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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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
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
| Length | Class-Num | C-Type |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
| // (Object payload) // |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-

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:

```
++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Length            |       5       |      11       |
++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Virtual Network Name                          |
++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
//                Virtual Network Name, continued.             //
++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Virtual Network Name, continued.              |
++-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

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.
Object header and payload:

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Length            |       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 \(4 + 4 \times N\), 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:

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Length          |       5       |      13       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Virtual Network ID                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

**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:

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Length          |       5       |      14       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Virtual Network ID                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

**Figure 5: Outgoing Virtual Network ID Object**
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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

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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


7.2. Informative References


Appendix A. Additional Stuff

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