

# Lecture 2



# Hardware Fundamentals

# Objectives




# Hardware Fundamentals

# Network Hardware

## Network adapter

- Physical layer (Layer 1)
- Data Link layer (Layer 2)

## Repeater

- Physical layer (Layer 1)

## Hub

- Physical layer (Layer 1)

## Bridge

- Data Link layer (Layer 2)

## Switch

- Operate at the Layer 2
- Support Layer 3 functionality

# Network Hardware

## **Router**

- **Operates at the Network layer (Layer 3)**

## **Access point**

- **Acts as a bridge**

## **Wireless router**

- **Combines bridge, router, switch, and AP functionality**

# Network Adapter

**can communicate on a network**

**networking medium**      **physical access to a**  
**addresses**      **MAC**

# Types of Network Adapter

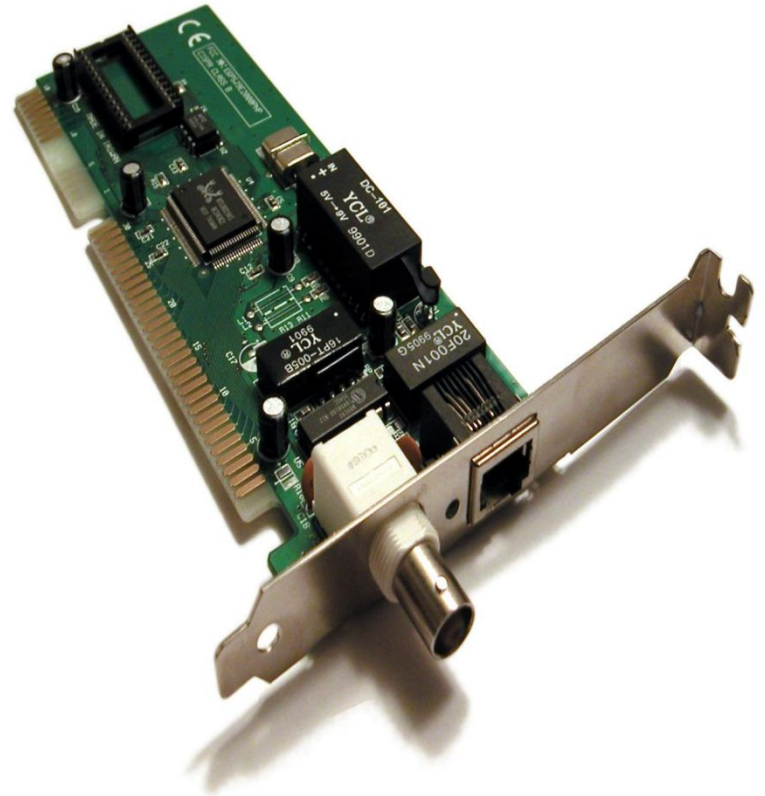
**wired and  
wireless**

- **Wired Network Adapter**
- **Wireless Network Adapter**
- **Network USB Adapter**

# Wired Network Adapter

**for a wired connection**

**apply the  
proper drivers upon  
detection of the device**





# Wireless Network Adapter

**connects to a  
radio-based computer network.**



# Network USB Adapter

**USB wireless adapter**

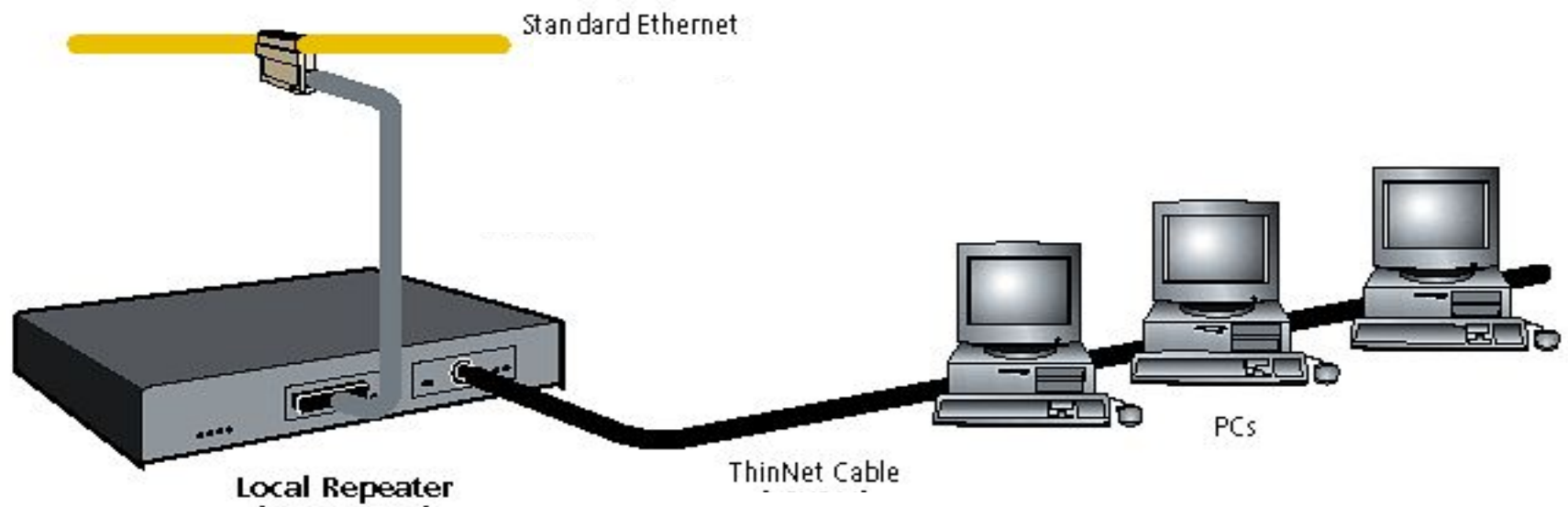


# Adapter MAC address

**Media Access Control (MAC)  
address**

# Repeater

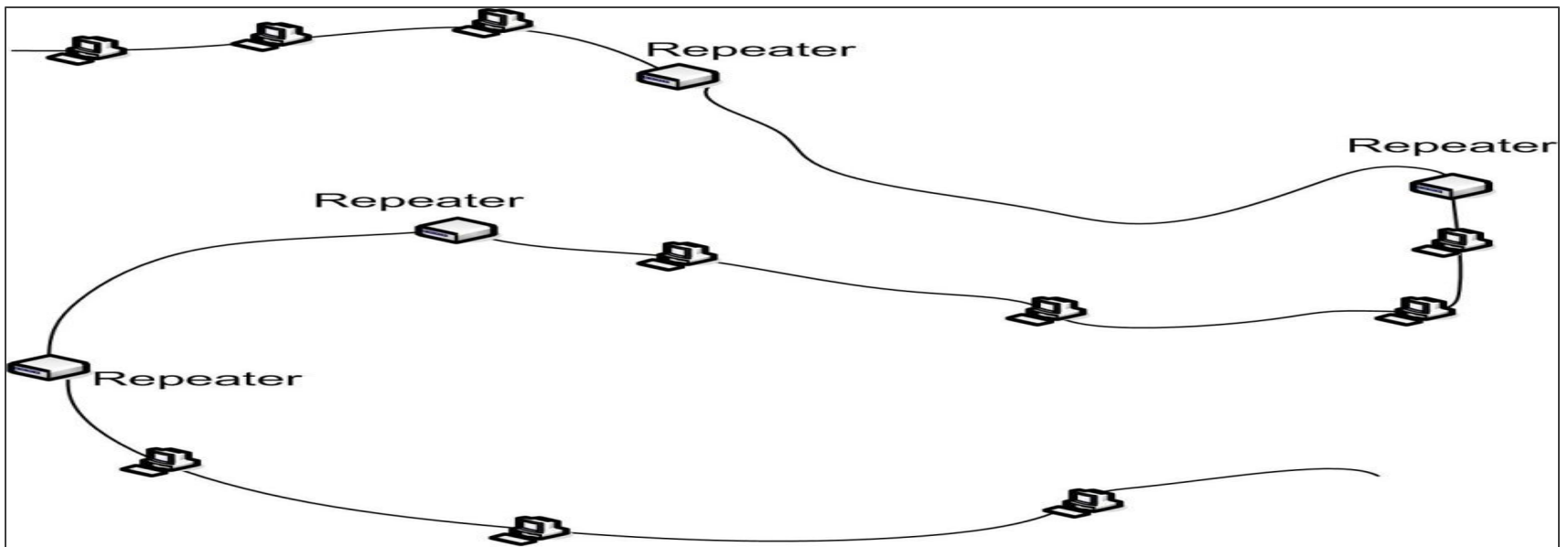
simply an amplifier



# Repeater use

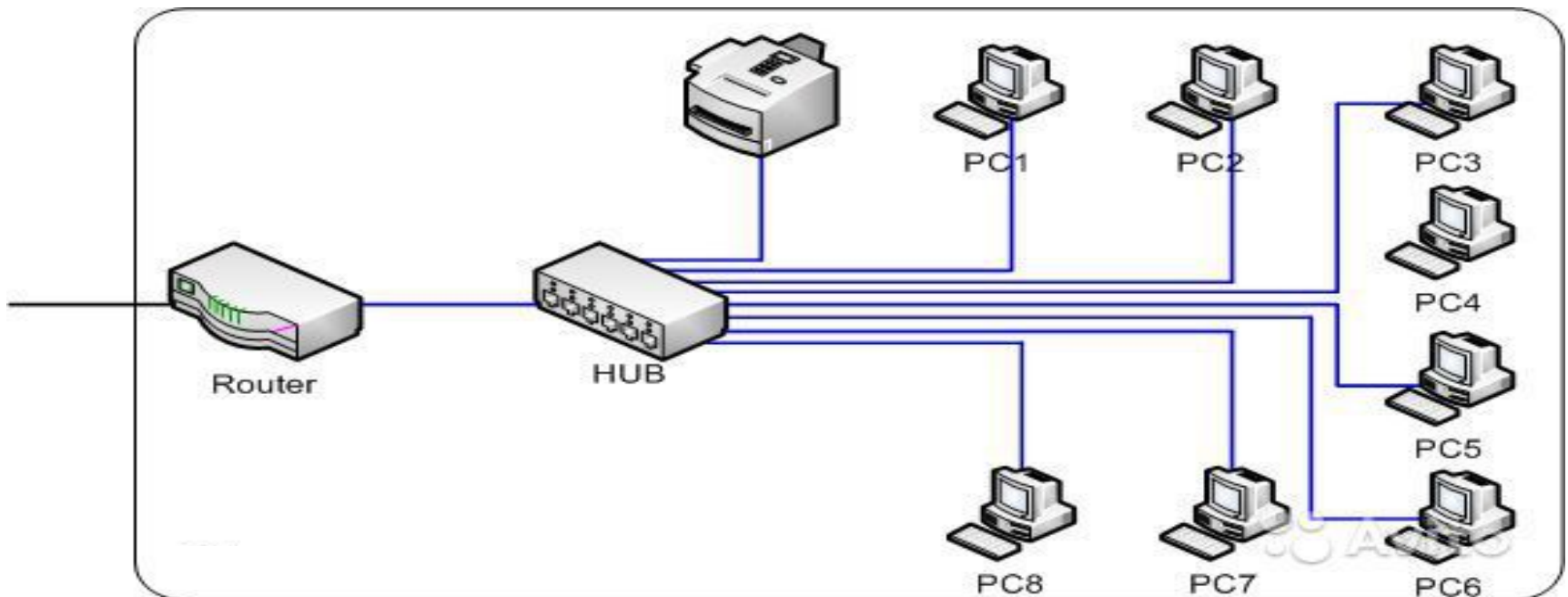
extend the maximum length

5-4-3 rule.

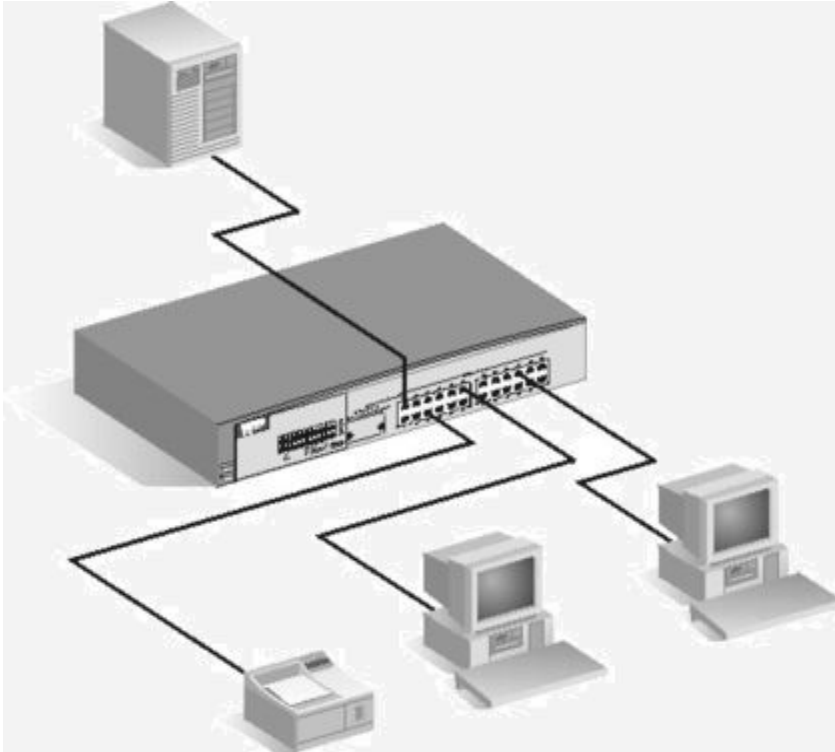


# Hub

for connecting  
together single  
network segment.



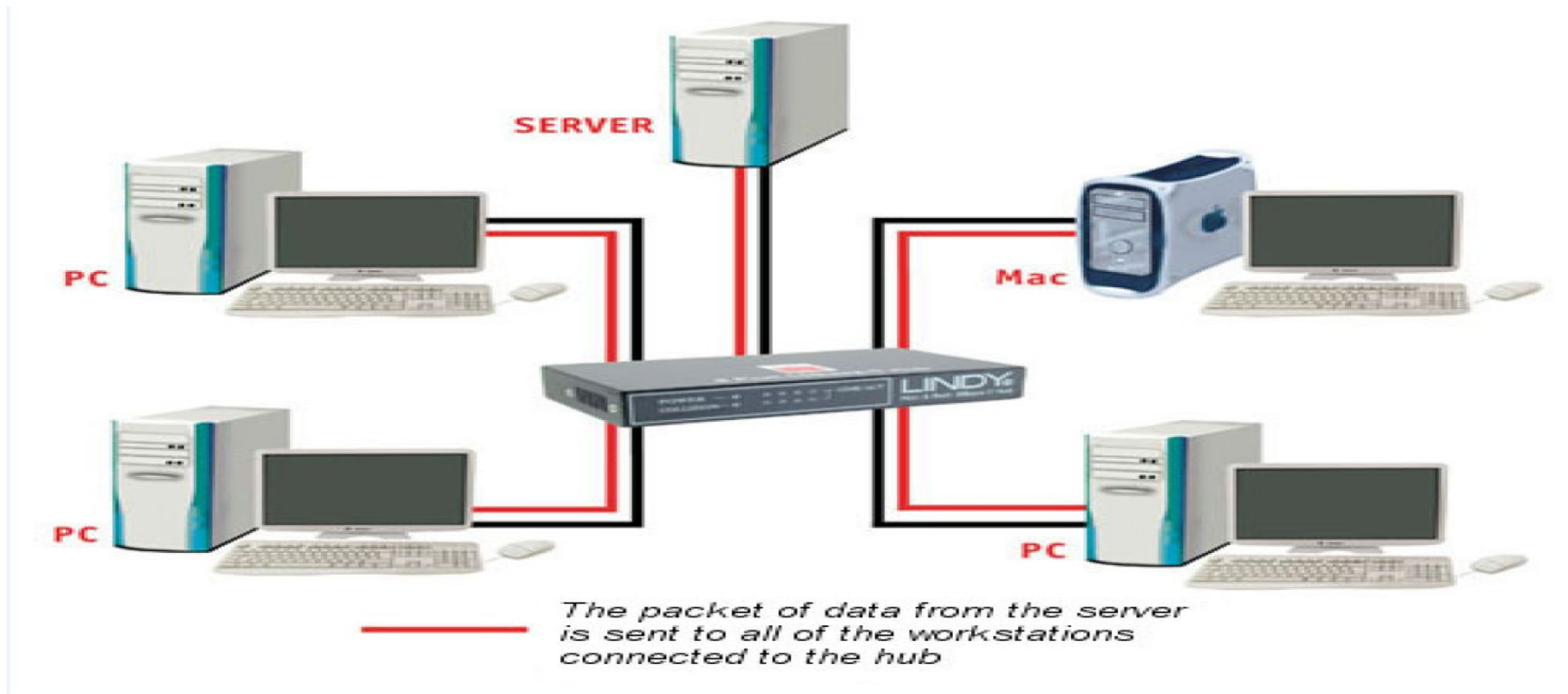
# Hub use



**electronically**

**do not manage**

# Hub and packet collisions



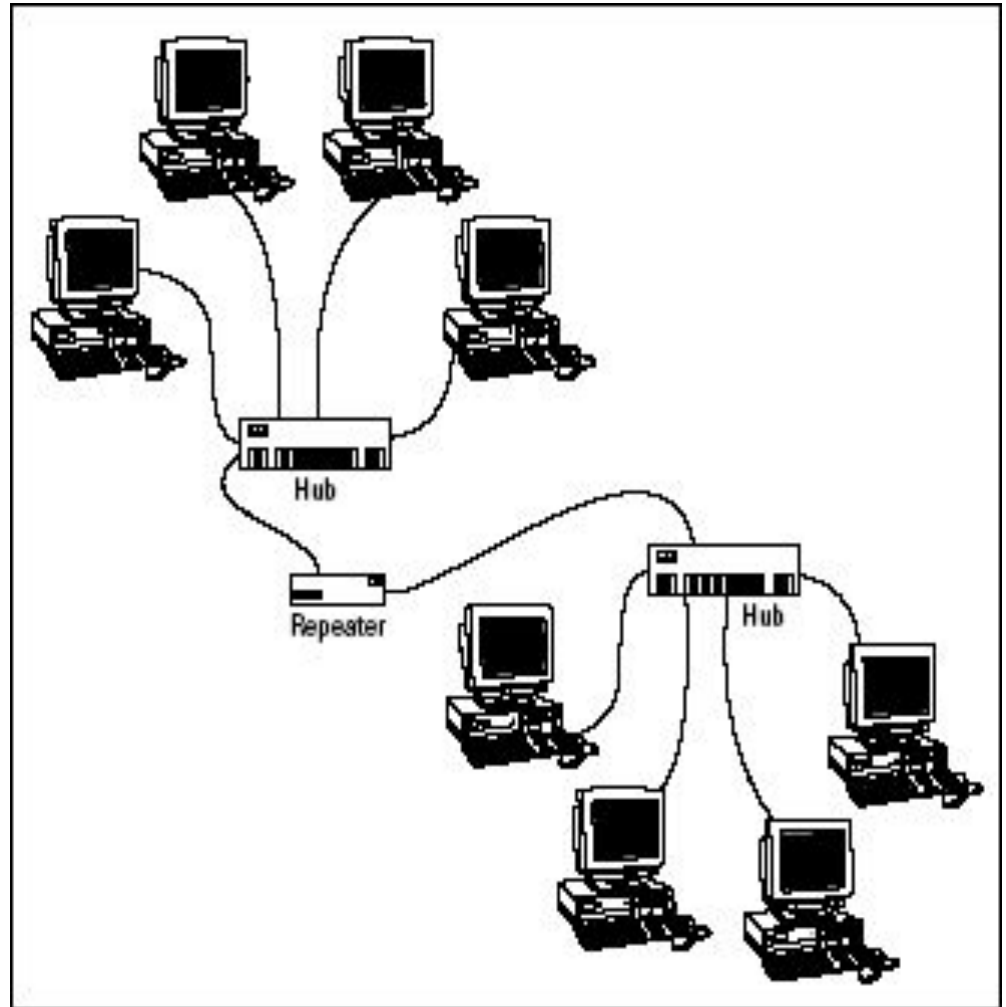
**packet collisions result**



# Connected Hubs

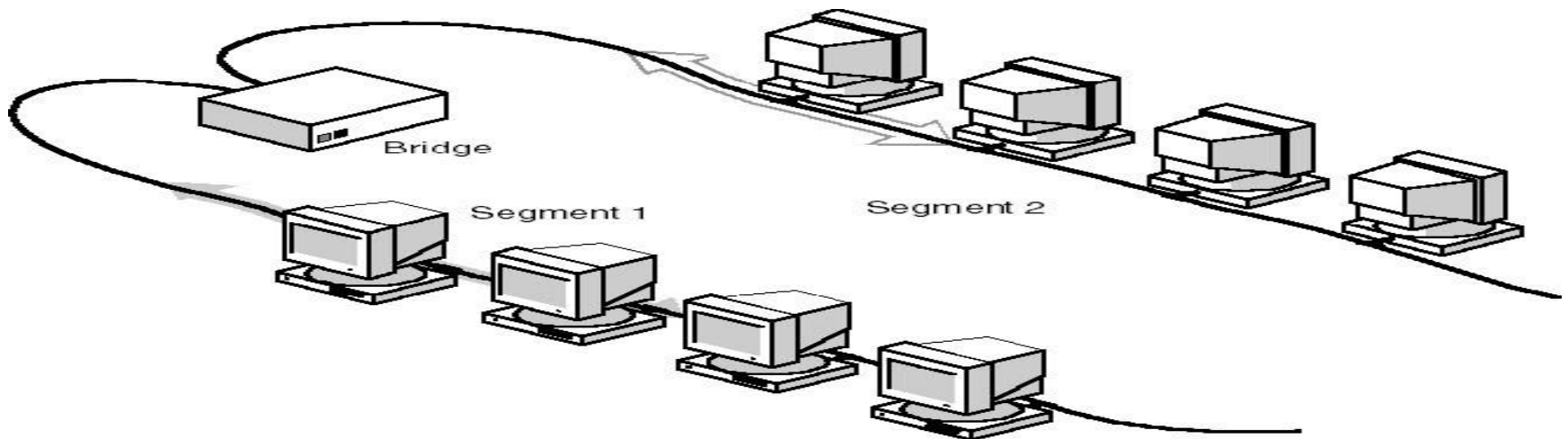
**uplink port**

**Uplink port**



# Bridge

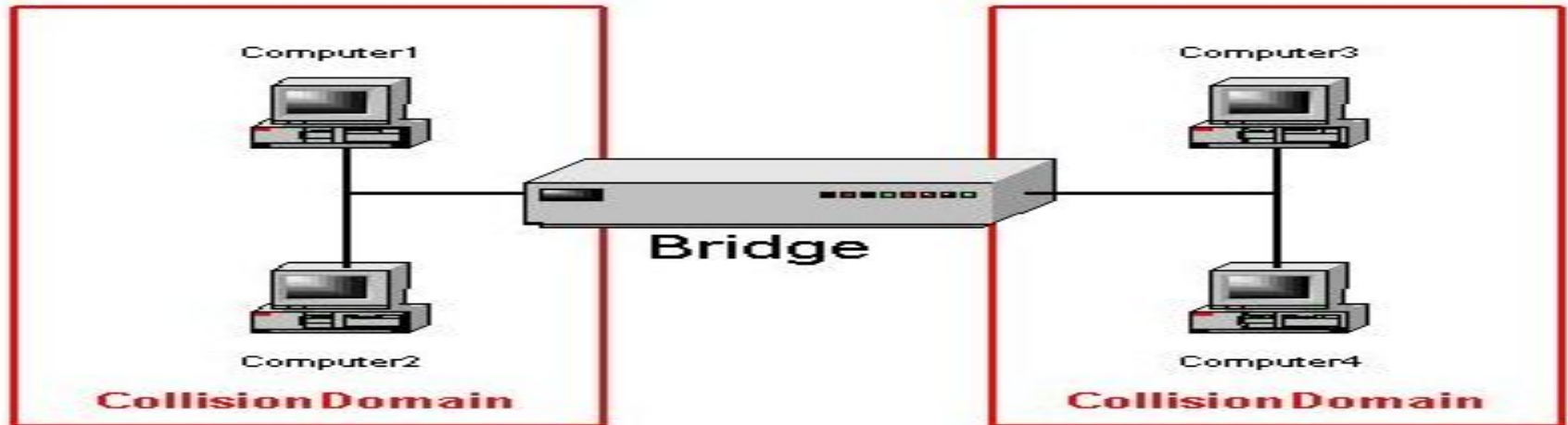
**connects multiple network segments (networks)**



**based on MAC addresses**  
**Layer 2 device**

# Bridge and collision domains

**Its job is simply to help ensure that the "scope" of collisions was made smaller**



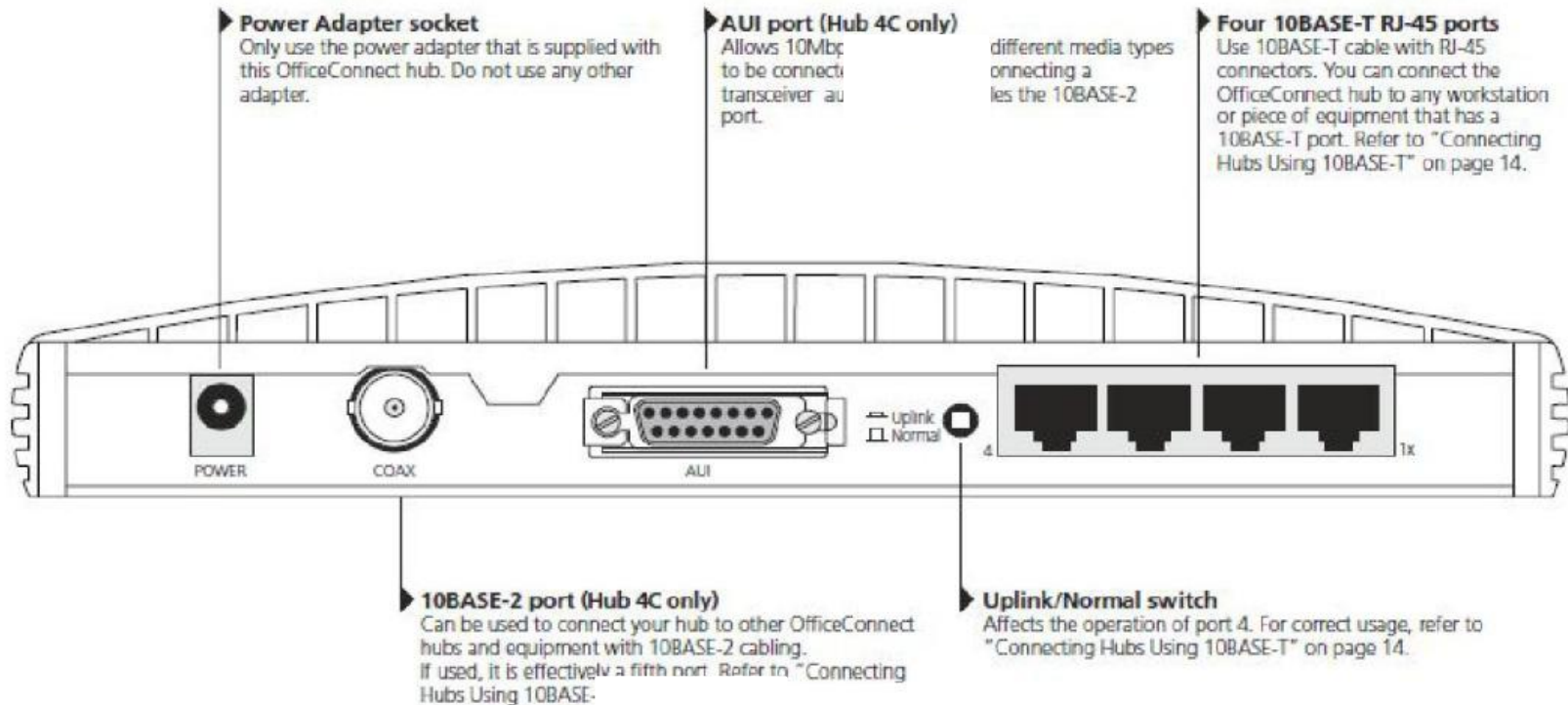
**In the diagram**

# Bridge and media types

**maybe one  
a wired one and the other a wireless one**

**connections  
between different media types of network**

# Bridge Sample

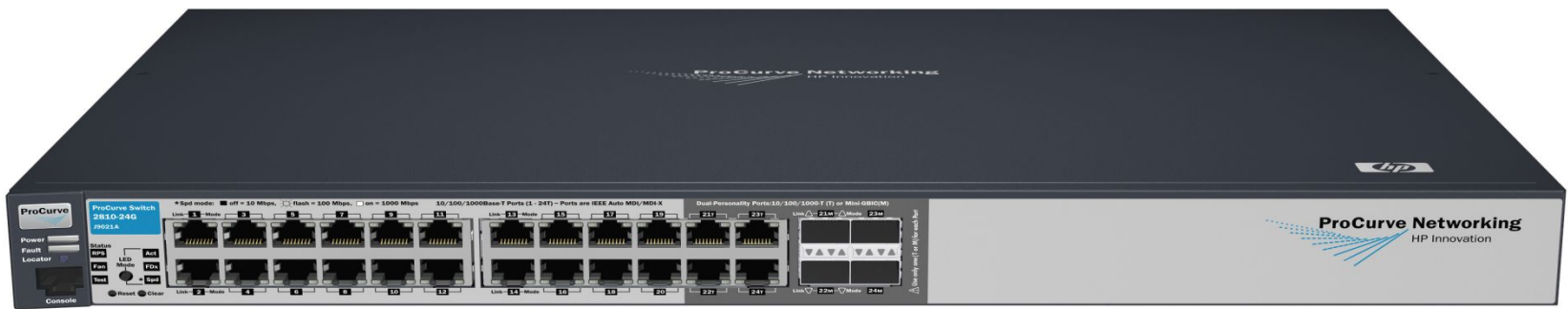


**10Base2, 10Base5**  
**10Base-T**

# Switch

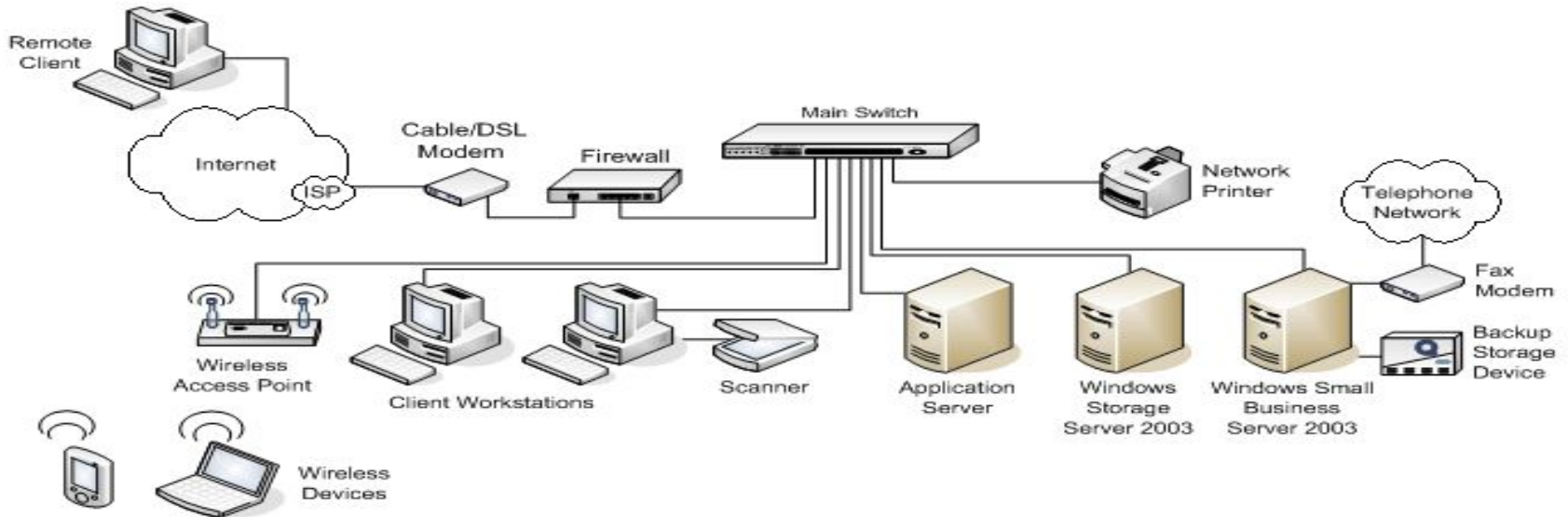
**that  
connects devices together on  
a computer network**

- **Switch provide:**
- **Connect network devices**
- **Network segmentation (VLANs)**
- **Remote management**
- **Communication security**



# Connect network devices

**multiport bridge**

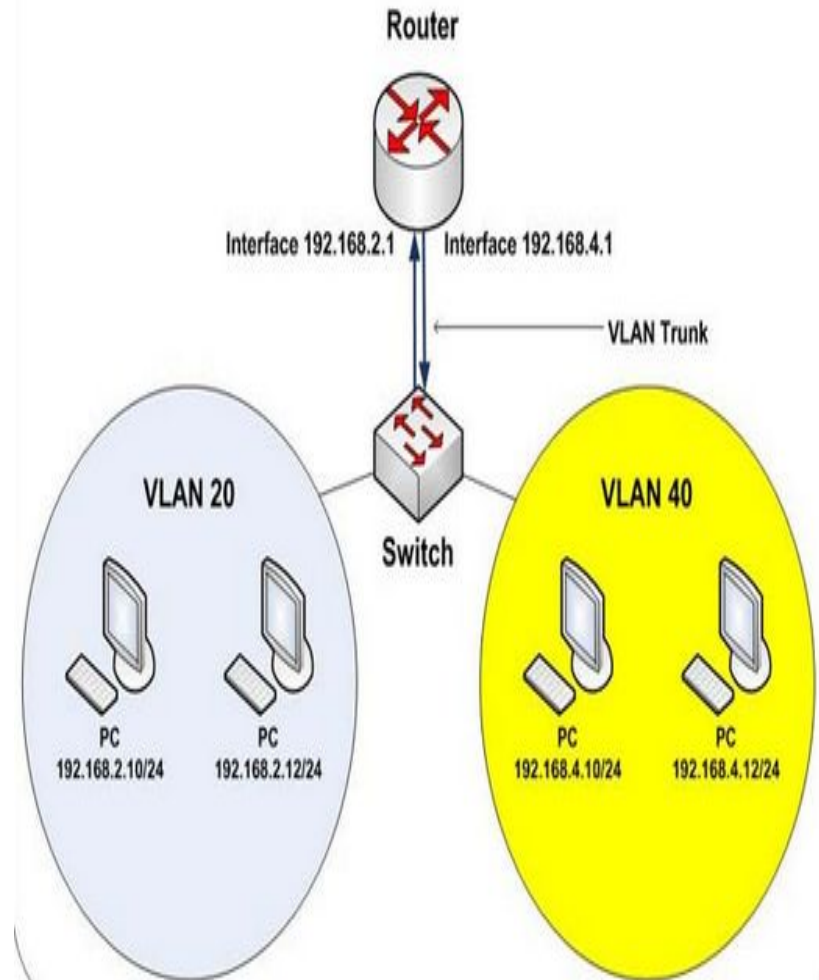


**based on the MAC address**

# Network segmentation (VLANs)

**VLANs provide a method for segmenting**

**traffic between VLANs is blocked unless the VLANs are connected by a router**





# Switch and remote management

**management**

**support remote**

**communication security**

**high level of**

# Router

**forwards data packets  
between computer networks**

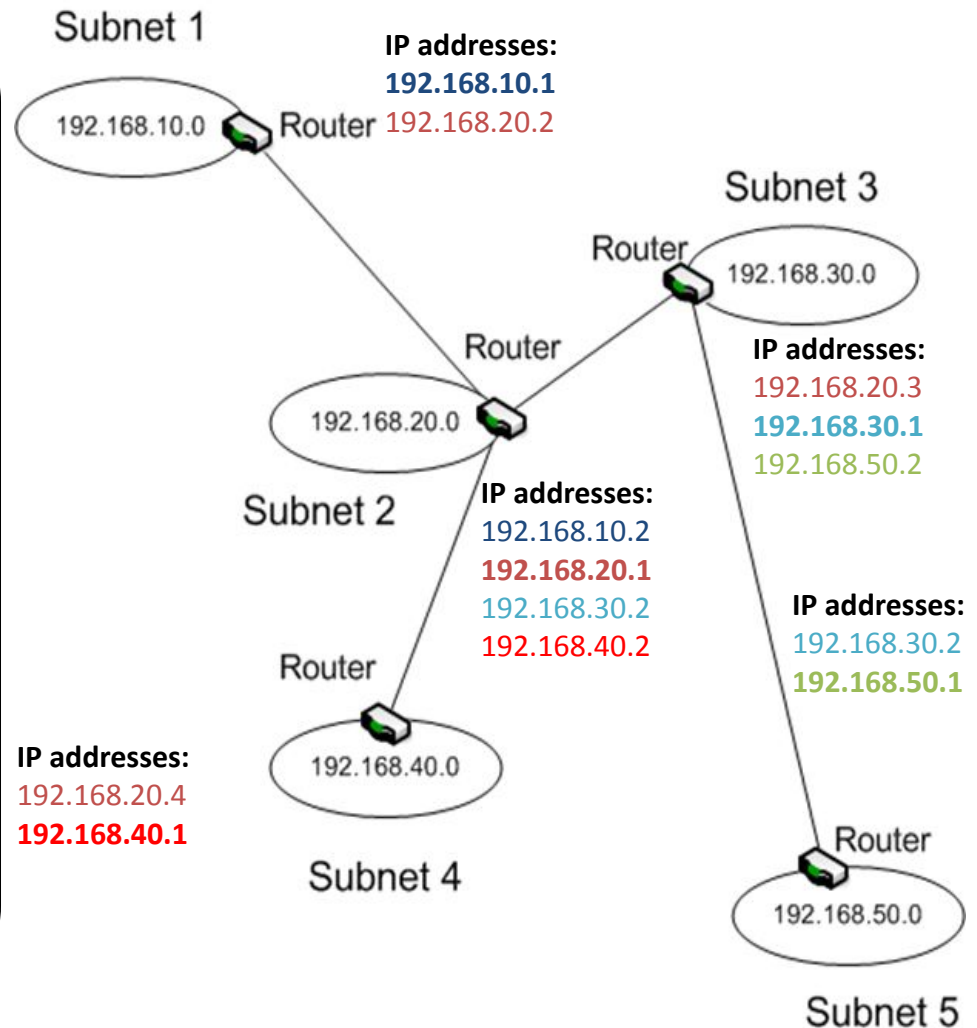


**router reads the  
address information**

# Routed Network

**Each router will have at least two ports**

**configured with a different network address**

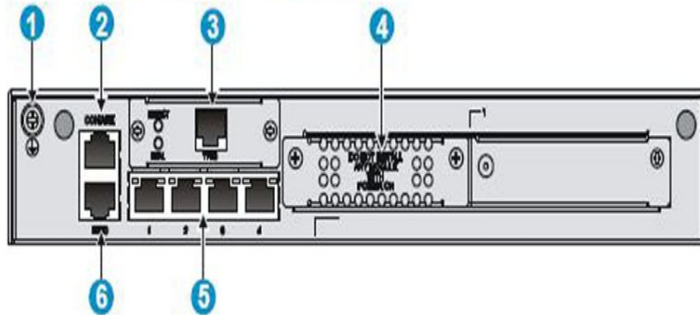


# Sample Router



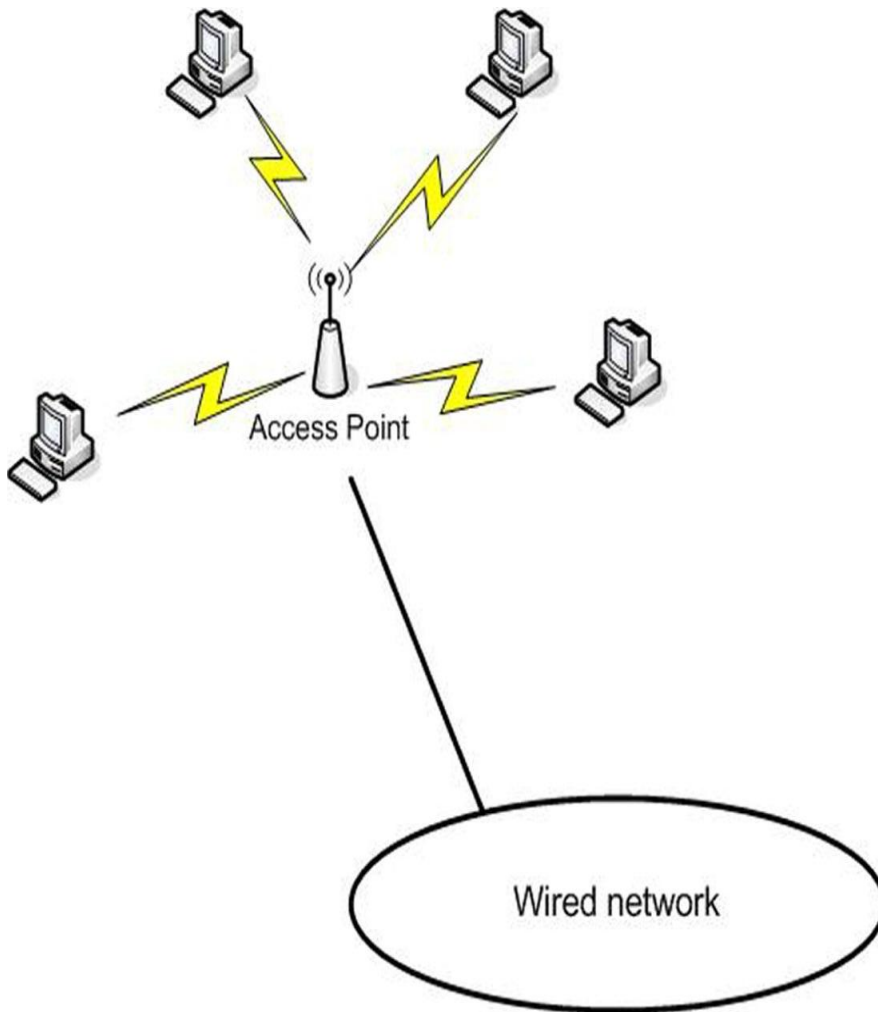
- |                  |                      |              |
|------------------|----------------------|--------------|
| (1) Power switch | (2) Power receptacle | (3) USB port |
| (4) Reset button |                      |              |

Figure



- |                     |                                       |                            |
|---------------------|---------------------------------------|----------------------------|
| (1) Grounding screw | (2) Console/AUX port                  | (3) T1 port TPRIO          |
| (4) SIC/DSIC slot   | (5) Ethernet LAN ports (ETH1 to ETH4) | (6) Ethernet WAN port ETH0 |

# Access Point



**Access Point (AP)**

**acts as a central  
connection point for  
wireless devices**

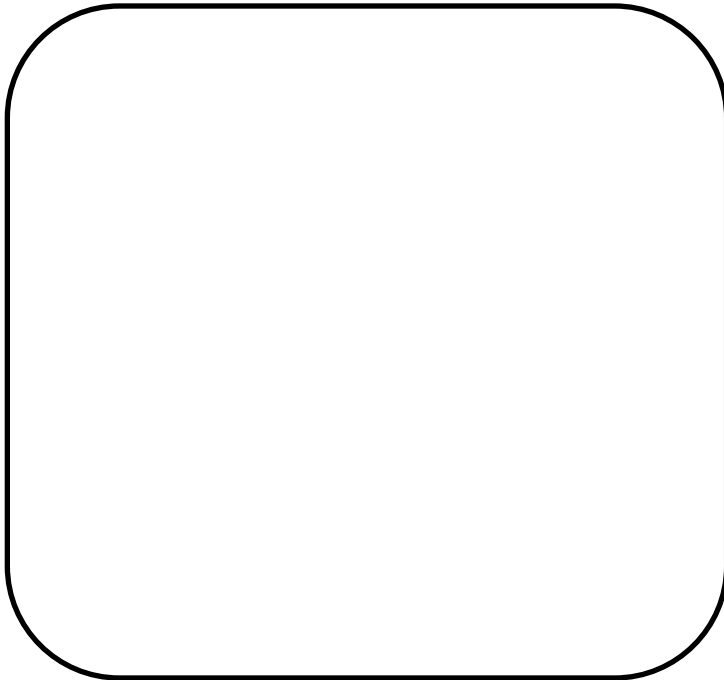
# MSM460 Front View

**have one or  
more internal  
radios**



**support both a web-based  
management tool and a CLI**

# MSM460 Back View



**does not  
have a power connector**

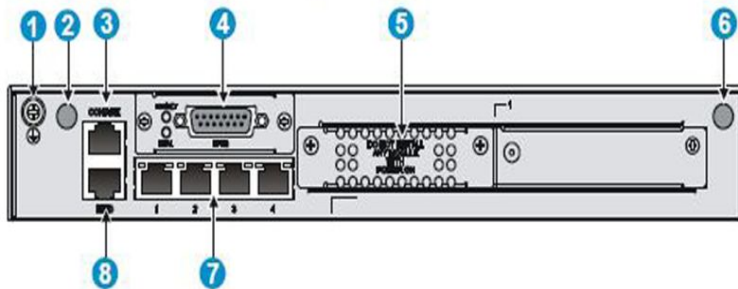


# Wireless Router



- |                  |                      |              |
|------------------|----------------------|--------------|
| (1) Power switch | (2) Power receptacle | (3) USB port |
| (4) Reset button |                      |              |

Figure 8 A



- |                                       |                            |                      |
|---------------------------------------|----------------------------|----------------------|
| (1) Grounding screw                   | (2) Antenna port           | (3) Console/AUX port |
| (4) E1 port EPRIO                     | (5) SIC/DSIC slot          | (6) Antenna port     |
| (7) Ethernet LAN ports (ETH1 to ETH4) | (8) Ethernet WAN port ETH0 |                      |

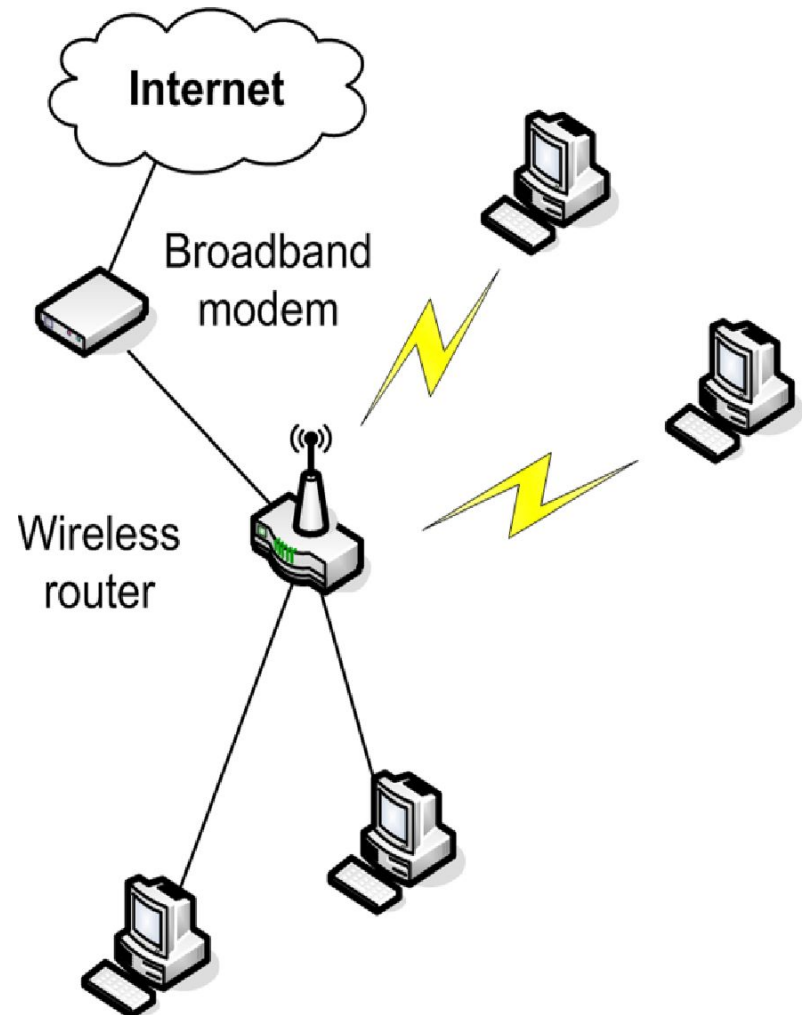
**combines bridge,  
router, switch, and  
AP functionality**

**is not routing  
wireless signals**



# Wireless Router Use

**give you an easy way to  
share a high-speed Internet  
connection**



# Summary

- **Network adapter**
- **Repeater**
- **Hub**
- **Bridge**
- **Switch**
- **Router**
- **Access point**
- **Wireless router**



# Hardware Fundamentals

# Switches

**The various types of switches contained in a network are:**



<b>Unmanaged switch</b>
<b>Smart managed switch</b>
<b>Managed switch</b>

# Unmanaged Switch

**low end**

**unmanaged switches**

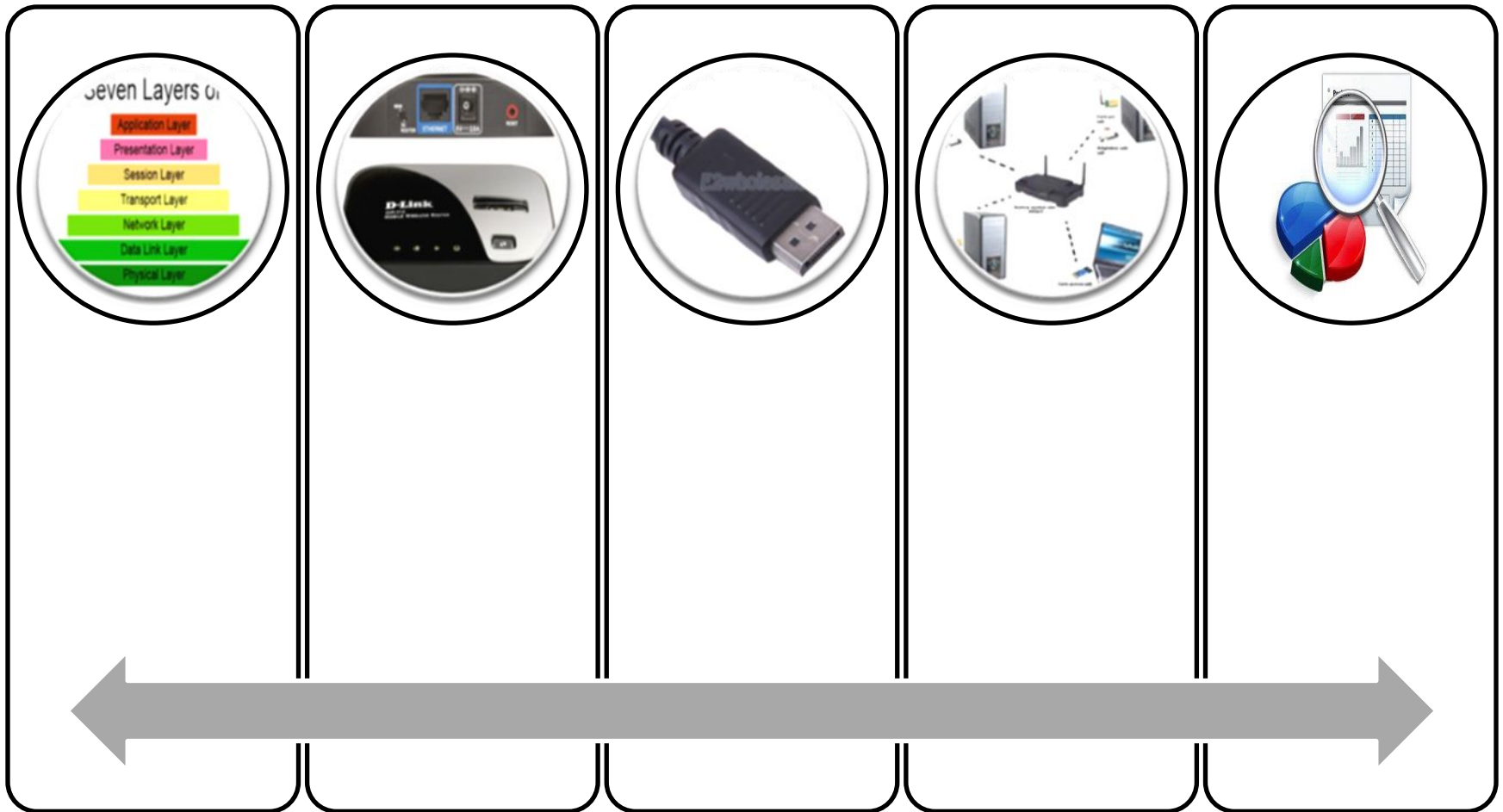


**HP 1405-5G  
Unmanaged  
desktop  
Switch**



**such as buffering traffic to avoid collisions**

# Unmanaged Switch



# Smart Managed Switch

also known as a web managed switch



**HP 1620-24G 24-PORT  
10/100/1000 Gigabit Smart  
Managed Switch**

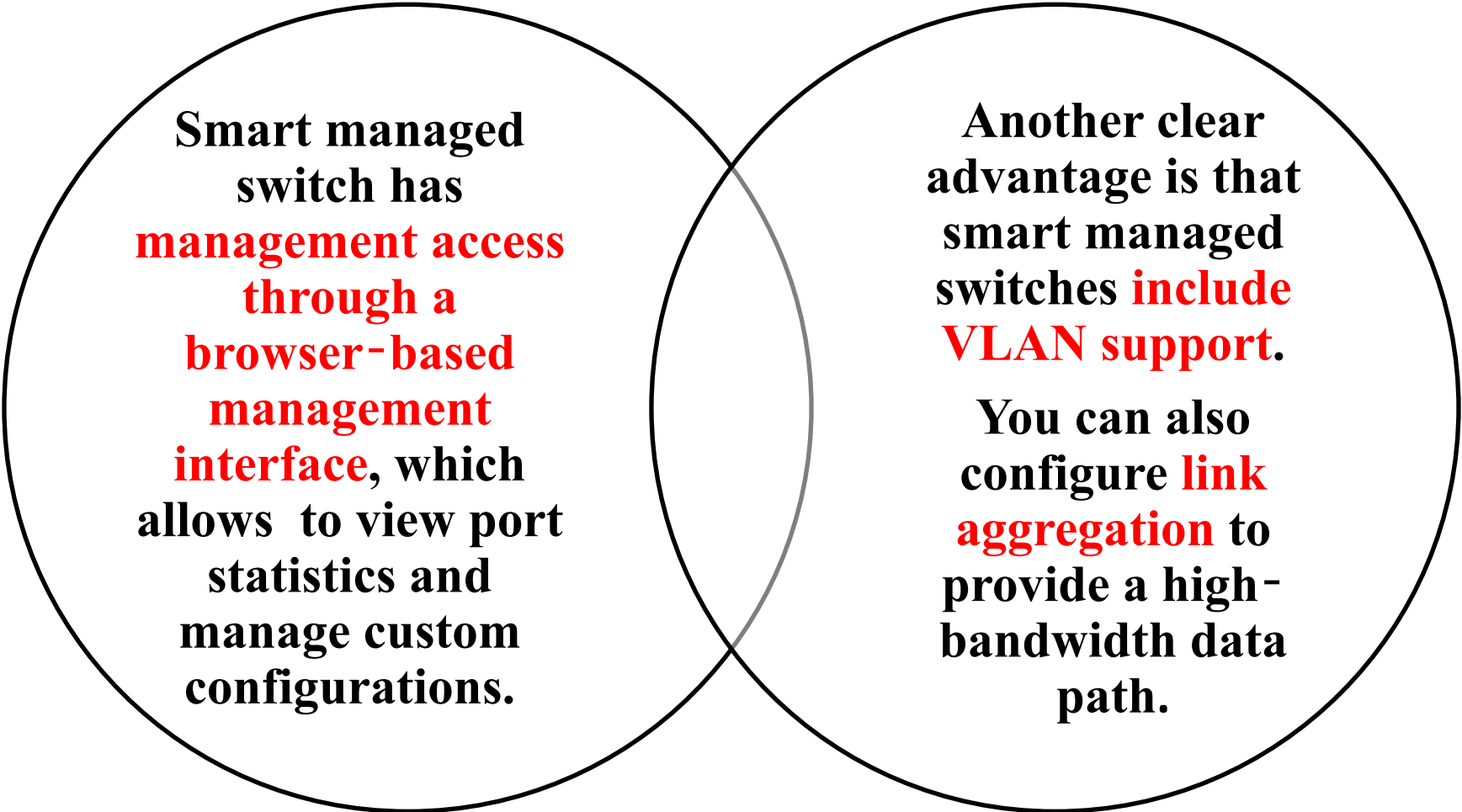


functionality at OSI Layer 2, but a small number include some Layer 3 functionality

static routes only

can typically be deployed as plug-and-play devices

# Smart Managed Switch Advantages



Smart managed switch has **management access through a browser-based management interface**, which allows to view port statistics and manage custom configurations.

Another clear advantage is that smart managed switches **include VLAN support**.

You can also configure **link aggregation** to provide a high-bandwidth data path.



# Smart Managed Switch Limited

- Most switches of this type also have an **RJ-45 console port**. Some also have a **USB connection** that can be used to connect directly to the switch. This is similar to the console connection on managed switches, but it can typically **be used to perform the same procedures as the web interface**.
- Smart managed switches also **include limited SNMP support**. SNMP management devices can **automatically discover and remotely monitor** smart managed switches. However, smart managed switches do not support remote management from an SNMP management device.

# Managed Switch

**that connects  
devices together**

**to the device  
for which the message was  
intended.**

**using a MAC address**



**HP 7510 Switch with 2 48-port  
Gig-T PoE+ Modules and  
768Gbps MPU**

# Managed Switch functionality

## Layer 3 functionality dynamic routing

- **Support for dynamic updates to network destinations and routes to allow for changes in available routes and network conditions.**

# Managed Switch interfaces

- **CLI (console port or over the network);**
- **Menu interface (console port or over the network);**
- **Web interface (over the network only).**

# Managed Switch and SNMP

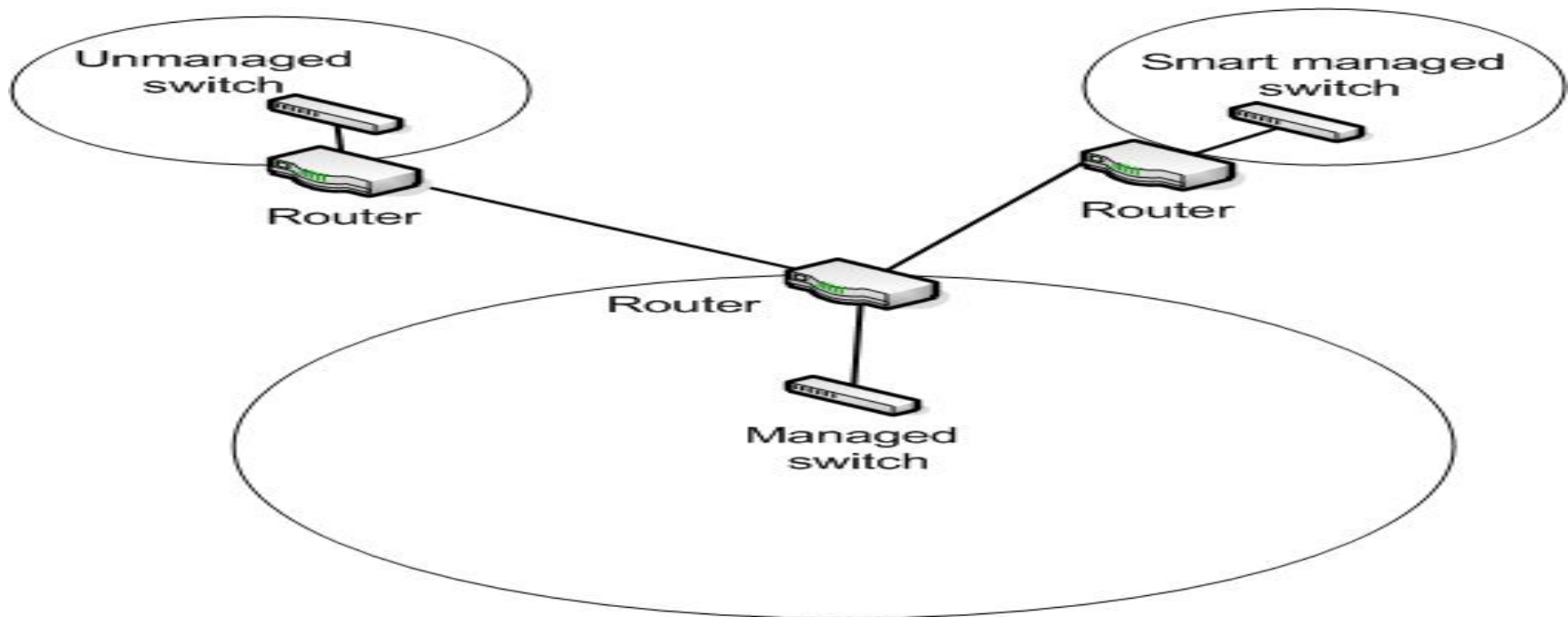
**monitored and configured through SNMP**

**available** **the switch's MIB**

- **A collection of management information about a device for use with SNMP management**

# Deployment Sample

**different types of switches in different physical locations**



# Summary

- **Unmanaged switch**
- **Smart managed switch**
- **Managed switch**



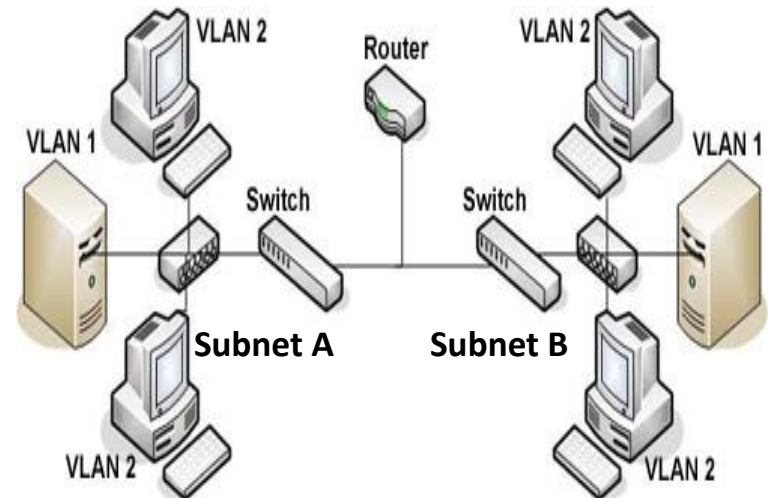
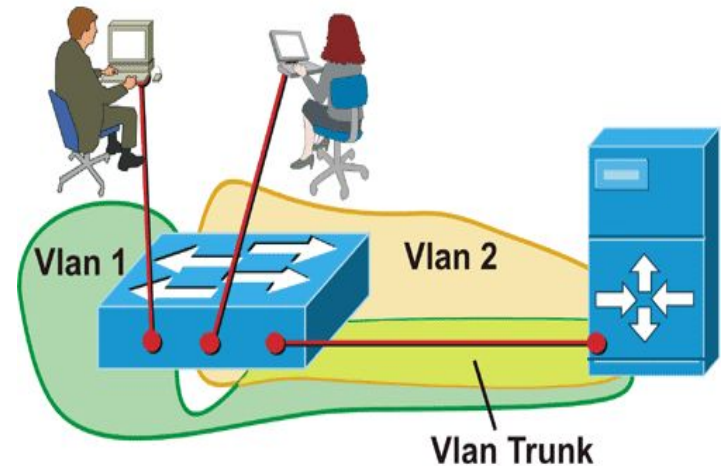
# Hardware Fundamentals



# Virtual LANs

**partitioned**  
**[pɑ:ˈtɪʃənd] and isolated**

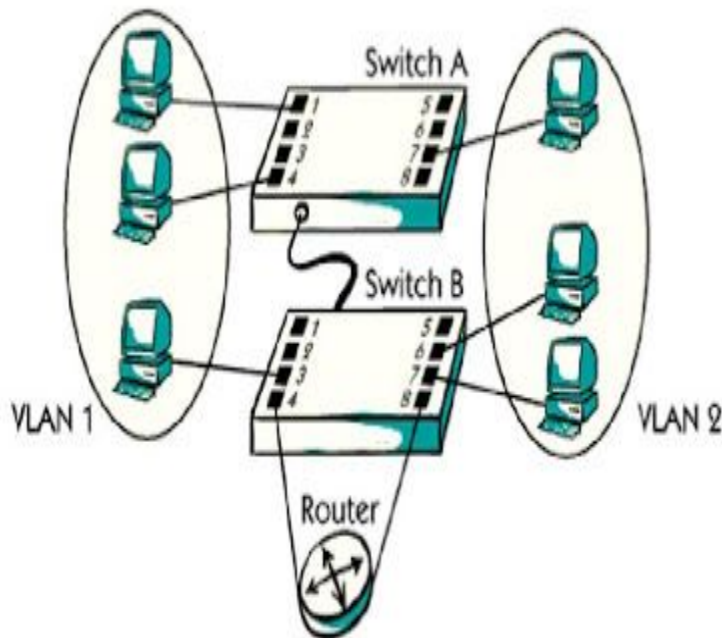
**a subnet is based on location  
(physical connection)  
is based on port configuration  
(logical connection)**



# Membership in Virtual LANs

**on the port to which a  
device is attached**

VLAN - Virtual Local Area Network



**ports  
located on different physical  
switches**

**Traffic between ports in the  
same VLAN**

**are propagated  
through the VLAN**

**Traffic between VLANs**

**does not cross VLANs**

# Virtual LANs (VLANs) Types

## Default VLAN

- Includes **all switch ports** when a switch is in its default configuration. In the default configuration, the default VLAN carries **both management traffic and standard network traffic**.

## Primary VLAN

- **Initially the default VLAN**. For HP switches, the primary VLAN is the only VLAN **on the switch that can receive a switch-generated address via DHCP**.
- You can designate a custom VLAN as the primary VLAN and make it responsible for some management functions.

# Virtual LANs (VLANs) Types

## Management VLAN

- Management VLAN is used for **managing the switch from a remote location** by using protocols such as telnet, SSH, SNMP, syslog etc.
- Normally the **Management VLAN is VLAN 1**, but you can use any VLAN as a management VLAN.
- To identify a specific VLAN as the only VLAN from which users **can connect to the switch management interface**.

# Virtual LANs (VLANs) Types

## Secure Management VLAN

- When created as a custom VLAN, the secure management VLAN **is an isolated network specifically used for switch management.** Access to management functions is then limited to only those ports configured as secure management VLAN members. Traffic cannot be routed to or from this VLAN.

## Voice VLAN

- Custom VLAN that can be created to isolate VoIP traffic from other network traffic.

# Creating a VLAN

- **Define the VLAN name and ID;**
- **Transfer ports from the default VLAN to the new VLAN;**
- **Assign an IP address to the VLAN (optional).**

# VLAN links

**Untagged/Access link; Tagged/ Trunk link**

**Untagged/Access  
link**

- Port linked to a network device other than another switch.

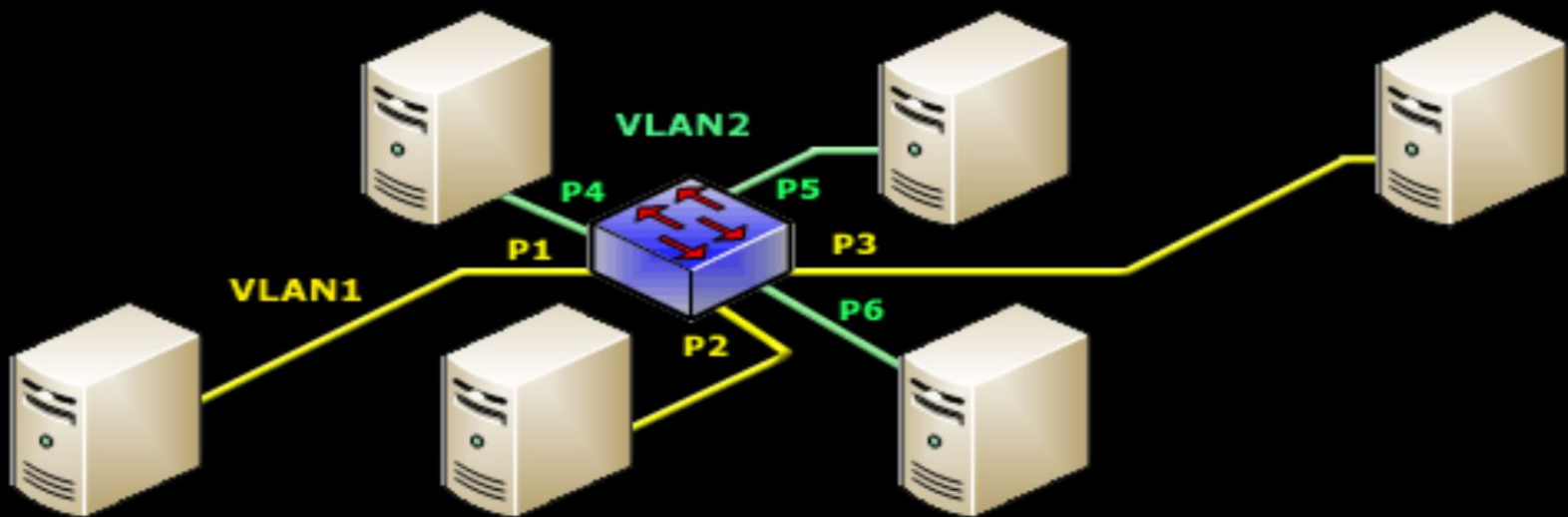
**Tagged/Trunk  
link**

- Port linked to another switch.

**Tagging is based on the 802.1Q standard.**

# Access link

**Each Access Link Port Is Assigned To One VLAN**

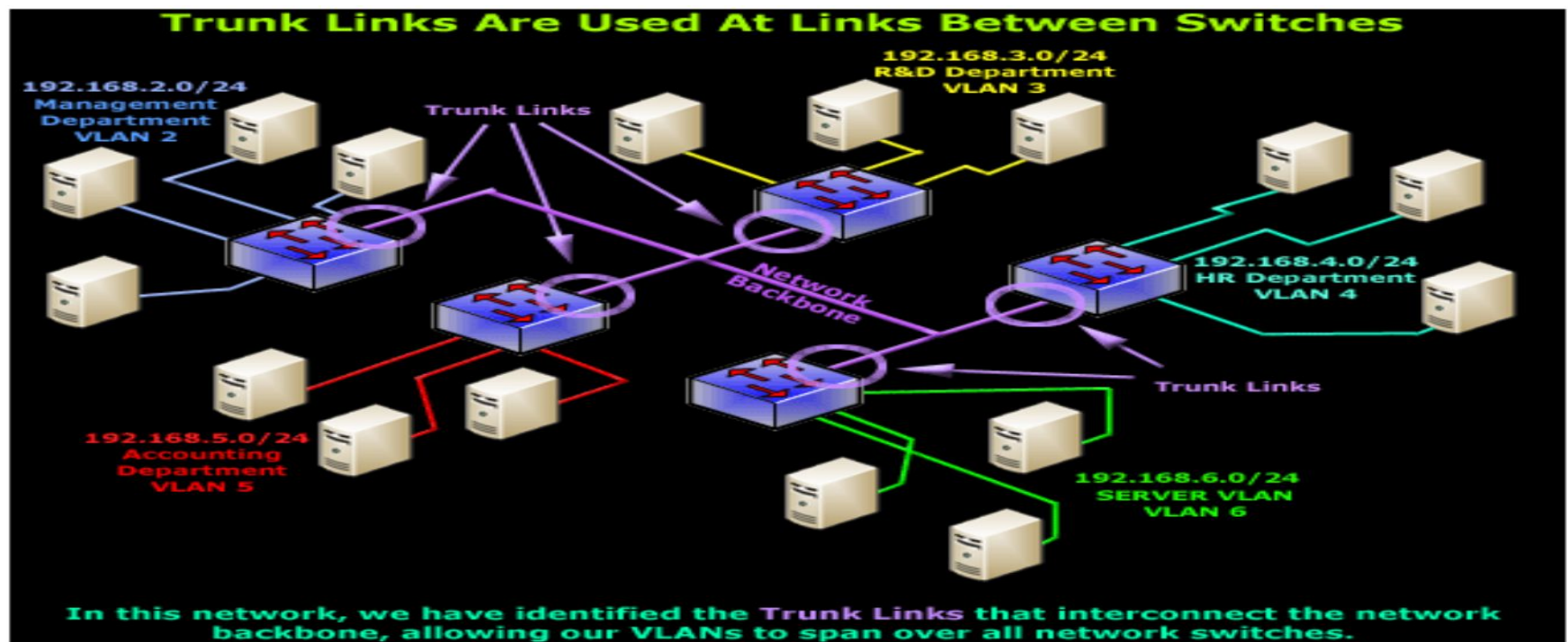


**This VLAN capable switch has been configured with 2 VLANs. Each VLAN acts as a separate network!**



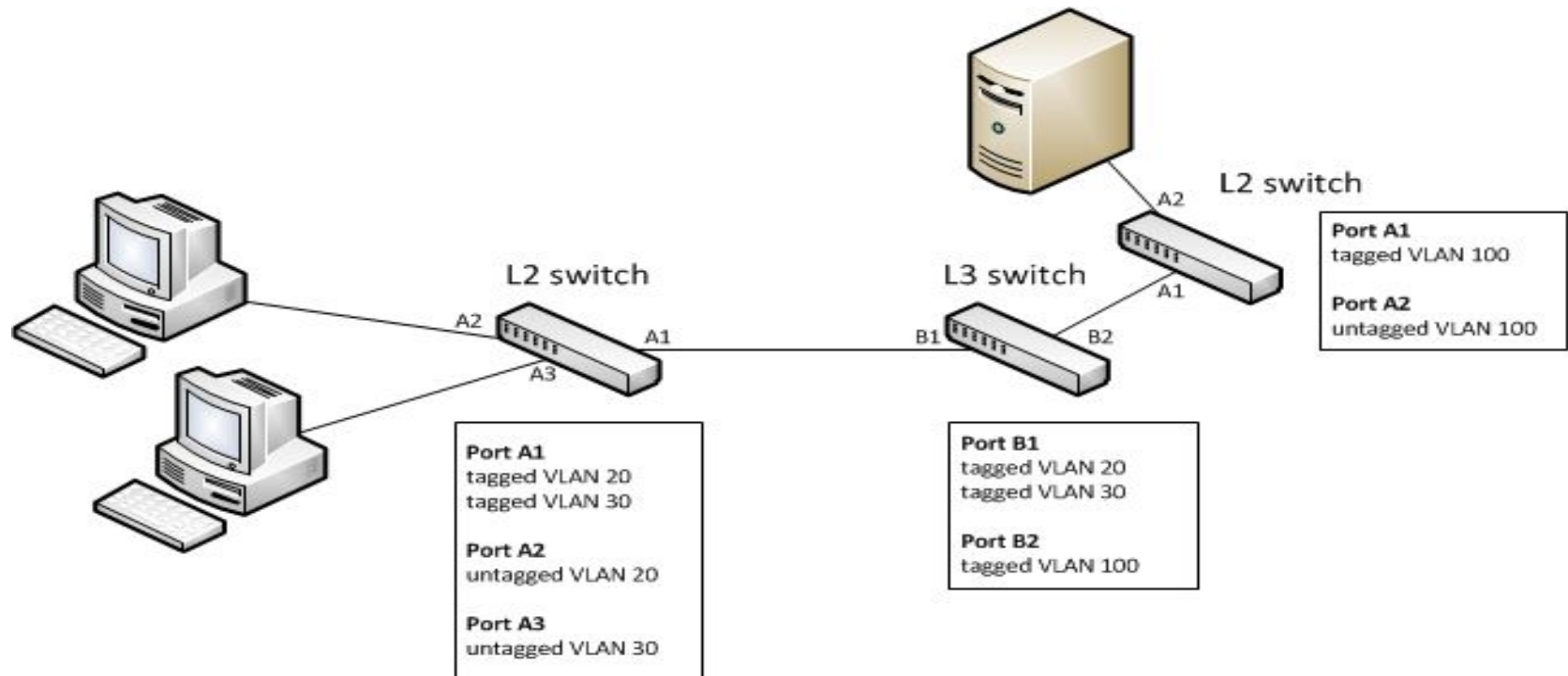
# Trunk link

These type of ports are usually found in connections between switches.



# Sample Network

**A port in a VLAN can be either tagged or untagged**



# Summary



# Hardware Fundamentals

# Switch Basics



[catalog.onliner.by](http://catalog.onliner.by)

# HP E3500-24G-PoE

Softech, cz



Softech, cz

**console port**

**USB port**

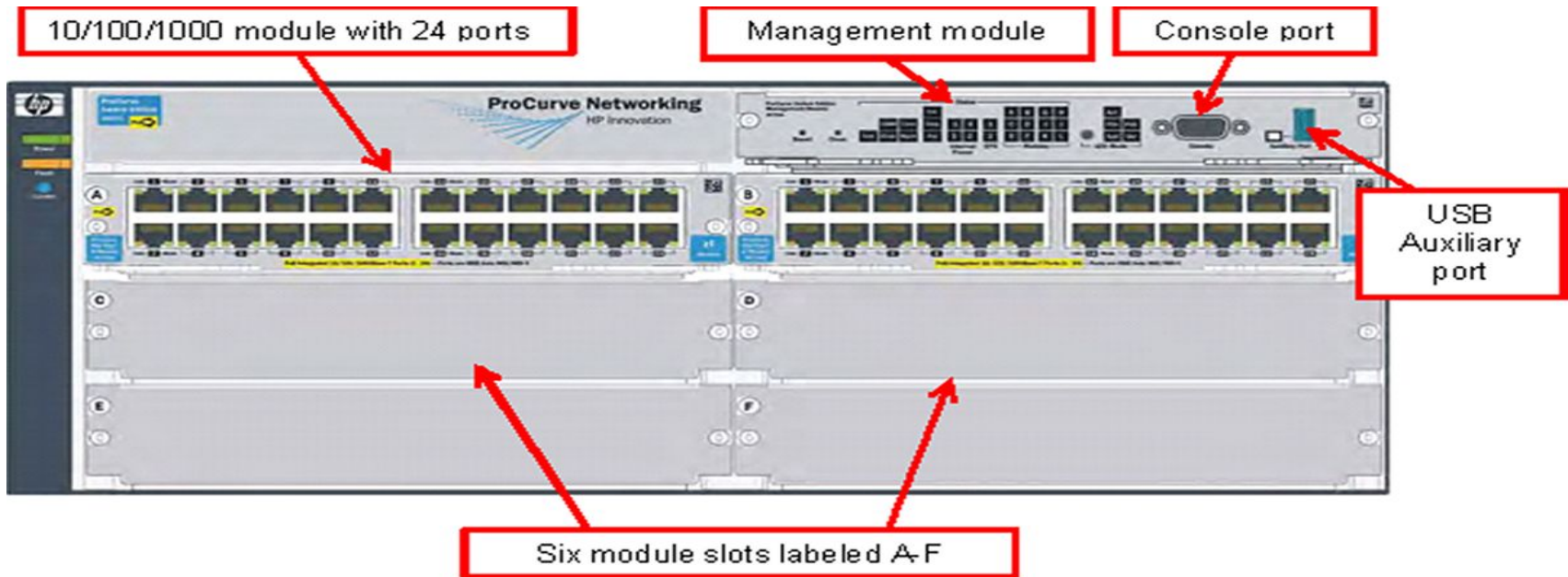
**20**

**10/100/1000 Base-T ports.**

**8 ports HP refers to  
as dual-personality  
ports**

- 4 ports support mini-GBIC or 10/100/1000 Base-T, giving you the option of wired or fiber optic media.
- 4 ports, if a transceiver is inserted, giving you the option of fiber optic media.

# HP 5406zl-48G switch



**up to six modules. The management module hosts the console and USB ports.**

# HP 5406zl-48G switch

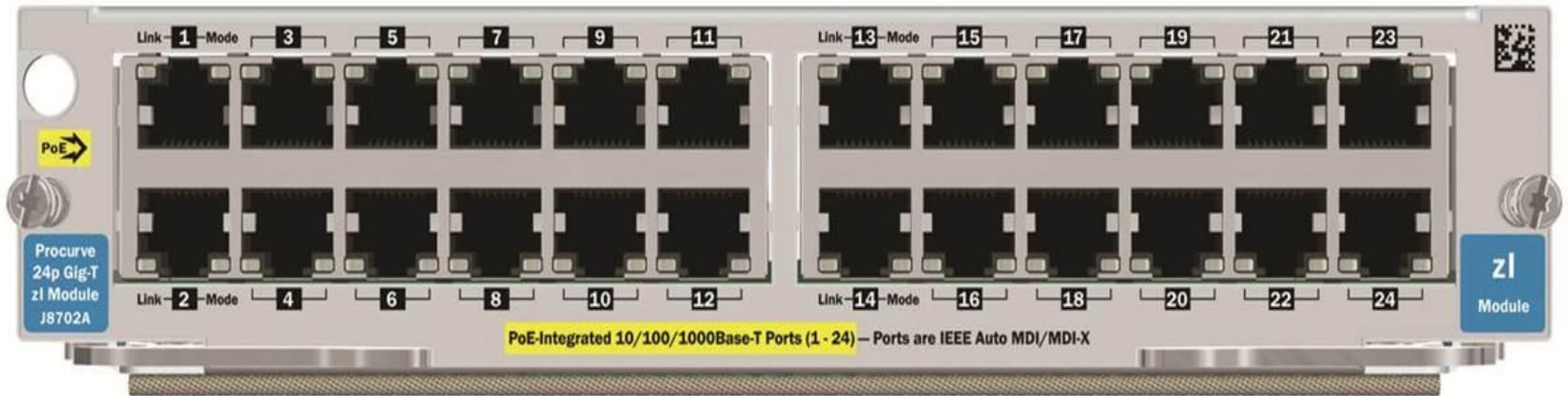
**You could install additional port modules, as needed**

**In many switches, the modules are hot-swappable.**

- Refers to device components and modules that **can be changed out without powering down the device.** One module can be changed with one of the same type while the remaining modules stay up and operational.



# Sample Module



**has 24 ports**

**The ports in a module are referred to by slot identifier**

# Switch management options

**have three  
management  
interface  
options**

- **Command line interface (CLI) (console port or over the network);**
- **Menu interface (console port or over the network);**
- **Web interface (over the network only).**

# Switch management options

**The Command line interface (CLI)**

**The menu interface**

**The web interface**

# Summary

- **CLI**
- **Menu interface**
- **Web interface**