

Notes for Cisco Routing and Switching1 – Introduction to Networks

Chapter 8. IP Addressing

1. An IPv4 address is comprised of 4 octets of binary digits, each containing 8 bits, resulting in a 32-bit address.
2. An IPv4 address is divided into two parts: a network portion - to identify the specific network on which a host resides, and a host portion - to identify specific hosts on a network. A subnet mask is used to identify the length of each portion.
3. The binary format for 255.255.255.192 is 11111111.11111111.11111111.11000000. The prefix length is the number of consecutive 1s in the subnet mask. Therefore, the prefix length is /26. (Στο test υπάρχει άλλος αριθμός)
4. A directed broadcast is a message sent to all hosts on a specific network. It is useful for sending a broadcast to all hosts on a nonlocal network. A multicast message is a message sent to a selected group of hosts that are part of a subscribing multicast group. A limited broadcast is used for a communication that is limited to the hosts on the local network. A unicast message is a message sent from one host to another.
5. Broadcasts are used by a number of protocols and cannot be avoided. A router does not forward broadcasts, thus creating a broadcast domain in each one of its interfaces. There are no broadcasts in IPv6. If a switch receives a broadcast packet, it will forward this packet through all of its interfaces, except the inbound interface.
6. If the block of addresses allocated to the pool is 192.168.10.0/24, there are 254 IP addresses to be assigned to hosts on the network. As there are X printers which need to have their addresses assigned statically, then there are $254-X$ IP addresses left for assignment.
7. The tunneling migration technique encapsulates an IPv6 packet inside an IPv4 packet. Encapsulation assembles a message and adds information to each layer in order to transmit the data over the network. Translation is a migration technique that allows IPv6-enabled devices to communicate with IPv4-enabled devices using a translation technique similar to NAT for IPv4. The dual-stack migration technique allows IPv4 and IPv6 protocol stacks to coexist on the same network simultaneously.
8. IPv4 addresses are represented as dotted decimal numbers and are 32 bits in length. IPv6 addresses are represented by hexadecimal numbers and are 128 bits in length.
9. When an IPv6 address is being compressed, the :: can be used to replace a recurring set of 0s only once.
10. Multicast, anycast, and unicast are types of IPv6 addresses. There is no broadcast address in IPv6. Loopback and link-local are specific types of unicast addresses.
11. There are three elements that make up an IPv6 global unicast address. A global routing prefix which is provided by an ISP, a subnet ID which is determined by the organization, and an interface ID which uniquely identifies the interface interface of a host.

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12. FF02::1 is the all-nodes multicast group within the scope of the local link. A packet with this destination address is received and processed by all IPv6-enabled interfaces.
13. When a Cisco router is being moved from an IPv4 network to a complete IPv6 environment:
Router# **configure terminal**
Router(config)# **interface fastethernet 0/0**
Router(config-if)# **ipv6 address 2001:db8:bced:1::9/64**
Router(config-if)# **no shutdown**
Router(config-if)# **exit**
Router(config)# **ipv6 unicast-routing**
14. The ICMP messages common to both ICMPv4 and ICMPv6 include: host confirmation, destination (net, host, protocol, port) or service unreachable, time exceeded, and route redirection. Router solicitation, neighbor solicitation, and router advertisement are new protocols implemented in ICMPv6.
15. When a host needs to find the MAC address of a destination host, address resolution is used. The IPv6 host device will send a neighbor solicitation (NS) message to the solicited node multicast address. This address has two components that make up the 128-bit address. The front part is FF02::1:FF00/104, and the second part is the right-most 24 bits of the link local or global unicast address of the destination host.
16. When a router receives a traceroute packet, the value in the TTL field is decremented by 1. When the value in the field reaches zero, the receiving router will not forward the packet, and will send an ICMP Time Exceeded message back to the source.
17. The IPv6 address ::1 is the loopback address. A successful ping to this address means that the TCP/IP stack is correctly installed. It does not mean that any addresses are correctly configured.
18. To convert a binary number to the decimal equivalent, add the value of the position where any binary 1 is present. For example $10100000=128+32=160$
19. To convert from hexadecimal to decimal, multiply each digit by the place value that is associated with the position of the digit and add the results. $0x3A=58$
20. The highest number you can write in an 8 bit byte is 11111111, which converts into decimal as 255.
Class A addresses are within the range 0.0.0.0/8 to 127.0.0.0/8.(127 is loopback)
Class B addresses are within the range 128.0.0.0/16 to 191.255.0.0/16.
Class C addresses are within the range 192.0.0.0/24 to 223.255.255.0/24.
Class D addresses are within the range 224.0.0.0 to 239.255.255.255.
Class E addresses are within the range 240.0.0.0 to 254.255.255.255.
21. Link-Local addresses are assigned automatically by the OS environment and are located in the block 169.254.0.0/16. The private addresses ranges are 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16. TEST-NET addresses belong to the range 192.0.2.0/24. The addresses in the block 240.0.0.0 to 255.255.255.254 are reserved as experimental addresses. Loopback addresses belong to the block 127.0.0.0/8.