CHAPTER 12
INTRODUCTION TO SCALING NETWORKS

Scaling Networks

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School of Industrial and System Engineering

CHAPTER 12

12.0 Introduction

12.1 Implementing a Network Design

12.2 Selecting Network Devices

12.3 Summary

CHAPTER 12: OBJECTIVES

- Describe the use of a hierarchical network for a small business.
- Describe recommendations for designing a network that is scalable.
- Describe the type of switches available for small-to-medium-sized business networks.
- Describe the type of routers available for small-to-medium-sized business networks.
- Configure and verify basic settings on a Cisco IOS device.

12.1 IMPLEMENTING A NETWORK DESIGN

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HIERARCHICAL NETWORK DESIGN

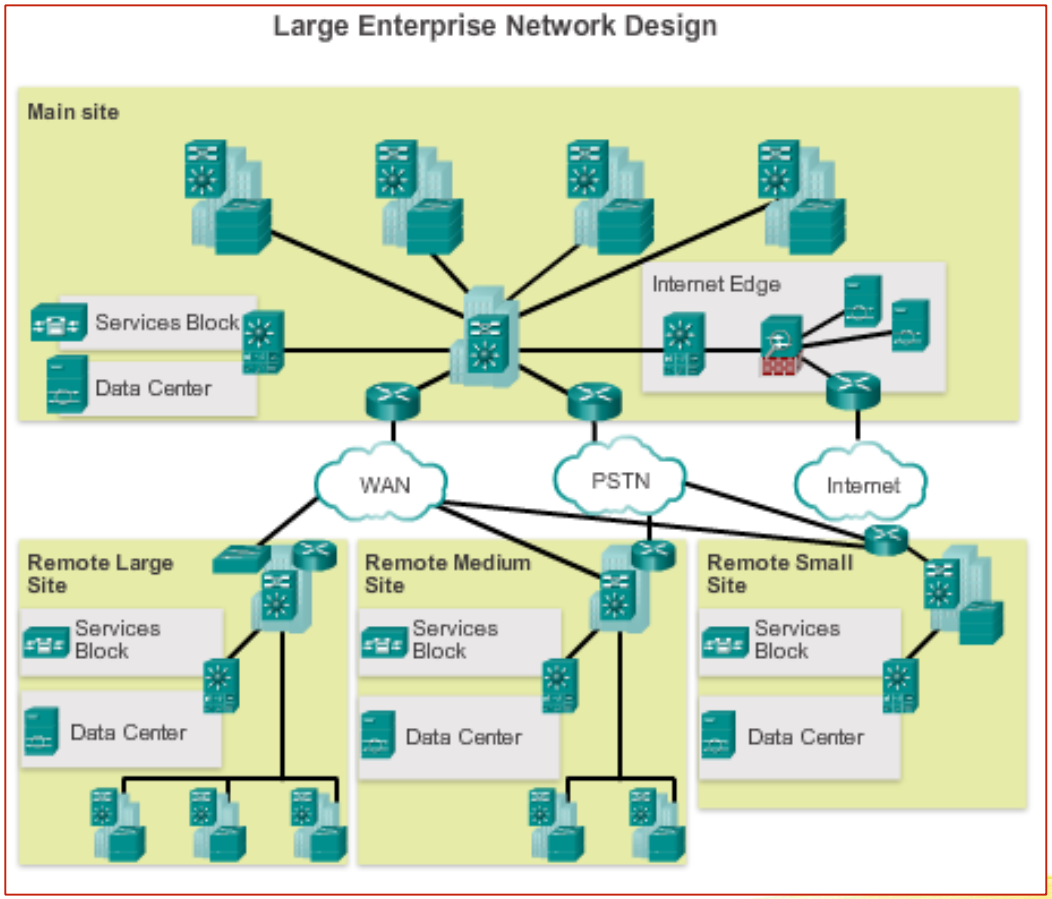
NETWORK SCALING NEEDS

Petumbuhan dan pengembangan, semua jaringan perusahaan harus:

- Mendukung Aplikasi kritis
- Mendukung trafik jaringan konvergen
- Mendukung kebutuhan bisnis yang beragam
- Memberikan control admin yang terpusat

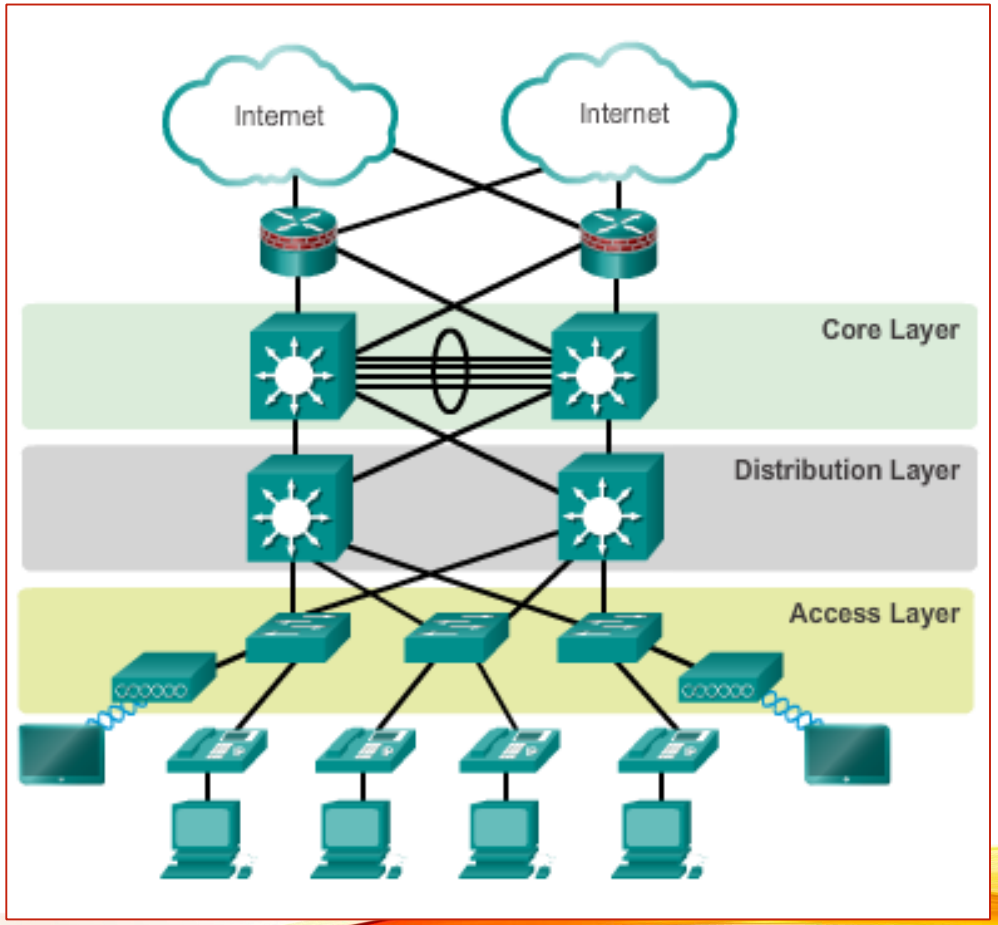
ENTERPRISE BUSINESS DEVICES

Untuk menyediakan jaringan dengan keandalan yang tinggi, perusahaan harus memasang peralatan untuk kelas perusahaan juga



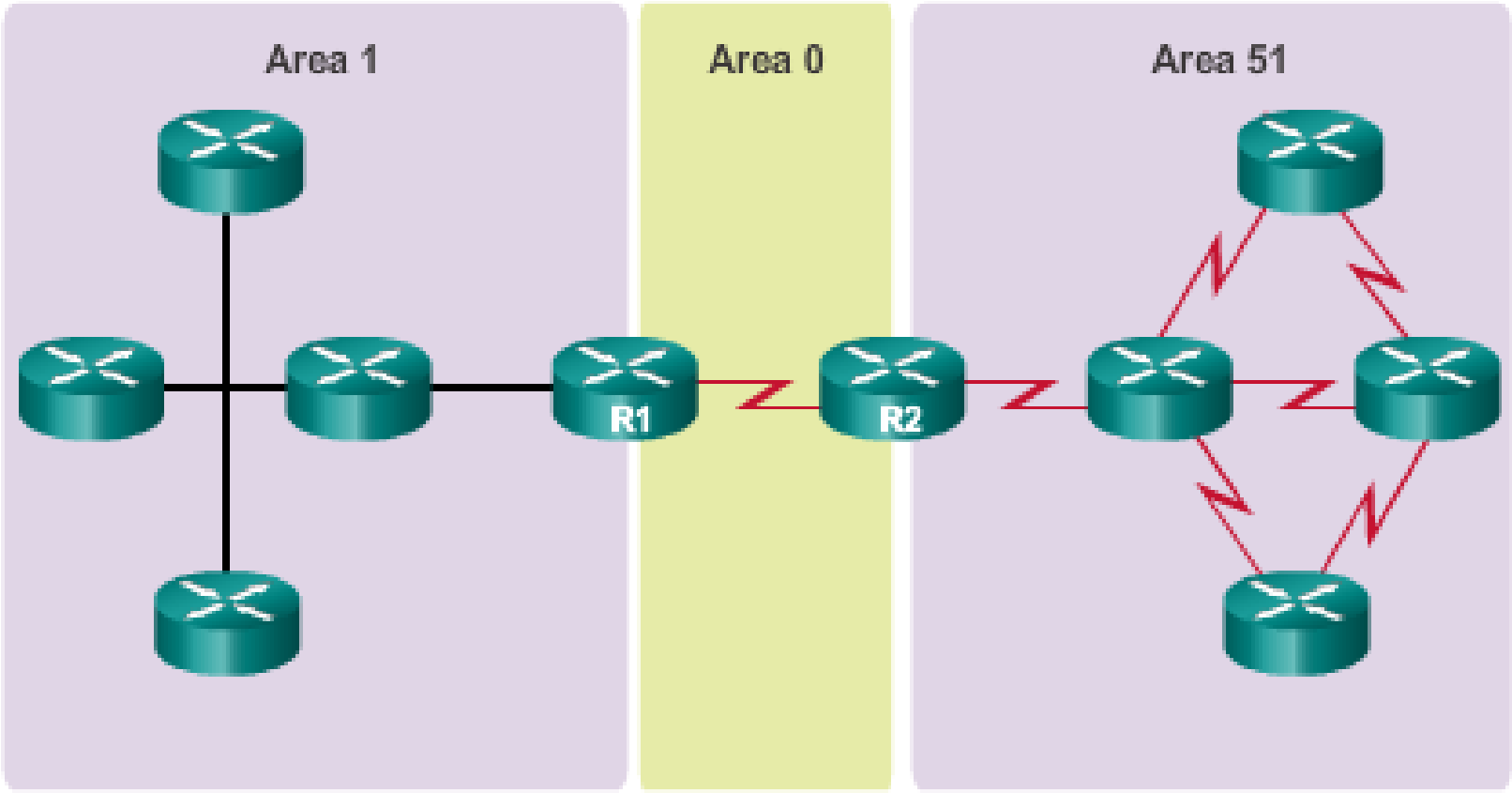
HIERARCHICAL NETWORK DESIGN

Mode ini membagi fungsionalitas jaringan kedalam tiga lapisan yang berbeda



FINE-TUNING ROUTING PROTOCOLS

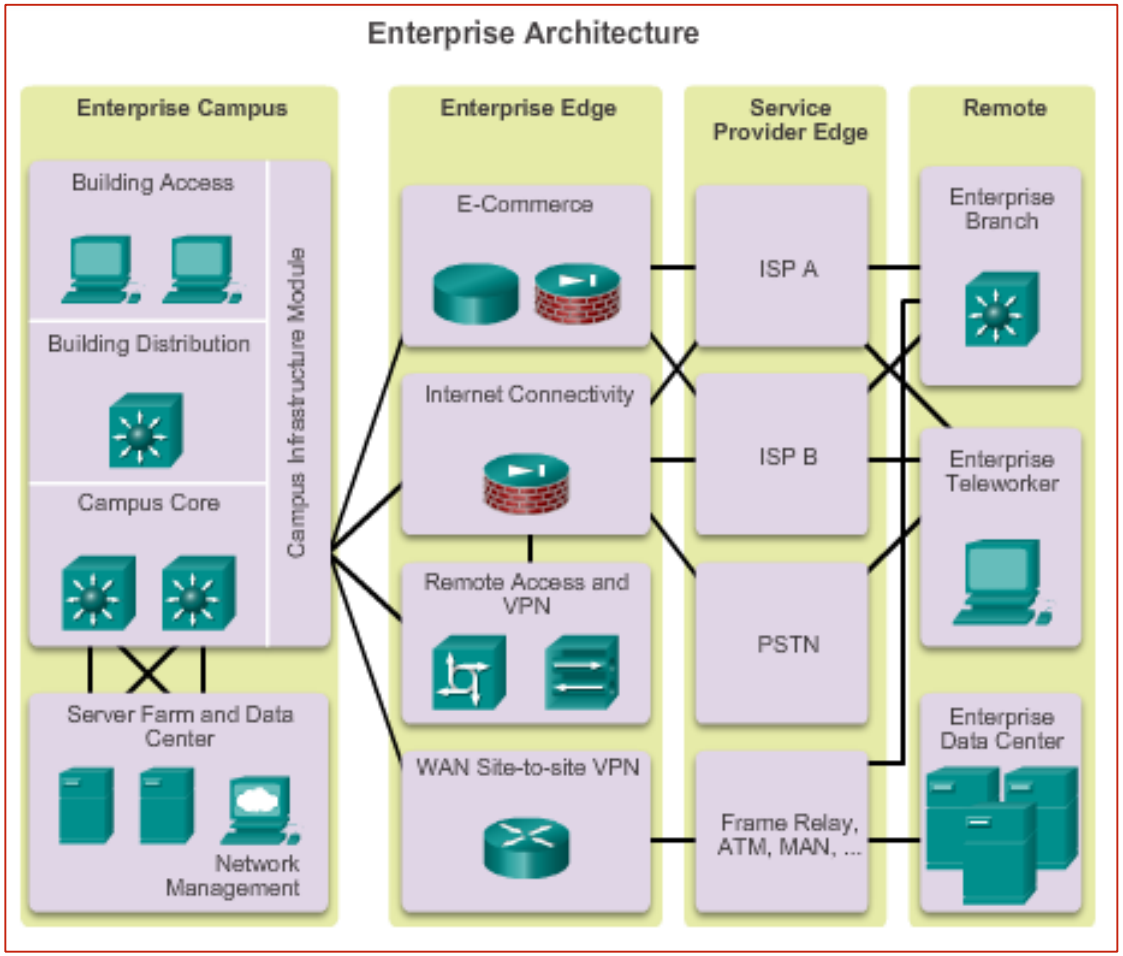
OSPF cocok untuk jaringan skala besar, hierarchical networks.



CISCO ENTERPRISE ARCHITECTURE

Modul Arsitektur perusahaan yang utama mencakup :

- Enterprise Campus
- Enterprise Edge
- Service Provider Edge
- Remote



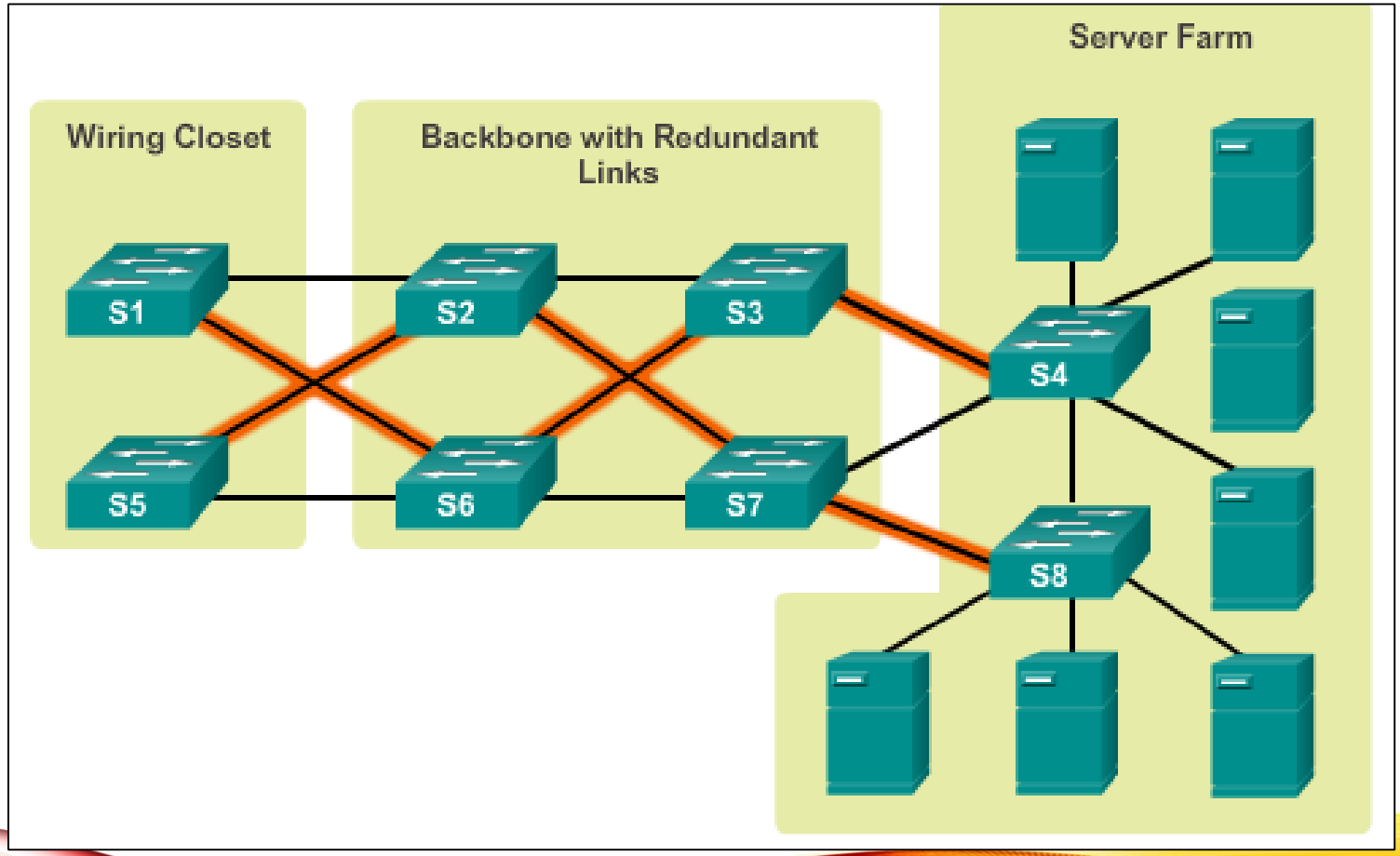
EXPANDING THE NETWORK

DESIGNING FOR SCALABILITY

- Selalu upgrade, baik peralatan yang modular maupuan perangkat pendukungnya
- Termasuk dapat menambahkan modul2 desain baru, dimodifikasi dengan tanpa mempengaruhi desain lama atau desain utama
- Buat skema pengalamatan.
- Gunakan router atau switch yang multilayer untuk membatasi trafik

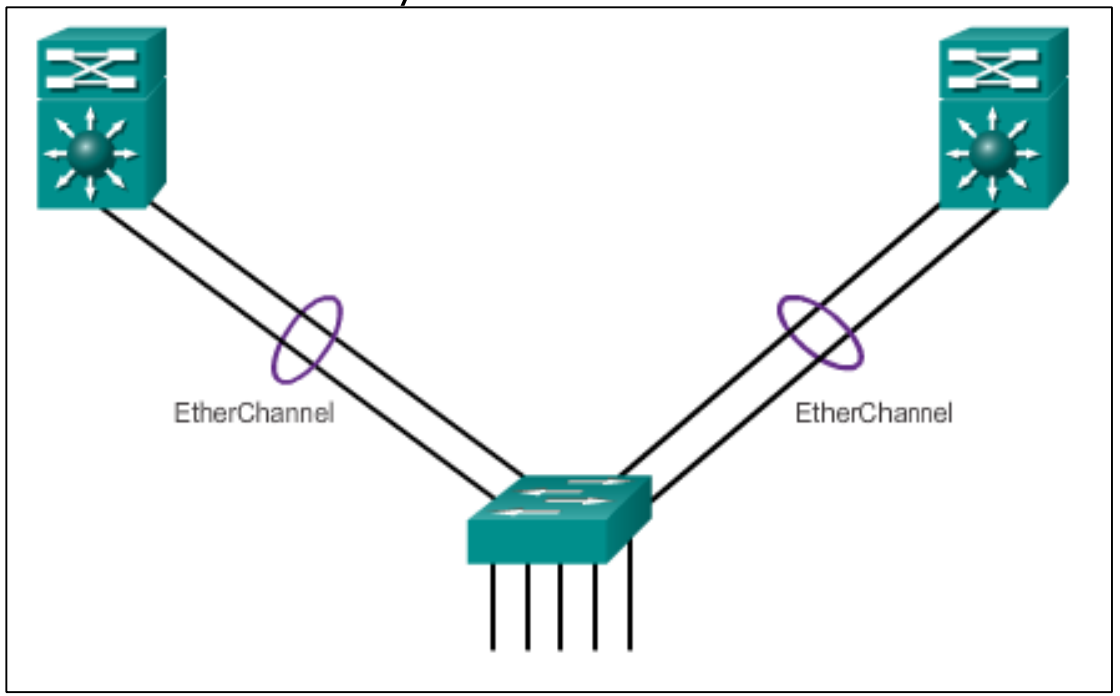
PLANNING FOR REDUNDANCY

- Instalasi duplikasi peralatan
- Membuat jalur backup



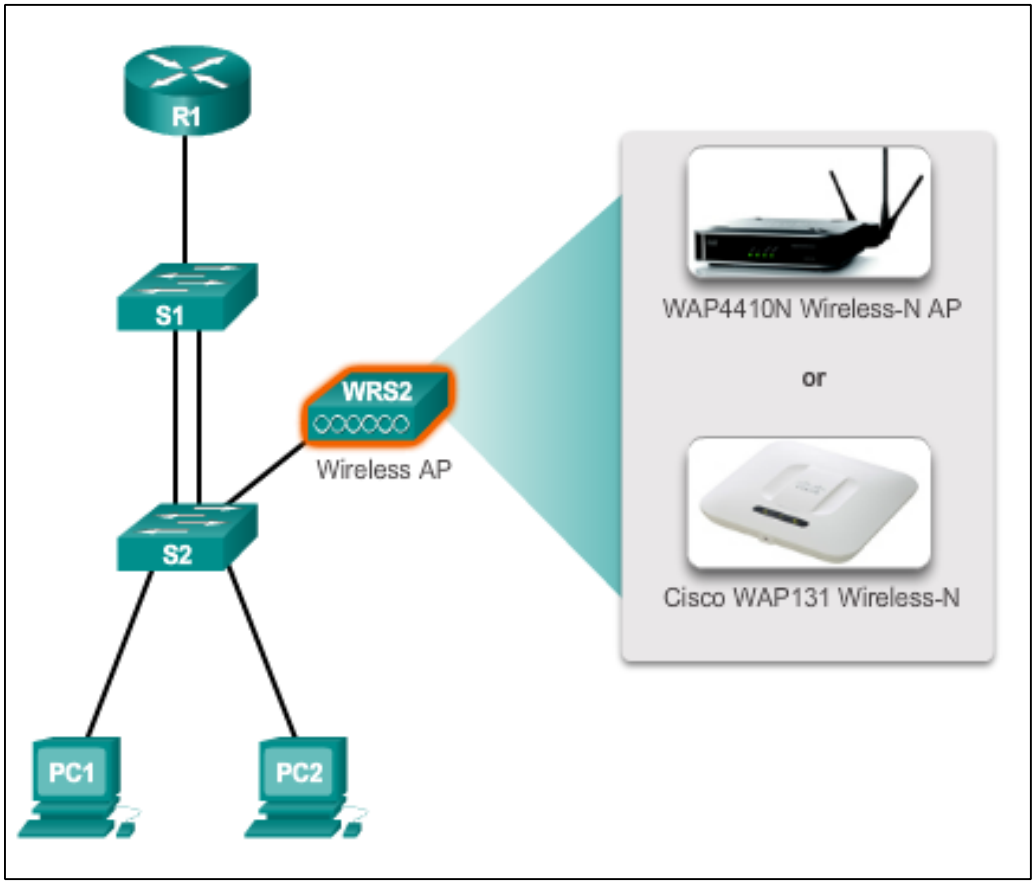
INCREASING BANDWIDTH

- Link aggregation meningkatkan jumlah bandwidth antar perangkat dengan menciptkan satu link logic dari beberapa link fisik.
- EtherChannel adalah bentuk dari link aggreration yang digunakan untuk switch layer 3



EXPANDING THE ACCESS LAYER

Pada jaringan akses dapat dikembangkan dengan penambahan wireless



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12.2 SELECTING NETWORK DEVICES

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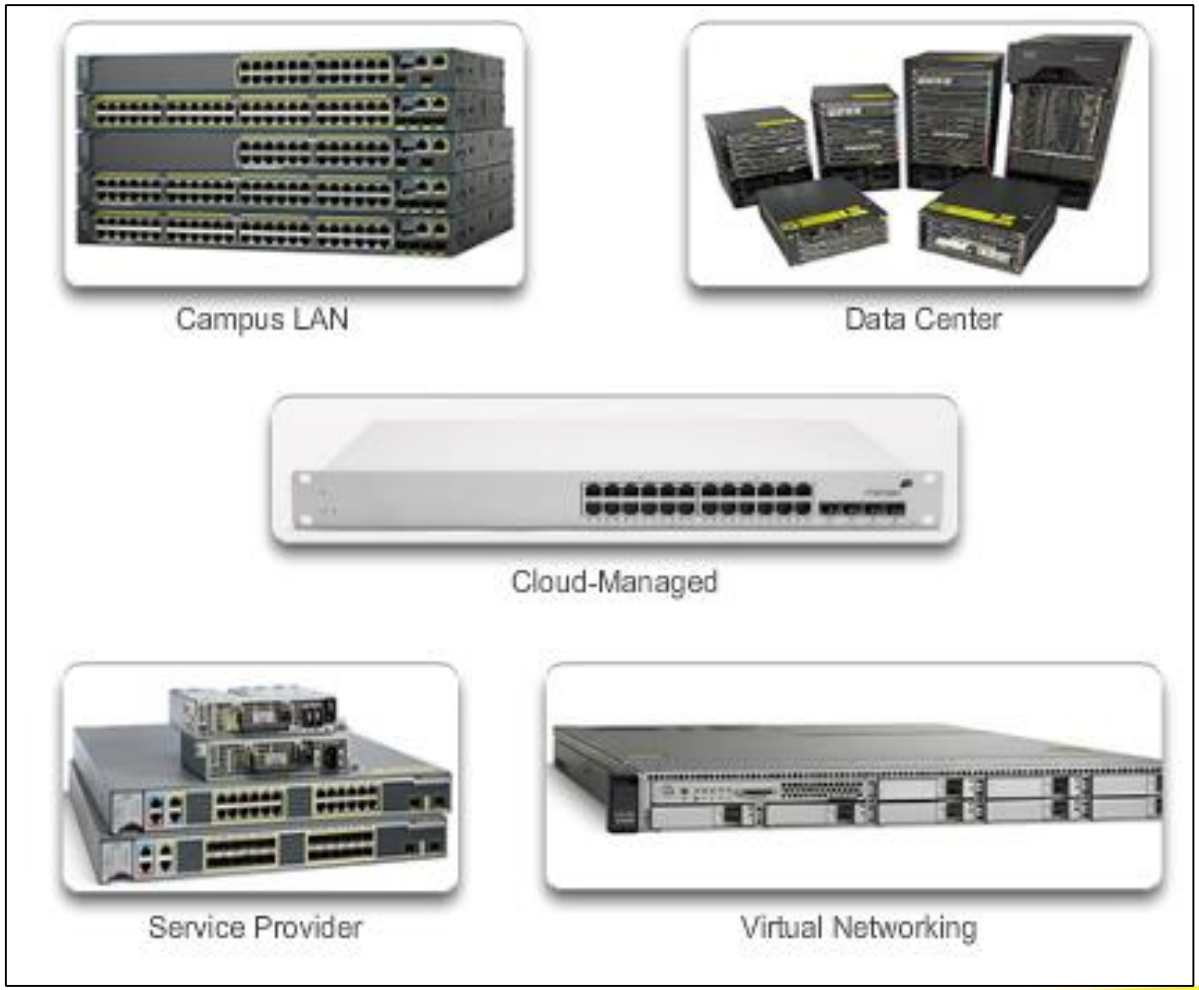
SWITCH HARDWARE

SWITCH PLATFORMS

Pemilihan perangkat:

- Fixed
- Modular
- Stackable
- Non-stackable



SWITCH HARDWARE

TIPE PORT

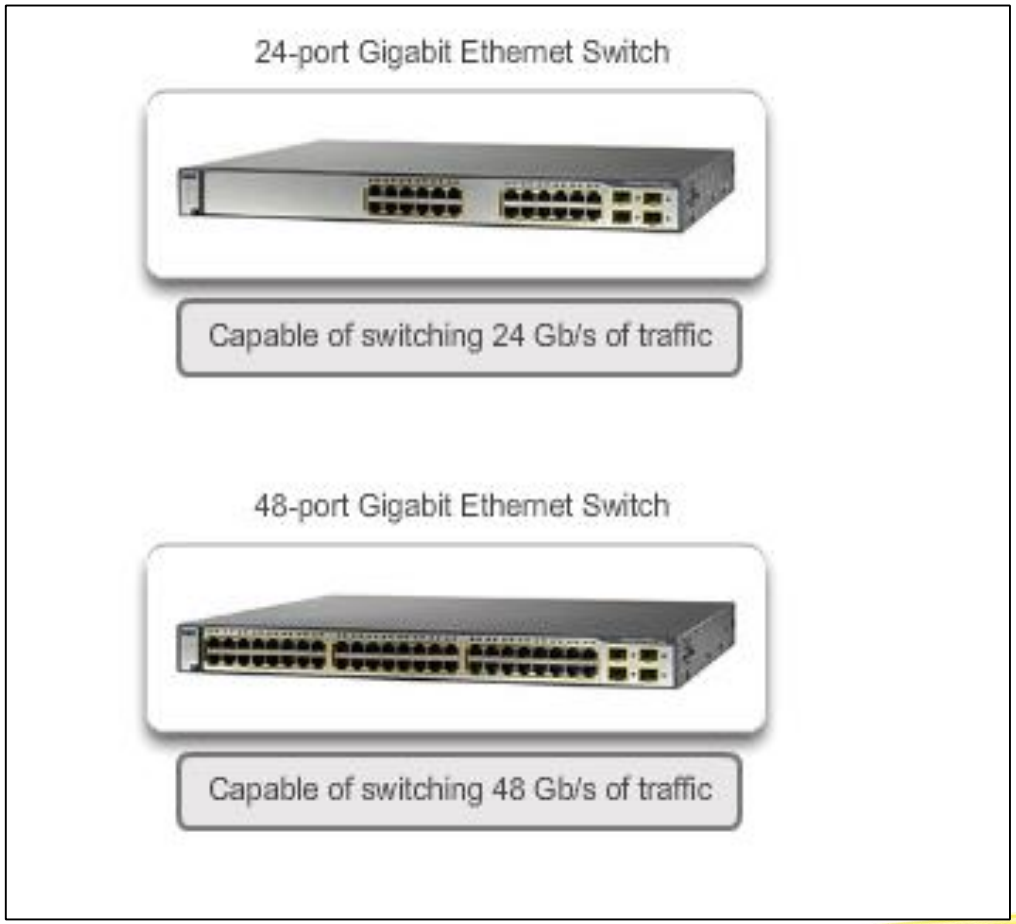
24-port switch

48-port switch

Modular switch with up to 1000+ ports

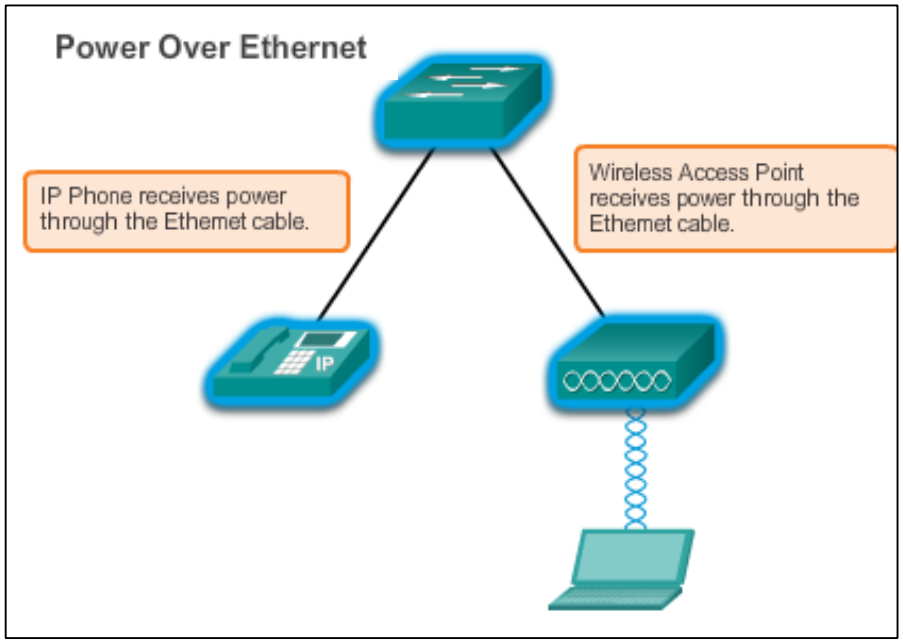
FORWARDING RATES

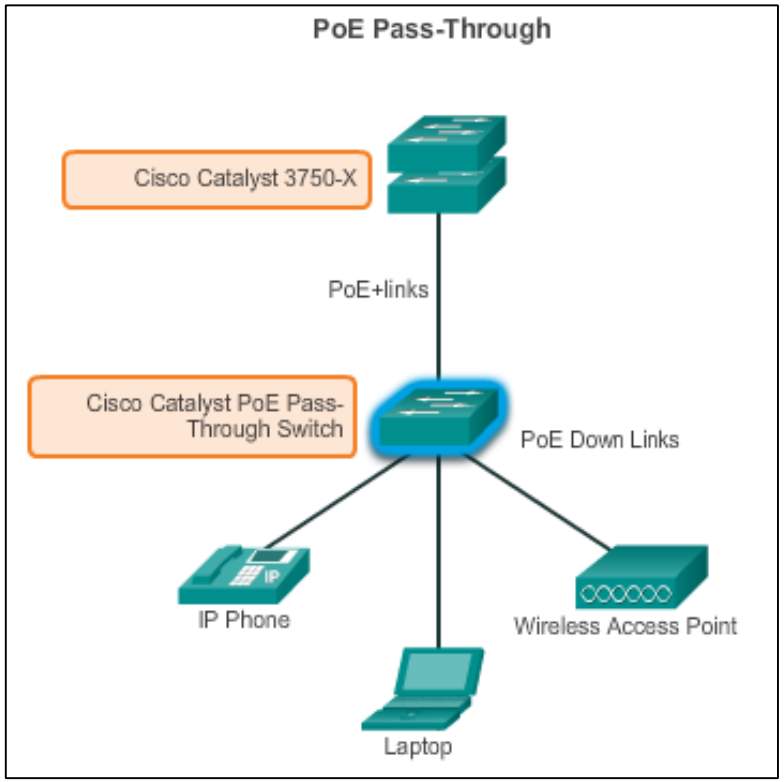
Kemampuan switch dalam dalam meneruskan data



SWITCH HARDWARE

POWER OVER ETHERNET





MULTILAYER SWITCHING

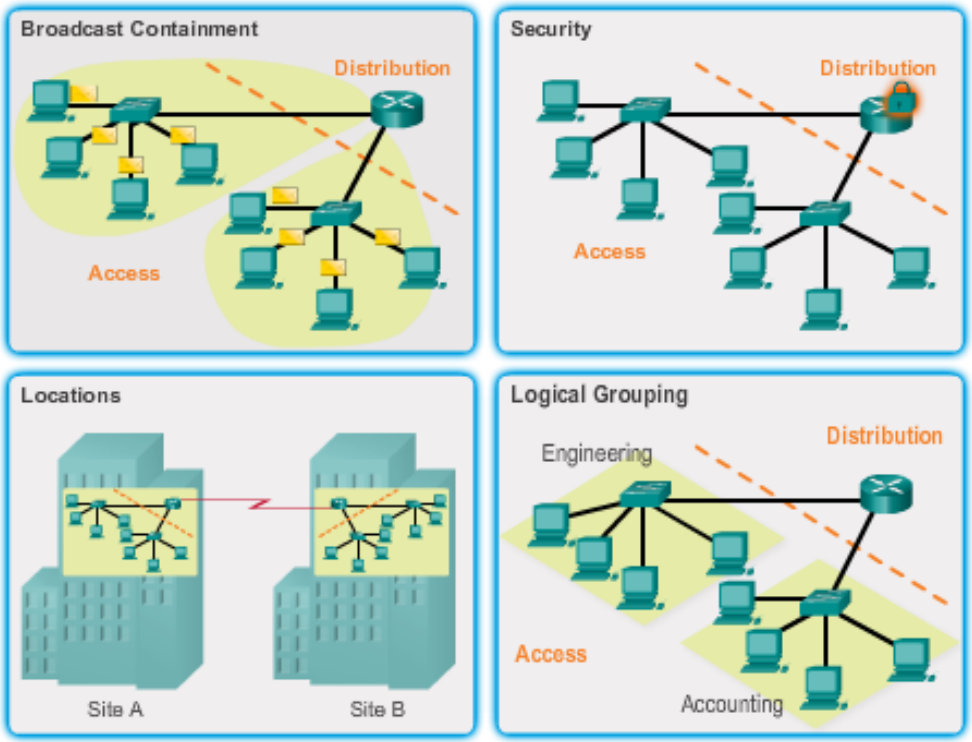
- Ditempatkan di layer core dan distribusi.
- Dapat mendukung dalam membangun routing table, mendukung beberapa protocol routing, dan paket IP

Cisco Catalyst 2960 Series Switches

ROUTER REQUIREMENTS

Peran Router:

- Interkoneksi beberapa situs
- Menyediakan jalur redudan
- Menghubungkan ke ISP
- Menerjemahkan antara jeni media dan protokol



ROUTER HARDWARE

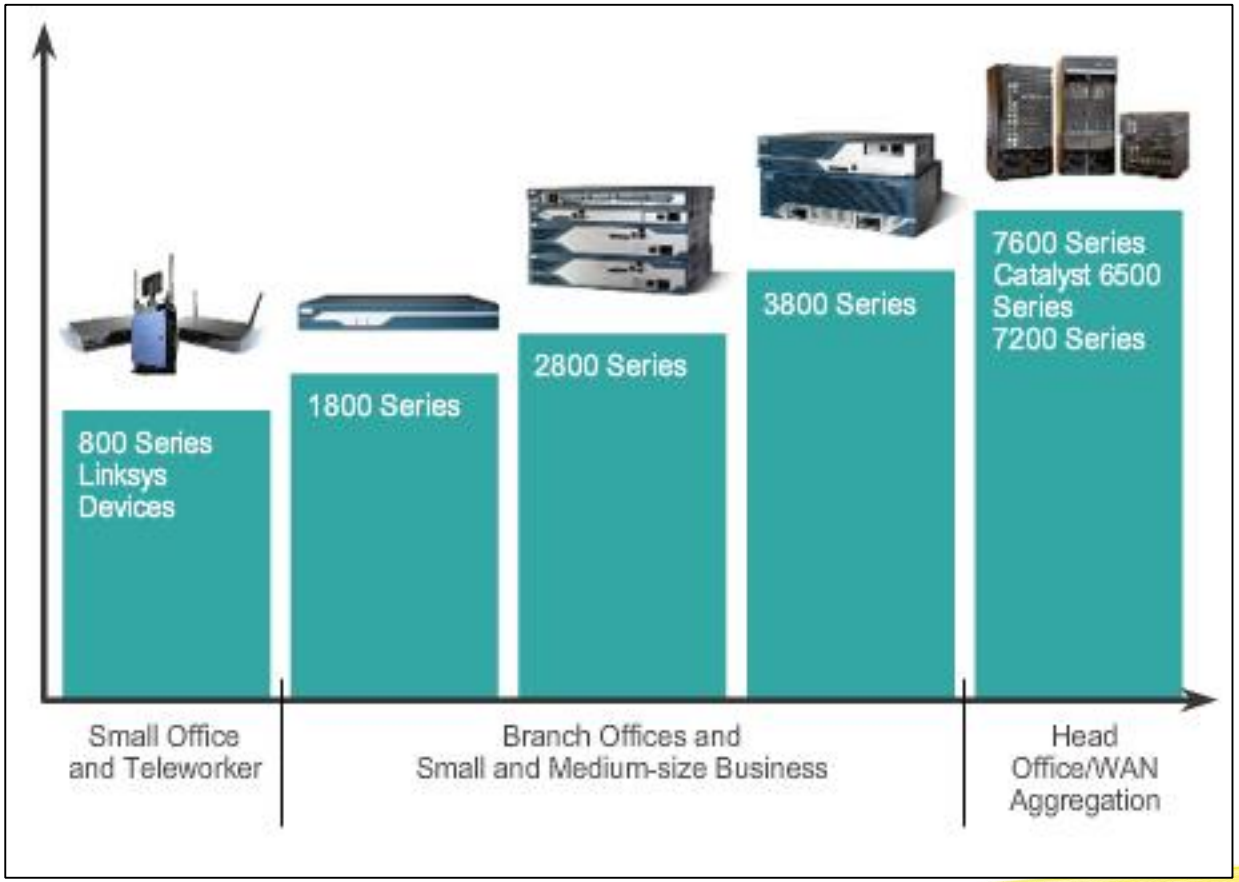
CISCO ROUTERS

Ada tiga jenis router:

- Branch – Highly available 24/7.
- Network Edge – High performance, high security, and reliable services. Connect campus, data center, and branch networks.
- Service provider routers

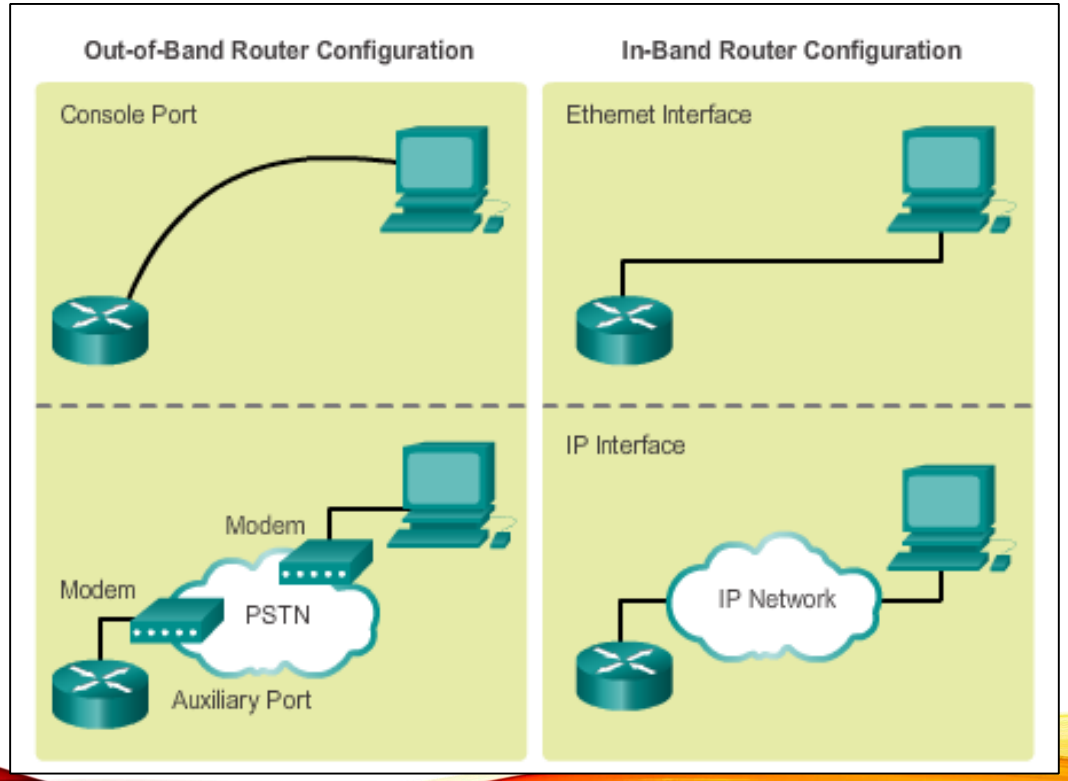
ROUTER HARDWARE

- Konfigurasi tetap – Built-in interfaces.
- Modular – Slots allow different interfaces to be added.



IN-BAND VS. OUT-OF-BAND MANAGEMENT

- **In-Band** requires, at least, one interface to be connected and operational and use of Telnet, SSH, or HTTP to access device.
- **Out-of-Band** requires direct connection to console or AUX port and Terminal Emulation client to access device.



BASIC ROUTER CLI COMMANDS

Dasar konfigurasi router mencakup:

- Hostname
- Passwords (console, Telnet/SSH, and privileged mode)
- Interface IP addresses
- Enabling a routing protocol

```
Router# configure terminal
Router(config)# hostname R1
R1(config)# enable secret class
R1(config)# line console 0
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# exec-timeout 0 0
R1(config-line)# line vty 0 4
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# exit
R1(config)# service password-encryption
R1(config)# banner motd $ Authorized Access Only! $
R1(config)# interface GigabitEthernet0/0
R1(config-if)# description Link to LAN 1
R1(config-if)# ip address 172.16.1.1 255.255.255.0
R1(config-if)# no shutdown
R1(config-if)# interface Serial0/0/0
R1(config-if)# description Link to R2
R1(config-if)# ip address 172.16.3.1 255.255.255.252
R1(config-if)# clock rate 128000
R1(config-if)# no shut
R1(config-if)# interface Serial0/0/1
R1(config-if)# description Link to R3
```

BASIC ROUTER SHOW COMMANDS

- **`show ip protocols`** – Displays information about routing protocol configured.
- **`show ip route`** – Displays routing table information.
- **`show ip ospf neighbor`** – Displays information about OSPF neighbors.
- **`show ip interfaces`** – Displays detailed information about interfaces.
- **`show ip interface brief`** – Displays all interfaces with IP addressing , interface, and line protocol status.
- **`show cdp neighbors`** – Displays information about all directly connected Cisco devices.

BASIC SWITCH CLI COMMANDS

- Hostname
- Passwords
- In-Band access requires the Switch to have an IP address (assigned to VLAN 1).
- Save configuration – **`copy running-config startup-config`** command.
- To clear switch – **`erase startup-config`**, and then **`reload`**.
- To erase VLAN information – **`delete flash:vlan.dat`**.

```
Switch# enable
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# hostname S1
S1(config)# banner motd %Unauthorized access prohibited%
S1(config)# enable password cisco
S1(config)# enable secret class
S1(config)# line con 0
S1(config-line)# password cisco
S1(config-line)# login
S1(config-line)# line vty 0 4
S1(config-line)# password cisco
S1(config-line)# login
S1(config-line)# interface vlan 1
S1(config-if)# ip address 192.168.1.5 255.255.255.0
S1(config-if)# no shutdown
S1(config-if)# exit
S1(config)# ip default-gateway 192.168.1.1
S1(config)# interface fa0/2
S1(config-if)# switchport mode access
S1(config-if)# switchport port-security
S1(config-if)# interface fa0/3
S1(config-if)# speed 10
S1(config-if)# duplex half
S1(config)# end
```

BASIC SWITCH SHOW COMMANDS

- **`show port-security`** – Displays any ports with security enabled.
- **`show port-security address`** – Displays all secure MAC addresses.
- **`show interfaces`** – Displays detailed information about interfaces.
- **`show mac-address-table`** – Displays all MAC addresses the switch has learned.
- **`show cdp neighbors`** – Displays all directly connected Cisco devices.

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12.3 SUMMARY

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CHAPTER 12: SUMMARY

This chapter:

- Introduces the hierarchical network design model that divides network functionality into the access layer, the distribution layer, and the core layer.
- Describes how the Cisco Enterprise Architecture further divides the network into functional components called *modules*.
- Defines how routers and multilayer switches are used to limit failure domains.
- Explains that a good network design includes a scalable IP scheme, fast converging and scalable routing protocols, appropriate Layer 2 protocols and devices that are modular or easily upgraded.

CHAPTER 12: SUMMARY (CONT.)

- Identifies that a mission-critical server should have a connection to two different access layer switches. It should also have redundant modules and backup power.
- Recognizes that routers and switches should be selected from the appropriate categories to meet the network's requirements.

TERIMA KASIH

Thank you very much for your kind attention