Computer Communication and Networks

(Lecture-08)

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Internet Protocol Address (IP Address)

(**I**nternet **P**rotocol address) The address of a connected device in an IP network (TCP/IP network), which is the worldwide standard both in-house and on the Internet. Every desktop and laptop computer, server, scanner, printer, modem, router, smartphone, tablet and smart TV is assigned an IP address, and every IP packet traversing an IP network contains a source IP address and a destination IP address. In other words, an IP address is a logical numeric address that is assigned to every single computer, printer, switch, router or any other device that is part of a TCP/IP-based network. The IP address is the core component on which the networking architecture is built; no network exists without it.

An IP address is a logical address that is used to uniquely identify every node in the network. They are similar to addresses in a town or city because the IP address gives the network node an address so that it can communicate with other nodes or networks, just like mail is sent to friends and relatives. It is the most significant and important component in the networking that binds the World Wide Web together.

Network nodes are assigned IP addresses by the Dynamic Host Configuration Protocol (DHCP) server as soon as the nodes connect to a network. DHCP assigns IP addresses using a pool of available addresses which are part of the whole addressing scheme. Though DHCP only provides addresses that are not static, many machines reserve static IP addresses that are assigned to that entity forever and cannot be used again. Within an isolated network, you can assign IP addresses at random as long as each one is unique. However, connecting a private network to the Internet requires using registered IP addresses (called Internet addresses) to avoid duplicates.

The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address.

The numerals in an IP address are divided into 2 parts:

- The network part specifies which networks this address belongs to and
- The host part further pinpoints the exact location.

A network address is also known as the numerical network part of an IP address. This is used to distinguish a network that has its own hosts and addresses. For example, in the IP address 192.168.1.0, the network address is 192.168.1.

A network address is any logical or physical address that uniquely differentiates a network node or device over a computer or telecommunications network. It is a numeric/symbolic number or address that is assigned to any device that seeks access to or is part of a network. It is a key networking technology component that facilitates identifying a network node/device and reaching a device over a network. It has several forms, including the Internet Protocol (IP) address, media access control (MAC) address and host address. Computers on a network use a network address to identify, locate and address other computers. Besides individual devices, a network address is typically unique for each interface; for example, a computer's Wi-Fi and local area network (LAN) card has separate network addresses.

Public and Private Addresses

For homes and small businesses, the entire local network (LAN) is exposed to the Internet via one public IP address. Large companies have several public IPs.

In contrast, the devices within the network use private addresses not reachable from the outside world, and the router enforces this standard. The same private IP address ranges are used in every network. Therefore, every computer in a company is assigned the same private IP address as a computer in thousands of other companies.

Logical vs. Physical

An IP address is a logical address that is assigned by software residing in a server or router (DHCP). The physical address is built into the hardware (MAC address). In order to locate a device in the network, the logical IP address is converted to a physical address by a resolution protocol within the TCP/IP suite of protocols (see ARP). An IP address can be changed because it is assigned, but the physical MAC address is hardwired into the device.

Static and Dynamic IP

Network infrastructure devices such as servers, routers and firewalls are typically assigned permanent "static" IP addresses. The client machines can also be assigned static IPs by a network

administrator, but most often are automatically assigned "dynamic" IP addresses via software in the router (DHCP). Internet service providers may change the IPs in the modems of their home users here and there, but business users must have consistent "static" IPs for servers that face the public.

The Dotted Decimal Address: x.x.x.x

IP addresses are written in "dotted decimal" notation, which is four sets of numbers separated by decimal points; for example, 204.171.64.2. Instead of the domain name of a website, the actual IP address can be entered into the browser. However, the Domain Name System (DNS) exists so users can enter **fuuast.edu.pk** instead of an IP address, and the domain (the URL) fuuast.edu.pk is converted to the numeric IP address (DNS).

The traditional IP addressing system (IPv4) uses a smaller 32-bit number that is split between the network and host (client, server, etc.). The host part can be further divided into subnetworks.

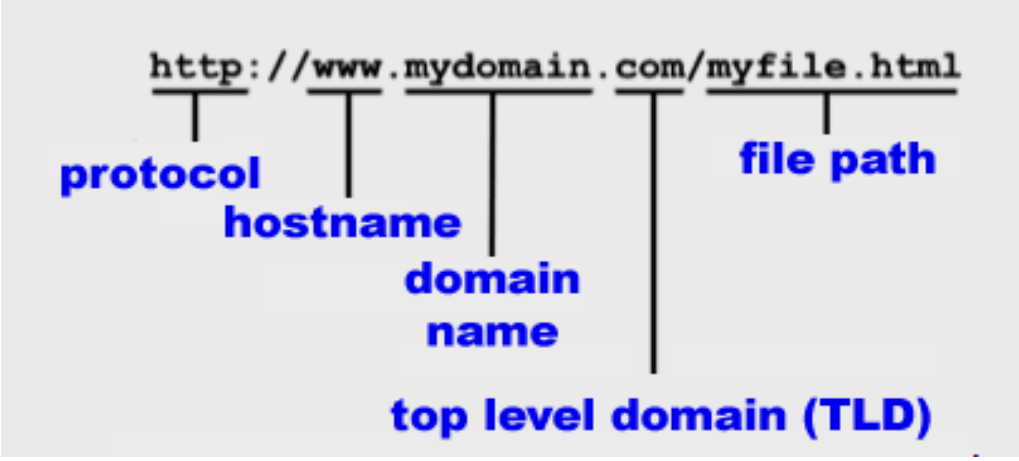
Class A, B and C

Based on the split of the 32 bits, an IP address is either Class A, B or C, the most common of which is Class C. More than two million Class C addresses are assigned, quite often in large blocks to network access providers for use by their customers. The fewest are Class A networks, which are reserved for government agencies and huge companies.

Although people identify the class by the first number in the IP address, a computer identifies class by the first three bits of the IP address (A=0; B=10; C=110).

Internet Hostnames

On the Internet, a hostname is part of the address typed into a browser to access a website. Traditionally, WWW has been used for Web server hostnames. However, most websites can be addressed without the WWW, because the HTTP server (Web server) network port number 80 is automatically passed to the correct server by the routing or firewall equipment whether the WWW is present or not. The hostname follows the protocol in a Web address.



The Format of an Internet Address

What is My IP Address?

To view your IP address you can use the ipconfig (IPCONFIG) command line tool. Ipconfig displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings.

To launch the command prompt from a Windows-based computer click: Start > All Programs > Accessories > Command Prompt. Type ipconfig and press the Enter key.

You can also use Google search to find your IP address. Type "what is my IP address" as a search query and Google will show the IP address of the computer from which the query was received as the top search result.

End of Lecture no. 8.