

Assignment for Protocols Security, 2021

Part VI - IPV6 Theoretical questions

- a. Explain special IPv6 addresses (reserved, private link-local and private site-local, loopback and unspecified), and how/where they are used.

Reserved IPs

As we already know, IPv6 uses a 128-bit address, thus allowing the use of 2^{128} different addresses, a significantly larger number than what the IPv4 protocol allowed us. However, there are a number of addresses that have special meaning in IPv6 (Similarly, the IPv4 protocol has addresses with special meanings, such as 224.0.0.0/4 for sending multicast messages), including:

Loopback (::1)

A unique virtual address that redirects all traffic back to your computer, aka 'localhost'. (Similarly, in the IPv4 protocol the address is 127.0.0.1).

This address most often used for internal testing, such as running a website or pre-production applications

Unspecified (::/128, also just ::)

As its name implies, this is an address that is not defined and is not assigned to a machine / node. It can be used as a source address when the destination of the message does not need to know its source.

Private site-local (FEC0::/10)

Based on the information I have located, it seems that the use of these addresses is not common. These are addresses that are not accessible from the outside, and it seems that these are similar to NAT addresses, ie a number of computers that go out of the network (usually for surfing the Internet) through a single address.

Private link-local (FE80::/10)

A new concept I learned, I did not know it before. The term refers to setting up addresses automatically without the need for DHCP and so computers on the same network can talk without DHCP assignments and this address is not accessible from the outside. This method is also called Stateless Configuration.

- b. Explain major functions of IPv6 Neighbor Discovery (ND) protocol, addresses used and mapping of its major functions to the parallel functions and protocols in the IPv4 world. Arrange your answer as a table.

The NDP (Neighbor Discovery Protocol) in IPv6, which is based on the ICMPv6 (Internet Control Message Protocol). The NDP replaces the ARP (Address Resolution Protocol) which does not exist in IPv6.

Functions	Addresses	IPv4
Address auto configuration		
Router discovery		
Address resolution		

- c. Explain with RFC references why /64 is the smallest recommended subnet for hosts?

Using a subnet length other than / 64 can break the protocols described in RFC 5375, and because common routers support IPv6 using software only when using another subnet and not / 64 may cause problems.

- d. Explain the difference between IPv6 address stateless and stateful auto-configuration. Are they mutually exclusive?

- e. Explain the Duplicate Address Detection used by IPv6 Stateless Auto-Configuration.

In stateless auto configuration the IP address is being generated by the host and being sent to network by multicast, and If the address already exists, the host generates a one

- f. What is "Solicited-Node Multicast Address"? How is it generated (bring an example) and how is it used?

solicited node multicast address is an IPV6 address, which formed by taking the low-order 24 bits of an address (unicast or anycast) and appending those bits to the prefix

used to verify whether a given IPv6 address is already used by the local-link or not

- g. What are the major differences between DHCP function for IPv4 networks and DHCPv6 for IPv6 networks?

There are several of the differences between DHCP for IPv4 and DHCPv6. DHCP is used by these two distinct network protocols (RFC 2132 and RFC 3315)

For exmaple, DHCP (IPv4) is use broadcast IPv4 messages on the LAN, may provide the default gateway IP address and using MAC address to identify clients.

while DHCPv6 is using RA and IPv6 multicast messages, canot provide the default gateway through DHCPv6, and use DHCP unique identifier for identifying clients

Sources

<https://datatracker.ietf.org>

https://en.wikipedia.org/wiki/Reserved_IP_addresses

<http://vlib.eitan.ac.il>

https://en.wikipedia.org/wiki/Neighbor_Discovery_Protocol

<https://blog.zivaro.com/accounting-differences-dhcpv6-dhcp>