



NSCET E-LEARNING PRESENTATION

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COMPUTER SCIENCE AND ENGINEERING

IIIrd YEAR / Vth SEMESTER

CS8591 – COMPUTER NETWORKS



**S C PRABANAND M.Tech
AP/CSE**

**Nadar Saraswathi College of Engineering & Technology,
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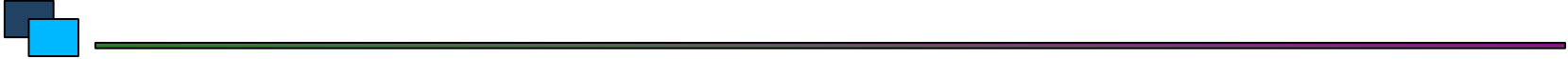


NETWORK LAYER

UNIT 03

LECTURE 01

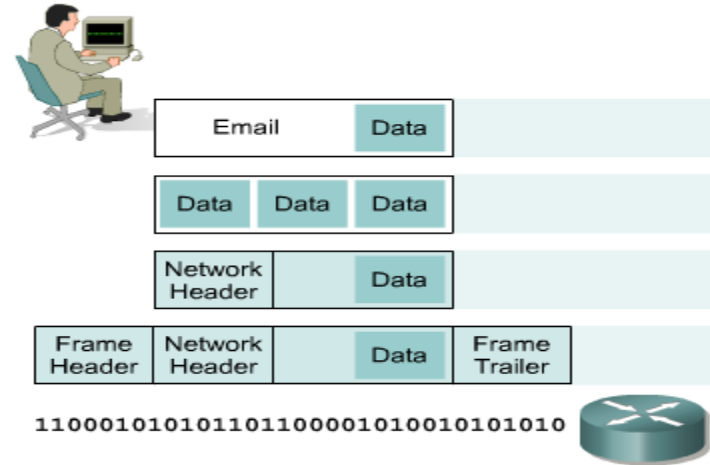




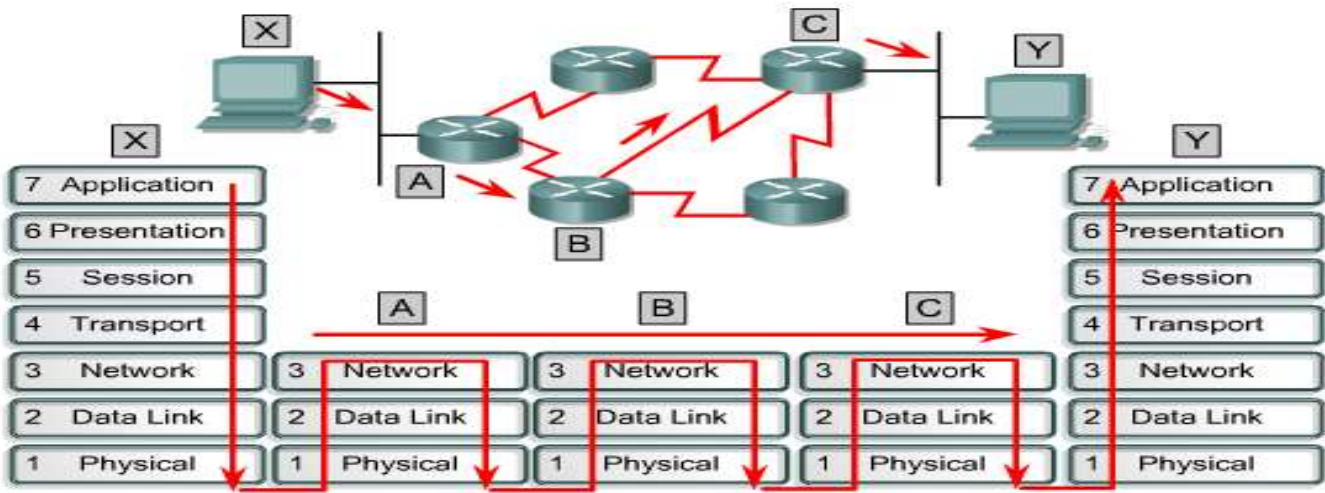
INTERNET PROTOCOL

IP as a Routed Protocol

- IP is a connectionless, unreliable, best-effort delivery protocol.
- IP accepts whatever data is passed down to it from the upper layers and forwards the data in the form of IP Packets.
- All the nodes are identified using an IP address.
- Packets are delivered from the source to the destination using IP address



Packet Propagation

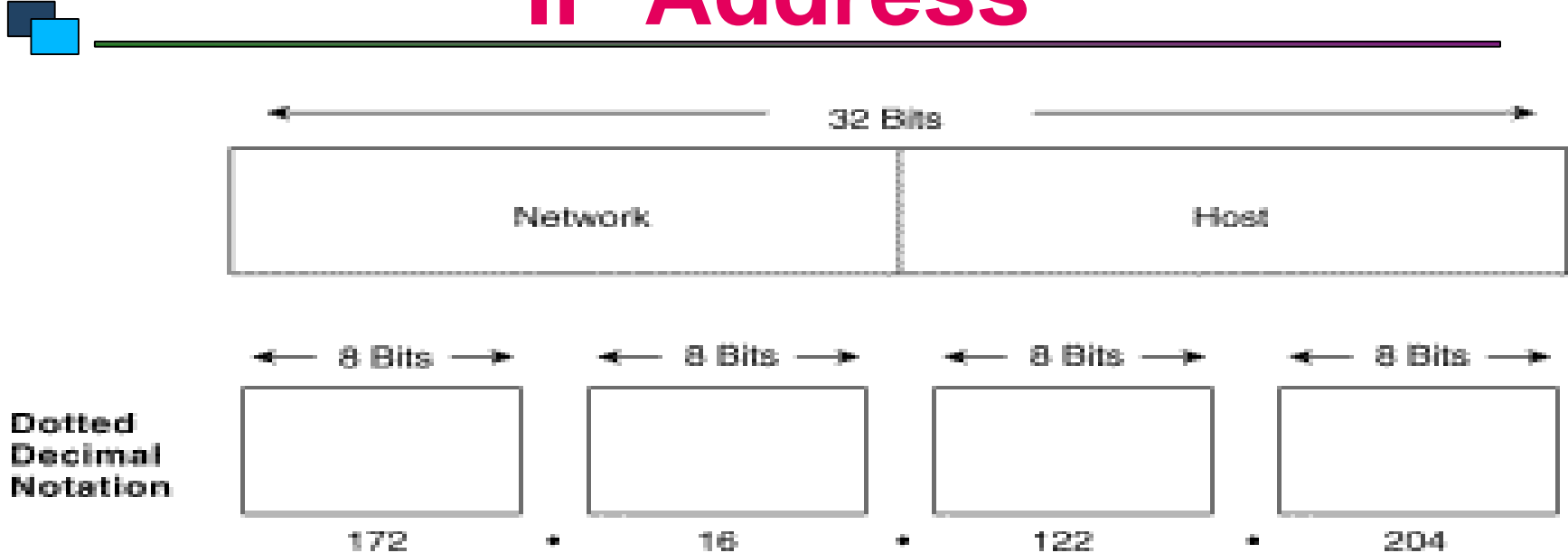


Each router provides its services to support upper-layer functions.

IP Address

- ❑ IP address is for the **INTERFACE** of a host. Multiple interfaces mean multiple IP addresses, i.e., routers.
- ❑ 32 bit IP address in dotted-decimal notation for ease of reading, i.e., 193.140.195.66
- ❑ Address 0.0.0.0, 127.0.0.1 and 255.255.255.255 carries special meaning.
- ❑ IP address is divided into a network number and a host number.
- ❑ Also bits in Network or Host Address cannot be all 0 or 1.

IP Address



Dotted
Decimal
Notation

172

.

16

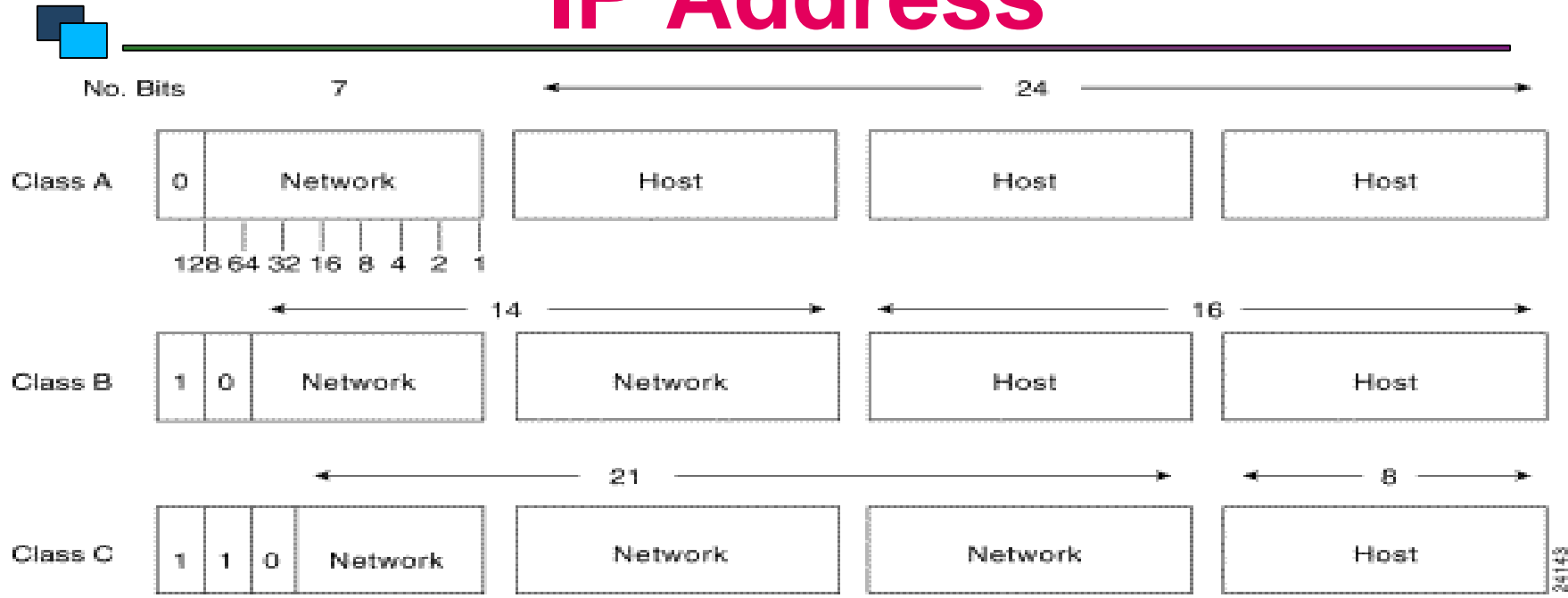
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122

.

204

IP Address



24143



IP Address

- ❑ **Class A** : Address begins with bit 0. It has 8 bit network number (range 0.0.0.0-to-127.255.255.255), 24 bit host number.
- ❑ **Class B** : Address begins with bits 10. It has 16 bit network number (range 128.0.0.0-to-191.255.255.255), 16 bit host number.
- ❑ **Class C** : Address begins with bits 110. It has 24 bit network number (range 192.0.0.0-to-223.255.255.255), 8 bit host number.
- ❑ **Class D** : Begins with 1110, multicast addresses (224.0.0.0-to-239.255.255.255)
- ❑ **Class E** : Begins with 11110, unused

Subnet Mask

- ❑ Consider IP address = 192.168.2.25
 - ❑ First few bits (left to right) identify network/subnet
 - ❑ Remaining bits identify host/interface
- ❑ Number of subnet bits is called subnet mask, e.g.
 - ❑ Subnet IP Address range is 192.168.2.0 – 192.168.2.255 or Mask = 255.255.255.0
 - ❑ Subnet IP Address range is 192.168.2.0 – 192.168.2.15 or Mask = 255.255.255.240

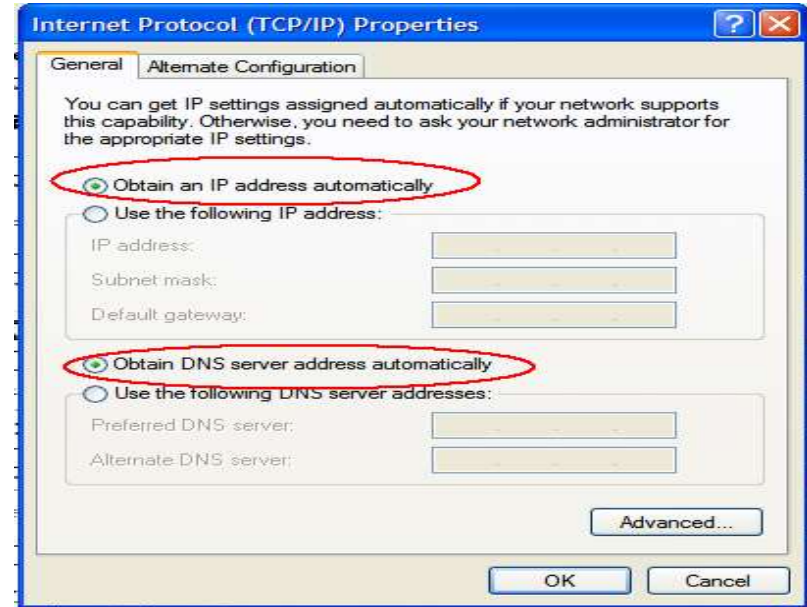
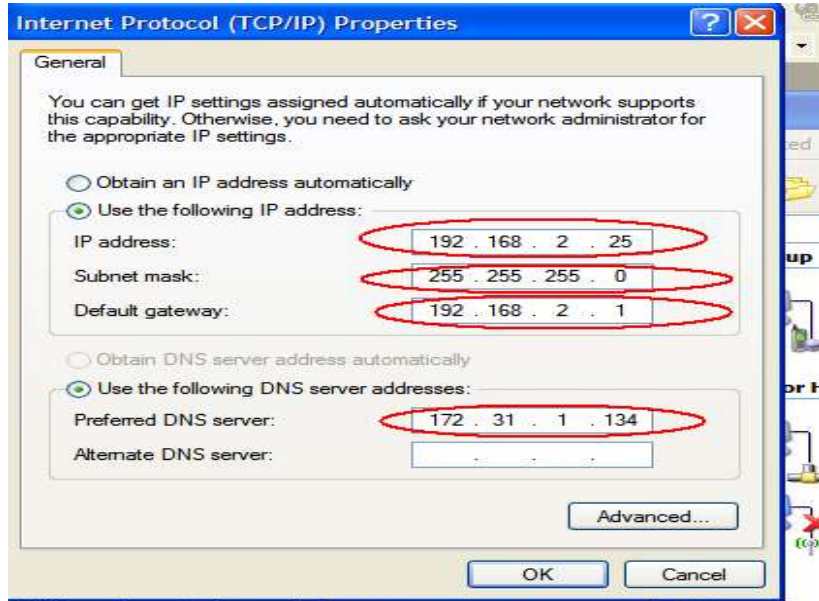
IP Address, Subnet Mask and Gateway

- ❑ IP Address and Subnet Mask define the Subnet
- ❑ For Example IP address 172.31.1.0 and Subnet Mask of 255.255.240.0 means that the subnet address ranges from 172.31.0.0 to 172.31.15.255
- ❑ Another notation is 172.31.1.0/28
- ❑ The first Address is the Network Address and the last Address is the Broadcast Address. They are reserved and cannot be assigned to any node.
- ❑ The Gateway Address is the Address of the router where the packet should be sent in case the destination host does not belong to the same subnet

IP Configuration of an Interface

Static

DHCP



ARP

- ❑ ARP (Address Resolution Protocol) is used in Ethernet Networks to find the MAC address of a node given its IP address.
- ❑ Source node (say 192.168.2.32) sends broadcast message (ARP Request) on its subnet asking ``Who is 192.168.2.33``.
- ❑ All computers on subnet receive this request
- ❑ Destination responds (ARP Reply) since it has 192.168.2.33
 - ❑ Provides its MAC address in response

IPv6

- ❑ Internet Protocol Version 4 is the most popular protocol in use today, although there are some questions about its capability to serve the Internet community much longer.
- ❑ IPv4 was finished in the 1970s and has started to show its age.
- ❑ The main issue surrounding IPv4 is addressing—or, the lack of addressing—because many experts believe that we are nearly out of the four billion addresses available in IPv4.
- ❑ Although this seems like a very large number of addresses, multiple large blocks are given to government agencies and large organizations.
- ❑ IPv6 could be the solution to many problems posed by IPv4

IPv6

- ❑ IPv6 uses 128 bit address instead of 32 bit address.
- ❑ The IPv6 addresses are being distributed and are supposed to be used based on geographical location.

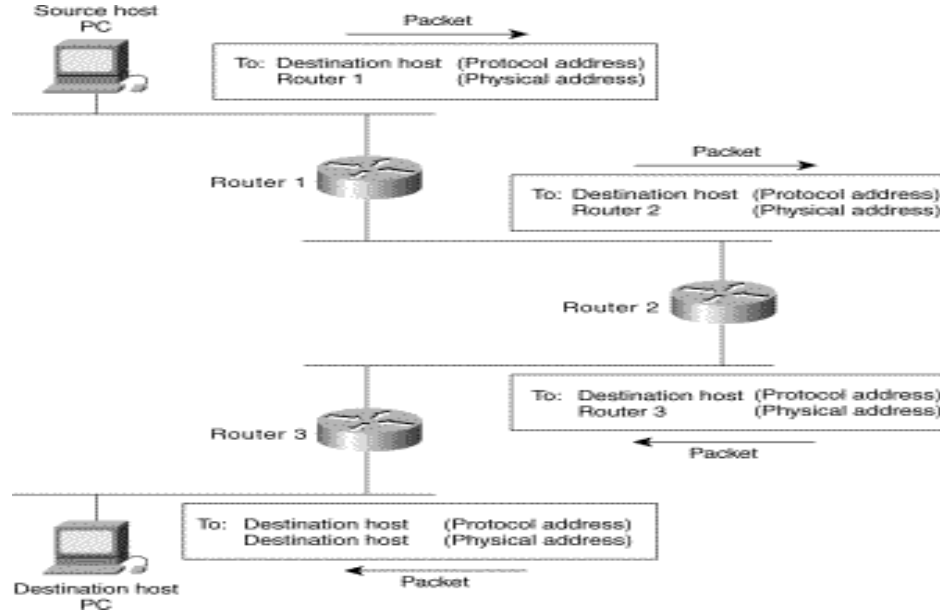


ROUTING

Router

- ❑ A router is a device that determines the next network point to which a packet should be forwarded toward its destination
- ❑ Allow different networks to communicate with each other
- ❑ A router creates and maintain a table of the available routes and their conditions and uses this information to determine the best route for a given packet.
- ❑ A packet will travel through a number of network points with routers before arriving at its destination.
- ❑ There can be multiple routes defined. The route with a lower weight/metric will be tried first.

Routing



Routing Protocols

- Static Routing

- Dynamic Routing

- **IGP (Interior Gateway Protocol): Route data within an Autonomous System**

- RIP (Routing Information Protocol)

- RIP-2 (RIP Version 2)

- OSPF (Open Shortest Path First)

- IGRP (Interior Gateway Routing Protocol)

- EIGRP (Enhanced Interior Gateway Routing Protocol)

- IS-IS

- **EGP (Exterior Gateway Protocol): Route data between Autonomous Systems**

- BGP (Border Gateway Protocol)

Internetworking Devices

Device	Description
Hub	Hubs are used to connect multiple users to a single physical device, which connects to the network. Hubs and concentrators act as repeaters by regenerating the signal as it passes through them.
Bridge	Bridges are used to logically separate network segments within the same network. They operate at the OSI data link layer (Layer 2) and are independent of higher-layer protocols.
Switch	Switches are similar to bridges but usually have more ports. Switches provide a unique network segment on each port, thereby separating collision domains. Today, network designers are replacing hubs in their wiring closets with switches to increase their network performance and bandwidth while protecting their existing wiring investments.
Router	Routers separate broadcast domains and are used to connect different networks. Routers direct network traffic based on the destination network layer address (Layer 3) rather than the workstation data link layer or MAC address.

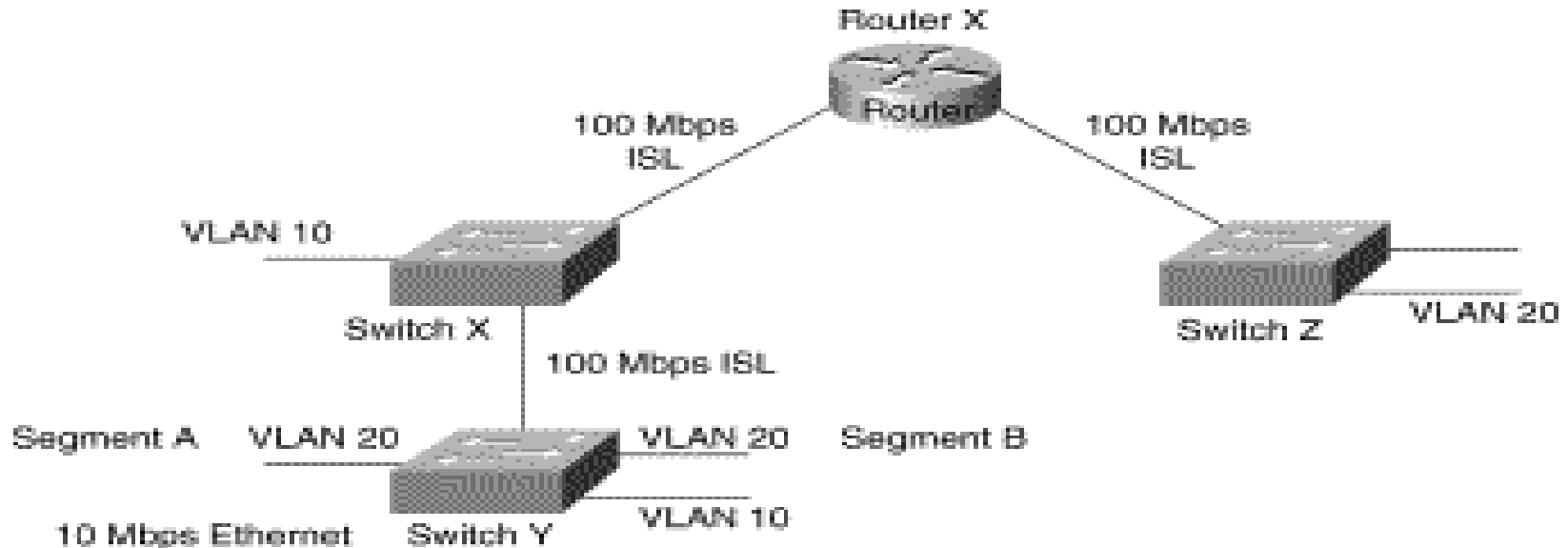


VLAN

VLANs

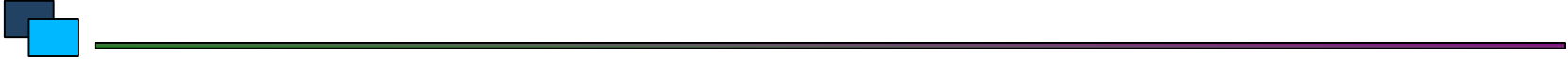
- ❑ VLANs (Virtual LAN) enable network managers to group users logically (based on functions, project teams or applications) rather than by physical location.
- ❑ Traffic can only be routed between VLANs.
- ❑ VLANs provide the segmentation traditionally provided by physical routers in LAN configuration.

VLANs and Inter VLAN Routing



Advantages of Using VLANs

- ❑ **Broadcast Control**— Just as switches physically isolate collision domains for attached hosts and only forward traffic out a particular port, VLANs provide logical bridging domains that confine broadcast and multicast traffic to the VLANs.
- ❑ **Security**— If you do not allow routing in a VLAN, no users outside of that VLAN can communicate with the users in the VLAN and vice versa. This extreme level of security can be highly desirable for certain projects and applications.
- ❑ **Performance**— You can assign users that require high-performance or isolated networking to separate VLANs.



TCP/UDP

TCP/UDP

- ❑ **Transport Layer Protocol**
- ❑ **TCP is connection Oriented (uses checksum and acknowledgment)**
- ❑ **UDP is Connectionless**
- ❑ **Both use the concept of Connection Port Number (16 Bit Source Port Number and Destination Port Number)**
- ❑ **Standard Applications have standard Port Numbers (Email 25, Telnet 23, FTP 20 & 21, SSH 22)**



THANKS!

Does anyone have any questions?
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