

ICMP

ICMP Messages

Messaging protocol for IPv4 (ICMPv4) and IPv6 (ICMPv6, includes additional functionality).

- **Host reachability:**
ICMP Echo Message can be used to test the reachability of a host on an IP network.
- **Destination or Service Unreachable:**
ICMP Destination Unreachable message can be used to notify the source that a destination or service is unreachable.
- **Time exceeded:**
When the Time to Live field (IPv4 TTL field, IPv6 Hop Limit field) in a packet is decremented to 0, an ICMP Time Exceeded message will be sent to the source host.

ICMPv6 Messages

Neighbor Discovery Protocol (NDP) messages:

- **Router Solicitation (RS) and Router Advertisement (RA):**
 - Messaging between an IPv6 router and an IPv6 device
 - Dynamic address allocation.
- **Neighbor Solicitation (NS) and Neighbor Advertisement (NA):**
 - Messaging between IPv6 devices
 - Duplicate address detection (DAD)
 - Address resolution

ICMPv6 RS Messages

- Sent by hosts
- To determine how to receive its IPv6 address information dynamically.


ICMPv6 RA Messages

- Sent by routers:
 - Every 200 seconds
 - In response to an RS message.
- Provide addressing information to IPv6-enabled hosts:
 - Prefix, prefix length, DNS address, and domain name.
 - Default gateway = link-local address of the router that sent the RA.





ICMPv6 NS Messages

- Sent by hosts
- To perform **DAD (Duplicate Address Detection)**:
 - Check the uniqueness of an address
 - Host sends its own GUA/LLA IPv6 address as the targeted IPv6 address.
 - If another device has this address ➡ Sends NA message.
- To determine the **MAC address of the destination**:
 - Device sends NS message to solicited node address.
 - Targeted device ➡ Responds NA message with MAC address.

Test connectivity - Ping

- Uses ICMP Echo and Reply messages
- **Common for the 1st ping to timeout** if address resolution (ARP or ND) needs to be performed before sending the ICMP Echo Request.
-  **Steps to network troubleshooting:**
 - **1** Ping the Loopback (127.0.0.1 or ::1/64)
 - **2** Ping the Default Gateway
 - **3** Ping the Remote Host

Test the path - Traceroute

- Test the path between two hosts. Command: `tracert` or `tracert`
- Provide a list of hops that were successfully reached along that path.
 -  Round-trip time for each hop
 -  * (lost or unreplied packet)
- Inner working:
 - 1st message: TTL=1  1st router responds with Time Exceeded message
 - 2nd message: TTL=2  2nd router responds with Time Exceeded message
 - ...