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The Network Overlay Discovery Protocol (NODP)

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Abstract

This document presents a mechanism for Auto-Discovery of membership

topology and capability information for network overlays. The mechanism described herein is referred to as the Network Overlay Discovery Protocol (NODP).

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[1.](#) Introduction

This document presents a mechanism for Auto-Discovery of membership topology and capability information for network overlays. The mechanism described herein is referred to as the Network Overlay Discovery Protocol (NODP).

Applications of this mechanism may include PPVPN Auto-Discovery and Discovery of IPv6 or IP Multicast overlay networks.

The protocol specified here is intended to be expandable, backwards-compatible, and interworkable with other architectures. As such, it is intended to be used for both intra- and inter- SP network overlays

It is designed to run as a payload within an underlying distribution protocol. It is assumed that the underlying distribution protocol will account for redistribution requirements (ie., flooding), peer authentication, reliability, etc.

[1.1.](#) PPVPN Auto-Discovery

This protocol is intended to function as an Auto-Discovery mechanism for PPVPNs. [[PPVPN-FW](#)], [[PPVPN-REQ](#)]

[PPVPN-FW] notes that Functional Components of a PPVPN are:

- o A mechanism to acquire overlay membership/capability information
- o A mechanism to tunnel traffic between overlay sites
- o For layer 3 PE-based overlays, a means to learn customer routes, distribute them across the provider network, and to advertise reachable destinations to customer sites.

This document outlines a protocol intended to provide a "mechanism to acquire overlay membership/capability information". This does not assume that a particular mechanism will be used to tunnel traffic between overlay sites, nor does it provide a means to learn, distribute, or advertise customer routes. However, the means

by which these functional components are accomplished may be indicated by this protocol as Capability information.

2. Network Overlay Discovery Protocol Specification

2.1. NODP Description

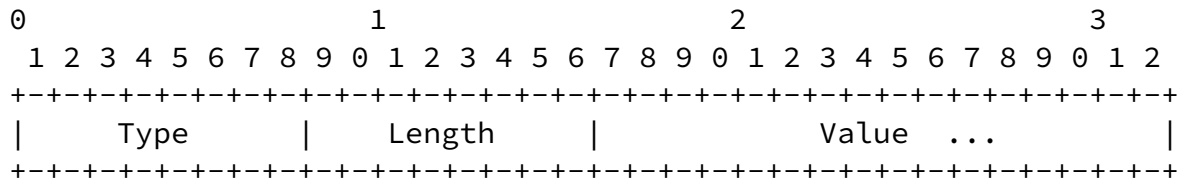
NODP is a mechanism by which nodes such as P, PE, and CE nodes can discover the topology and capabilities of an overlay network. The topology of an overlay network can be understood to be the collection of members participating in an overlay network and a description of how they are to be interconnected. The capabilities of an overlay network can be understood to be additional attributes of the overlay, such as details of how members are to be interconnected, addressing policy, reachability distribution mechanisms, and others.

Topology discovery is accomplished by flooding of Membership Advertisements. Each node participating in a NODP domain should send a Membership Advertisement to each of its NODP peers for for each of the overlay networks in which it will participate. Membership Advertisements received from a NODP peer by a node participating in a NODP domain should be redistributed to that nodes other NODP peers. If the receiving node may participate in the overlay network being advertised then it must save the advertisement locally in a topology database. This process eventually leads to a uniform view of overlay topology by all nodes which may participate in that overlay.

Each Membership Advertisement must contain a set of Attributes describing the overlay capabilities of the advertising node. Attributes can be described as Required Attributes or Optional Attributes. Required Attributes are Attributes that must be advertised, and must be recognized by a receiving node in order for the Membership Advertisement to be considered valid. Optional Attributes are Attributes that may be advertised, and indicate capabilities of the advertising node that may be supported by receiving nodes.

A Membership Advertisement may contain multiple Attributes of the same type. In this case, the node should choose which Attribute of that type will be used. If the node cannot support any of the Attributes of that type, then it may ignore them. However, if the Attribute type is a Required Attribute then the Membership Advertisement should not be considered valid. (see above)

The underlying distribution protocol may determine topology of the NODP peering. The relationship between NODP peers does not necessarily reflect the relationship between any two members of the same overlay on different nodes. In other words, the topology of the overlay does not have to be the same as the topology of the NODP domain.



2.3.1. Type Field

The Type field indicates the type of Attribute that is being specified. Attribute Types are described in [section 3](#).

2.3.2. Length Field

The Length field indicates the size of the Value field, in Octets.

An Attribute's size must be a multiple of 32 bits.

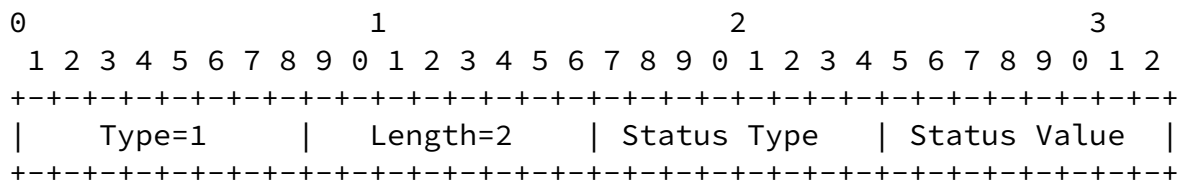
2.3.3. Value Field

The Value field is a variable length field, the format of which is determined by Type. The size of this field is indicated in octets by the Length field.

3. Attributes

3.1. Status Attribute

The Status Attribute is assigned the Type of 1. The Status Attribute has the following format:



The Attribute's Value field is composed of two sub-fields, Status Type and Status Value.

3.1.1. Overlay Active Status Attribute

The Overlay Active Status Attribute indicates whether the advertising node currently recognizes the indicated overlay as active or not.


```

Protocol
  Static      = 0
  OSPF       = 1
  RIP        = 2

```

The Parameters field of the Overlay Routing Protocol Attribute is used to distribute parameters needed to initiate the selected protocol.

[3.3.1. Static](#)

If the Protocol field of an Overlay Routing Protocol Attribute is set to 0, then the route distribution mechanism for the indicated overlay is static configuration of routing. No further setup of the route distribution mechanism is assumed to be necessary.

[3.3.2. OSPF](#)

If the Protocol field of an Overlay Routing Protocol Attribute is set to 1, then the route distribution mechanism for the indicated overlay is OSPF. The Parameters field should be one octet in length, making the Length field 2. The Parameters field must contain the OSPF Area that will be used in any adjacency which is established over the overlay Tunneling mechanism to the advertising node.

[3.3.3. RIP](#)

If the Protocol field of a Overlay Routing Protocol Attribute is set to 2, then the route distribution mechanism for the indicated overlay is RIP. The Parameters field should be one octet in length, making the Length field 2. The Parameters field must contain the RIP version that will be used in any adjacency which is established over the overlay Tunneling mechanism to the advertising node.

[3.4. Overlay Tunnel Methods](#)

```

0          1          2          3
 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 2
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   Type=4   |   Length   |   Method   | Parameters... |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

[3.4.1. NULL Method](#)

```

Method = 0
Parameters = 0

```

The NULL Method indicates that an advertising node cannot accept Overlay Tunnel connections for the advertised overlay. If the NULL Method is included as an Attribute, then the advertisement must not contain any other Method Attributes. If a node receives a NULL Method Attribute in an Advertisement, it must ignore any other Method Attributes included in the Advertisement.

3.4.2. PPP/L2TP/UDP/IPSec

0										1										2										3									
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	2	3	4	5	6	7	8	9	0
Type=4										Length										Method=1										LNS IP Ver									
LNS IP										...																													
Session Id (user id)										...																													

3.5. Topology Attributes

Topology Attributes indicate the advertising node's policy for overlay Tunnel interconnection.

Multiple topologies are not allowed to be announced in a single Membership Advertisement.

0										1										2										3									
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	2	3	4	5	6	7	8	9	0
Type=5										Length										Topology										Parameters									

3.5.1. Full Mesh

Full Mesh indicates that this node will accept tunnel connections of advertised tunnel type for advertised overlay from any authenticated node.

0										1										2										3									
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	2	3	4	5	6	7	8	9	0
Type=5										Length=2										Topology=1										RESERVED									

4. Security Considerations

The Auth field value TBD.

5. IANA Considerations

IANA considerations are discussed in [[GID](#)].

6. Acknowledgements

Thanks to Paul Knight for his review and comments.

7. References

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- [PPVPN-FW] Callon, R., Suzuki, M., et al., "A Framework for Provider
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- [PPVPN-REQ] Carugi, et al., "Service requirements for Provider Provisioned
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