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IP, Addressing and Services

S. Hussain Ali

M.S. (Computer Engineering)

Department of Computer Engineering
King Fahd University of Petroleum and Minerals
Dhahran, Saudi Arabia

Topics Covered in this Session

- What is TCP/IP?
- TCP/IP Utilities
- TCP/IP Protocol suite
- TCP/IP Addressing, Sub netting
- Domain Name System
- IPv6

TCP/IP

- Industry-Standard Suite of Protocols
- Routable Enterprise Networking Protocol
- Technology for connecting dissimilar systems
- Robust, scalable, cross-platform client/server framework
- Method of gaining access to the Internet

Sample TCP/IP Utilities

- FTP, TFTP, RCP, Telnet
- RSH, REXEC, LPR, LPQ, LPD
- Ping, Ipconfig, nslookup, hostname, netstat
- Nbtstat, route, tracert, arp, finger

TCP/IP Protocol Suite

TCP/IP Model

TCP/IP Protocols

Application	FTP	Telnet	HTTP	NetBIOS
Transport	TCP		UDP	
Internetwork	IP (ICMP, IGMP, ARP)			
Network Interface	LAN (Ethernet, TR, FDDI)		WAN (Serial, Frame Relay, ATM)	

Network Interface Technologies

- IP Over LAN Technologies
 - » Ethernet, Token Ring, ARCnet, FDDI
- IP Over WAN Technologies
 - » Serial lines
 - » Packet switched networks
 - » Frame Relay
 - » ATM

Address Resolution Protocol

- Successful mapping of an IP address (logical) to a hardware address (physical).
- Address resolution is the function of ARP
- ARP uses a local broadcast to obtain a hardware address
- Address mappings are stored in a cache for future reference

Internet Protocol

- Addresses and Routes packets
- Connectionless
 - » No session is established
- Best effort+delivery
- Fragments and reassembles packets

Session Control Protocol (TCP)

- Connection oriented
- Reliable delivery
- Byte-stream communications
- Uses port numbers as endpoints to communicate
- Examples: FTP (21), Telnet (23), DNS (53)

User Datagram Protocol (UDP)

- Connectionless
- Does not guarantee delivery
- Reliability is the responsibility of the application
- Uses port numbers as endpoint to communicate
- Examples: TFTP (63) , SNMP (161), Domain (53)

IP Addressing

- Each host is identified by a logical unique IP address.
- Each IP address defines network ID and host ID.
- Patch choice is based on location
- Location is represented by an address



IP Address Classes

- Class A

- » (1.0.0.0 to 126.0.0.0)
- » Number of hosts addresses: 16,777,214



- Class B

- » (128.1.0.0 to 191.254.0.0)
- » Number of hosts addresses: 65,534.



- Class C

- » (192.0.1.0 to 223.255.254.0)
- » Number of hosts addresses: 254



- Class D: for multicast Class E: for research

- N: Network ID assigned by NIC

- H: Host number assigned by network administrator

Subnetting

- With subnetting, you can divide your network into smaller networks by using some of the host ID bits (in the IP address) as part of Network ID.
- It is achieved by the clever use of **Subnet mask**.
- Routers are used to send traffic between two subnets. These devices are identified as **Gateway address**.

Exercise

- Find out your machines IP address, subnet mask and default gateway address.
- Solution: Run `ipconfig /all`

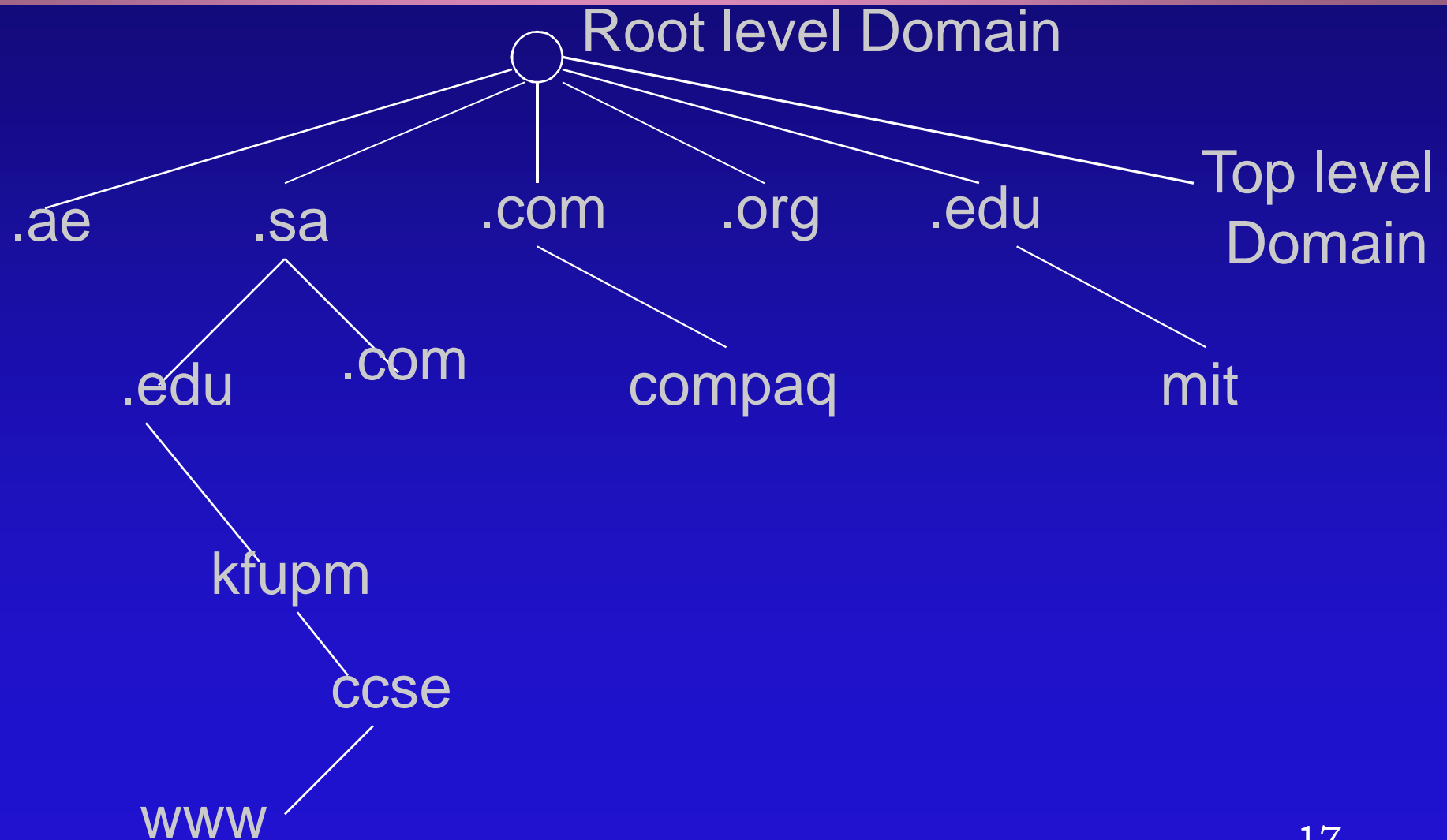
Domain Name System

- Humans identify network resources with names while machines identify them with the number.
- Domain Name System does the hostname to IP address resolution or vice versa.
- DNS offers a distributed client/server database of forward mappings (hostname to IP addresses) and reverse mappings (IP address to host names) in a TCP/IP network like Internet.

How it works?

- In DNS jargon, clients are identified as resolvers and servers as name servers.
 - » Resolvers pass name requests between applications and name server
 - » Name server takes requests and resolve computer (or domain name) to IP address.
 - » If the name server is not able to resolve the request, it may forward the request to another name server that can resolve it.
 - » Name servers are grouped into different levels that are called domains.

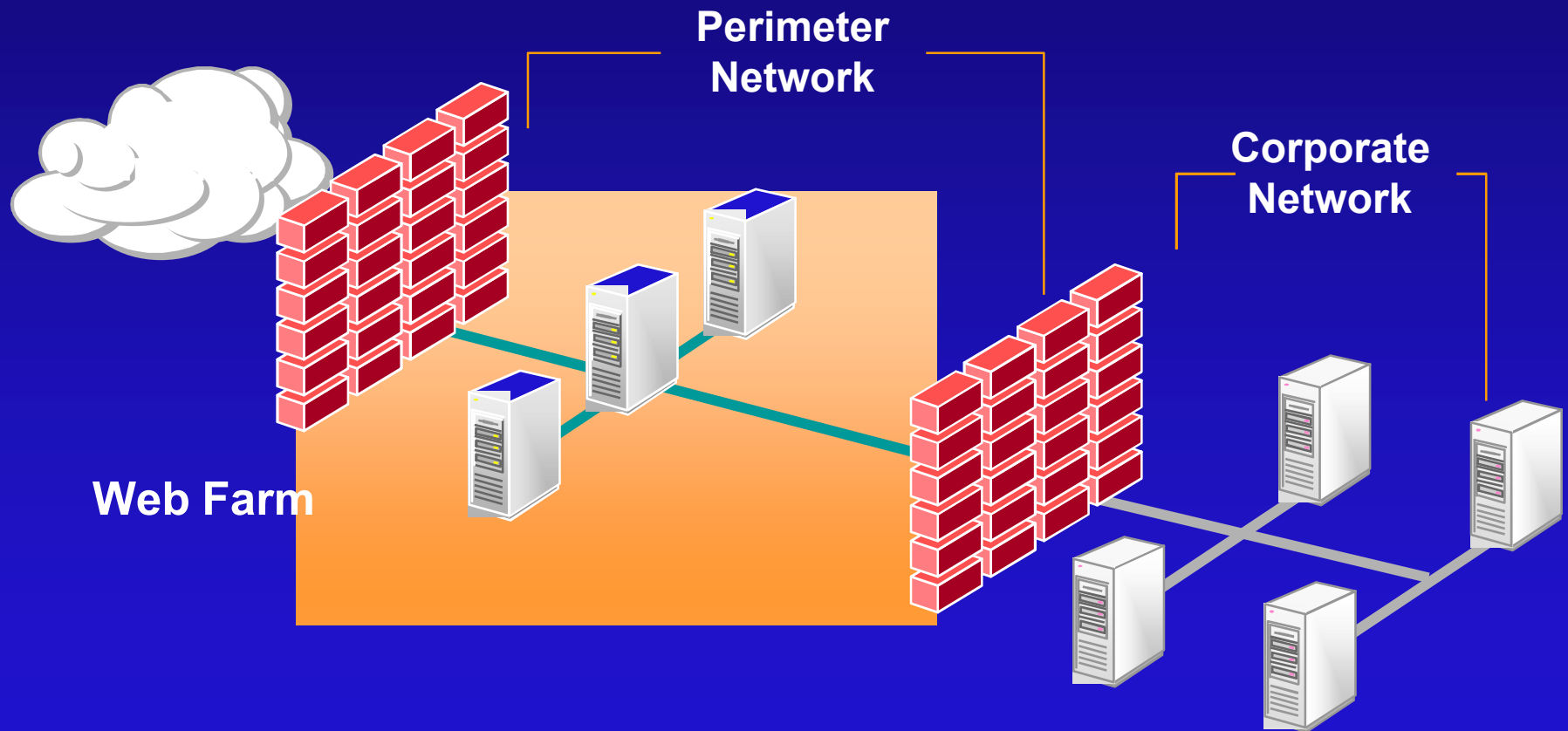
Domain Name Space



Exercise

- Find out the DNS server address of your machine.
 - » Use ipconfig command
- Find out IP address of www.ccse.kfupm.edu.sa.
 - » Use ping www.ccse.kfupm.edu.sa
 - » Use nslookup command.

Publishing Network Infrastructure



Summary

- » TCP/IP Protocol
- » IP Addressing
- » Domain Name System
- » Network Infrastructure