

LSR Working Group
Internet-Draft
Updates: 6987, 8870 (if approved)
Intended status: Standards Track
Expires: 15 February 2026

L. Gong
W. Cheng
China Mobile
C. Lin
New H3C Technologies
A. Lindem
Arrcus, Inc.
R. Chen
ZTE Corporation
14 August 2025

Advertising Unreachable Links in OSPF
draft-ietf-lsr-ospf-ls-link-infinity-04

Abstract

In certain scenarios, it is necessary to advertise unreachable links in OSPF, which should be explicitly excluded from the related SPF calculation. This document specifies using `LSLinkInfinity(0xffff)` to advertise an OSPF link as unreachable.

Stub Router Advertisement (RFC 6987) defines `MaxLinkMetric(0xffff)` to indicate a router-LSA link should not be used for transit traffic. This document updates RFC 6987 and RFC 8770. When an OSPFv2 router supports the Unreachable Link support capability defined in this document, the OSPFv2 stub router `MaxLinkMetric(0xffff)` MUST be updated to `MaxReachableLinkMetric(0xfffe)`.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on 15 February 2026.

Copyright Notice

Copyright (c) 2025 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Revised BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Revised BSD License.

Table of Contents

1. Introduction	2
1.1. Requirements Language	3
2. Use Cases	3
2.1. Case 1: Traffic Engineering	3
2.2. Case 2: Flexible Algorithm	3
3. Solution based on LSLinkInfinity	4
4. Backward Compatibility	5
4.1. LSLinkInfinity Backward Compatibility	5
4.2. Stub Router Advertisement Backward Compatibility	6
5. Management Considerations	6
6. Security Considerations	7
7. IANA Considerations	7
8. Contributors	7
9. References	7
9.1. Normative References	7
9.2. Informative References	8
Authors' Addresses	9

1. Introduction

In specific scenarios, there is a requirement to advertise unreachable links in OSPF, which MUST NOT be considered during the standard SPF computation. For example, a link may be available for Traffic Engineering (TE) purposes but not suitable for hop-by-hop routing. Another example is an OSPF link with dedicated resources for a network slice included in a Flexible Algorithm (Flex-Algorithm) but excluded from the default topology.

This document proposes a mechanism to advertise infinity links in OSPF.

1.1. 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.

2. Use Cases

2.1. Case 1: Traffic Engineering

A network topology is shown in Figure 1. There is a link available for Traffic Engineering between Node A and E. If this link is used for SPF calculations, best-effort traffic will be routed on the link.

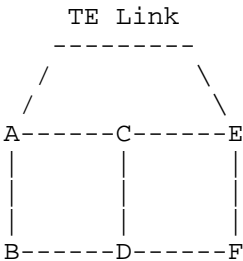


Figure 1: Network Topology

2.2. Case 2: Flexible Algorithm

A network topology is shown in Figure 2. The links between nodes A, B, C, and D are to be used exclusively for a flex-algorithm used for a specific network slice. These links have an Extended Administrative Group (EAG) [RFC7308] attribute specifying the "red" color.

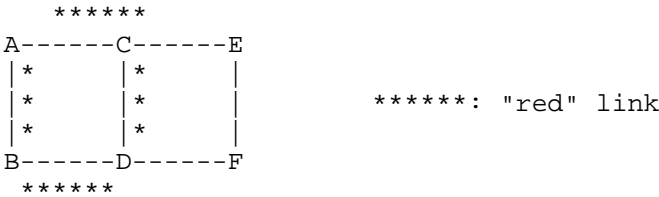


Figure 2: Network Topology

Flex-Algorithm 128 is enabled on Nodes A, B, C, and D, with an EAG rule including "red" and the Metric-Type is designated to be a type other than the IGP metric. Flex-Algorithm allows OSPF to compute the paths along the constrained topology. The topology used by Flex-Algorithm 128 is shown in Figure 3.



Figure 3: Topology of Flex-Algorithm 128

Flex-Algorithm 128 is used for routing particular flows, such as those for a network slice. The "red" links used by Flex-Algorithm 128 are sub-interfaces with dedicated queues for guaranteed bandwidth. Sub-interfaces in other network slices and default topology are omitted from the example figure for clarity. So, it is expected that only the particular flows are routed on these links using Flex-Algorithm 128. However, these links are also contained in the default topology computed by the normal SPF calculation, and these links may also be used for best-effort traffic. Therefore, it is a problem that the dedicated links for Flex-Algorithm are still reachable in base SPF calculation.

If the IGP metrics for all the "red" links are advertised as unreachable, the base topology will be as shown in Figure 4, excluding all the "red" links. This allows only the network slice traffic to be routed on the "red" links by Flex-Algorithm 128.

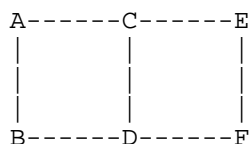


Figure 4: Base SPF Topology Excluding Unreachable Links

3. Solution based on LSLinkInfinity

This document specifies that if the IGP metric of a link is advertised as LSLinkInfinity (0xffff), it MUST NOT be considered during the related SPF computation. This applies to both the Flex-Algorithm SPF and the base SPF as long as LSLinkInfinity is specified for the IGP metric.

OSPF Routers MUST NOT treat links with an advertised metric of `LSLinkInfinity` as unreachable unless all routers in the OSPF area have advertised this capability. If all OSPF Routers in the area have advertised this capability, then links with an advertised metric of `LSLinkInfinity` MUST be treated as unreachable. Upon detection of a change in the number of routers in the area not supporting the Unreachable Link support capability changes to 0 or from 0 to greater than 0, all OSPF routers in the area MUST recalculate their routes.

An IGP metric with `LSLinkInfinity` indicating a link is unreachable is applicable to the following TLVs/LSAs:

- * The Router-LSA [RFC2328] and [RFC5340]
- * The OSPFv2 Extended Link TLV of OSPFv2 Extended Link Opaque LSA [RFC7684]
- * The Router-Link TLV of OSPFv3 E-Router-LSA [RFC8362]

4.2. Stub Router Advertisement Backward Compatibility

Stub Router Advertisement [RFC6987] defines `MaxLinkMetric (0xffff)` to indicate a router-LSA link should not be used for transit traffic.

This document updates [RFC6987] and [RFC8770]. When an OSPFv2 router supports the Unreachable Link support capability defined in this document, the OSPFv2 stub router `MaxLinkMetric(0xffff)` MUST be updated to `MaxReachableLinkMetric(0xfffe)`.

When an OSPFv2 router supports [RFC6987] and the Unreachable Link support capability defined in this document, it MUST also support advertise all its non-stub links with a link cost of `MaxReachableLinkMetric (0xfffe)`. Since `MaxLinkMetric` will not be used to indicate a link is unreachable unless all OSPFv2 routers in the area support this specification as specified in section 3, all routers in the area will also support the usage of `MaxReachableLinkMetric` to indicate an OSPF stub router link should not be used for transit traffic.

An OSPFv3 router can simply use the R-bit [RFC5340] for stub router advertisement.

5. Management Considerations

Support of the Unreachable Link support capability SHOULD be configurable.

In some networks, the operator may still want links with maximum metric(0xffff) to be treated as reachable. For example, when auto-costing of links is used and there is a mix of low-speed and high-speed links. In such cases, the updated routers can disable the Unreachable Link support capability and still treat links with maximum metric as reachable.

It is also RECOMMENDED that implementations supporting this document and auto-costing limit the maximum computed cost to MaxReachableLinkMetric (0xfffe).

6. Security Considerations

The document does not introduce any new security issues for the OSPF protocol. The security considerations for [RFC2328],[RFC5340],[RFC6987], and [RFC7770] are applicable to protocol extension.

7. IANA Considerations

This document defines a new bit in the registry "OSPF Router Functional Capability Bits":

Bit Number	Capability Name	Reference
0(TBD)	Unreachable Link support	This document

Table 2

8. Contributors

The following individuals have contributed to this document:

Mengxiao Chen
New H3C Technologies
China
Email: chen.mengxiao@h3c.com

Yanrong Liang
Ruijie Networks Co., Ltd.
China
Email: liangyanrong@ruijie.com.cn

9. References

9.1. Normative References

- [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>>.
- [RFC2328] Moy, J., "OSPF Version 2", STD 54, RFC 2328, DOI 10.17487/RFC2328, April 1998, <<https://www.rfc-editor.org/info/rfc2328>>.
- [RFC7684] Psenak, P., Gredler, H., Shakir, R., Henderickx, W., Tantsura, J., and A. Lindem, "OSPFv2 Prefix/Link Attribute Advertisement", RFC 7684, DOI 10.17487/RFC7684, November 2015, <<https://www.rfc-editor.org/info/rfc7684>>.
- [RFC7770] Lindem, A., Ed., Shen, N., Vasseur, JP., Aggarwal, R., and S. Shaffer, "Extensions to OSPF for Advertising Optional Router Capabilities", RFC 7770, DOI 10.17487/RFC7770, February 2016, <<https://www.rfc-editor.org/info/rfc7770>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.
- [RFC8362] Lindem, A., Roy, A., Goethals, D., Reddy Vallem, V., and F. Baker, "OSPFv3 Link State Advertisement (LSA) Extensibility", RFC 8362, DOI 10.17487/RFC8362, April 2018, <<https://www.rfc-editor.org/info/rfc8362>>.

9.2. Informative References

- [RFC5340] Coltun, R., Ferguson, D., Moy, J., and A. Lindem, "OSPF for IPv6", RFC 5340, DOI 10.17487/RFC5340, July 2008, <<https://www.rfc-editor.org/info/rfc5340>>.
- [RFC6987] Retana, A., Nguyen, L., Zinin, A., White, R., and D. McPherson, "OSPF Stub Router Advertisement", RFC 6987, DOI 10.17487/RFC6987, September 2013, <<https://www.rfc-editor.org/info/rfc6987>>.
- [RFC7308] Osborne, E., "Extended Administrative Groups in MPLS Traffic Engineering (MPLS-TE)", RFC 7308, DOI 10.17487/RFC7308, July 2014, <<https://www.rfc-editor.org/info/rfc7308>>.
- [RFC8770] Patel, K., Pillay-Esnault, P., Bhardwaj, M., and S. Bayraktar, "Host Router Support for OSPFv2", RFC 8770, DOI 10.17487/RFC8770, April 2020, <<https://www.rfc-editor.org/info/rfc8770>>.

Authors' Addresses

Liyan Gong
China Mobile
China
Email: gongliyan@chinamobile.com

Weiqiang Cheng
China Mobile
China
Email: chengweiqiang@chinamobile.com

Changwang Lin
New H3C Technologies
China
Email: linchangwang.04414@h3c.com

Acee Lindem
Arrcus, Inc.
United States of America
Email: acee.ietf@gmail.com

Ran Chen
ZTE Corporation
China
Email: chen.ran@zte.com.cn