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ICMP Extensions for Routing Instances draft-shen-icmp-routing-inst-00.txt

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Abstract

This document specifies the extensions to ICMP that allows routing instance information to be included inside the ICMP packet. These extensions can be used to facilitate the troubleshooting network problems within a routing domain or across multiple routing domains.

<u>1</u>. Conventions Used In This Document

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 $\underline{\text{RFC2119}}$ [10].

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2. Introduction

Internet Control Message Protocol (ICMP) [1] has been widely used for troubleshooting purposes. This document utilizes the ICMP multi-part message extension [2] to define a number of important routing instance objects in ICMP messages.

When using traceroute diagnostic tool through multiple routing domains, it is useful to have ICMP Time exceeded messages to include the AS number $[\underline{3}]$ the router or virtual router belongs to.

Within the same routing domain, if a network operates with multiple topologies for IGP [4, 5], it is crucial in network troubleshooting to know the multi-topology identifier the traceroute packet of inbound interface is associated with. This information can be included in the ICMP messages.

With the traditional Interior Gateway Protocol (IGP) diagnostics, it is useful for the ICMP Time exceeded messages to report OSPF area [6] the router belongs to or to report the IS-IS [7] level the router or link belong to when the IGP being IS-IS. The OSPF area and IS-IS level can also belong to a specific routing instance the inbound interface is associated with for the traceroute packets.

A router may support VRRP [9] over a LAN interface and it is informative to know if the interface has redundancy protection and it's configured virtual router identifier (VRID).

3. ICMP Multiple-part Message Extension

This document uses the ICMP extension [2]. The ICMP message MUST include the IP header and leading payload octets of the original datagram. An ICMP Extension Structure Header MUST follow the octets from the original datagram and come before any ICMP Extension Objects.

4. Routing Objects for ICMP

This section defines a number of ICMP routing instance objects that can be optionally appended to the ICMP Time Exceeded and Destination Unreachable messages.

4.1 Autonomous System Number Object

The router MAY include the AS number [3] when sending out the

ICMP messages.

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Class-Num = 5 C-type = 1 Length = 8

Object payload:

Figure 1: AS Number Object

4.2 Multi-Topology ID Object

The router MAY include the MT ID $[\underline{4}, \underline{5}]$ when sending out the ICMP messages.

Class-Num = 5 C-type = 2 Length = 8

Object payload:

Figure 2: MT ID Object

The MT ID is a 12 bit number for IS-IS MT, and it is a 7 bit number for OSPF.

4.3 OSPF Area ID Object

The router MAY include the Area ID for OSPF $[\underline{6}]$ when sending out the ICMP messages.

Class-Num = 5 C-type = 3 Length = 8 Object payload:

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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 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 4 5 6 7 8 9 0 1 5 6 7 8 9 0 1 5 6 7 8 8 9 0 1 5 6 7 8

Figure 3: OSPF Area ID Object

4.4. IS-IS Level Object

The router MAY include the IS-IS level $[\underline{7}]$ when sending out the ICMP messages.

Class-Num = 5 C-type = 4 Length = 8

Object payload:

Figure 4: IS-IS Level Object

The Instance ID is a 16 bit number [<u>11</u>], default value is zero. The Level is a 8 bit number, currently defined as following:

1 - IS-IS level-1
2 - IS-IS level-2
3 - IS-IS level-1-2

4.5 IGRP and EIGRP AS ID Object

The router MAY include the IGRP AS ID or EIGRP AS Number when sending out the ICMP messages.

Class-Num = 5 C-type = 5 Length = 8

Object payload:

Figure 5: IGRP or EIGRP AS ID Object

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The IGRP/EIGRP AS ID is a 32 bit number.

4.6 Virtual Router Identifier Object

The router MAY include the virtual router identifier of VRRP $[\underline{9}]$ when sending out the ICMP messages.

```
Class-Num = 5
C-type = 6
Length = 8
```

Object payload:

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
+-	+ -	+ -	+ - •	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+ - +	+ - +	+ - +		+	+	+ - +	+ - +	+ - +	+ - +	+ - 4	+ - +
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Figure 6: VRID Object

Virtual Router ID is an 8 bit number.

5. Security Considerations

These ICMP extensions can provide operators with additional routing information during network troubleshooting. It may be desirable to provide this information only to network operators. This may be desirable in particular for the IGP routing related objects. The implementation should allow the configuration of the policy control over the operation of these objects. For example, an access list can be attached to check the IP destination of the ICMP packets with this extension belong to internal network management subnet.

<u>6</u>. IANA Considerations

IANA should should reserve from the ICMP Extension Object registry: 5 for the routing instance objects. IANA should also reserve from the objects c-types as described in <u>section 4</u> of this document.

7. Acknowledgement

TBA.

<u>8</u>. References

<u>8.1</u>. Normative References

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ICMP Routing Instance

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