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D. Yeung
Cisco Systems
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ICMP Extensions for Virtual Network
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Abstract

This document specifies the extensions to ICMP that allow virtual network information to be included in an ICMP packet. These extensions can be used to facilitate troubleshooting network problems within a virtual network or across multiple virtual networks.

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ICMP Virtual Network

July 2012

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[1.](#) Introduction

Internet Control Message Protocol (ICMP) [[RFC0792](#)] has been widely used for troubleshooting purposes. This document utilizes the ICMP multi-part message extension [[RFC4884](#)] to define new virtual network information objects in ICMP messages.

When using a traceroute diagnostic tool across virtual network domains, it is useful to have ICMP Time Exceeded messages, defined in [section 4.2](#) and 4.5 of [[RFC4884](#)], to include transit virtual network information of intermediate routers.

[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 [[RFC2119](#)].

[2.](#) ICMP Multiple-part Message Extension

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.

[3.](#) Virtual Network Information Objects for ICMP

This section defines a list of new ICMP virtual network information objects that can be optionally appended to the ICMP Time Exceeded and Destination Unreachable messages. These new ICMP virtual network information objects are defined per [section 8](#), ICMP Extension Objects, of [[RFC4884](#)] and have the format below.

Object header and payload:

0

1

2

3

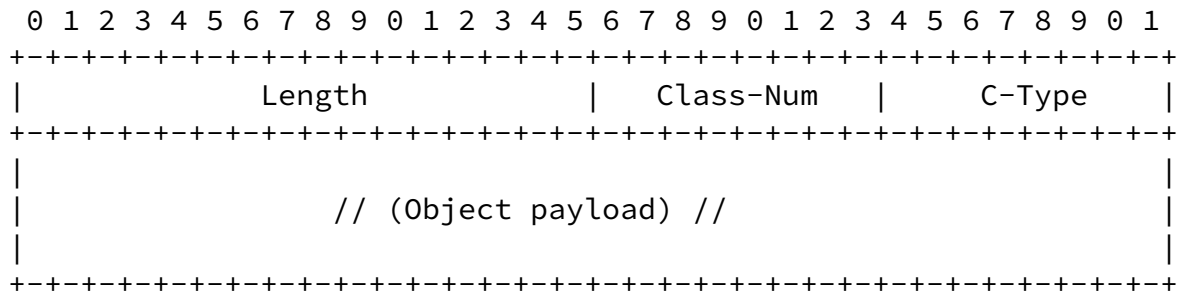


Figure 1: ICMP Extension Objects

[3.1.](#) Incoming Virtual Network Name Object

The router MAY include the incoming virtual network name object when sending out the ICMP messages.

Object header and payload:

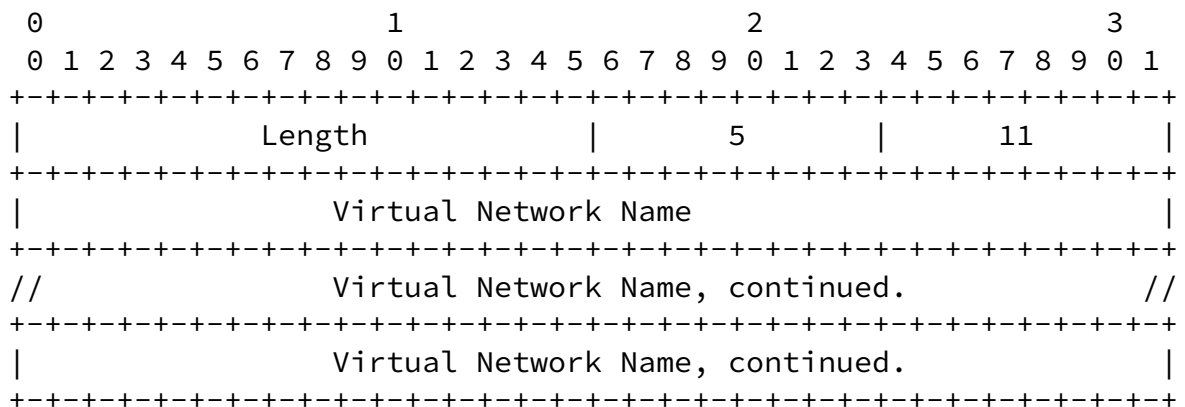


Figure 2: Incoming Virtual Network Name Object

Length:

Length of the object, measured in octets, including the object header and object payload. The value is $4 + 4 * N$, where N is the number of 4-octets used to store the Virtual Network Name.

Class-Num:

Set to the value of 5 to identify the Virtual Network

Information Object class.

C-Type:

Set to the value of 11 to identify the Incoming Virtual Network Name Object.

Virtual Network Name:

This object payload contains the name of the virtual network of the incoming interface. Human-readable text for this object MUST be provided in the US-ASCII charset [[ANSI.X3-4.1986](#)] using the Default Language [[RFC2277](#)]. This field must have a length that is a multiple of 4 bytes; the string should be padded with zeroes as necessary.

[3.2.](#) Outgoing Virtual Network Name Object

The router MAY include the outgoing virtual network name object when sending out the ICMP messages.

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Object header and 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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     |          5          |          12          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Virtual Network Name                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
//                                     Virtual Network Name, continued.                                     //
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Virtual Network Name, continued.                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

Figure 3: Outgoing Virtual Network Name Object

Length:

Length of the object, measured in octets, including the object header and object payload. The value is $4 + 4 * N$, where N is the number of 4-octets used to store the Virtual Network Name.

Class-Num:

Set to the value of 5 to identify the Virtual Network Information Object class.

C-Type:

Set to the value of 12 to identify the Outgoing Virtual Network Name Object.

Virtual Network Name:

This object payload contains the name of the virtual network of the outgoing interface should the original packet is forwarded. Human-readable text for this object MUST be provided in the US-ASCII charset [[ANSI.X3-4.1986](#)] using the Default Language [[RFC2277](#)]. This field must have a length that is a multiple of 4 bytes; the string should be padded with zeroes as necessary.

[3.3.](#) Incoming Virtual Network ID Object

The router MAY include the incoming virtual network ID object when sending out the ICMP messages.

Object header and payload:

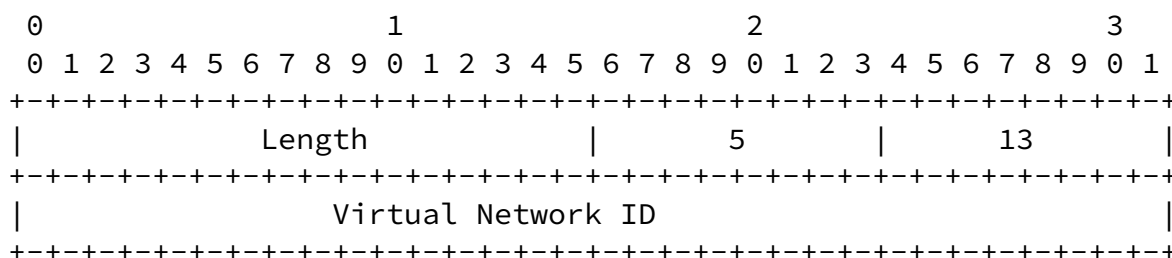


Figure 4: Incoming Virtual Network ID Object

Length:

Length of the object, measured in octets, including the object header and object payload. The value is 8.

Class-Num:

Set to the value of 5 to identify the Virtual Network Information Object class.

C-Type:

Set to the value of 13 to identify the Incoming Virtual Network Name ID.

Virtual Network ID:

This object payload contains the ID of the virtual network of the incoming interface.

[3.4.](#) Outgoing Virtual Network ID Object

The router MAY include the outgoing virtual network ID object when sending out the ICMP messages.

Object header and payload:

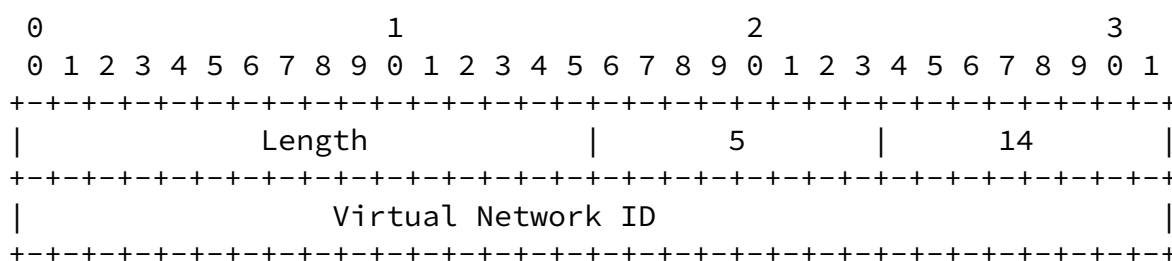


Figure 5: Outgoing Virtual Network ID Object

Length:

Length of the object, measured in octets, including the object header and object payload. The value is 8.

Class-Num:

Set to the value of 5 to identify the Virtual Network Information Object class.

C-Type:

Set to the value of 14 to identify the Outgoing Virtual Network Name ID.

Virtual Network ID:

This object payload contains the ID of the virtual network of the outgoing interface should the original packet is forwarded.

[4.](#) Acknowledgements

The authors would like to thank Padma Pillay-Esnault, Naiming Shen and many others for review and comments.

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[5.](#) IANA Considerations

This document defines new ICMP Extension Object Class 5 for the Virtual Network Information Object registry.

Within the new Virtual Network Information Object class, the following Class Sub-type are defined.

Object Name	Class Sub-type Value
Incoming Virtual Network Name Object	11
Outgoing Virtual Network Name Object	12
Incoming Virtual Network ID Object	13
Outgoing Virtual Network ID Object	14

Table 1: Virtual Network Information Object Class Sub-types

[6.](#) Security Considerations

These ICMP extensions can provide operators with additional information during network troubleshooting. It may be desirable to provide this information only to network operators. 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.

[7.](#) References

[7.1.](#) Normative References

- [RFC0792] Postel, J., "Internet Control Message Protocol", STD 5, [RFC 792](#), September 1981.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC4884] Bonica, R., Gan, D., Tappan, D., and C. Pignataro, "Extended ICMP to Support Multi-Part Messages", [RFC 4884](#), April 2007.

[7.2.](#) Informative References

- [ANSI.X3-4.1986] American National Standards Institute, "Coded Character Set - 7-bit American Standard Code for Information Interchange", ANSI X3.4, 1986.
- [RFC2277] Alvestrand, H., "IETF Policy on Character Sets and Languages", [BCP 18](#), [RFC 2277](#), January 1998.

[Appendix A.](#) Additional Stuff

Author's Address

Derek Yeung
Cisco Systems
170 West Tasman Drive
San Jose, CA 95134
USA

Phone:
EMail: myeung@cisco.com