra (no back link), and because router X will not have links to its neighbors.

To address both problems, router X announces its router-LSA to the neighbors with the cost of all non-stub links (links of the types other than 3) being set to MaxLinkMetric (defined in Section 3).

The solution above applies to both OSPFv2 [RFC2328] and OSPFv3 [RFC5340].

2.1. OSPFv3-Only Solution

OSPFv3 [RFC5340] introduces additional options to provide similar control of the forwarding topology; the R-bit provides an indication of whether a router is active and should be used for transit traffic.

It is left to network operators to decide which technique to use in their network. See Section 4 for more details.

3. Maximum Link Metric

Section 2 refers to the cost of all non-stub links as MaxLinkMetric, which is a new fixed architectural value introduced in this document.

MaxLinkMetric
: The metric value indicating that a router-LSA link (see Section 2) should not be used for transit traffic. It is defined to be the 16-bit binary value of all ones: 0xffff.

4. Deployment Considerations

When using MaxLinkMetric, some inconsistency may be seen if the network is constructed of routers that perform an intra-area Dijkstra calculation as specified in [RFC1247] (discarding link records in router-LSAs that have a MaxLinkMetric cost value) and routers that perform it as specified in [RFC1583] and higher (do not treat links with MaxLinkMetric cost as unreachable). Note that this inconsistency will not lead to routing loops, because if there are some alternate paths in the network, both types of routers will agree on using them rather than the path through the stub router. If the path through the stub router is the only one, the routers of the first type will not use the stub router for transit (which is the desired behavior), while the routers of the second type will still use this path.

On the other hand, clearing the R-bit will consistently result in the router not being used for transit.

The use of MaxLinkMetric or the R-bit in a network depends on the objectives of the operator. One of the possible considerations for selecting one or the other is in the desired behavior if the path through the stub router is the only one available. Using MaxLinkMetric allows for that path to be used while the R-bit doesn’t.

5. Security Considerations

The technique described in this document does not introduce any new security issues into the OSPF protocol.

6. Acknowledgements

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7. References

7.1. Normative References

[RFC2328] Moy, J., "OSPF Version 2", STD 54, RFC 2328, April 1998.

[RFC5340] Coltun, R., Ferguson, D., Moy, J., and A. Lindem, "OSPF for IPv6", RFC 5340, July 2008.

7.2. Informative References

[RFC1247] Moy, J., "OSPF Version 2", RFC 1247, July 1991.

[RFC1583] Moy, J., "OSPF Version 2", RFC 1583, March 1994.

[RFC3137] Retana, A., Nguyen, L., White, R., Zinin, A., and D. McPherson, "OSPF Stub Router Advertisement", RFC 3137, June 2001.

Appendix A. Changes from RFC 3137

This document obsoletes [RFC3137].

In addition to editorial updates, this document defines a new architectural constant (MaxLinkMetric in Section 3) to eliminate any confusion about the interpretation of LSInfinity. It also incorporates and explains the use of the R-bit [RFC5340] as a solution to the problem addressed in the text.

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