

LAN design using layer 3 switches

Mario Baldi

Politecnico di Torino

<http://www.mario-baldi.net>

Pietro Nicoletti

Studio Reti

<http://www.studioreti.it>

Based on chapter 10 of:

M. Baldi, P. Nicoletti, "Switched LAN", McGraw-Hill, 2002, ISBN 88-386-3426-2

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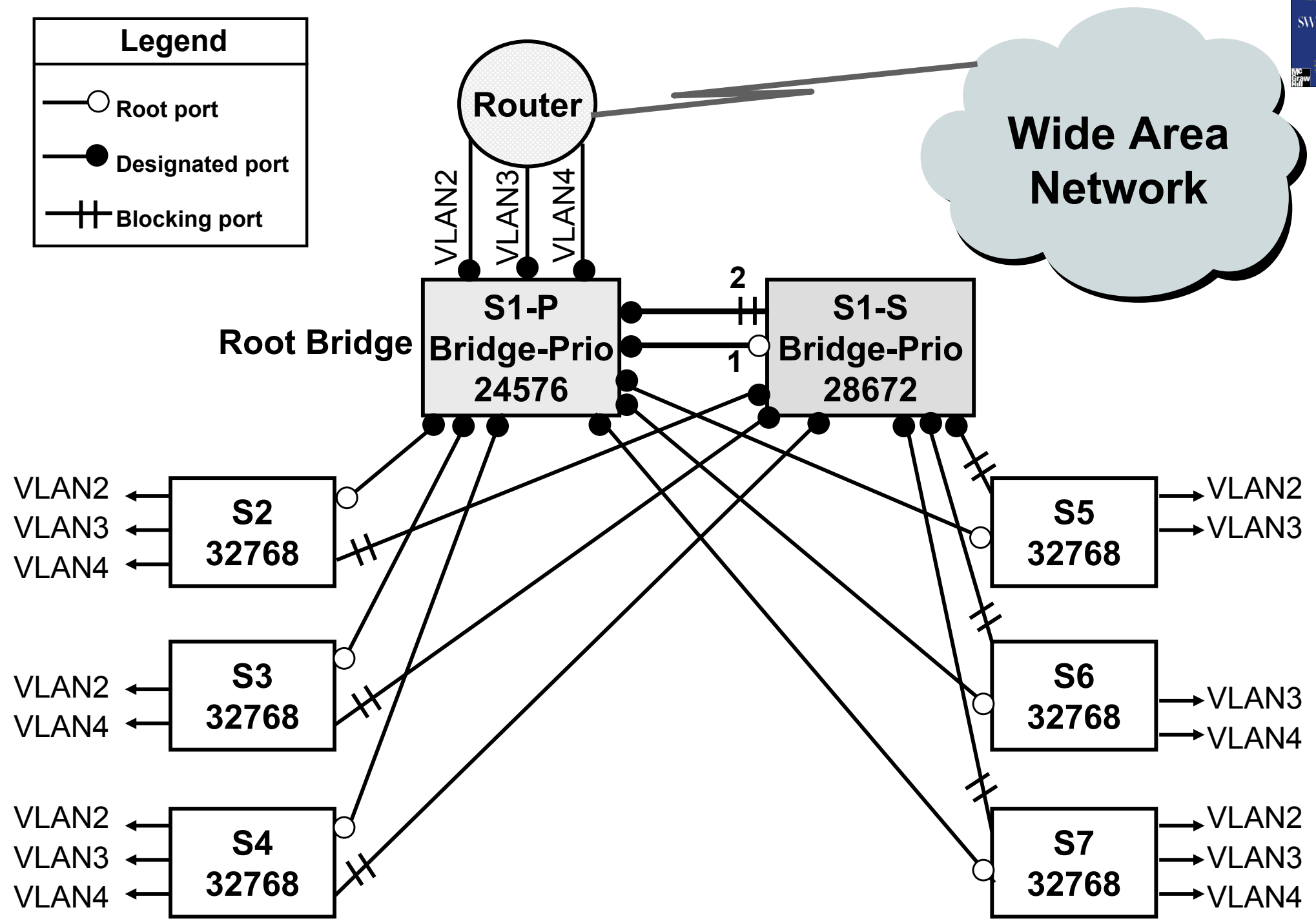
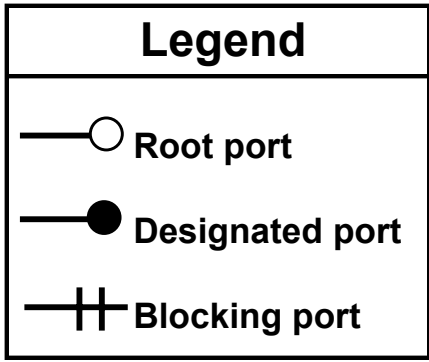
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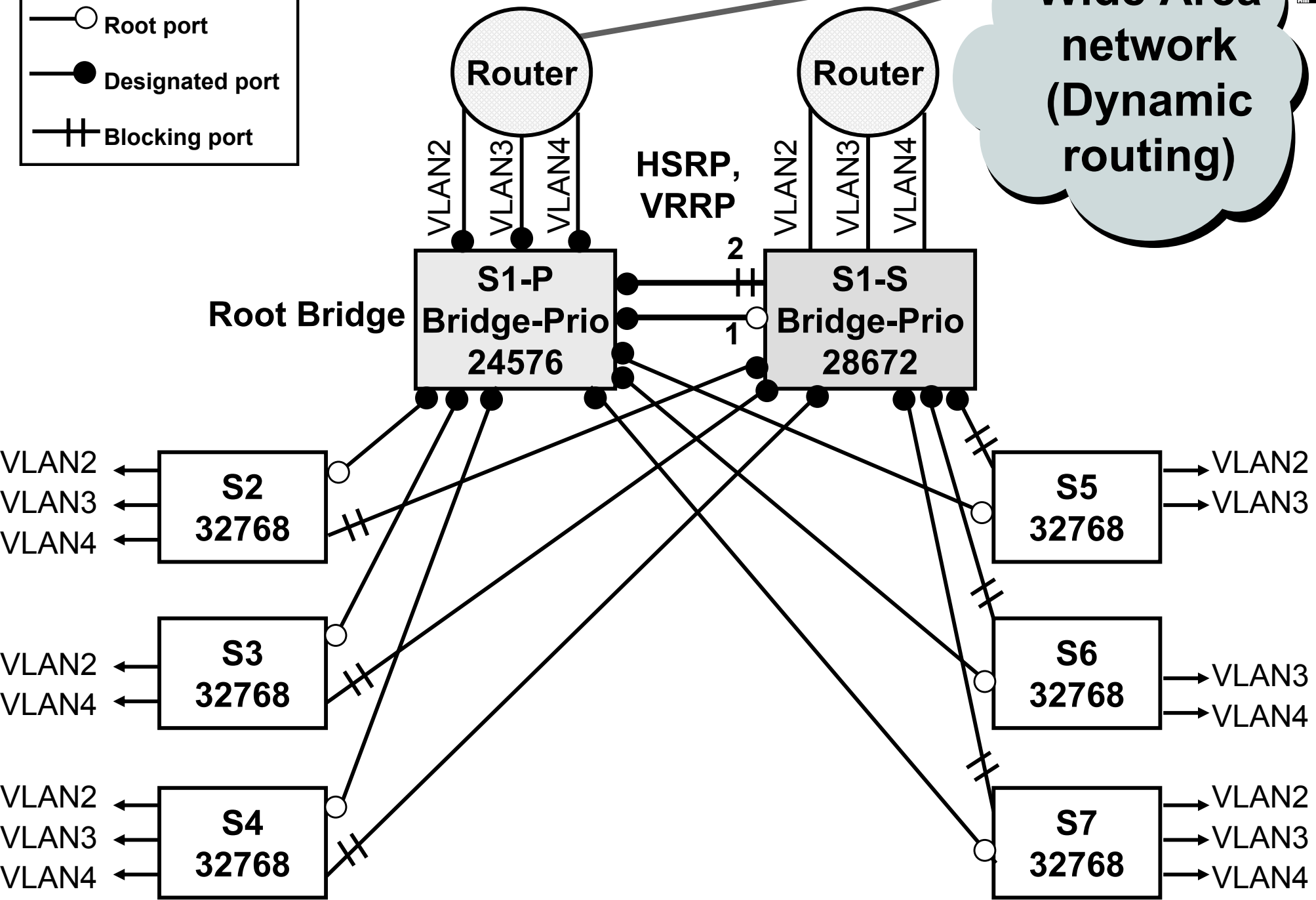
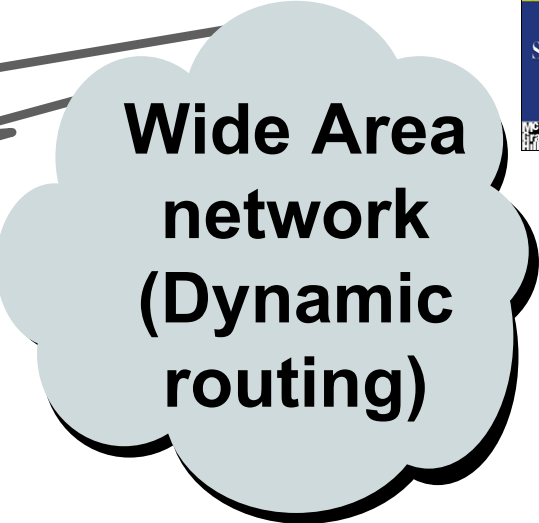
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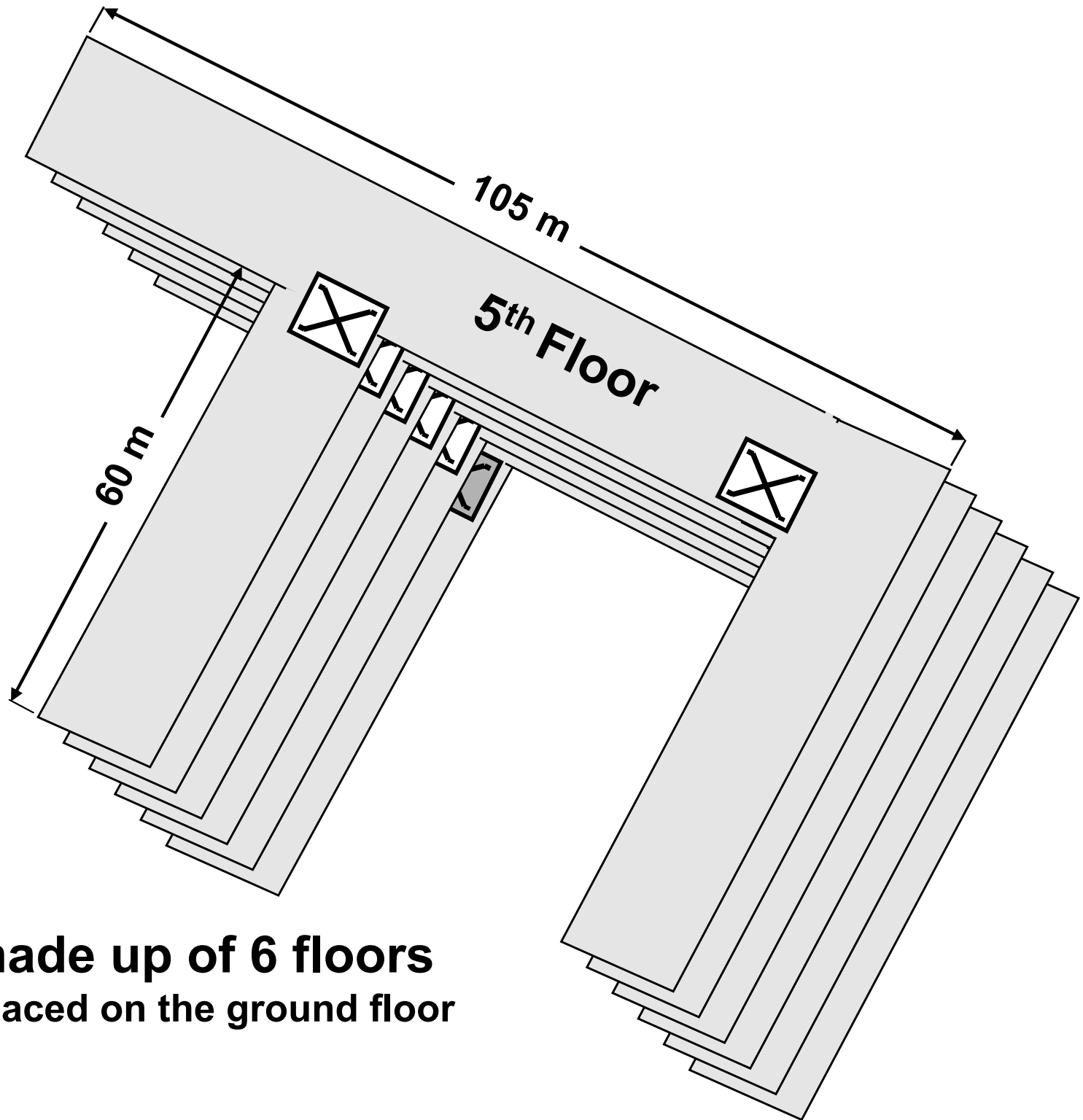
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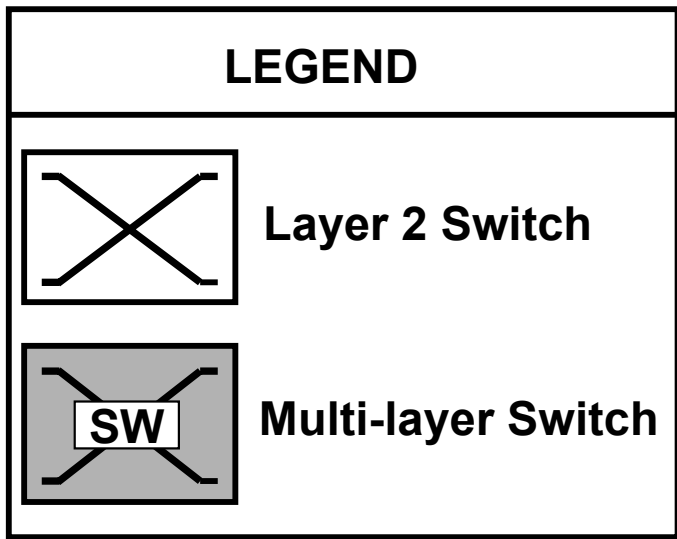


Legend	
	Root port
	Designated port
	Blocking port

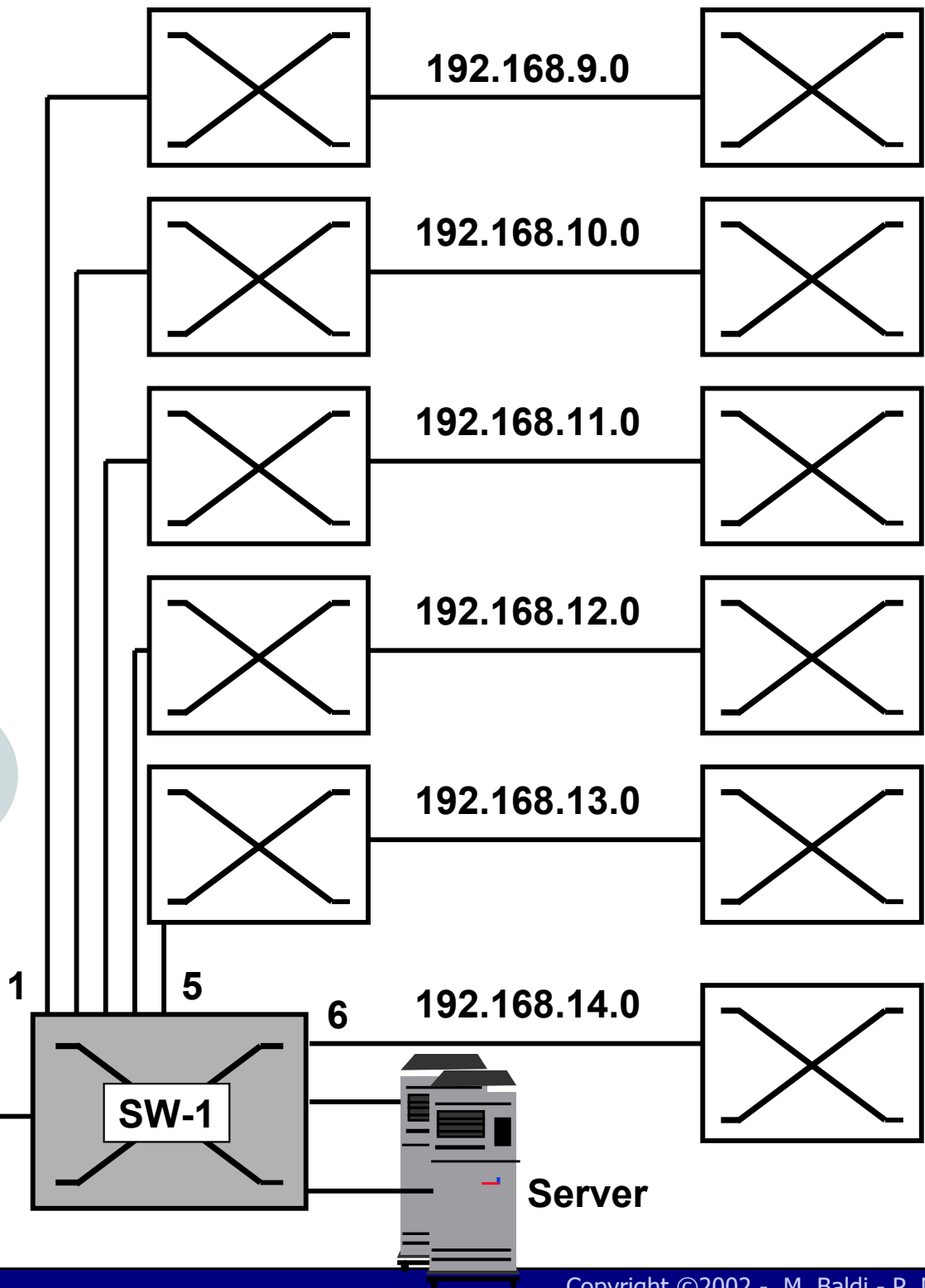
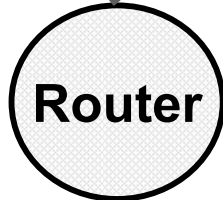




Building made up of 6 floors
Server farm placed on the ground floor



Switch and router connected to access ports



Step 1: VLAN creation

```
Sw#vlan database
Sw(vlan)#vlan 2 name Ammin
VLAN 2 added:
    Name: Ammin
Sw(vlan)#vlan 3 name Vendite
VLAN 3 added:
    Name: Vendite
Sw(vlan)#vlan 4 name Gruppo-1
VLAN 4 added:
    Name: Gruppo-1
Sw(vlan)#vlan 5 name Gruppo-2
VLAN 5 added:
    Name: Gruppo-2
Sw(vlan)#vlan 6 name Gruppo-3
VLAN 6 added:
    Name: Gruppo-3
Sw(vlan)#vlan 7 name Gruppo-4
VLAN 7 added:
    Name: Gruppo-4
Sw(vlan)#exit
APPLY completed.
Exiting....
Sw#
```

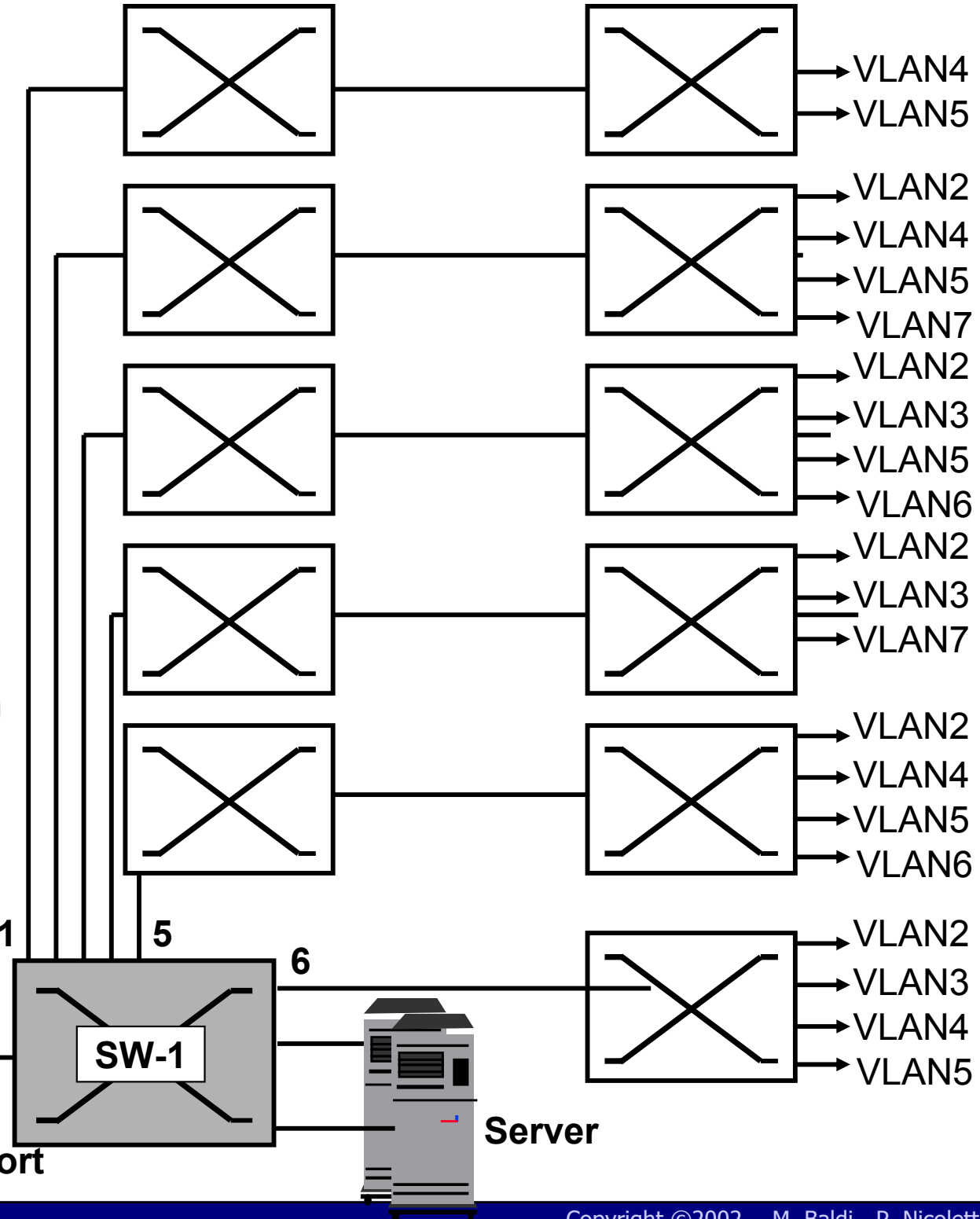
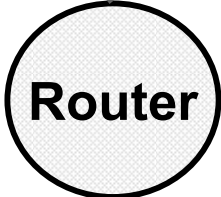
Step 2: Access ports definition

```
Sw(config)#int GigabitEthernet 0/1
Sw(config-if)#switchport access vlan 2
Sw(config-if)#exit
.....
Sw(config)#int GigabitEthernet 0/2
Sw(config-if)#switchport access vlan 3
Sw(config-if)#exit
.....
Sw(config)#int GigabitEthernet 0/3
Sw(config-if)#switchport access vlan 4
Sw(config-if)#exit
.....
Sw(config)#int GigabitEthernet 0/4
Sw(config-if)#switchport access vlan 5
Sw(config-if)#exit
.....
Sw(config)#int GigabitEthernet 0/5
Sw(config-if)#switchport access vlan 6
Sw(config-if)#exit
.....
Sw(config)#int GigabitEthernet 0/6
Sw(config-if)#switchport access vlan 7
Sw(config-if)#exit
```

Step 3: IP addresses assignment to virtual interfaces (VLAN)

```
Sw(config)#interface vlan 2
Sw(config-if)#ip address 192.168.9.1 255.255.255.0
Sw(config-if)#no shutdown
Sw(config-if)#exit
Sw(config)#interface vlan 3
Sw(config-if)#ip address 192.168.10.1 255.255.255.0
Sw(config-if)#no shutdown
Sw(config-if)#exit
Sw(config)#interface vlan 4
Sw(config-if)#ip address 192.168.11.1 255.255.255.0
Sw(config-if)#no shutdown
Sw(config-if)#exit
Sw(config)#interface vlan 5
Sw(config-if)#ip address 192.168.12.1 255.255.255.0
Sw(config-if)#no shutdown
Sw(config-if)#exit
Sw(config)#interface vlan 6
Sw(config-if)#ip address 192.168.13.1 255.255.255.0
Sw(config-if)#no shutdown
Sw(config-if)#exit
Sw(config)#interface vlan 7
Sw(config-if)#ip address 192.168.14.1 255.255.255.0
Sw(config-if)#no shutdown
Sw(config-if)#exit
```


VLAN - Subnet IP
VLAN 2 - 192.168.9.0
VLAN 3 - 192.168.10.0
VLAN 4 - 192.168.11.0
VLAN 5 - 192.168.12.0
VLAN 6 - 192.168.13.0
VLAN 7 - 192.168.14.0



Switch connected to trunk ports and router connected to an access port

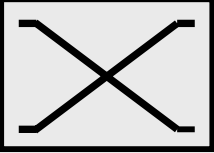
Step 2: Trunk ports definition

```

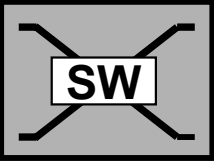
Sw(config)#interface GigabitEthernet 0/1
Sw(config-if)#switchport mode trunk
Sw(config-if)#switchport trunk allowed vlan add 1,4,5
Sw(config-if)#exit
Sw(config)#interface GigabitEthernet 0/2
Sw(config-if)#switchport mode trunk
Sw(config-if)#switchport trunk allowed vlan add 1,2,4,5,7
Sw(config-if)#exit
Sw(config)#interface GigabitEthernet 0/3
Sw(config-if)#switchport mode trunk
Sw(config-if)#switchport trunk allowed vlan add 1,2,3,5,6
Sw(config-if)#exit
Sw(config)#interface GigabitEthernet 0/4
Sw(config-if)#switchport mode trunk
Sw(config-if)#switchport trunk allowed vlan add 1,2,3,7
Sw(config-if)#exit
Sw(config)#interface GigabitEthernet 0/5
Sw(config-if)#switchport mode trunk
Sw(config-if)#switchport trunk allowed vlan add 1,2,4,5,6
Sw(config-if)#exit
Sw(config)#interface GigabitEthernet 0/6
Sw(config-if)#switchport mode trunk
Sw(config-if)#switchport trunk allowed vlan add 1,2,3,4,5

```

LEGEND



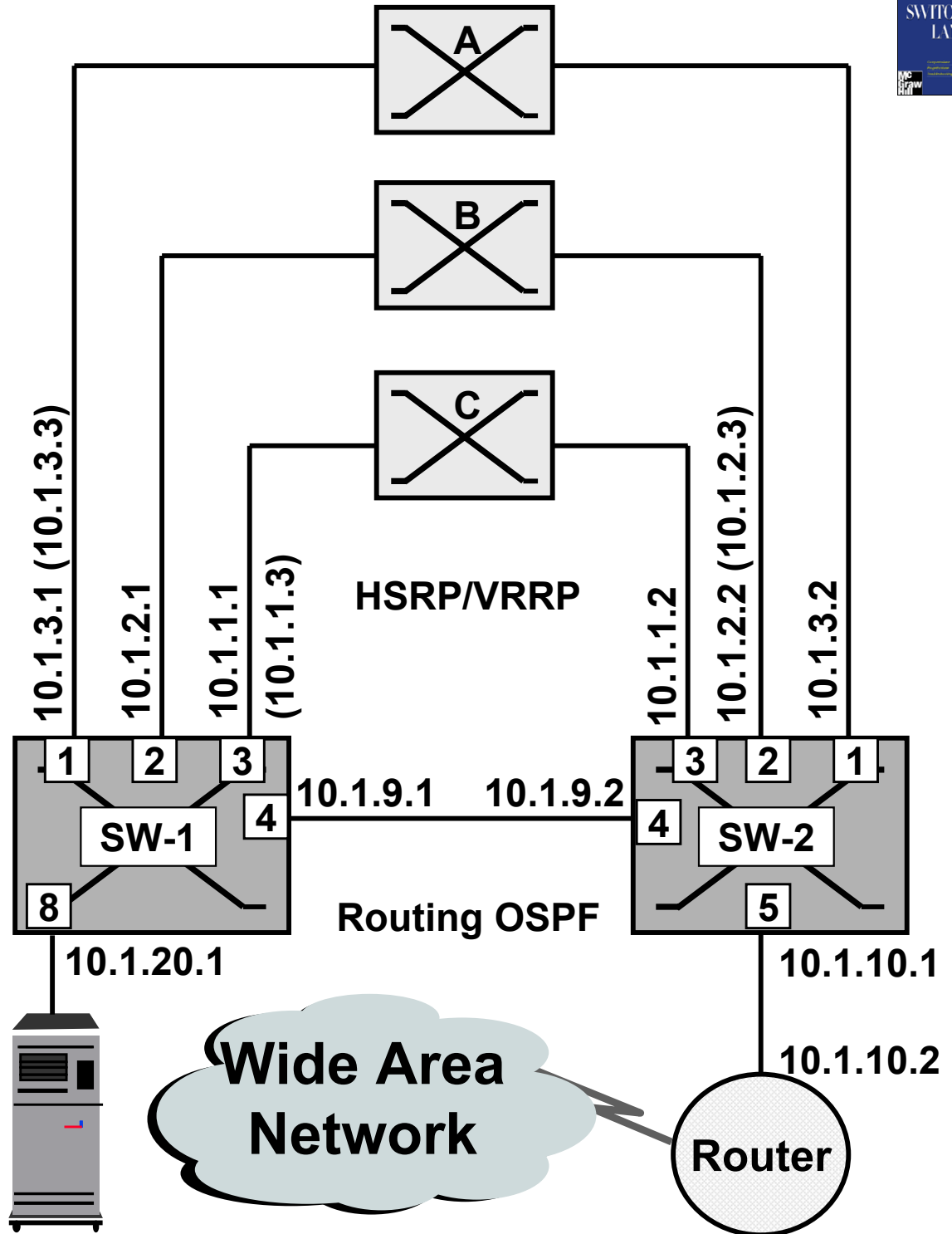
Layer 2 Switch

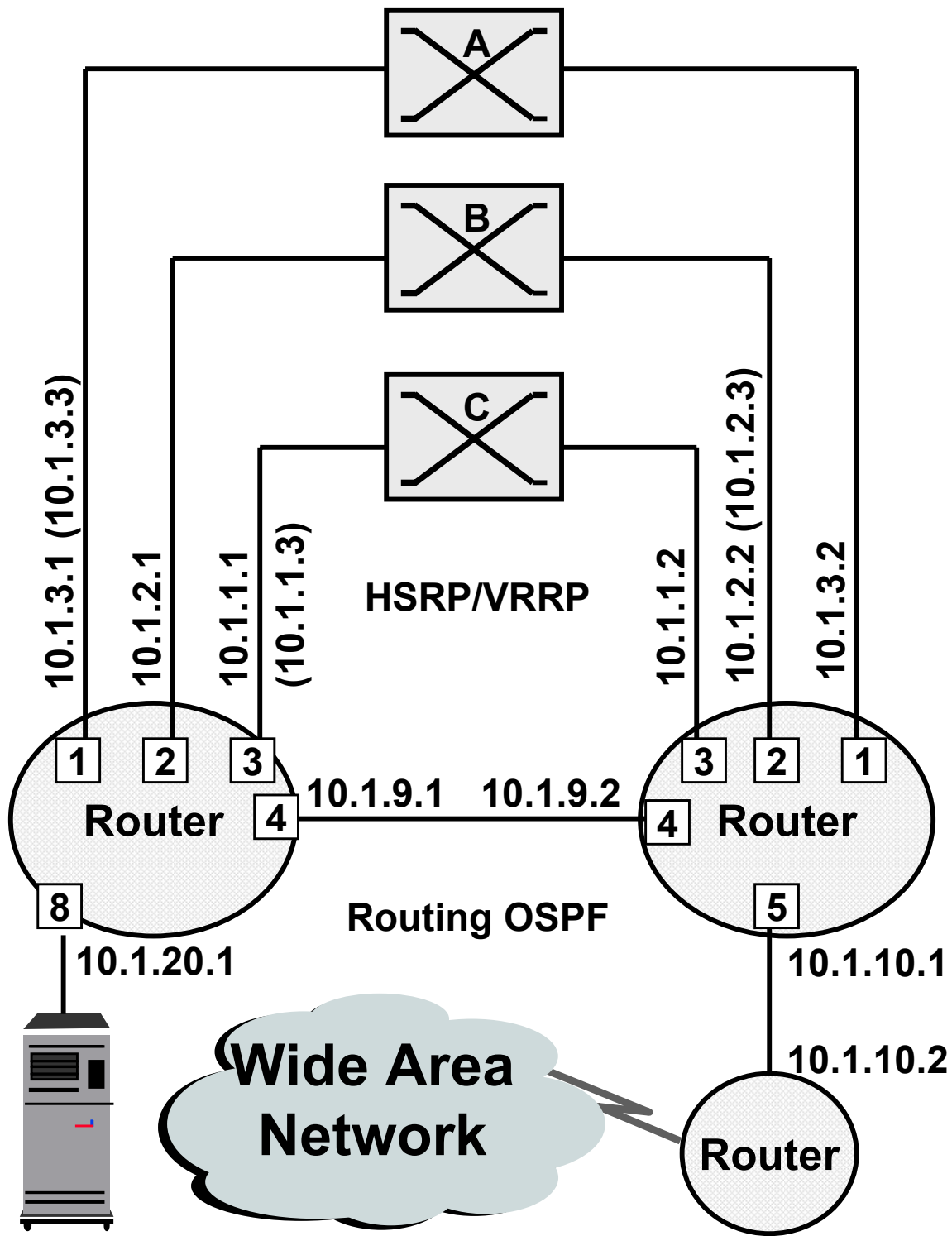


Multi-layer Switch

SW-1 port 1	Access (VLAN 4)
SW-1 port 2	Access (VLAN 3)
SW-1 port 3	Access (VLAN 2)
SW-1 port 4	Access (VLAN 5)
SW-1 port 8	Access (VLAN 7)
SW-2 port 1	Access (VLAN 4)
SW-2 port 2	Access (VLAN 3)
SW-2 port 3	Access (VLAN 2)
SW-2 port 4	Access (VLAN 5)
SW-2 port 5	Access (VLAN 6)

*There is no need
for the Spanning Tree!*





SW-1: IP addresses assignment and HSRP configuration

```
SW-1 (config) #interface vlan 2
SW-1 (config-if) #ip address 10.1.1.1 255.255.255.0
SW-1 (config-if) #standby 8 preempt
SW-1 (config-if) #standby 8 priority 105
SW-1 (config-if) #standby 8 ip 10.1.1.3
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
SW-1 (config) #interface vlan 3
SW-1 (config-if) #ip address 10.1.2.1 255.255.255.0
SW-1 (config-if) #standby 9 preempt
SW-1 (config-if) #standby 9 ip 10.1.2.3
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
SW-1 (config) #interface vlan 4
SW-1 (config-if) #ip address 10.1.3.1 255.255.255.0
SW-1 (config-if) #standby 10 preempt
SW-1 (config-if) #standby 10 priority 105
SW-1 (config-if) #standby 10 ip 10.1.3.3
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
SW-1 (config) #interface vlan 5
SW-1 (config-if) #ip address 10.1.9.1 255.255.255.252
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
SW-1 (config) #interface vlan 7
SW-1 (config-if) #ip address 10.1.20.1 255.255.255.252
```

Active Candidate

Standby Candidate

Active Candidate

SW-2: IP addresses assignment and HSRP configuration

```
SW-2 (config) #interface vlan 2
SW-2 (config-if) #ip address 10.1.1.2 255.255.255.0
SW-2 (config-if) #standby 8 preempt
SW-2 (config-if) #standby 8 ip 10.1.1.3
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
SW-2 (config) #interface vlan 3
SW-2 (config-if) #ip address 10.1.2.2 255.255.255.0
SW-2 (config-if) #standby 9 preempt
SW-2 (config-if) #standby 9 ip 10.1.2.3
SW-2 (config-if) #standby 9 priority 105
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
SW-2 (config) #interface vlan 4
SW-2 (config-if) #ip address 10.1.3.2 255.255.255.0
SW-2 (config-if) #standby 10 preempt
SW-2 (config-if) #standby 10 ip 10.1.3.3
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
SW-2 (config) #interface vlan 5
SW-2 (config-if) #ip address 10.1.9.2 255.255.255.252
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
SW-2 (config) #interface vlan 6
SW-2 (config-if) #ip address 10.1.10.1 255.255.255.252
```

Standby candidate

Active candidate

Standby candidate

SW-1: OSPF routing configuration

```
SW-1 (config) #interface vlan 5
SW-1 (config-if) #ip ospf cost 8
SW-1 (config) #exit
SW-1 (config) #router ospf 1
SW-1 (config) #redistribute connected
SW-1 (config-router) #network 10.1.1.0 0.0.0.255 area 40
SW-1 (config-router) #network 10.1.2.0 0.0.0.255 area 40
SW-1 (config-router) #network 10.1.3.0 0.0.0.255 area 40
SW-1 (config-router) #network 10.1.9.0 0.0.0.3 area 40
```

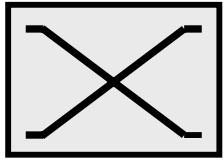
SW-2: OSPF routing configuration

```
SW-2 (config) #interface vlan 5
SW-2 (config-if) #ip ospf cost 8
SW-2 (config) #exit
SW-2 (config) #router ospf 1
SW-2 (config-router) #network 10.1.1.0 0.0.0.255 area 40
SW-2 (config-router) #network 10.1.2.0 0.0.0.255 area 40
SW-2 (config-router) #network 10.1.3.0 0.0.0.255 area 40
SW-2 (config-router) #network 10.1.9.0 0.0.0.3 area 40
SW-2 (config-router) #network 10.1.10.0 0.0.0.3 area 40
```

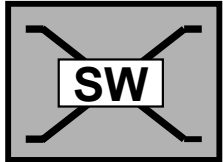
Router: OSPF routing configuration

```
Router (config) #router ospf 1
Router (config-router) #network 10.1.10.0 0.0.0.3 area 40
.....
```

LEGEND



Layer 2 Switch



Multi-layer Switch

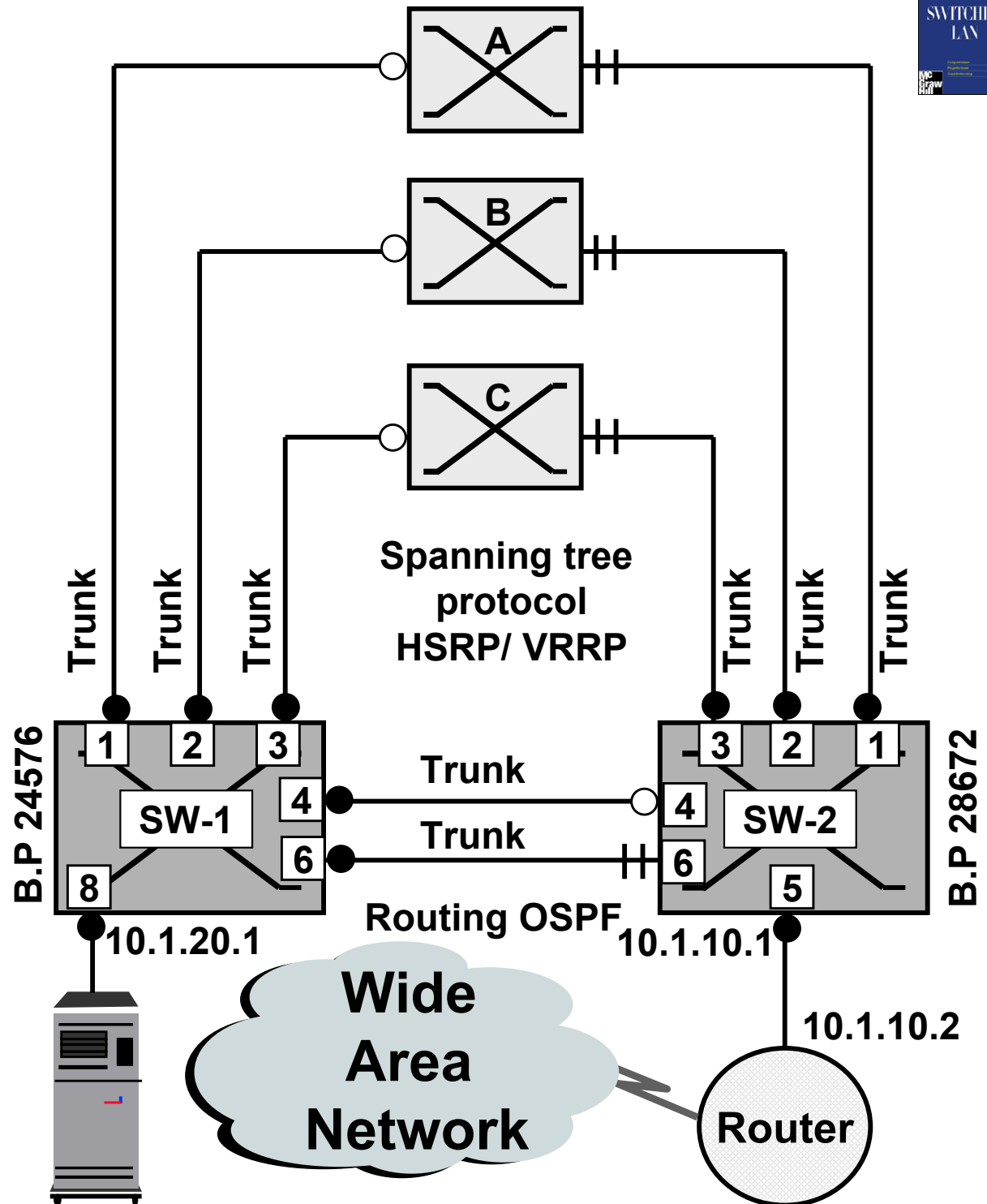
SW-1 ports 1,2,3,4 Trunk
SW-1 port 8 Access (VLAN7)

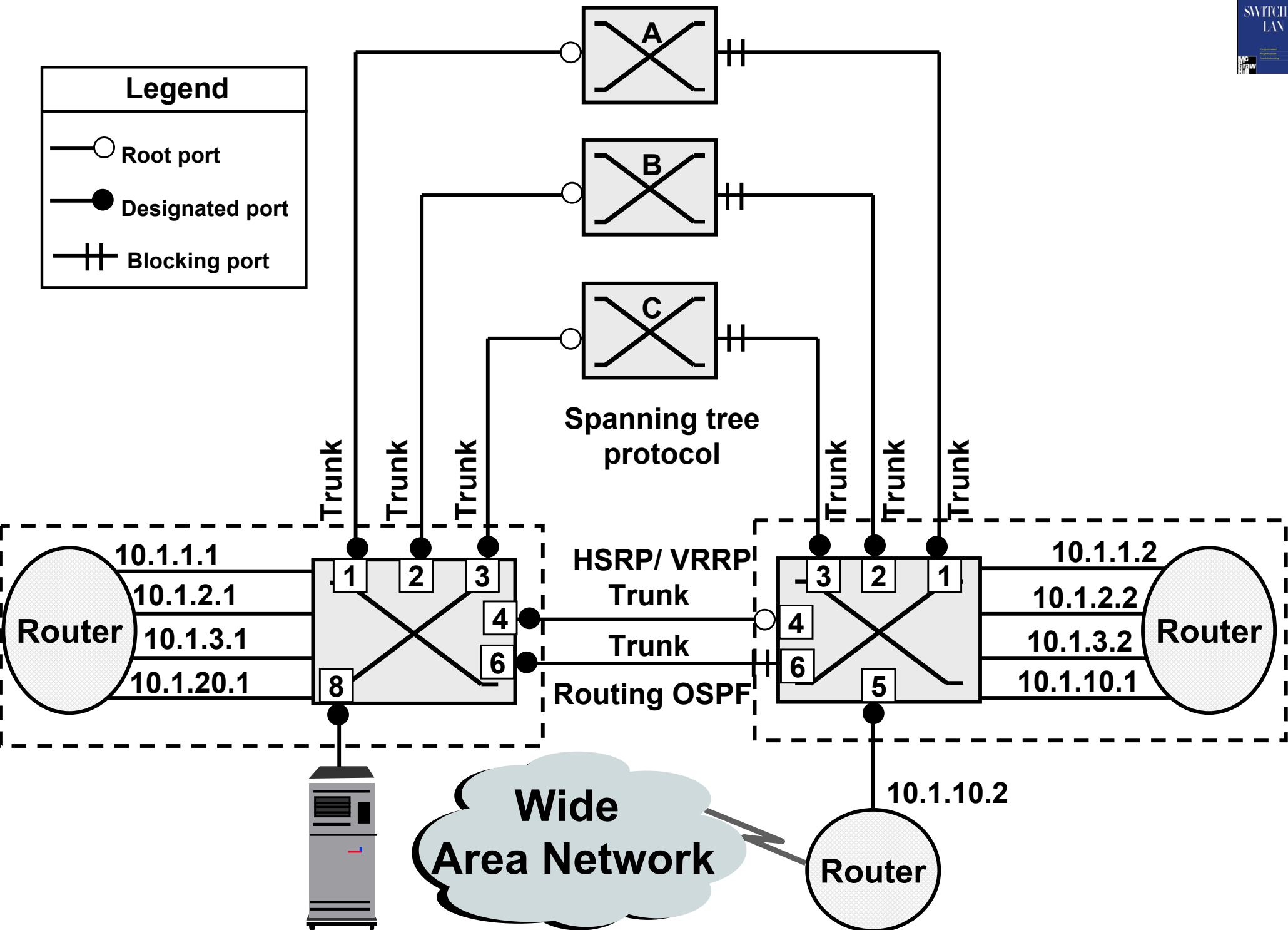
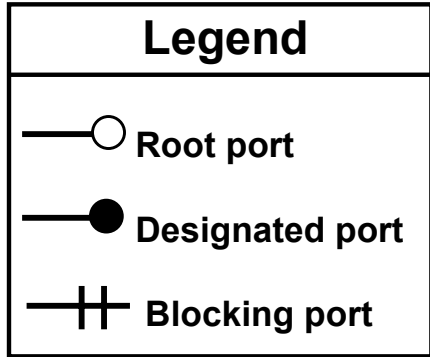
SW-2 ports 1,2,3,4 Trunk
SW-2 port 5 Access (VLAN6)

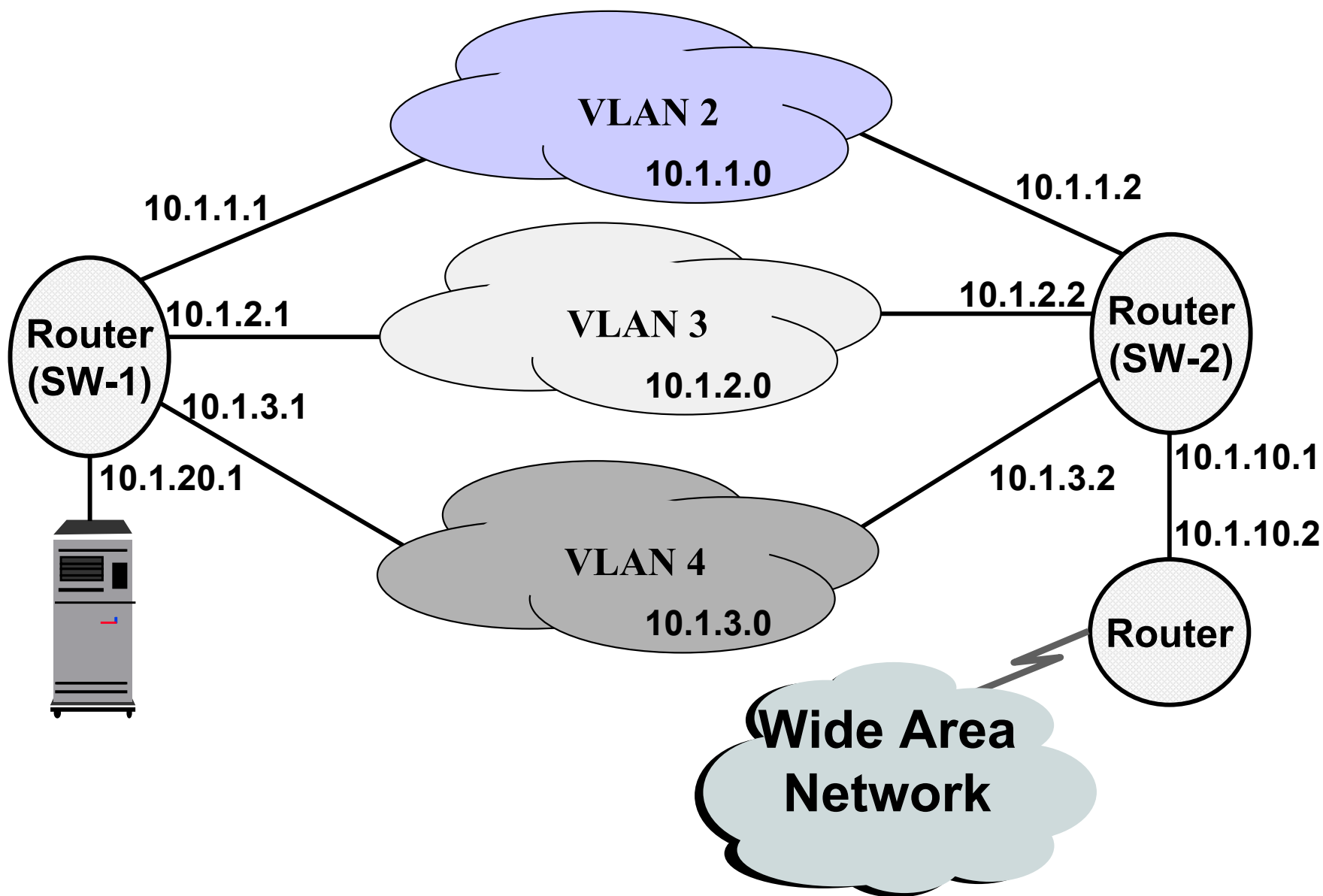
SW-1 VLAN 2 IP addr 10.1.1.1
SW-1 VLAN 3 IP addr 10.1.2.1
SW-1 VLAN 4 IP addr 10.1.3.1
SW-1 VLAN 7 IP addr 10.1.20.1

SW-2 VLAN 2 IP addr 10.1.1.2
SW-2 VLAN 3 IP addr 10.1.2.2
SW-2 VLAN 4 IP addr 10.1.3.2
SW-2 VLAN 6 IP addr 10.1.10.1

- Root port
- Designated port
- Blocking port







SW-1: IP addresses assignment and HSRP configuration

```
SW-1 (config) #interface vlan 2
SW-1 (config-if) #ip address 10.1.1.1 255.255.255.0
SW-1 (config-if) #standby 8 preempt
SW-1 (config-if) #standby 8 priority 105
SW-1 (config-if) #standby 8 ip 10.1.1.3
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
SW-1 (config) #interface vlan 3
SW-1 (config-if) #ip address 10.1.2.1 255.255.255.0
SW-1 (config-if) #standby 9 preempt
SW-1 (config-if) #standby 9 priority 105
SW-1 (config-if) #standby 9 ip 10.1.2.3
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
SW-1 (config) #interface vlan 4
SW-1 (config-if) #ip address 10.1.3.1 255.255.255.0
SW-1 (config-if) #standby 10 preempt
SW-1 (config-if) #standby 10 priority 105
SW-1 (config-if) #standby 10 ip 10.1.3.3
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
SW-1 (config) #interface vlan 7
SW-1 (config-if) #ip address 10.1.20.1 255.255.255.252
SW-1 (config-if) #no shutdown
SW-1 (config-if) #exit
```

Active candidate

Active candidate

Active candidate

SW-2: IP addresses assignment and HSRP configuration

```
SW-2 (config) #interface vlan 2
SW-2 (config-if) #ip address 10.1.1.2 255.255.255.0
SW-2 (config-if) #standby 8 preempt
SW-2 (config-if) #standby 8 ip 10.1.1.3
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
SW-2 (config) #interface vlan 3
SW-2 (config-if) #ip address 10.1.2.2 255.255.255.0
SW-2 (config-if) #standby 9 preempt
SW-2 (config-if) #standby 9 ip 10.1.2.3
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
SW-2 (config) #interface vlan 4
SW-2 (config-if) #ip address 10.1.3.2 255.255.255.0
SW-2 (config-if) #standby 10 preempt
SW-2 (config-if) #standby 10 ip 10.1.3.3
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
SW-2 (config) #interface vlan 6
SW-2 (config-if) #ip address 10.1.10.1 255.255.255.252
SW-2 (config-if) #no shutdown
SW-2 (config-if) #exit
```

Standby candidate

Standby candidate

Standby candidate

SW-1: OSPF routing configuration

```
SW-1 (config) #router ospf 1  
SW-1 (config) #redistribute connected  
SW-1 (config-router) #network 10.1.1.0 0.0.0.255 area 40  
SW-1 (config-router) #network 10.1.2.0 0.0.0.255 area 40  
SW-1 (config-router) #network 10.1.3.0 0.0.0.255 area 40
```

SW-2: OSPF routing configuration

```
SW-2 (config) #router ospf 1  
SW-2 (config-router) #network 10.1.1.0 0.0.0.255 area 40  
SW-2 (config-router) #network 10.1.2.0 0.0.0.255 area 40  
SW-2 (config-router) #network 10.1.3.0 0.0.0.255 area 40  
SW-2 (config-router) #network 10.1.10.0 0.0.0.3 area 40
```

Router: OSPF routing configuration

```
Router (config) #router ospf 1  
Router (config-router) #network 10.1.10.0 0.0.0.3 area 40  
..... •
```

