

# Extending ICMP for Multi-path

[draft-many-intarea-icmp-mp-01](#)

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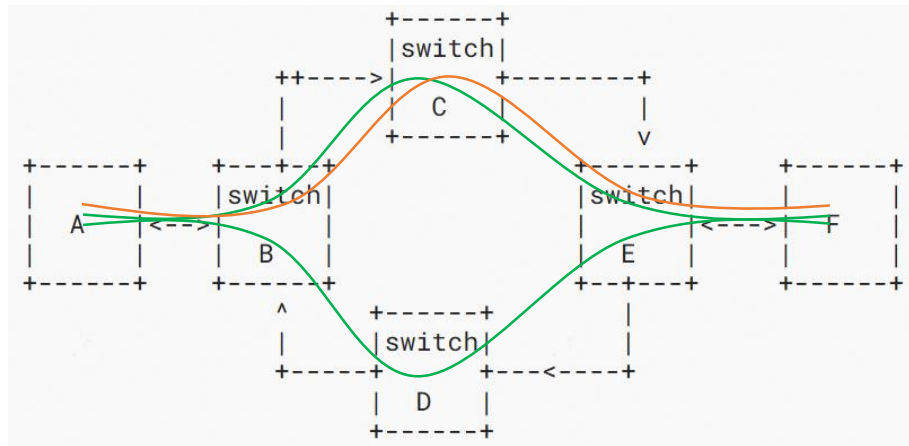
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# Introduction

- **Traceroute** uses the ICMP Time Exceeded Message to collect the nodes' information along the route, including the **IP addresses**, and **host name** of nodes.
- RFC4884 redefines some ICMP messages to support multi-part operation. It **defines an extension structure** at the end of the ICMP message to carry the additional information.
- RFC5837 extends the ICMP messages with a **Interface Information Object** to carry the interface information(including **ifIndex, IPv4 address, IPv6 address, name and MTU**).
- RFC8335 defines PROBE, which is used to query the status of a interface by sending ICMP Extended Echo Request message. The ICMP Extended Echo Reply message includes a **"State"** field to reflect the state of the ARP table or Neighbor Cache entry to **indicate whether the interface is reachable**.

# Motivation

- Traceroute is typically used to collect the information of a **single path**, when using Traceroute in a **multi-path topology**, the Traceroute can only get the information of **one of the available paths**, and do not know that there are multiple paths.

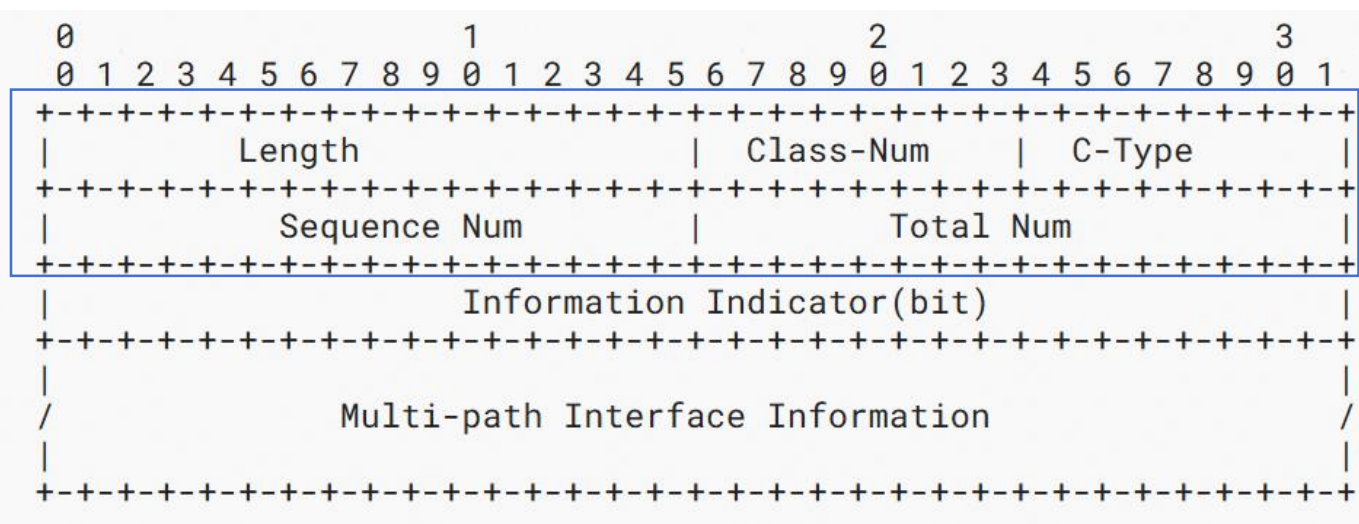


- Traceroute path A->B->C->E->F
- Packet forwarding path A->B->C/D->E->F

Problem: It is difficult for users to located the **faults on the paths that are not detected by traceroute**(e.g. D).

# ICMP Extension 1/3

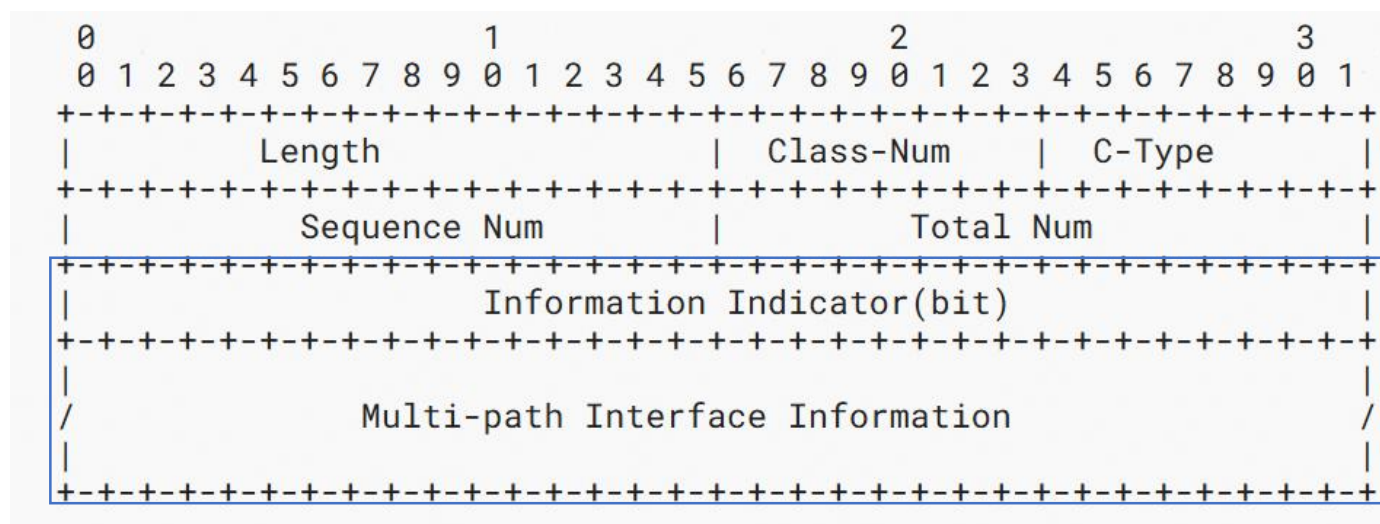
- Define a new ICMP extension object: Multi-path Interface Information (MPIO) Object



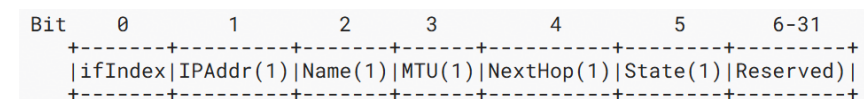
- C-Type: indicates the types of interface information.
  - 1: IPv4 interface;
  - 2: IPv6 interface;
- Sequence Num: the sequence number of this current interface.
- Total Num: the total number of interfaces.

# ICMP Extension 2/3

- Define a new ICMP extension object: Multi-path Interface Information (MPII) Object



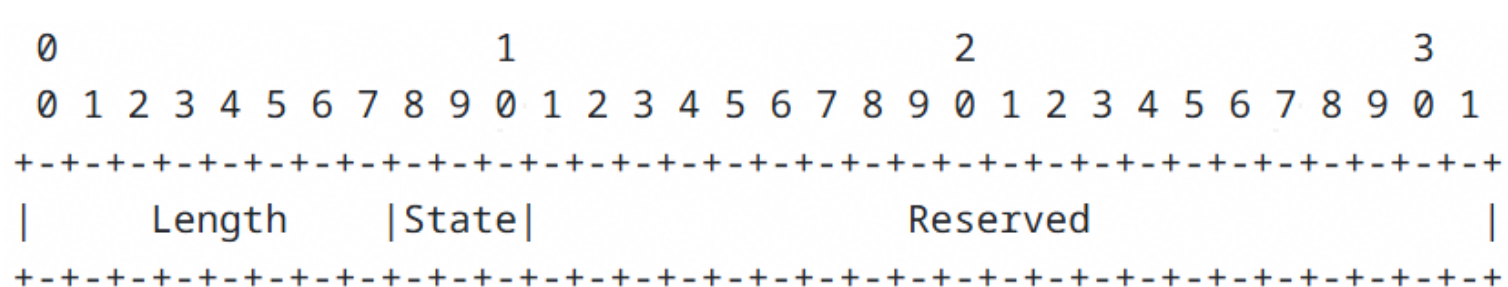
- Information Indicator: controls the following multi-path interface information in the Object.



- Multi-path interface information: carries the detailed multi-path interface information as specified in the Information Indicator.

# ICMP Extension 3/3

- This document reuse the IfIndex, IPAddr, Name, and MTU formats defined in RFC5837. The **Nexthop and State** information is new.
- The Nexthop bit indicates that an IP Address Sub-Object for the nexthop is present. **If both IPAddr and Nexthop bit are set**, then the **two Sub-Objects MUST be placed in order**.
- The State bit indicates that an Interface State Sub-Object is included.



State: the same as defined in RFC8335:  
0: Reserved;  
1: Incomplete;  
2: Reachable;  
3: Stale;  
4: Delay;

# Next Steps

- Is this motivation and use case clear?
- Continue to improve the document
- Welcome for contribution and comments.