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Advertising Tunnelling Capability in OSPF
draft-ietf-ospf-encapsulation-cap-00

Abstract

Some networks use tunnels for a variety of reasons. A large variety of tunnel types are defined and the ingress needs to select a type of tunnel which is supported by the egress. This document defines how to advertise egress tunnel capabilities in OSPF Router Information.

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1. Introduction

Some networks use tunnels for a variety of reasons, such as:

- o Partial deployment of MPLS-SPRING as described in [I-D.xu-spring-islands-connection-over-ip], where IP tunnels are used between MPLS-SPRING-enabled routers so as to traverse non-MPLS routers.

- o Partial deployment of MPLS-BIER as described in Section 6.9 of [I-D.ietf-bier-architecture], where IP tunnels are used between MPLS-BIER-capable routers so as to traverse non MPLS-BIER [I-D.ietf-bier-mpls-encapsulation] routers.

- o Partial deployment of IPv6 (resp. IPv4) in IPv4 (resp. IPv6) networks as described in [RFC5565], where IPvx tunnels are used between IPvx-enabled routers so as to traverse non-IPvx routers.

- o Remote Loop Free Alternate repair tunnels as described in [RFC7490], where tunnels are used between the Point of Local Repair and the selected PQ node.

The ingress needs to select a type of tunnel which is supported by the egress. This document describes how to use OSPF Router Information to advertise the egress tunnelling capabilities of nodes. In this document, OSPF means both OSPFv2 and OSPFv3.

1.1. 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].

2. Terminology

This memo makes use of the terms defined in [RFC4970].

3. Advertising Encapsulation Capability

Routers advertises their supported encapsulation type(s) by advertising a new TLV of the OSPF Router Information (RI) Opaque LSA [RFC4970], referred to as Encapsulation Capability TLV. This TLV is applicable to both OSPFv2 and OSPFv3. The Encapsulation Capability TLV SHOULD NOT appear more than once within a given OSPF Router Information (RI) Opaque LSA. The scope of the advertisement depends on the application but it is recommended that it SHOULD be domain-wide. The Type code of the Encapsulation Capability TLV is TBD1, the Length value is variable, and the Value field contains one or more Tunnel Encapsulation Type sub-TLVs. Each Encapsulation Type sub-TLVs indicates a particular encapsulation format that the advertising router supports.

4. Tunnel Encapsulation Type

The Tunnel Encapsulation Type sub-TLV is structured as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Tunnel Type (2 Octets)     |         Length (2 Octets)     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
|                             Value                             |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

* Tunnel Type (2 octets): identifies the type of tunneling technology being signaled. This document defines the following types:

1. L2TPv3 over IP [RFC3931] : Type code=1;

2. GRE [RFC2784] : Type code=2;

3. Transmit tunnel endpoint [RFC5566] : Type code=3;

4. IPsec in Tunnel-mode [RFC5566] : Type code=4;

5. IP in IP tunnel with IPsec Transport Mode [RFC5566] : Type code=5;

6. MPLS-in-IP tunnel with IPsec Transport Mode [RFC5566] : Type code=6;

7. IP in IP [RFC2003] [RFC4213]: Type code=7;

8. VXLAN [RFC7348]: Type code=8;

9. NVGRE [RFC7637]: Type code=9;

10. MPLS [RFC3032]: Type code=10;

11. MPLS-in-GRE [RFC4023]: Type code=11;

12. VXLAN GPE [I-D.ietf-nvo3-vxlan-gpe]: Type code=12;

13. MPLS-in-UDP [RFC7510]: Type code=13;

14. MPLS-in-UDP-with-DTLS [RFC7510]: Type code=14;

15. MPLS-in-L2TPv3 [RFC4817]: Type code=15;

16. GTP: Type code=16;

Unknown types are to be ignored and skipped upon receipt.

* Length (2 octets): unsigned integer indicating the total number of octets of the value field.

* Value (variable): zero or more Tunnel Encapsulation Attribute sub-TLVs as defined in Section 5.

5. Tunnel Encapsulation Attribute

The Tunnel Encapsulation Attribute sub-TLV is structured as as follows:

```
+-----------------------------------+
|      Sub-TLV Type (1 Octet)       |
+-----------------------------------+
|     Sub-TLV Length (1 Octet)      |
+-----------------------------------+
|     Sub-TLV Value (Variable)      |
|                                   |
+-----------------------------------+
```

* Sub-TLV Type (1 octet): each sub-TLV type defines a certain property about the tunnel TLV that contains this sub-TLV. The following are the types defined in this document:

1. Encapsulation Parameters: sub-TLV type = 1; (See Section 5.1)

2. Encapsulated Protocol: sub-TLV type = 2; (See Section 5.2)

3. End Point: sub-TLV type = 3; (See Section 5.3)

4. Color: sub-TLV type = 4; (See Section 5.4)

* Sub-TLV Length (1 octet): unsigned integer indicating the total number of octets of the sub-TLV value field.

* Sub-TLV Value (variable): encodings of the value field depend on the sub-TLV type as enumerated above. The following sub-sections define the encoding in detail.

Any unknown sub-TLVs MUST be ignored and skipped. However, if the TLV is understood, the entire TLV MUST NOT be ignored just because it contains an unknown sub-TLV.

If a sub-TLV is erroneous, this specific Tunnel Encapsulation MUST be ignored and skipped. However, others Tunnel Encapsulations MUST be considered.

5.1. Tunnel Parameters sub-TLV

This sub-TLV has its format defined in [RFC5512] under the name Encapsulation sub-TLV.

5.2. Encapsulated Protocol sub-TLV

This sub-TLV has its format defined in [RFC5512] under the name Protocol Type.

5.3. End Point sub-TLV

The value field carries the Network Address to be used as tunnel destination address.

If length is 4, the Address Family (AFI) is IPv4.

If length is 16, the Address Family (AFI) is IPv6.

5.4. Color sub-TLV

The valued field is a 4 octets opaque unsigned integer.

The color value is user defined and configured locally on the routers. It may be used by the service providers to define policies.

6. IANA Considerations

6.1. OSPF Router Information

This document requests IANA to allocate a new code point from registry OSPF Router Information (RI).

Value	TLV Name	Reference
TBD1	Tunnel Capabilities	This document

6.2. IGP Tunnel Encapsulation Types Registry

This document requests IANA to create a new registry "IGP Tunnel Encapsulation Types" with the following registration procedure:

Registry Name: IGP Tunnel Encapsulation Type.

Value	Name	Reference
0	Reserved	This document
1	L2TPv3 over IP	This document
2	GRE	This document
3	Transmit tunnel endpoint	This document
4	IPsec in Tunnel-mode	This document
5	IP in IP tunnel with IPsec Transport Mode	This document
6	MPLS-in-IP tunnel with IPsec Transport Mode	This document
7	IP in IP	This document
8	VXLAN	This document
9	NVGRE	This document
10	MPLS	This document
11	MPLS-in-GRE	This document
12	VXLAN-GPE	This document
13	MPLS-in-UDP	This document
14	MPLS-in-UDP-with-DTLS	This document
15	MPLS-in-L2TPv3	This document
16	GTP	This document
17-250	Unassigned	
251-254	Experimental	This document
255	Reserved	This document

Assignments of Encapsulation Types are via Standards Action [RFC5226].

6.3. IGP Tunnel Encapsulation Attribute Types Registry

This document requests IANA to create a new registry "IGP Tunnel Encapsulation Attribute Types" with the following registration procedure:

Registry Name: IGP Tunnel Encapsulation Attribute Types.

Value	Name	Reference
0	Reserved	This document
1	Encapsulation parameters	This document
2	Protocol	This document
3	End Point	This document
4	Color	This document
5-250	Unassigned	
251-254	Experimental	This document
255	Reserved	This document

Assignments of Encapsulation Types are via Standards Action [RFC5226].

7. Security Considerations

Security considerations applicable to softwires can be found in the mesh framework [RFC5565]. In general, security issues of the tunnel protocols signaled through this IGP capability extension are inherited.

If a third party is able to modify any of the information that is used to form encapsulation headers, to choose a tunnel type, or to choose a particular tunnel for a particular payload type, user data packets may end up getting misrouted, misdelivered, and/or dropped.

Security considerations for the base OSPF protocol are covered in [RFC2328] and [RFC5340].

8. Acknowledgements

This document is partially inspired by [RFC5512].

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