IP Address

- IP address identifies any device connected to the Internet

- IPv4 dotted decimal notation
  - Four 8-bit numbers separated by dots
  - 10101100 00010000 00000000 01100100 → 172.16.0.100

- IPv6 notation
  - 8 groups of 4 hexadecimal digits each separated by colons
  - 2001:0DB8:0000:0000:0000:ff00:0042:8329

IP Address: Purpose

- Identifying Devices

- Routing Data

- Controlling Access

- Providing Location Information

MAC Address

- Unique identifier assigned to a network interface controller (NIC) for use as a network address in communications withing a network segment

- Within OSI Model, MAC addresses are used in the medium access control protocol sub-layer of the data link layer

- MAC Address Notation
  - 6 groups of 2 hexadecimal digits each separated by hyphens, colons, or without a separator
  - 00:AA:BB:44:55:66

MAC Address

◆ Primarily assigned by device manufacturers

◆ Often referred to as the burned-in address, or as an Ethernet hardware address, hardware address, or physical address

◆ MAC Addresses are unique

MAC Address: Purpose

- Identifying Devices

- Preventing Unauthorized Access

- Tracing Source of Network Traffic

DNS

- Stands for Domain Name System

- Devices on the network has IP addresses, but human always prefers names instead of numeric addresses

- DNS maps the human readable name to IP Address

DNS Process Overview

◆ User machine runs client side of the DNS application

◆ The browser (or any other program that uses URL) extracts the hostname to the client side of the DNS application

◆ The DNS client sends a query containing the hostname to a DNS application

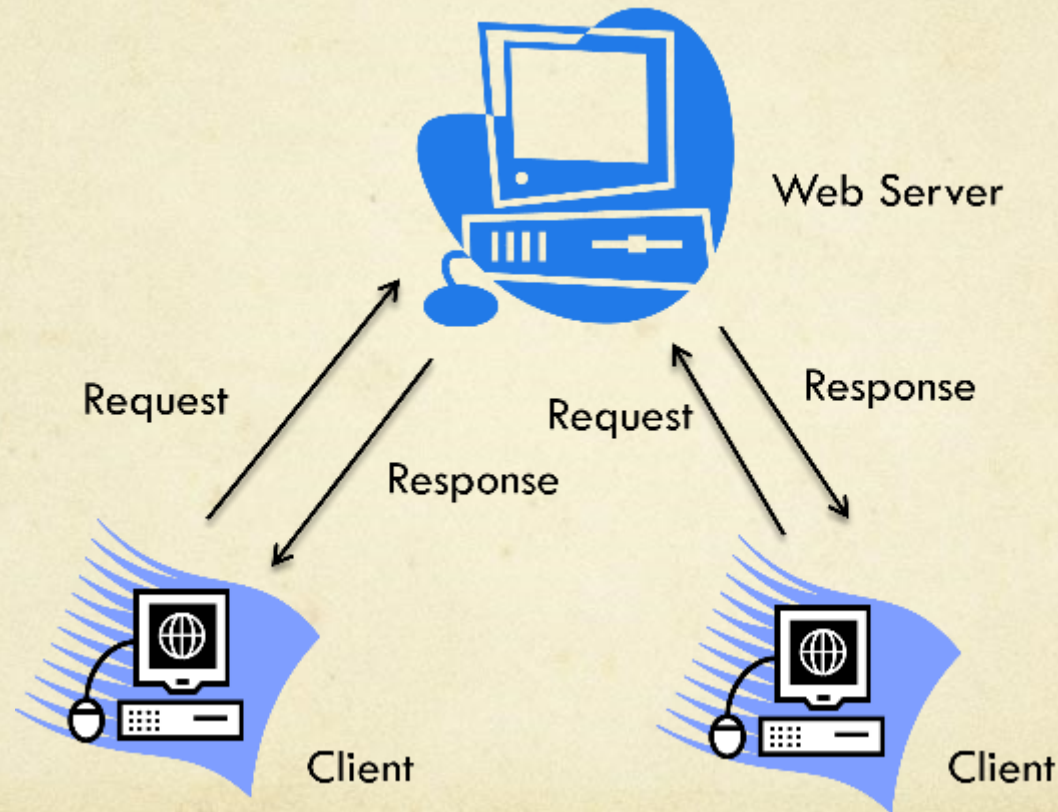◆ The DNS client eventually receives a reply, which includes the IP addresses off the hostname

DNS: Purpose

◆ Translates domain names to IP addresses

◆ Provides a consistent way to access resources

◆ Improves performance

◆ Provides security

HTTP

- Stands for Hyper Text Transfer Protocol

- Uses the services of TCP on well-known port 80

- HTTP messages are read and interpreted by the HTTP server and HTTP client (Browser)

- HTTP is a stateless protocol as HTTP server does not store any information for the clients

- HTTP uses TCP

HTTP Communication

HTTP: Purpose

- Transferring hypertext documents

- Providing a way for clients to request resources from servers

- Allowing for communication between clients and servers

FTP

- Stands for File Transfer Protocol

- Standard network protocol used to transfer files between computers

- Two-way protocol: Files can be transferred in both directions

- Uses two ports: port 21 for control traffic and port 20 for data traffic

- FTP is a secure protocol, but it can be configured to be insecure

FTP: Purpose

◆ Transferring files between a client and a server

◆ Providing a secure way to transfer files

◆ Being easy to use

SSH

- Stands for Secure Shell Protocol

- Allows users to securely access a remote computer over a network

- Uses encryption to protect data in transit: SECURE

- Can be used to run commands on a remote computer, transfer files, and manage services

- Versatile tool that can be used for a variety of tasks, including system administration, software development, and file sharing

SSH: Purpose

- Secure Remote Access

- File Sharing

- Port Forwarding

- Command Execution