

Virtualne mreže i inter-Vlan rutiranje

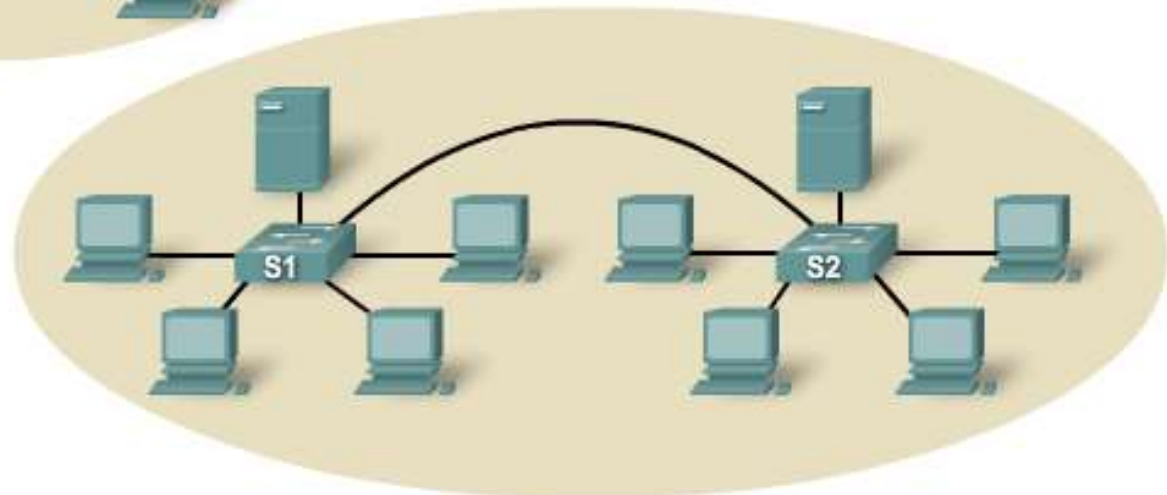
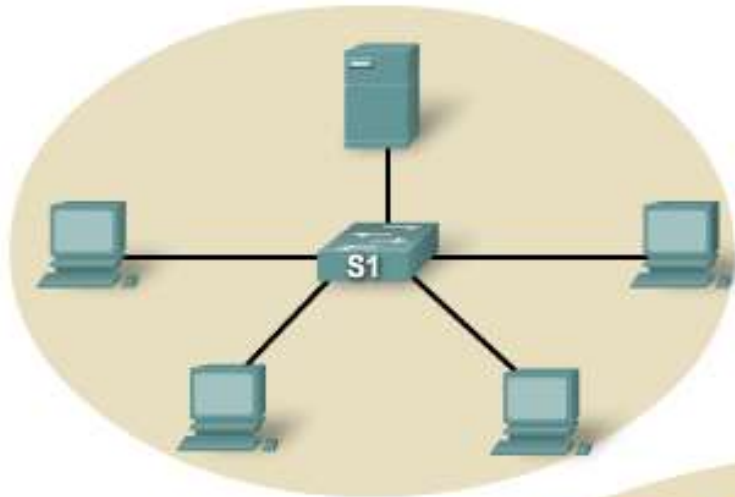
Sadržaj

- * Brotkast domeni i razdvajanje brotkast domena
 - * Virtualne mreže
 - * IEEE 802.1q
 - * Konfiguracija VLAN-ova
 - * Inter-VLAN rutiranje
 - * Konfiguracija Inter-VLAN rutiranja
-
- Literatura: *CCNA Exploration LAN Switching and Wireless*, kompletna poglavlja 3 i 6
 - Konfiguracija L3 svičeva

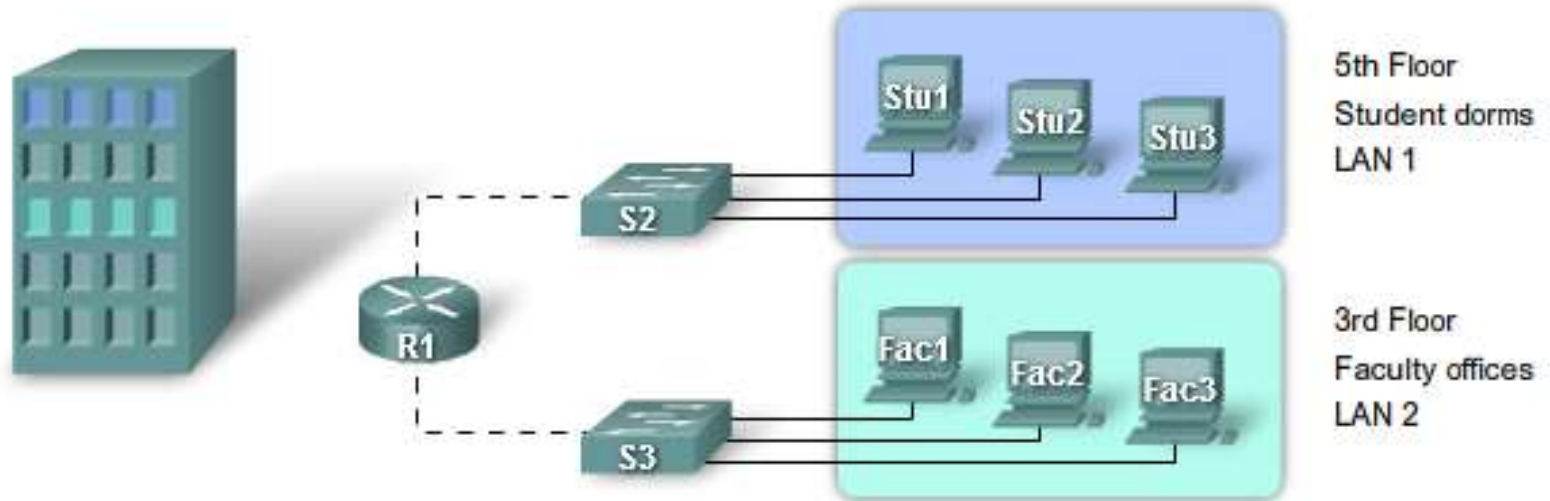
Brotkast domeni i razdvajanje brotkast domena

Brotkast domen

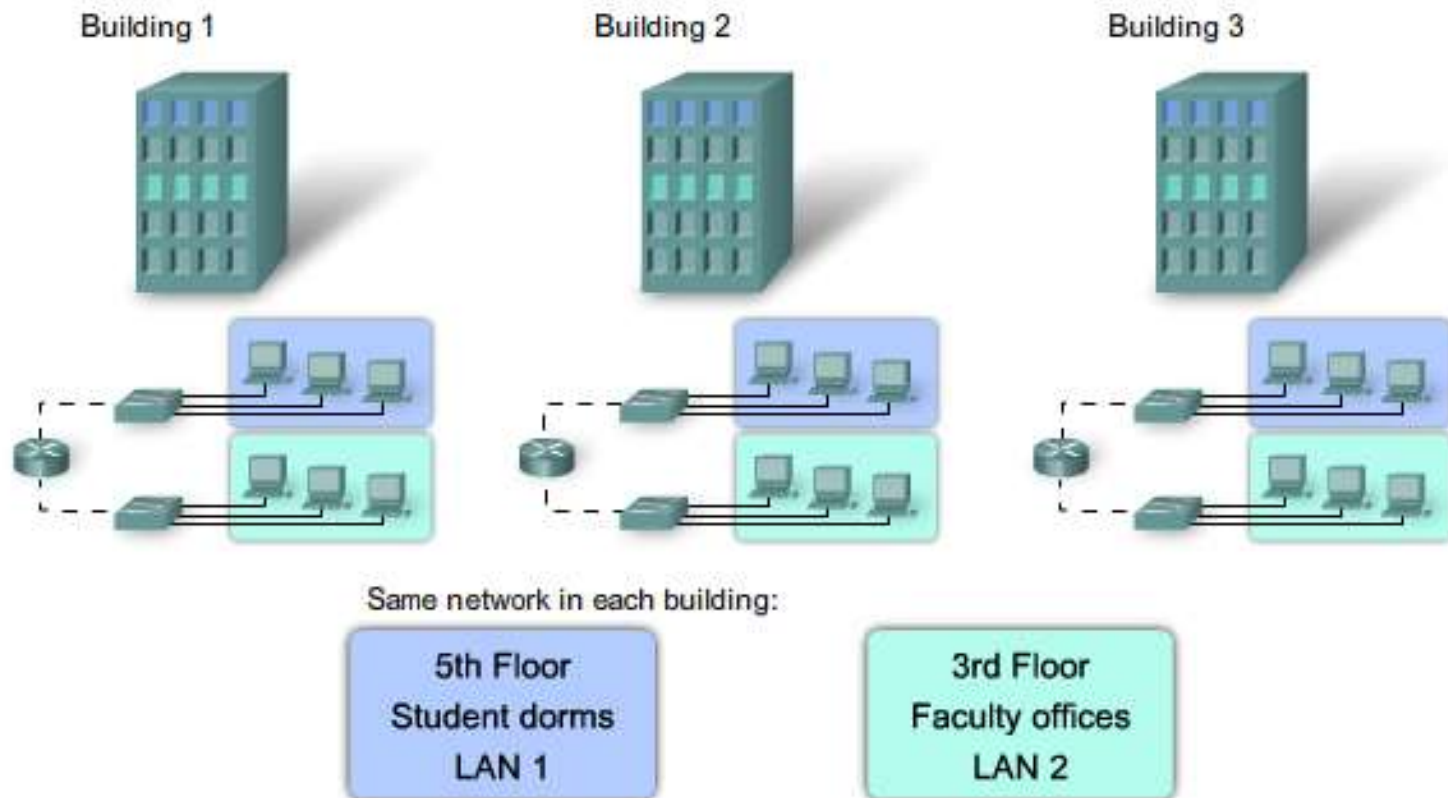
- * Brotkast domen čini skup uređaja do kojih se prostire brotkast frejm poslat sa bilo kog uređaja tog skupa



- * Bez virtualnih mreža, brotkast domeni mogu biti razdvojeni jedino uređajima L3 nivoa, kao što su ruteri

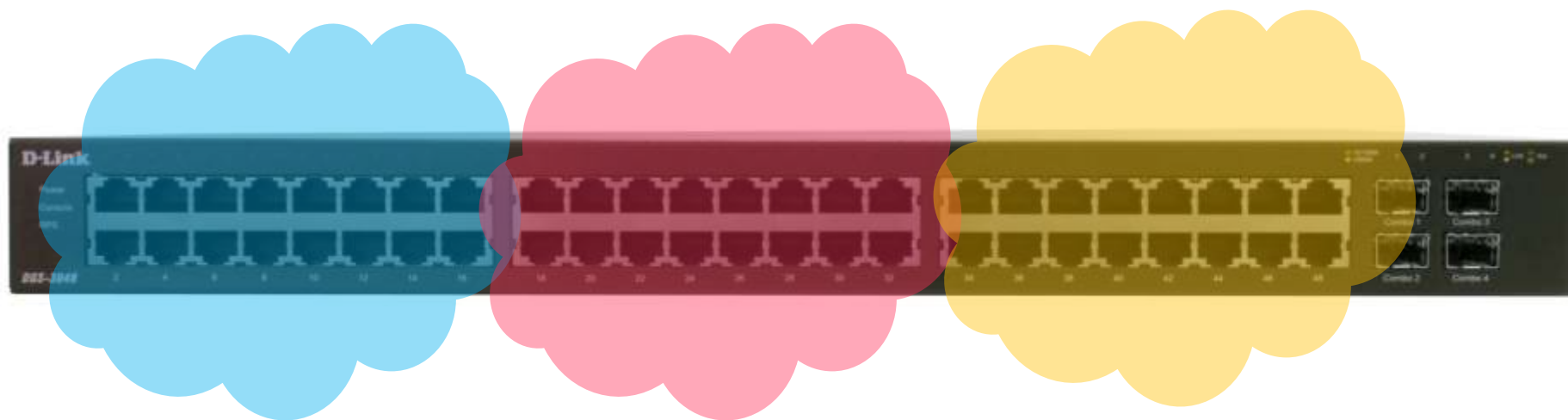


- * Ukoliko je potrebno da korisnici na različitim lokacijama pripadaju istom brotkast domenu, teško je projektovati takvu mrežu na "klasičan" način.



Administrativno razdvajanje brotkast domena

- * Iz operativnog sistema upravljivih mrežnih svičeva moguće je administrativno razdvojiti portove u različite brotkast domene



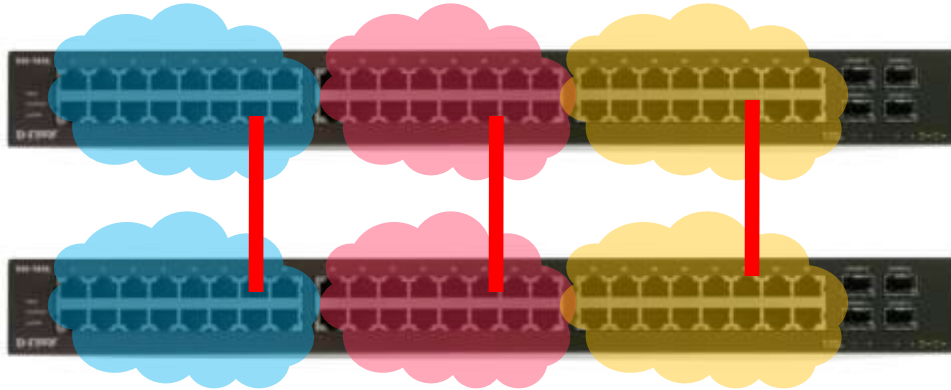
- * Dobijeni logički raspored je ekvivalentan:



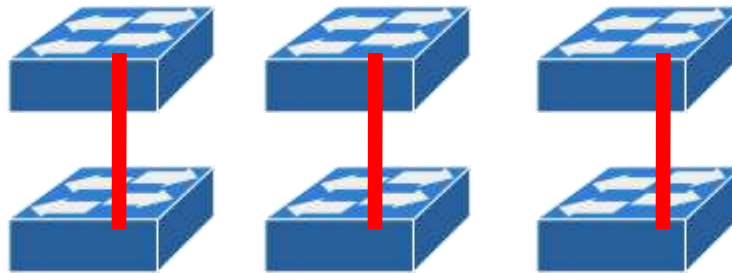
Administrativno razdvajanje brotkast domena

- * Ako su 2 sviča razdvojena na po tri brotkast domena, praktično se na mreži se nalazi 6 "logičkih" svičeva, koji se međusobno mogu povezati kao da su u pitanju "fizički" uređaji:

Fizički izgled:



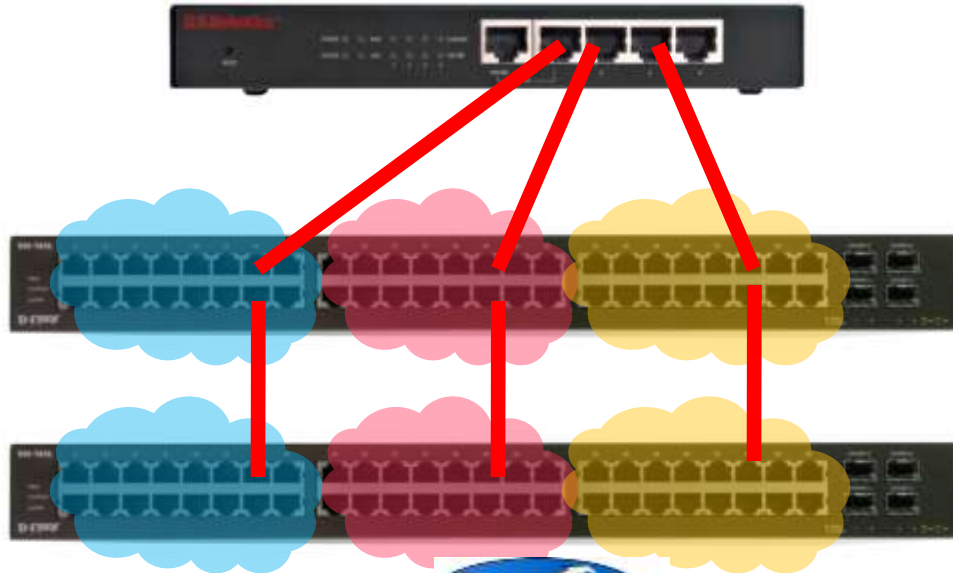
Logički izgled:



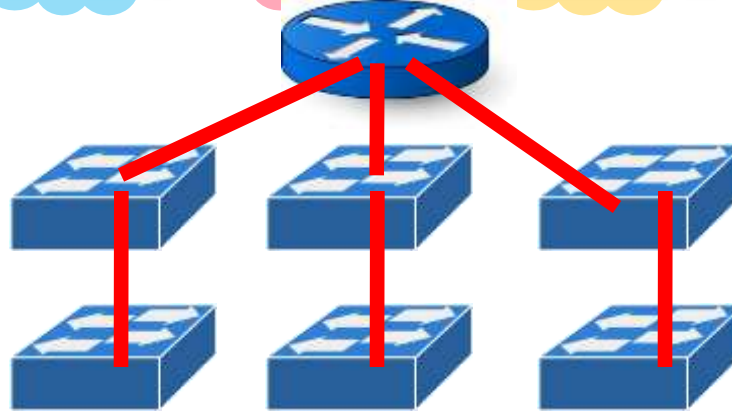
Administrativno razdvajanje brotkast domena

- * Ovako razdvojeni brotkast domeni mogu imati međusobnu komunikaciju jedino preko rutera

Fizički izgled:



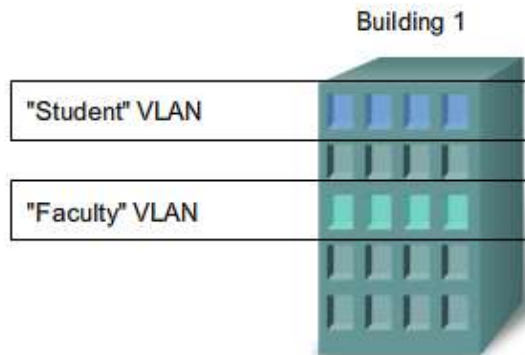
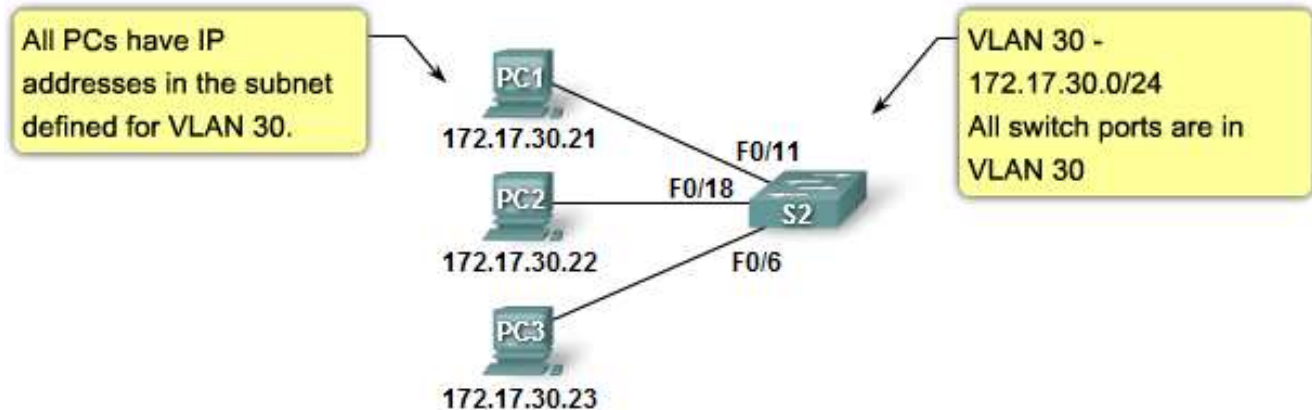
Logički izgled:



Virtualne mreže

VLAN

* Virtualna mreža je administrativno definisani skup portova na svičevima koji pripadaju istom brotkast domenu



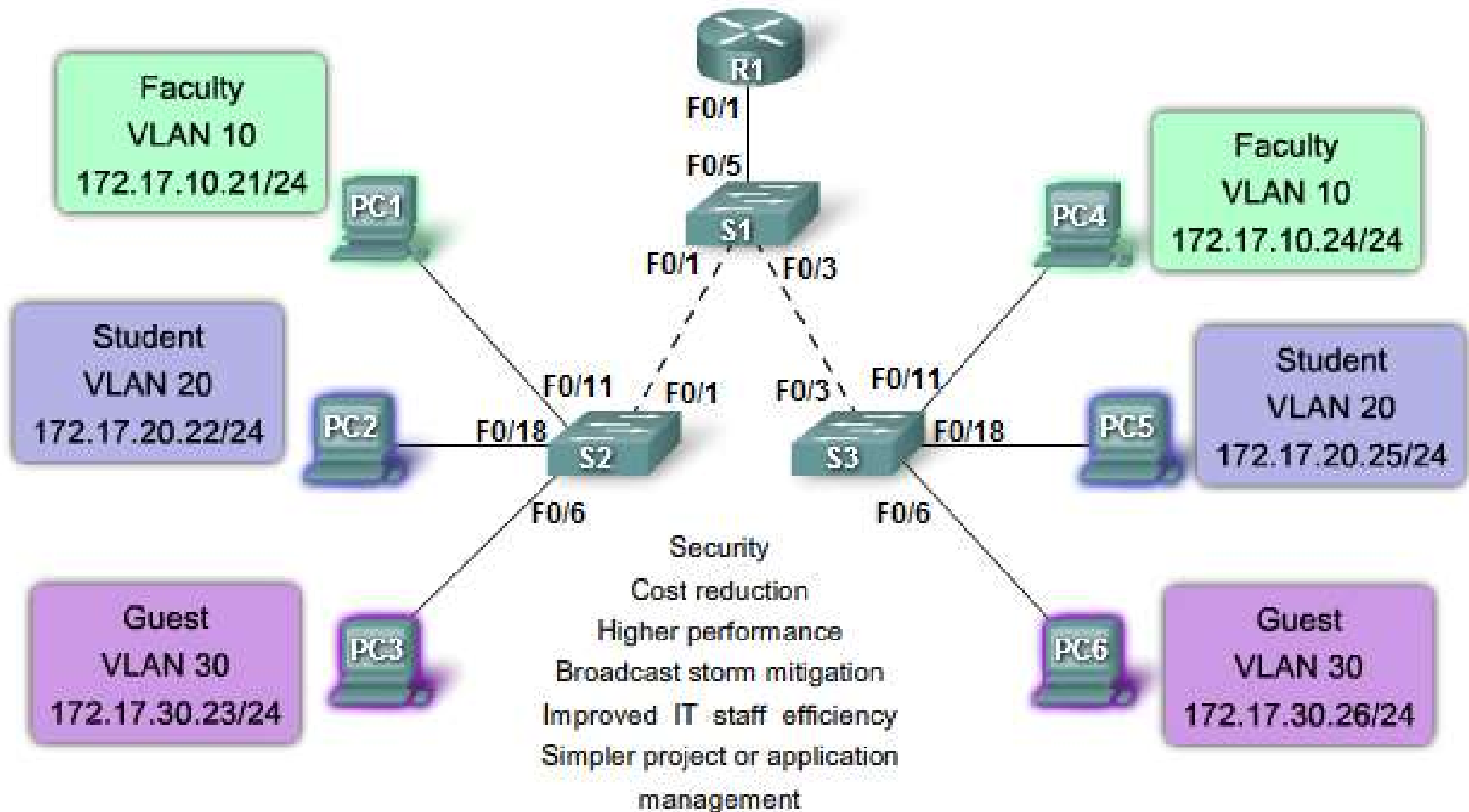
- A VLAN = Subnet (in modern switched LANs)
- On the switch
 - Configure the VLAN
 - Assign the port to the VLAN
- On the PC assign an IP address in the VLAN subnet

- A VLAN is an independent LAN network.
- A VLAN allows student and faculty PCs to be separated although they share the same infrastructure.
- A VLAN can be named for easier identification.

Prednosti od uvođenja virtualnih mreža

- * Mogućnost nezavisnog projektovanja fizičke i logičke topologije
- * Bezbednost
- * Bolje performanse
- * Ograničavanje eventualnih "brotkast" oluja u slučaju nepravilno konfigurisanih redundantnih topologija
- * Bolja mogućnost održavanja mreže

Koristi od uvođenja virtualnih mreža



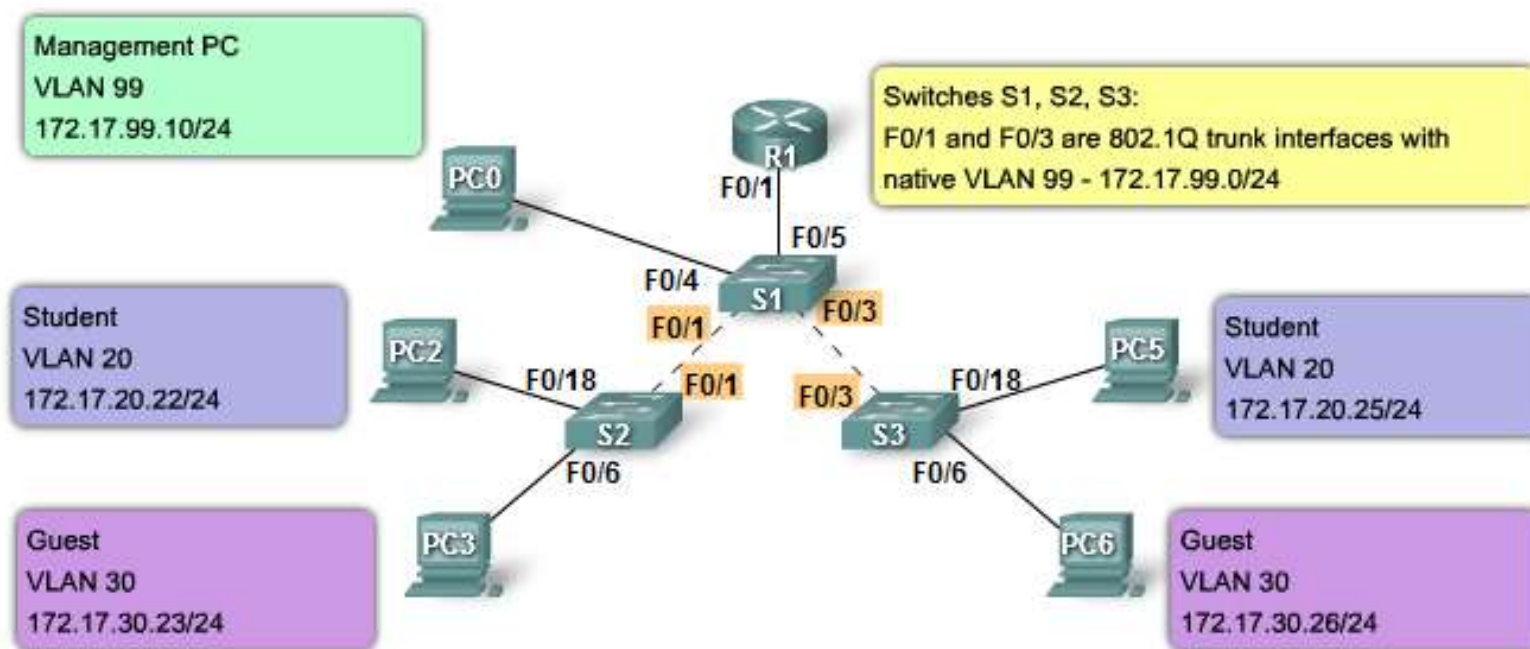
Označavanje VLAN-ova

- VLAN ID
 - Normal-range IDs
 - 1 – 1005
 - 1002 -1005 reserved for Token Ring and FDDI VLANs
 - 1 and 1002 to 1005 are automatically created and cannot be removed
 - Stored in the `vlan.dat` file in flash memory
 - Extended-range IDs
 - 1006 – 4094
 - Designed for service providers
 - Have fewer options than normal range VLANs
 - Stored in the running configuration file
- A Cisco Catalyst 2960 switch supports 255 normal and extended range VLANs

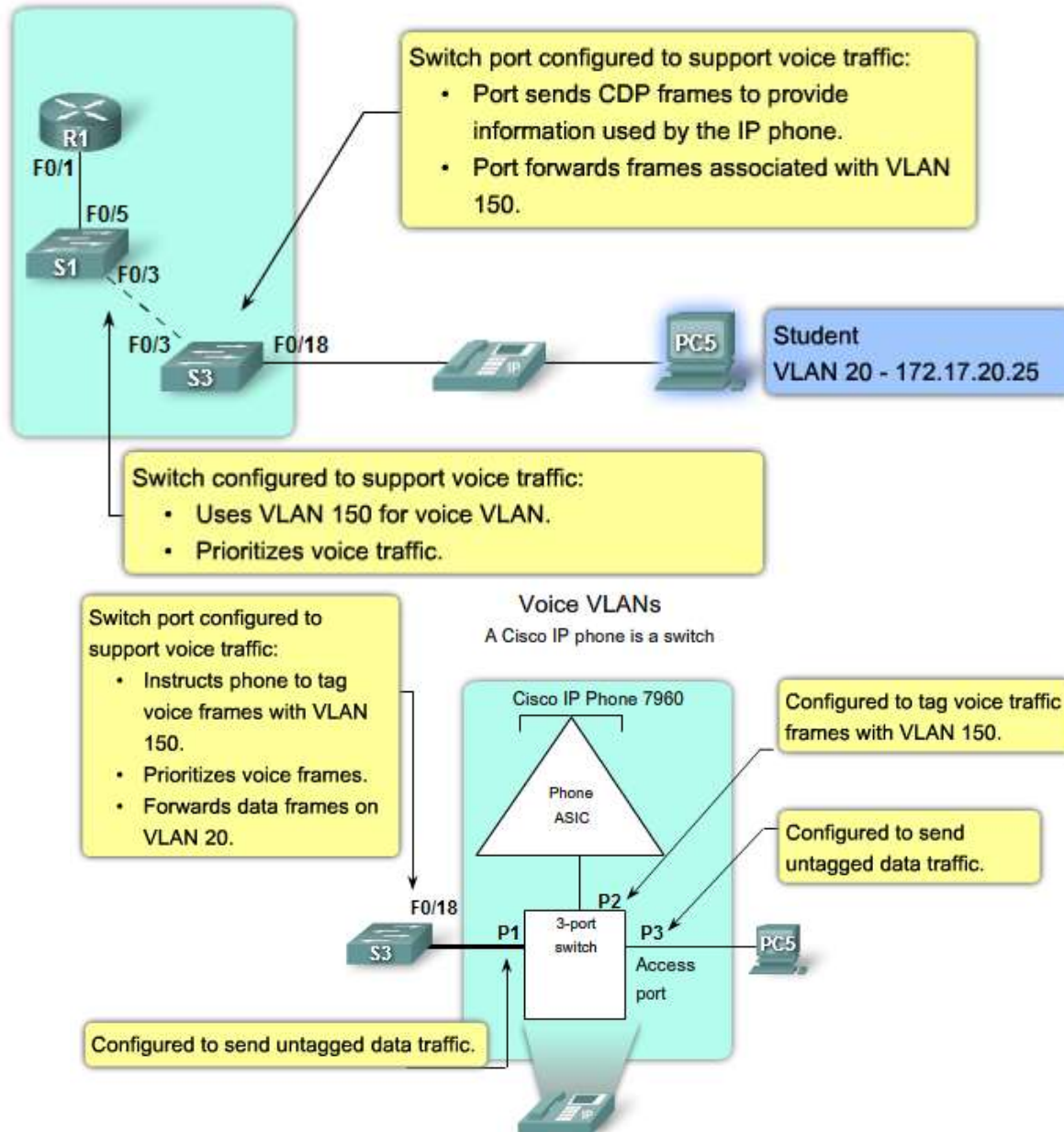
Tipovi VLAN-ova

* VLAN-ovi se mogu klasifikovati prema nameni na:

- VLAN za podatke
- Default VLAN
- "Native" VLAN
- Menadžment VLAN
- "Voice" VLAN



"Voice" VLAN



Modovi za dodelu porta sviča VLANu

* Statički mod

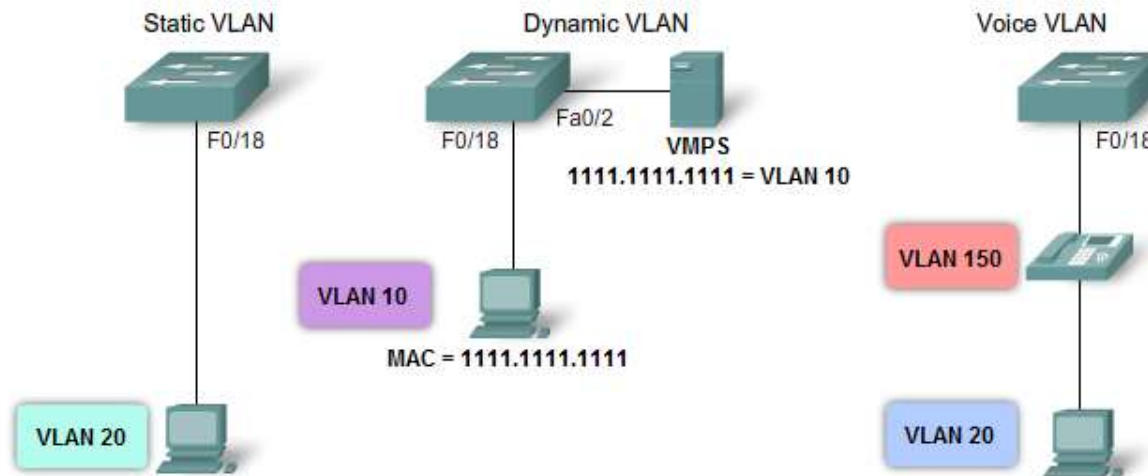
- Port je administrativno dodeljen brotkast domenu

* Dinamički mod

- Prilikom pristupa uređaja portu, na osnovu MAC adrese uređaja svič određuje kom brotkast domenu pripada uređaj. Obično za ovaj mod postoji centralizovani server koga mogu kontaktirati svičevi.

* "Voice" mod

- Specijalan tip, gde port sviča istovremeno pripada dvama brotkast domenima: brotkast domenu za podatke i za *voice*.



Primer statičkog moda

- * Port sviča se može priključiti brotkast domenu na sledeći način

Static Port Mode Configuration

```
S3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#interface fastEthernet0/18
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 20
S3(config-if)#end
```

Primer *voice* moda

- * Port sviča se može konfigurisati tako *voice* port na sledeći način

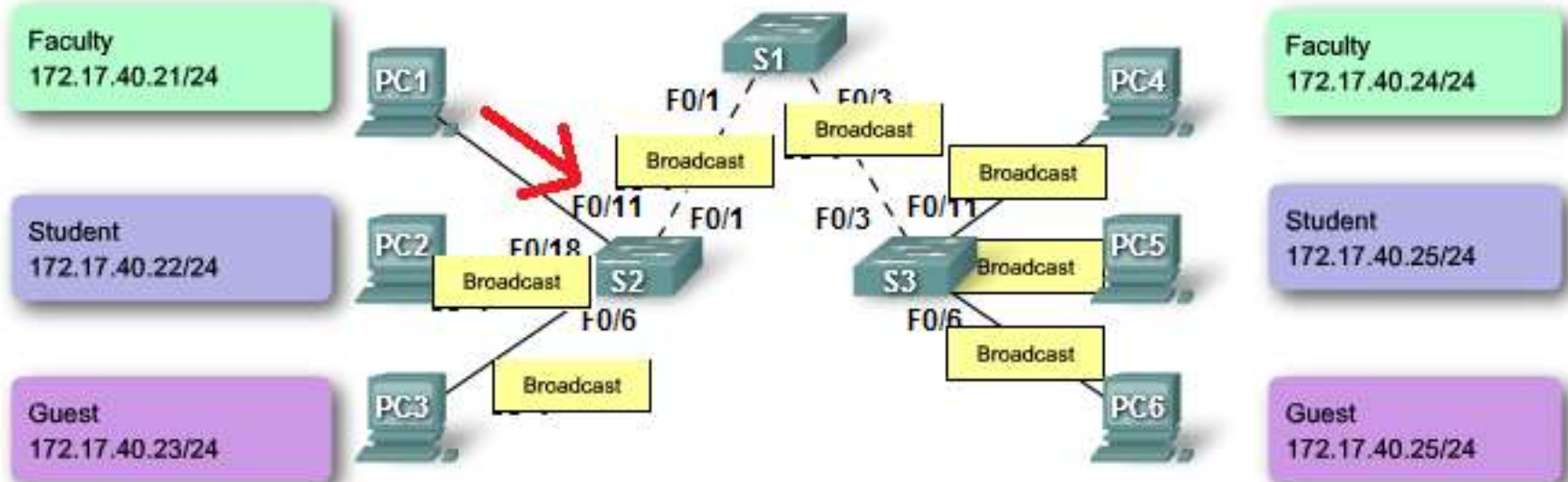
Voice Mode Configuration

```
S3(config)#interface fastEthernet 0/18
S3(config-if)#mls qos trust cos
S3(config-if)#switchport voice vlan 150
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 20
S3(config-if)#end
```

```
S3#show interfaces fa0/18 switchport
Name: Fa0/18
Switchport: Enabled
Administrative Mode: static access
Operational Mode: down
Administrative Trunking Encapsulation: dot1q
Negotiation of Trunking: Off
Access Mode VLAN: 20 (untagged)
```

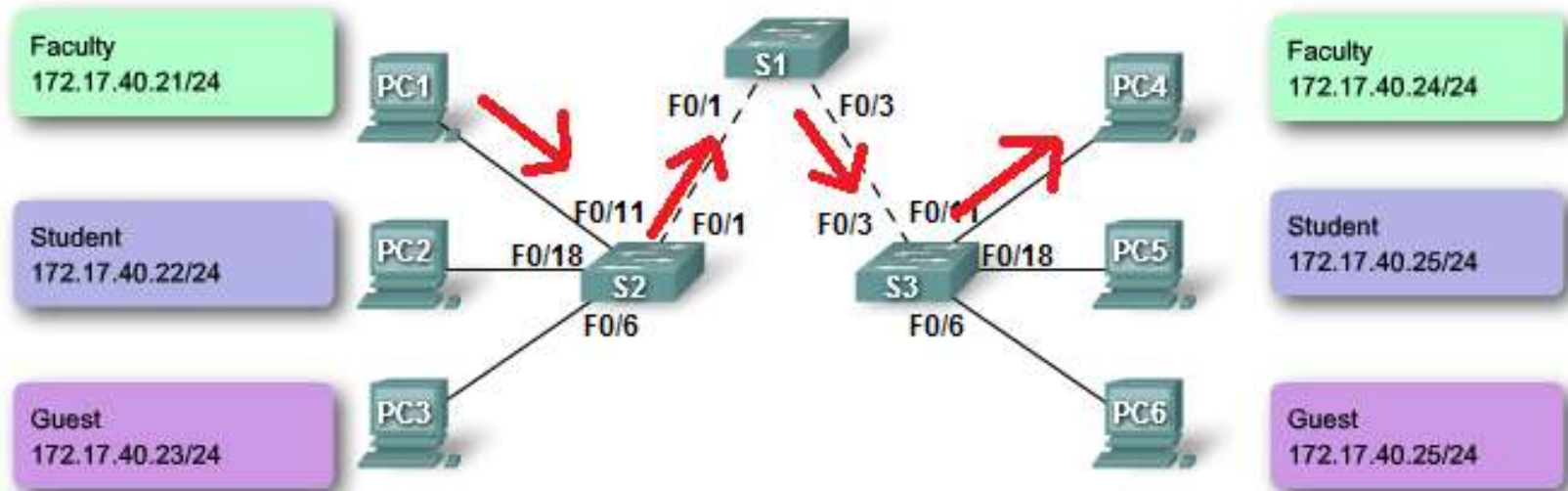
Kontrola brotkast domena VLAN-ovima

* Bez VLAN-ova



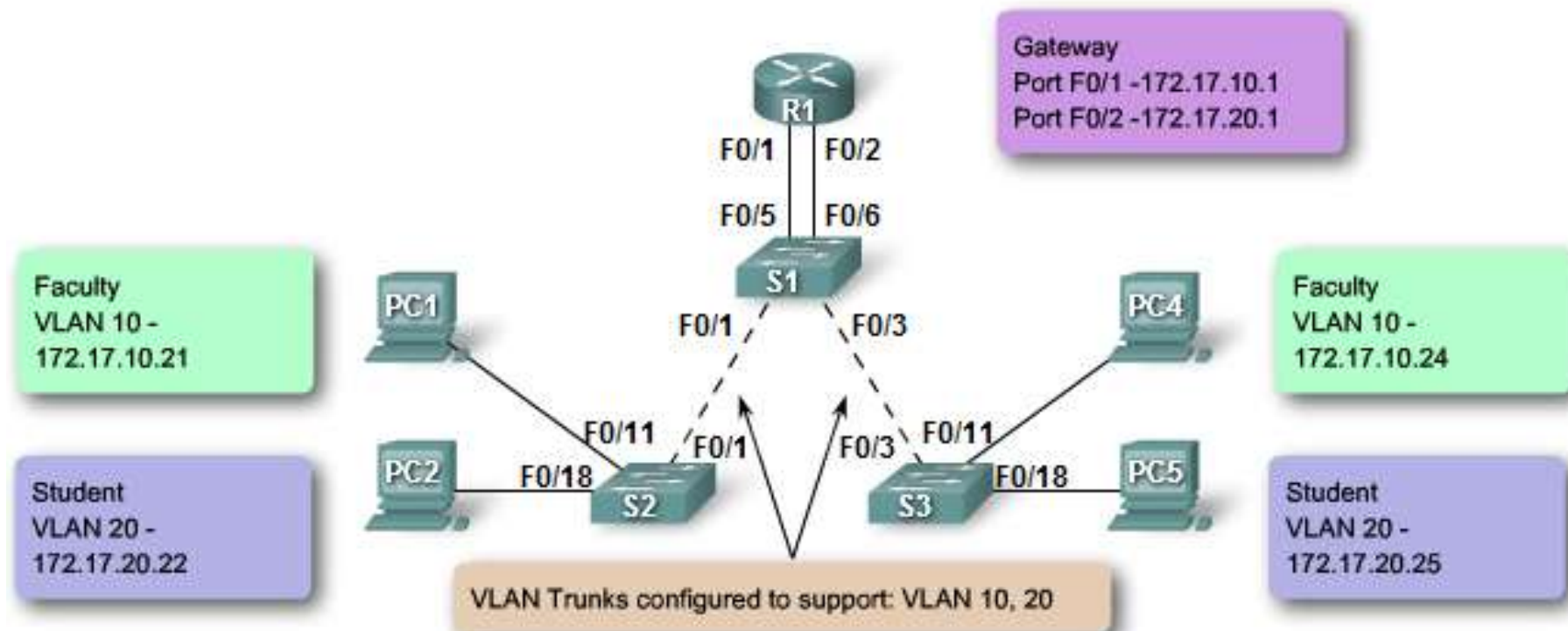
Kontrola brotkast domena VLAN-ovima

* Sa VLAN-ovima



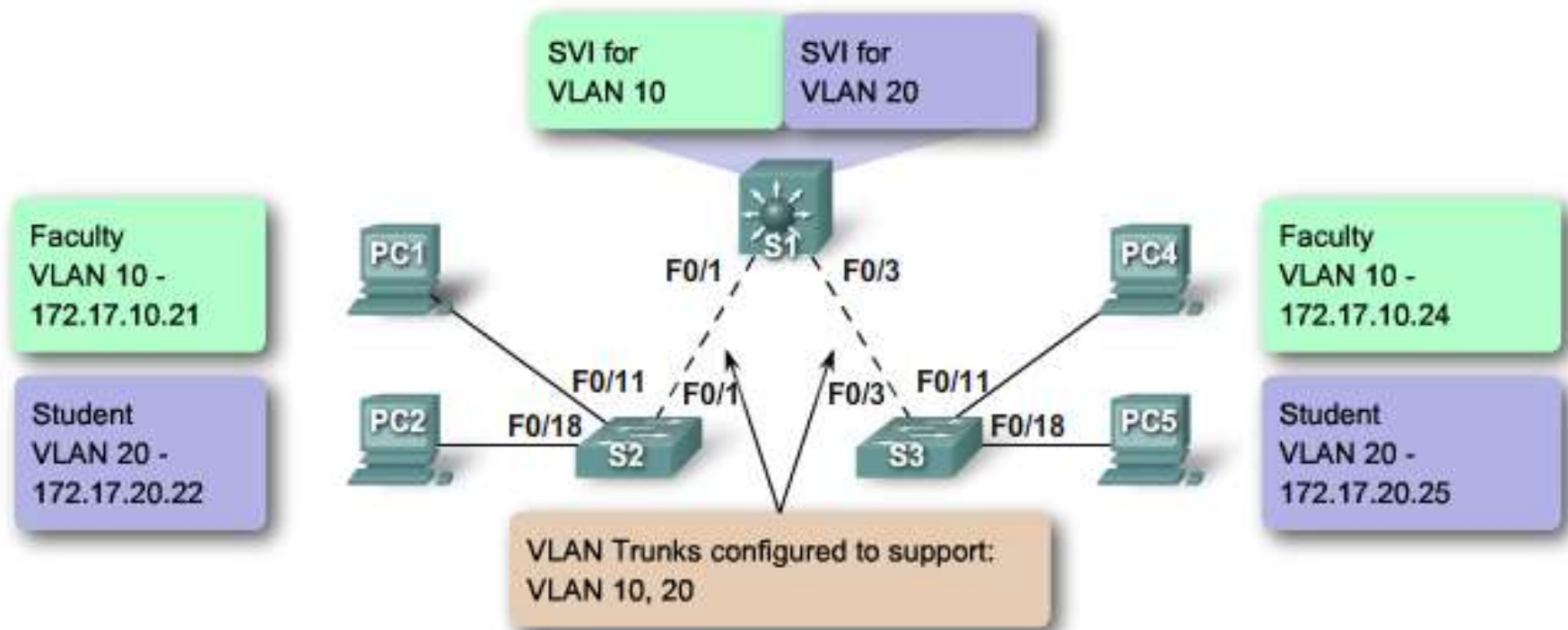
Inter- i Intra-VLAN komunikacija

* Detaljno objašnjenje...



L3 svičevi

- * SVI interfejsi
- * Inter- i Intra-VLAN komunikacija preko L3 sviča



IEEE 802.1q

Trunk

- * Trunk (eng. *trunk*) je veza preko koje se prenose frejmovi iz više VLAN-ova
- * Trunk port je port koji je "deo" više brotkast domena istovremeno.
- * Da bi se razlikovalo kom domenu frejm pripada, frejm se na tranku dodatno "obeležava"
- * Postoje dva protokola
 - ISL (vlasnički protokol, Cisco)
 - IEEE 802.1q (skraćeno: dot1q)

Trunk

VLAN 10 Faculty/Staff - 172.17.10.0/24
VLAN 20 Students - 172.17.20.0/24
VLAN 30 Guest - 172.17.30.0/24
VLAN 99 Management and Native - 172.17.99.0/24

Ports
F0/1-5 are 802.1Q trunk interfaces with native VLAN 99
F0/11-17 are in VLAN 10
F0/18-24 are in VLAN 20
F0/6-10 are in VLAN 30

Faculty
VLAN 10 -
172.17.10.21

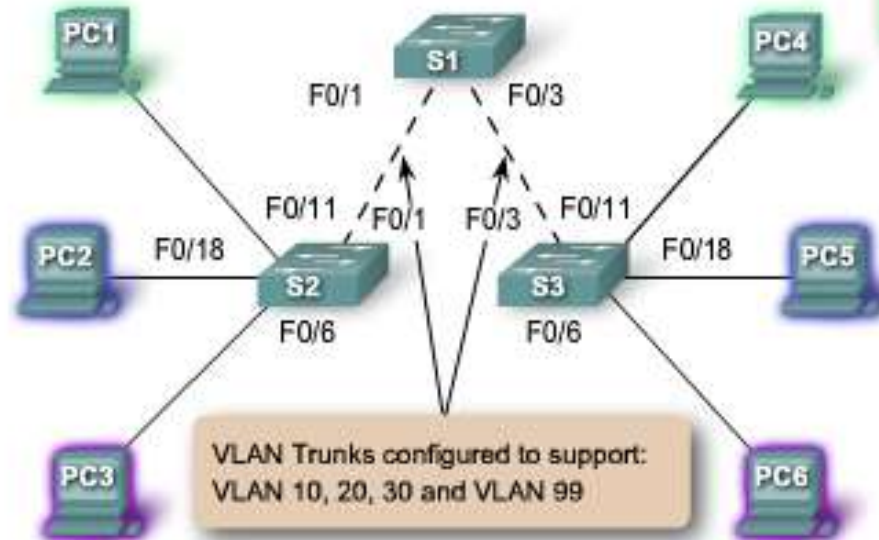
Student
VLAN 20 -
172.17.20.22

Guest
VLAN 30 -
172.17.30.23

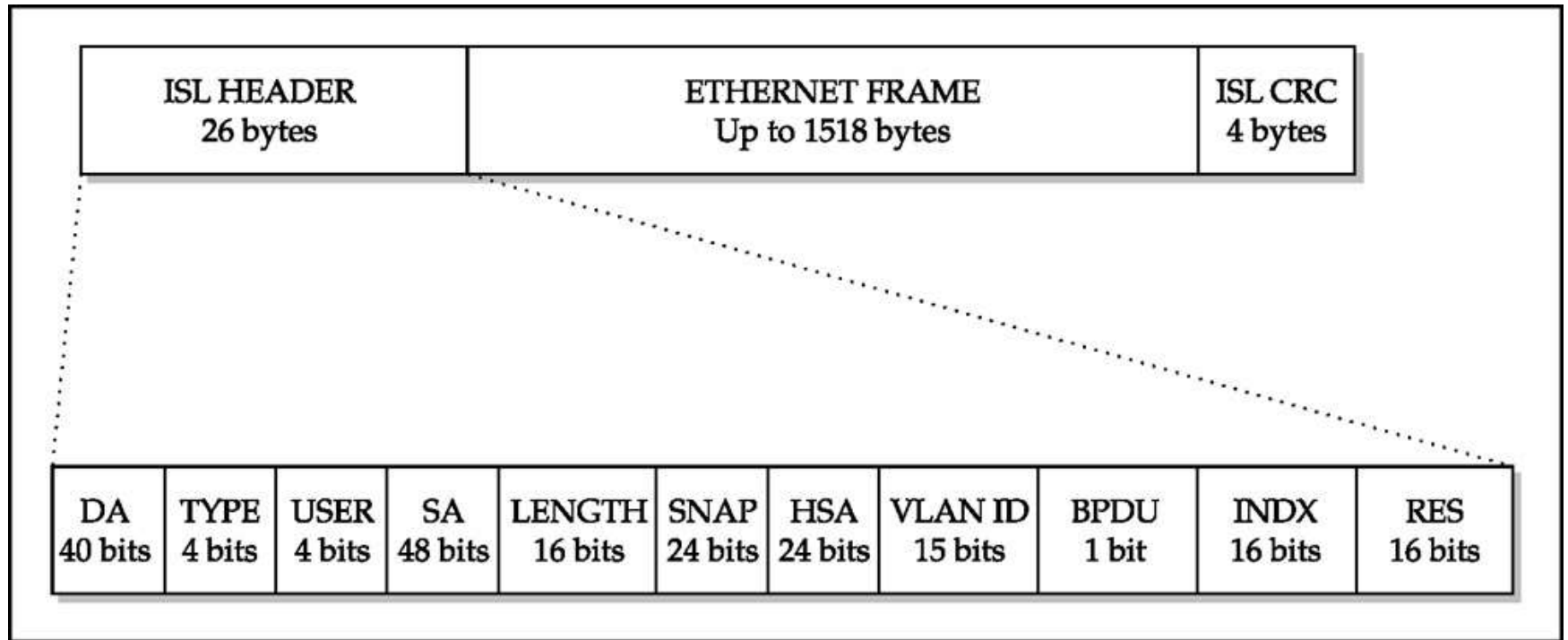
Faculty
VLAN 10 -
172.17.10.24

Student
VLAN 20 -
172.17.20.25

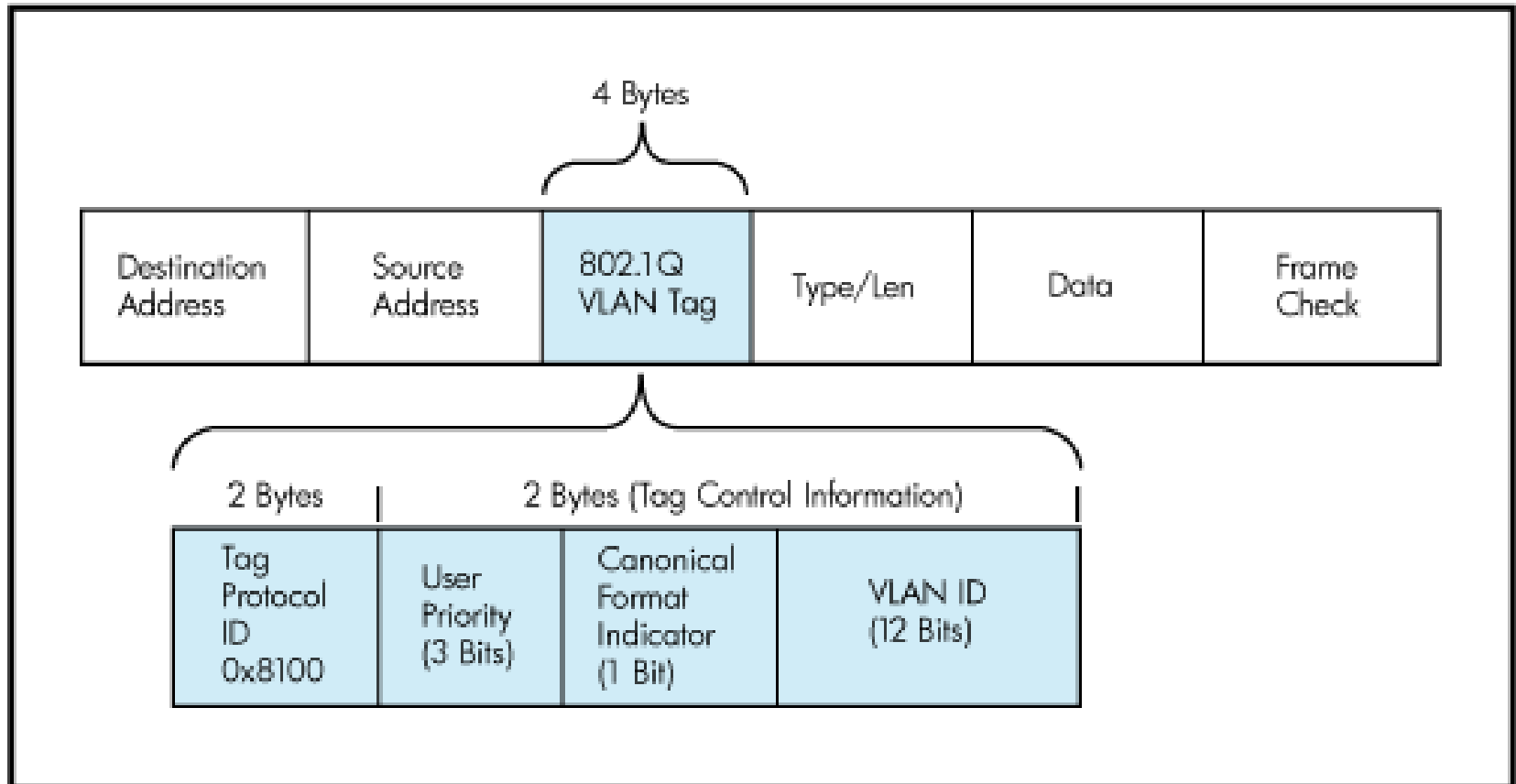
Guest
VLAN 30 -
172.17.30.26



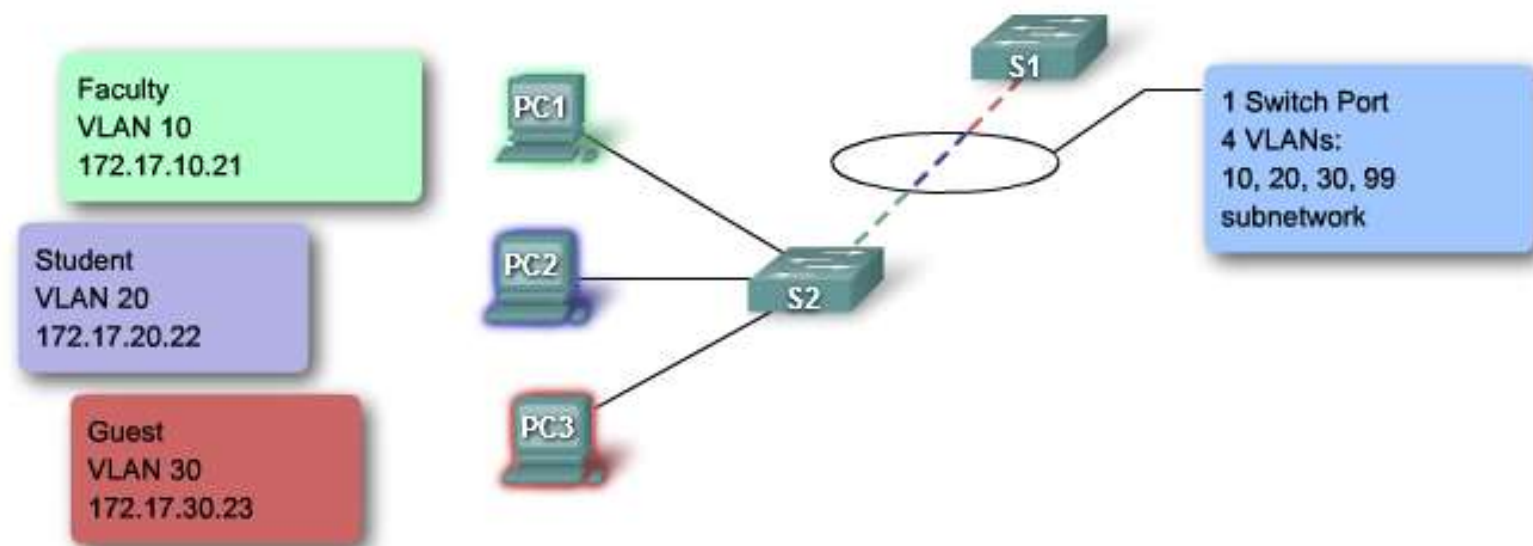
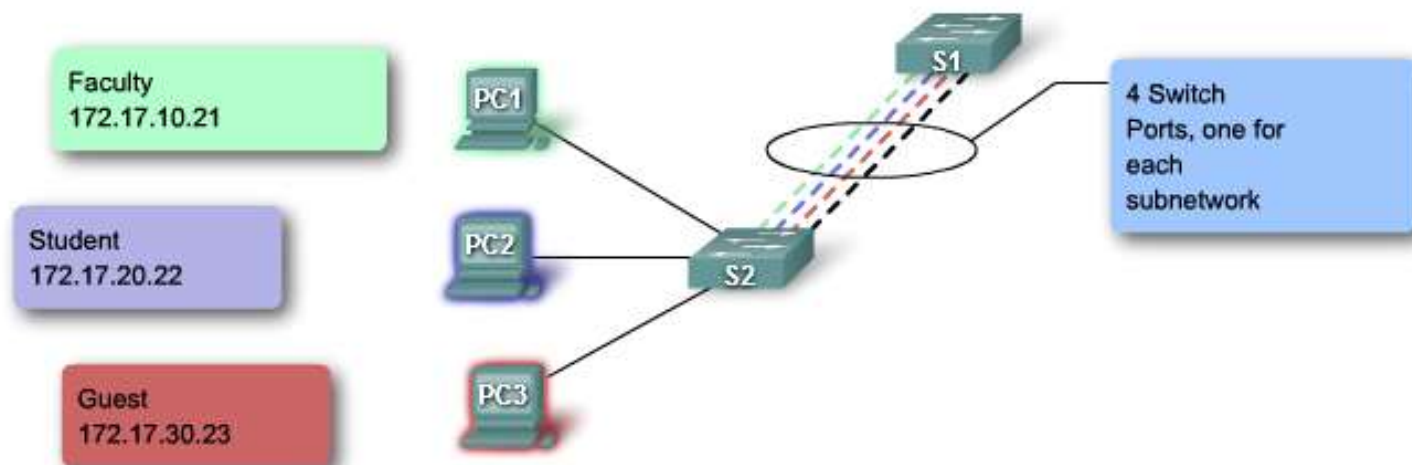
ISL frejm format



IEEE 802.1q frejm format



VLAN sa trankom i bez tranka



Tagovani frejmovi na "nativ" VLAN-u

Tagged Frames on the Native VLAN

- Dropped by the switch
- Devices should not tag control traffic destined for the native VLAN

UnTagged Frames on the Native VLAN

- Have their PVID changed to value of the configured native VLAN
- Remains untagged
- Are forwarded on the configured native VLAN

Podešavanje porta sviča

* Podešavanje *nativ* VLAN-a je opciono

- Ako se ne zada eksplicitno, *nativ* VLAN je VLAN1

Native VLANs and 802.1Q Trunking

Cisco IOS CLI Command Syntax

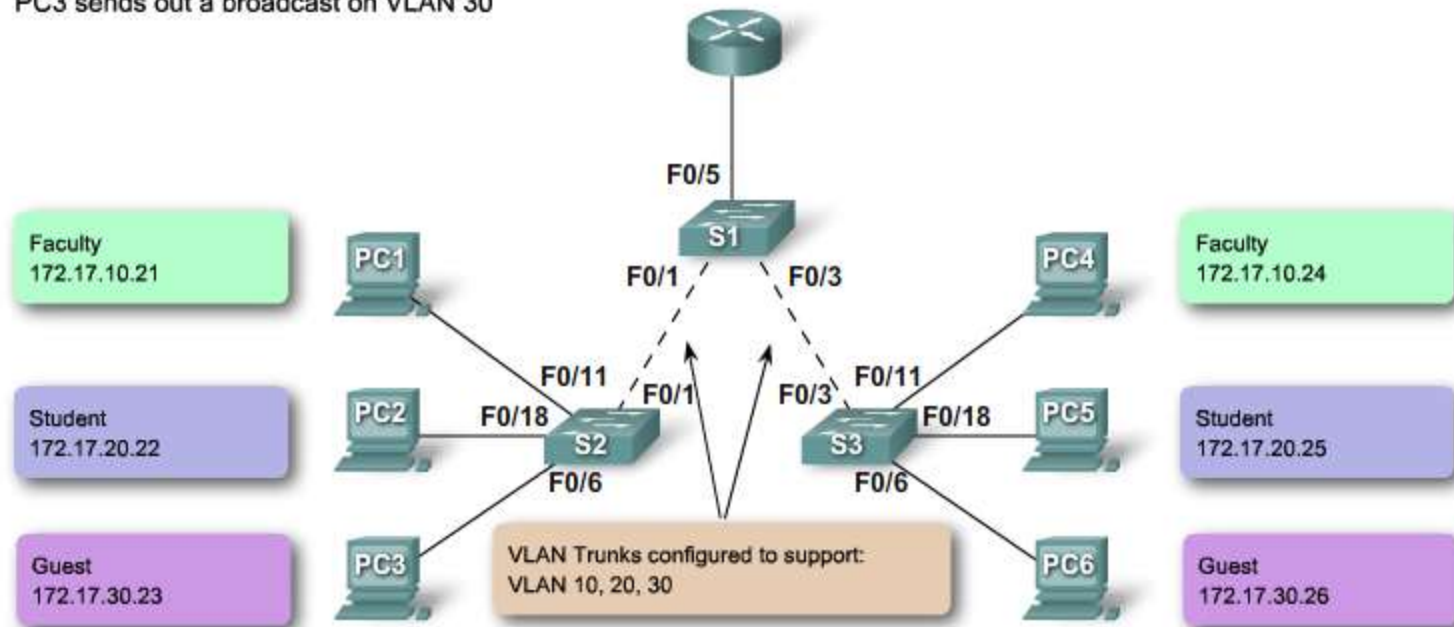
Enter global configuration mode on switch S1.	S1# configure terminal
Enter interface configuration mode.	S1(config)# interface F0/1
Define the F0/1 interface as an IEEE 802.1Q trunk.	S1(config-if)# switchport mode trunk
Configure the VLAN 99 to be the native VLAN.	S1(config-if)# switchport trunk native vlan 99
Return to privileged EXEC mode.	S1(config-if)# end

```
S1#show interfaces F0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: down
Administrative Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 50
Trunking Native Mode VLAN: 99 (VLAN0099)
Administrative Native VLAN tagging: enabled
...
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
...
Trunking VLANs Enabled: ALL
```

Princip rada trunk portova

Trunking Operation

PC1 sends out a broadcast on VLAN 10
PC3 sends out a broadcast on VLAN 30



Click Play button to progress through the animation.

DTP protokol

- * Dynamic Trunking Protocol (DTP) je vlasnički protokol kompanije Cisco.
- * Na svim portovima je DTP uključen po *default-u*:
 - Portovi preko kojih su međusobno povezani susedni svičevi periodično razmenjuju DTP pakete.
 - Prilikom razmene paketa, svič može doći do određenih zaključaka neophodnih da sam inicira promenu moda u kom se port nalazi.
- * Modovi u kom se port kod DTP protokola može naći:
 - Access
 - Klasičan tip porta sviča
 - Dynamic auto
 - Pasivno sluša, ako dobije zahtev od druge strane preći će u trunk
 - Dynamic desirable
 - Aktivno pokušava da "prevede" drugu stranu u trunk. Ako ne usle, ostaće u access modu
 - Trunk
 - Trunk port. Šalje DTP pakete.

Interakcija DTP portova

DTP Switchport Mode Interactions

	Dynamic Auto	Dynamic Desirable	Trunk	Access
Dynamic Auto	Access	Trunk	Trunk	Access
Dynamic Desirable	Trunk	Trunk	Trunk	Access
Trunk	Trunk	Trunk	Trunk	Not Recommended
Access	Access	Access	Not Recommended	Access

Note: Table assumes DTP is enabled at both ends.

* `show dtp interface` - to determine current settings

Konfiguracija VLAN-ova

Koraci pri konfiguraciji

- * Kreiranje VLAN-ova
- * Statička dodela portova brotkast domenima
- * Provera VLAN-ova
- * Podešavanje *trunk-ova* za komunikaciju između svičeva
- * Provera trankova

Kreiranje VLAN-a

Add a VLAN

Cisco IOS CLI Command Syntax

Switch from privileged EXEC mode to global configuration mode.

```
S1#configure terminal
```

Create a VLAN. Vlan id is the VLAN number that is to be created.
Switches to VLAN configuration mode for VLAN vlan id.

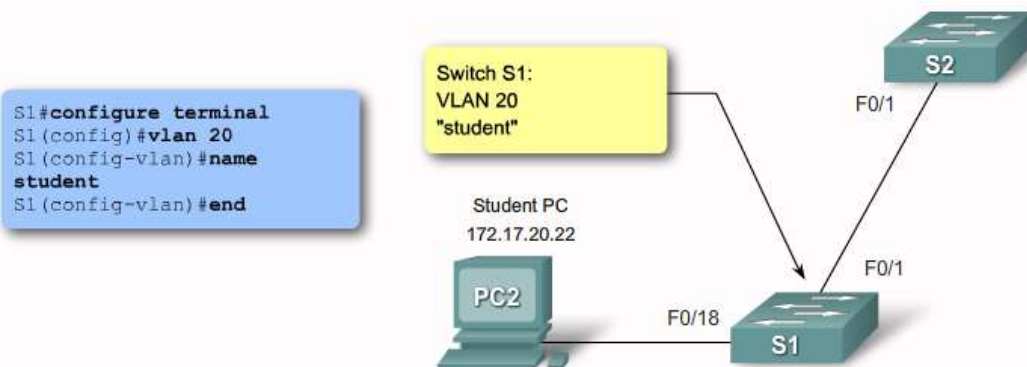
```
S1(config)#vlan vlan id
```

(Optional) Specify a unique VLAN name to identify the VLAN.
If no name is entered the VLAN number, padded zeros, is appended the word 'VLAN', for example, VLAN0020.

```
S1(config-vlan)#name vlan name
```

Return to privileged EXEC mode. You must end your configuration session for the configuration to be saved in the vlan.dat file and for configuration to take effect.

```
S1(config-vlan)#end
```



```
S1#show vlan brief
```

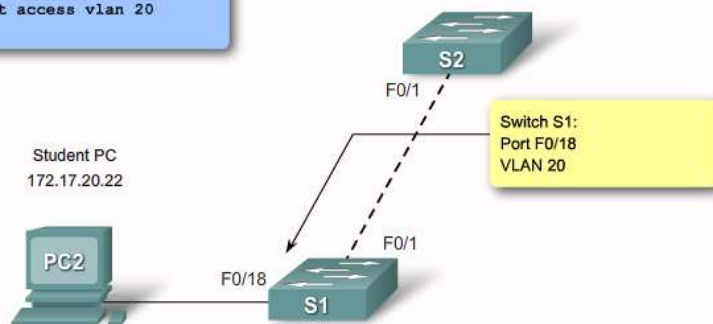
VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gi0/1, Gi0/2
20	student	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
S1#conf t
```

Dodela porta brotkast domenu

Cisco IOS CLI Command Syntax	
Enter global configuration mode.	S1# configure terminal
Enter the interface to assign the VLAN.	S1(config)# interface <i>interface id</i>
Define the VLAN membership mode for the port.	S1(config-if)# switchport mode access
Assign the port to a VLAN.	S1(config-if)# switchport access vlan <i>vlan id</i>
Return to privileged EXEC mode.	S1(config-if)# end

```
S1#configure terminal
S1(config)#interface F0/18
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 20
S1(config-if)#end
```



```
S1#show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, Fa0/10, Fa0/11, Fa0/12 Fa0/13, Fa0/14, Fa0/15, Fa0/16 Fa0/17, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24, Gi0/1 Gi0/2
20	student	active	Fa0/18
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

S1#

Upravljanje pristupom porta VLAN-u

- * **Naredba** `no switchport access vlan N` vraća port u VLAN1
- * **Ako port pripada nekom vlanu naredbom** `switchport access vlan N`, port se dodeljuje vlanu N
- * **Brisanje vlana** (`no vlan <br.vlana>`) deaktivira sve portove koji su u tom trenutku u tom vlanu

Podేశavanje tranka

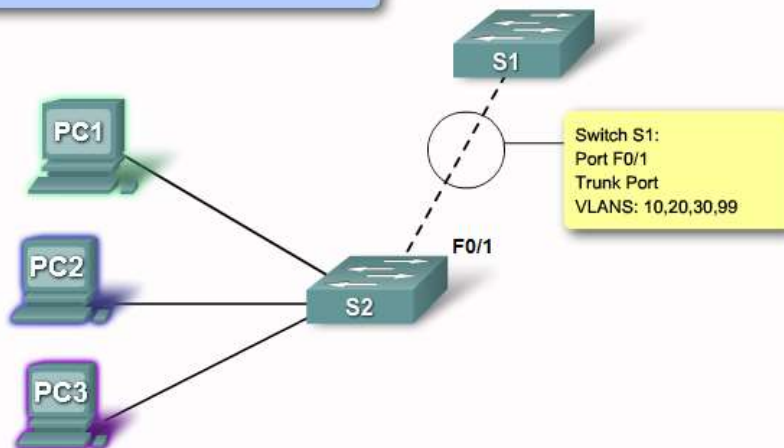
Cisco IOS CLI Command Syntax	
Enter global configuration mode.	S1# configure terminal
Enters the interface configuration mode for the defined interface.	S1(config)# interface <i>interface id</i>
Force the link connecting the switches to be a trunk link.	S1(config-if)# switchport mode trunk
Specify another VLAN as the native VLAN for untagged for IEEE 802.1Q trunks.	S1(config-if)# switchport trunk native vlan <i>vlan id</i>
Return to privileged EXEC mode.	S1(config-if)# end

VLAN 10 -Faculty/Staff - 172.17.10.0/24
VLAN 20 - Students - 172.17.20.0/24
VLAN 30 - Guest (Default) - 172.17.30.0/24
VLAN 99 - Management and Native - 172.17.99.0/24

Faculty
VLAN 10
172.17.10.21

Student
VLAN 20
172.17.20.22

Guest
VLAN 30
172.17.30.23



```
S1#config terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
S1(config)#interface f0/1  
S1(config-if)#switchport mode trunk  
S1(config-if)#switchport trunk native vlan 99  
S1(config-if)#end
```

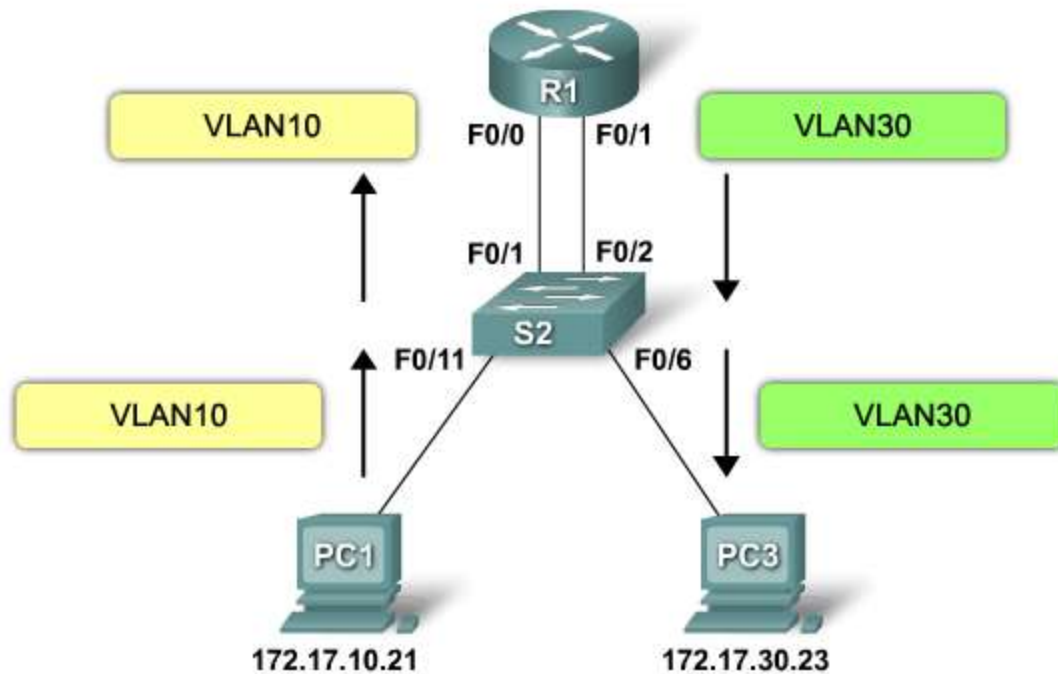

Dodatna podešavanja tranka

Cisco IOS CLI Command Syntax	
Use this command in the interface configuration mode to reset all of the VLANs configured on the trunk interface.	<code>S1(config-if)#no switchport trunk allowed vlan</code>
Use this command in the interface configuration mode to reset the native VLAN back to VLAN 1.	<code>S1(config-if)#no switchport trunk native vlan</code>
Use this command in the interface configuration mode to reset the trunk port interface back to a static access mode port.	<code>S1(config-if)#switchport mode access</code>

Inter-VLAN rutiranje

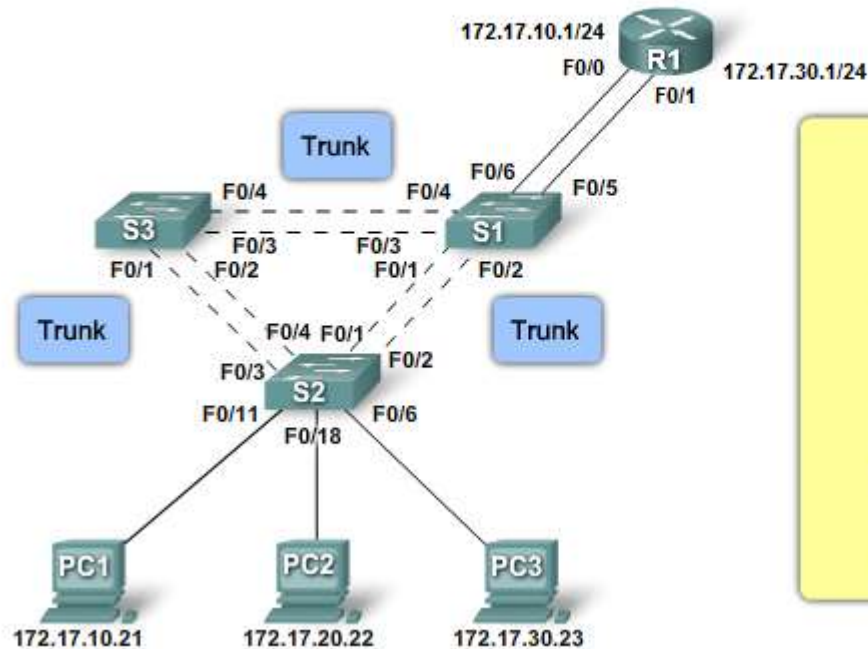
Inter VLAN rutiranje

What is Inter-VLAN Routing?



Tradicionalno Inter-VLAN rutiranje

Traditional Inter-VLAN Routing



Switch S1 Ports

F0/6 = VLAN10

F0/5 = VLAN30

F0/1-F0/4 = Trunk

Switch S2 Ports

F0/11 = VLAN10

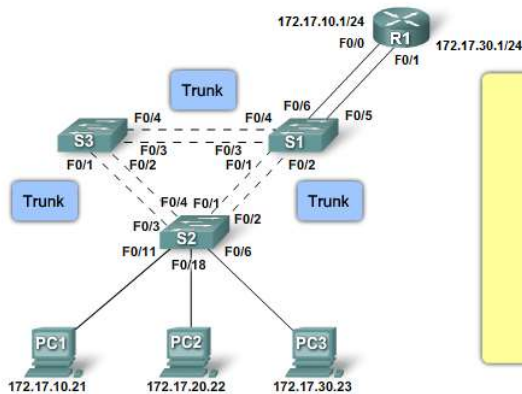
F0/18 = VLAN 20

F0/6 = VLAN30

F0/1-F0/4 = Trunk

Tradicionalno Inter-VLAN rutiranje

Traditional Inter-VLAN Routing



Switch S1 Ports
F0/6 = VLAN10
F0/5 = VLAN30
F0/1-F0/4 = Trunk

Switch S2 Ports
F0/11 = VLAN10
F0/18 = VLAN 20
F0/6 = VLAN30
F0/1-F0/4 = Trunk

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface f0/0
R1(config-if)#ip address 172.17.10.1 255.255.255.0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up
R1(config-if)#interface f0/1
R1(config-if)#ip address 172.17.30.1 255.255.255.0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up
R1(config-if)#end
%SYS-5-CONFIG_I: Configured from console by console
R1#
```

```
R1#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS
       level-2
       ia - IS-IS inter area, * - candidate default, U - per-user
       static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

172.17.0.0/24 is subnetted, 2 subnets
C      172.17.30.0 is directly connected, FastEthernet0/1
C      172.17.10.0 is directly connected, FastEthernet0/0
```

“Router-on-a-Stick” rutiranje

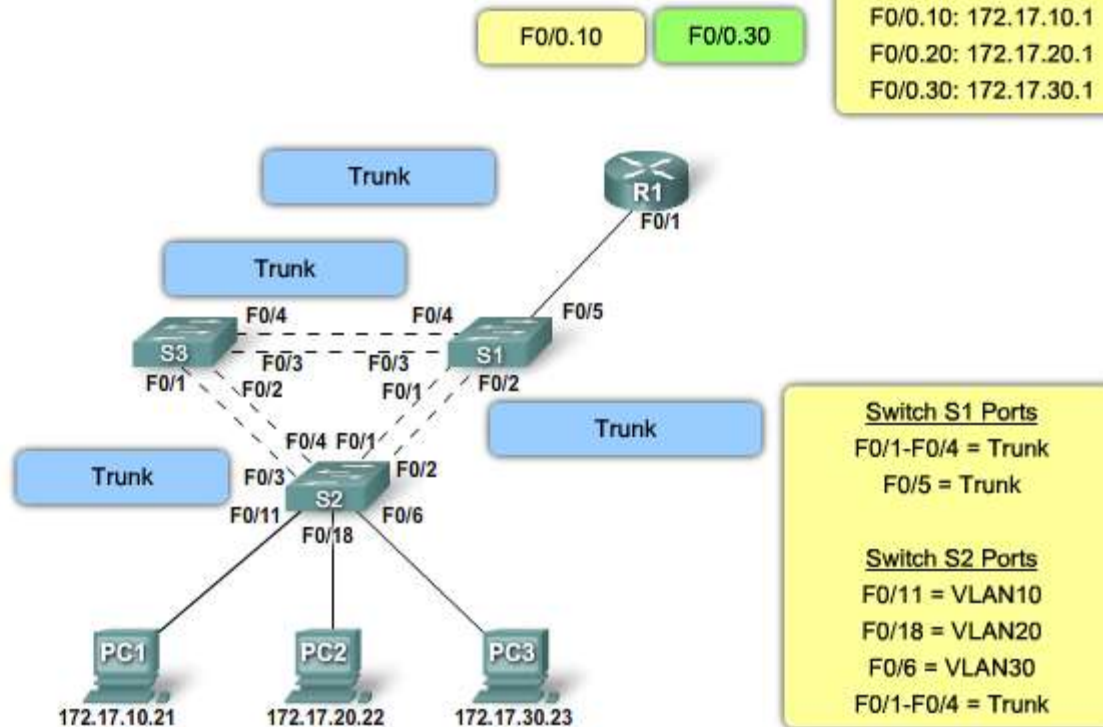
Router Subinterfaces and Inter-VLAN Routing

PC1 sends an ARP request for the MAC address of its default gateway, which is the VLAN subinterface on router R1.

The ARP request is sent out for the IP address 172.17.10.1, which corresponds to the subnet PC1 is connected to.

The ARP request is sent to switch S2 on VLAN10, and is tagged and forwarded out the trunk link to switch S1.

Switch S1 maintains the VLAN tag on the broadcast frame as it forwards it out the other trunk link connected to router R1.



"Router-on-a-Stick" rutiranje

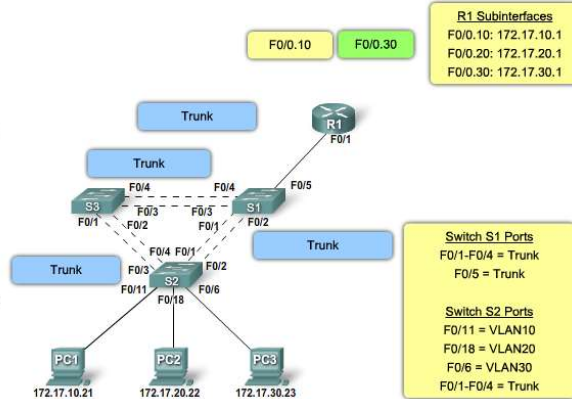
Router Subinterfaces and Inter-VLAN Routing

PC1 sends an ARP request for the MAC address of its default gateway, which is the VLAN subinterface on router R1.

The ARP request is sent out for the IP address 172.17.10.1, which corresponds to the subnet PC1 is connected to.

The ARP request is sent to switch S2 on VLAN10, and is tagged and forwarded out the trunk link to switch S1.

Switch S1 maintains the VLAN tag on the broadcast frame as it forwards it out the other trunk link connected to router R1.



```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface f0/0.10
R1(config-subif)#encapsulation dot1q 10
R1(config-subif)#ip address 172.17.10.1 255.255.255.0
R1(config-subif)#interface f0/0.30
R1(config-subif)#encapsulation dot1q 30
R1(config-subif)#ip address 172.17.30.1 255.255.255.0
R1(config-subif)#interface f0/0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up
R1(config-if)#end
R1#
```

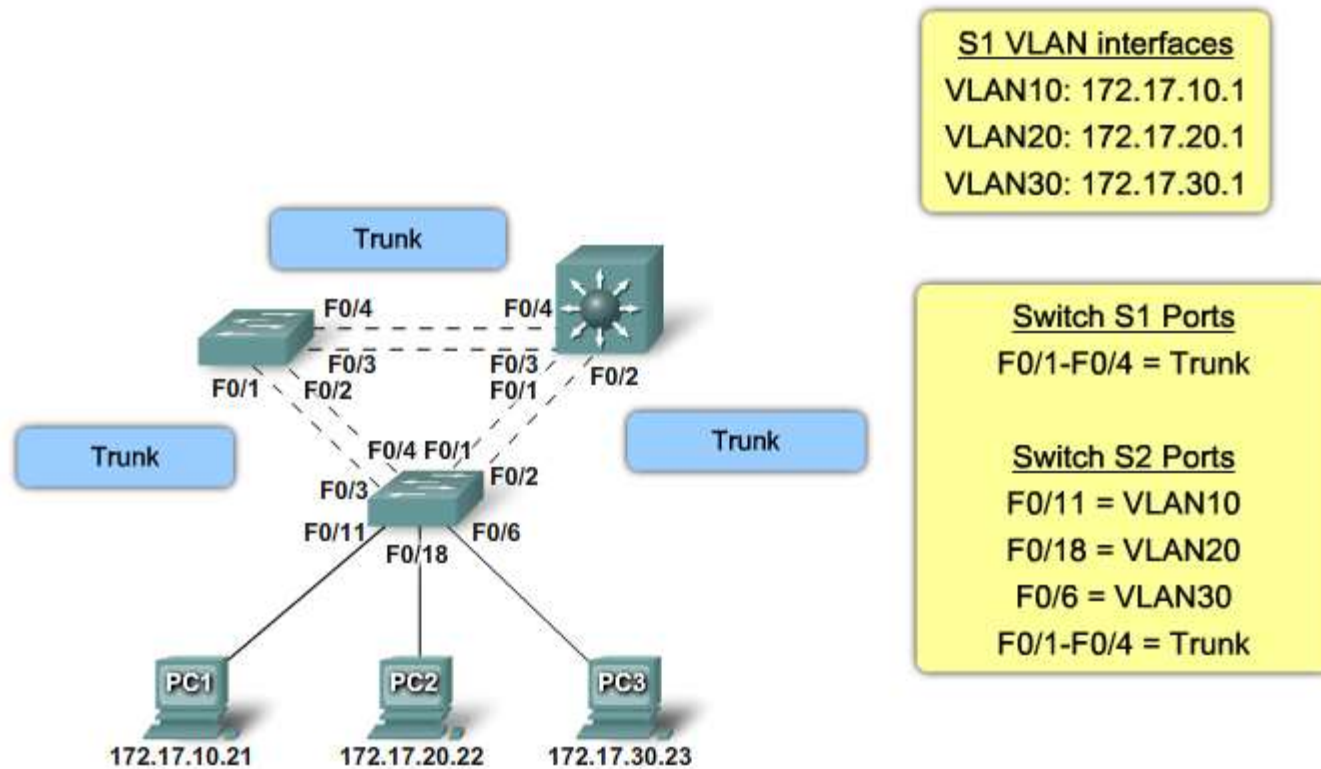
```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B -
BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

      172.17.0.0/24 is subnetted, 2 subnets
C       172.17.10.0 is directly connected, FastEthernet0/0.10
C       172.17.30.0 is directly connected, FastEthernet0/0.30
```

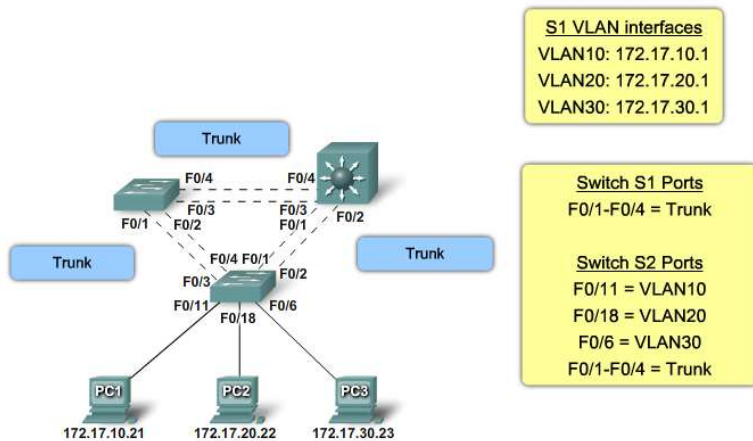

Inter-VLAN rutiranje na L3 sviču

Switch-based Inter-VLAN Routing



Inter-VLAN rutiranje na L3 sviču

Switch-based Inter-VLAN Routing



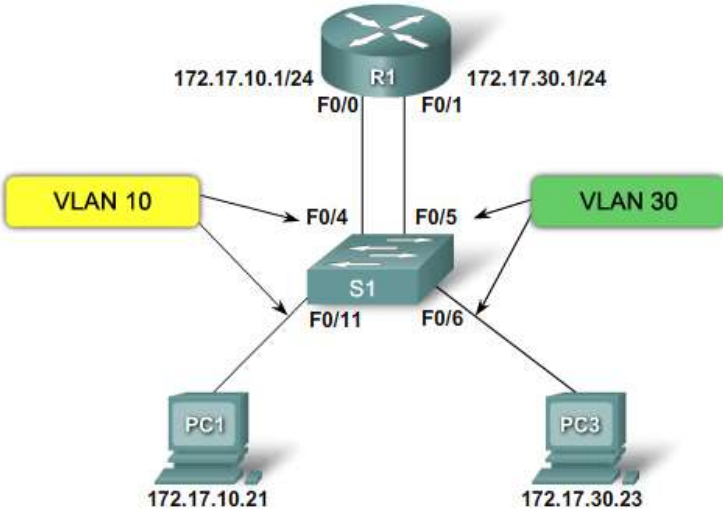
```
SW(conf)#ip routing
SW(conf)#interface vlan 10
SW(conf-if)#ip address 172.17.10.1 255.255.255.0
SW(conf-if)#exit
SW(conf)#interface vlan 20
SW(conf-if)#ip address 172.17.20.1 255.255.255.0
SW(conf-if)#exit
SW(conf)#interface vlan 30
SW(conf-if)#ip address 172.17.30.1 255.255.255.0
SW(conf-if)#exit
```

Prednosti i mane različitih tipova

Physical Interface	Subinterface
One physical interface per VLAN	One physical interface for many VLANs
No bandwidth contention	Bandwidth contention
Connected to access mode switch port	Connected to trunk mode switch port
More expensive	Less expensive
Less complex connection configuration	More complex connection configuration

Konfiguracija Inter-VLAN rutiranja

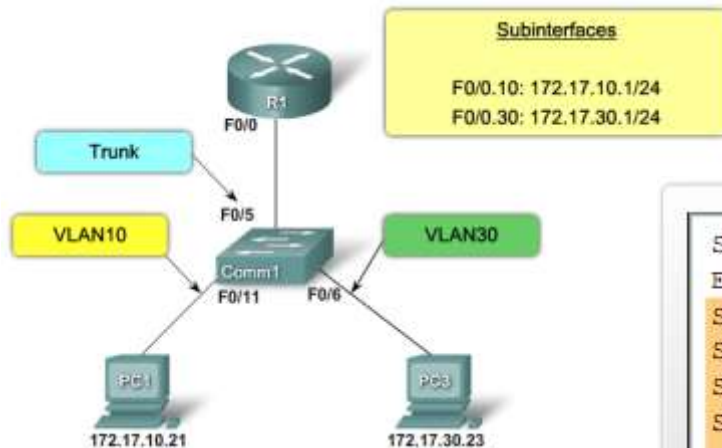
Konfiguracija tradicionalnog načina rut.



```
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#vlan 10
S1(config-vlan)#vlan 30
S1(config-vlan)#exit
S1(config)#interface f0/11
S1(config-if)#switchport access vlan 10
S1(config-if)#interface f0/4
S1(config-if)#switchport access vlan 10
S1(config-if)#interface f0/6
S1(config-if)#switchport access vlan 30
S1(config-if)#interface f0/5
S1(config-if)#switchport access vlan 30
S1(config-if)#end
%SYS-5-CONFIG_I: Configured from console by console
S1#copy running-config startup-config
```

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface f0/0
R1(config-if)#ip address 172.17.10.1 255.255.255.0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up
R1(config-if)#interface f0/1
R1(config-if)#ip address 172.17.30.1 255.255.255.0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up
R1(config-if)#end
R1#copy running-config startup-config
```

Konfiguracija Router-on-a-Stick rut.



```
S1#configure terminal
Enter configuration commands, one per line.
S1(config)#vlan 10
S1(config-vlan)#vlan 30
S1(config-vlan)#exit
S1(config)#interface f0/5
S1(config-if)#switchport mode trunk
S1(config-if)#end
S1#
```

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface f0/0.10
R1(config-subif)#encapsulation dot1q 10
R1(config-subif)#ip address 172.17.10.1 255.255.255.0
R1(config-subif)#interface f0/0.30
R1(config-subif)#encapsulation dot1q 30
R1(config-subif)#ip address 172.17.30.1 255.255.255.0
R1(config-subif)#interface f0/0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.10,
```

Provera isparvnosti

- * Show naredba za proveru sadržaja ruting tabele
 - show ip route
- * Provera konfiguracije
 - show running-conf
- * Ping i Tracert sa računara

Potencijalni problemi

- * Pogrešno konfigurirana pripadnost portova VLAN-ovima
- * Pogrešno konfigurisan *trunk*
- * Pogrešno zadana enkapsulacija na ruteru
- * Pogrešne IP adrese na ruteru

