Switch- och WAN-teknik

F2: Kapitel 3 och 4

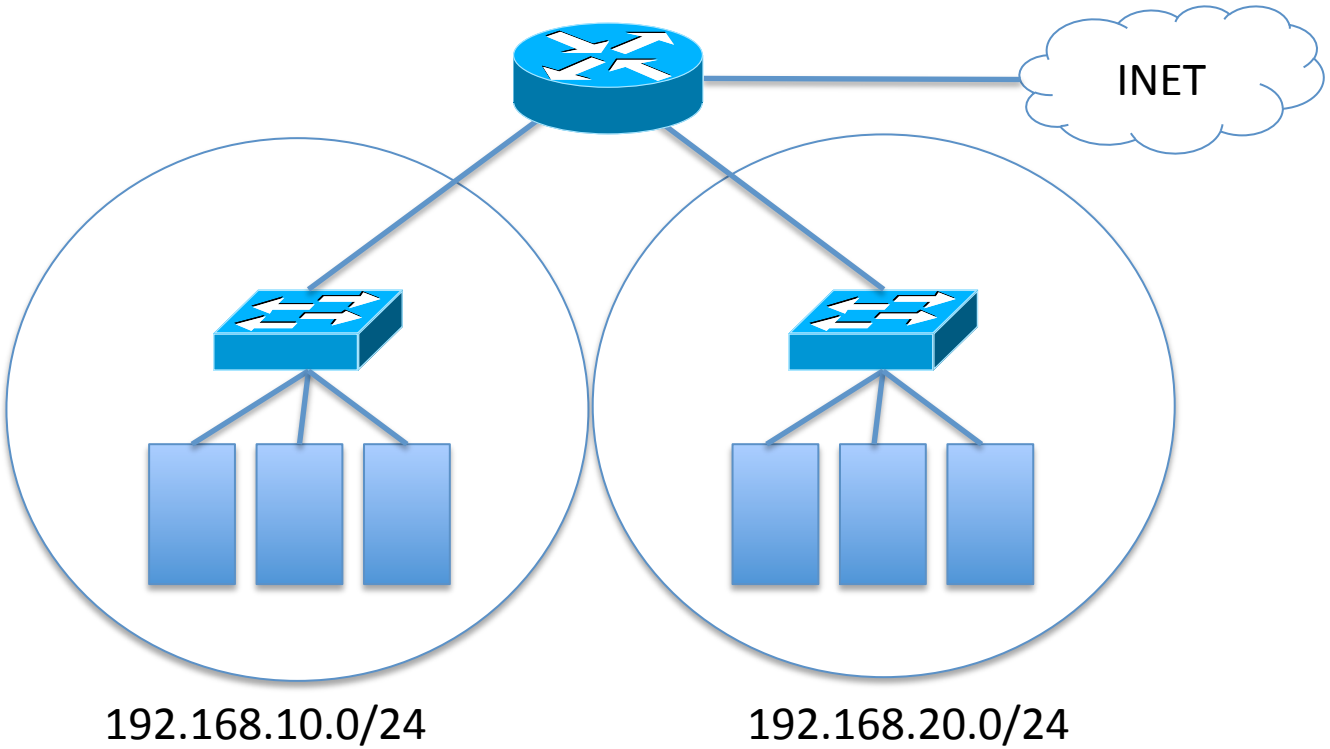
Kapitel 3

VLAN

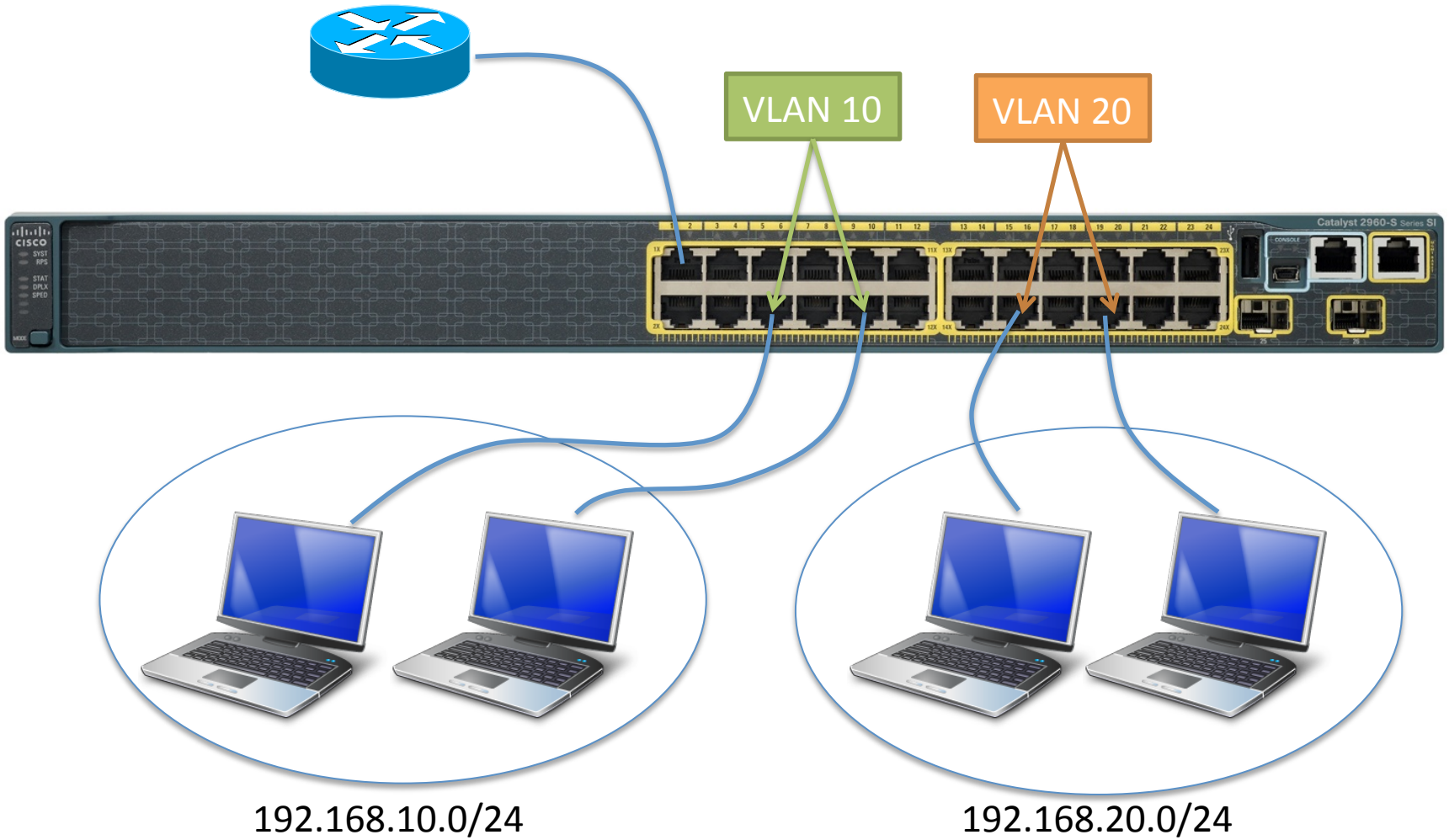
Vad är ett VLAN?

VLAN står för Virtual LAN och är en teknik för att dela en switch i flera olika delar, där varje del tillhör olika IP-nät.

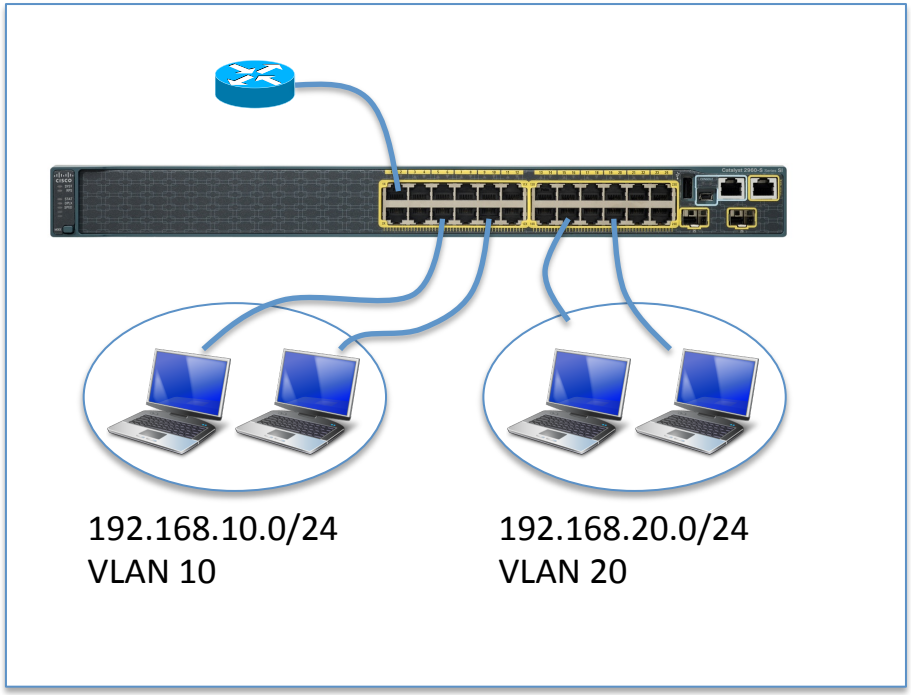
Exempel: Enkelt nätverk med två subnät enligt traditionell modell:



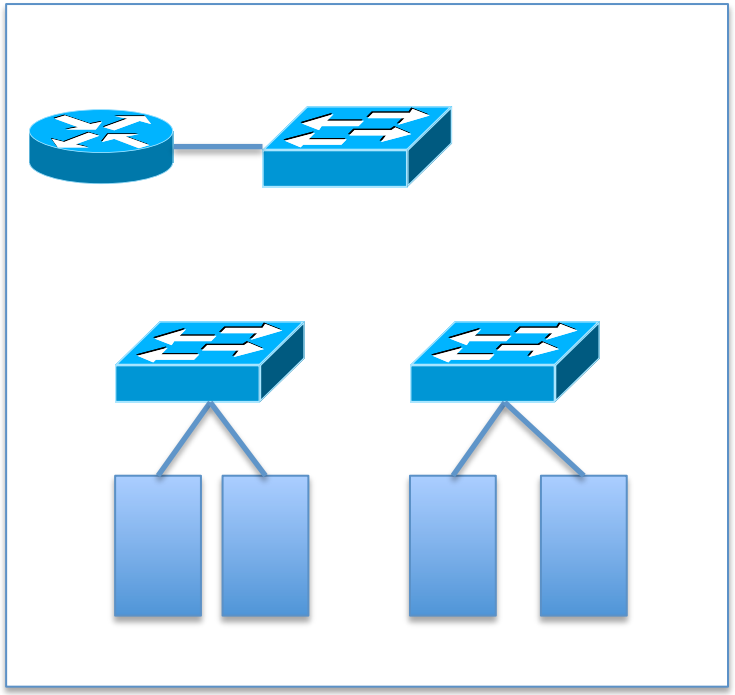
VLAN



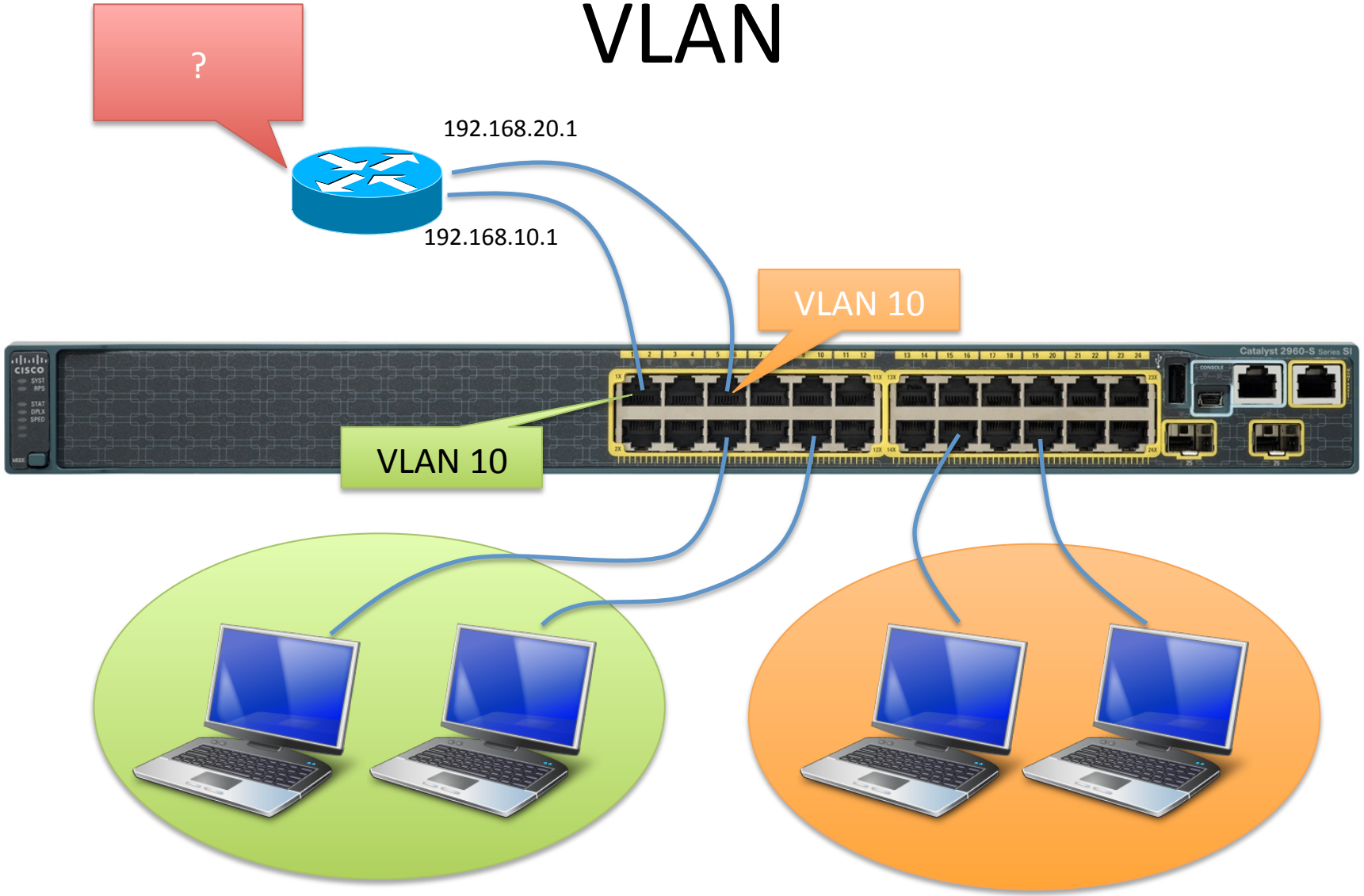
VLAN



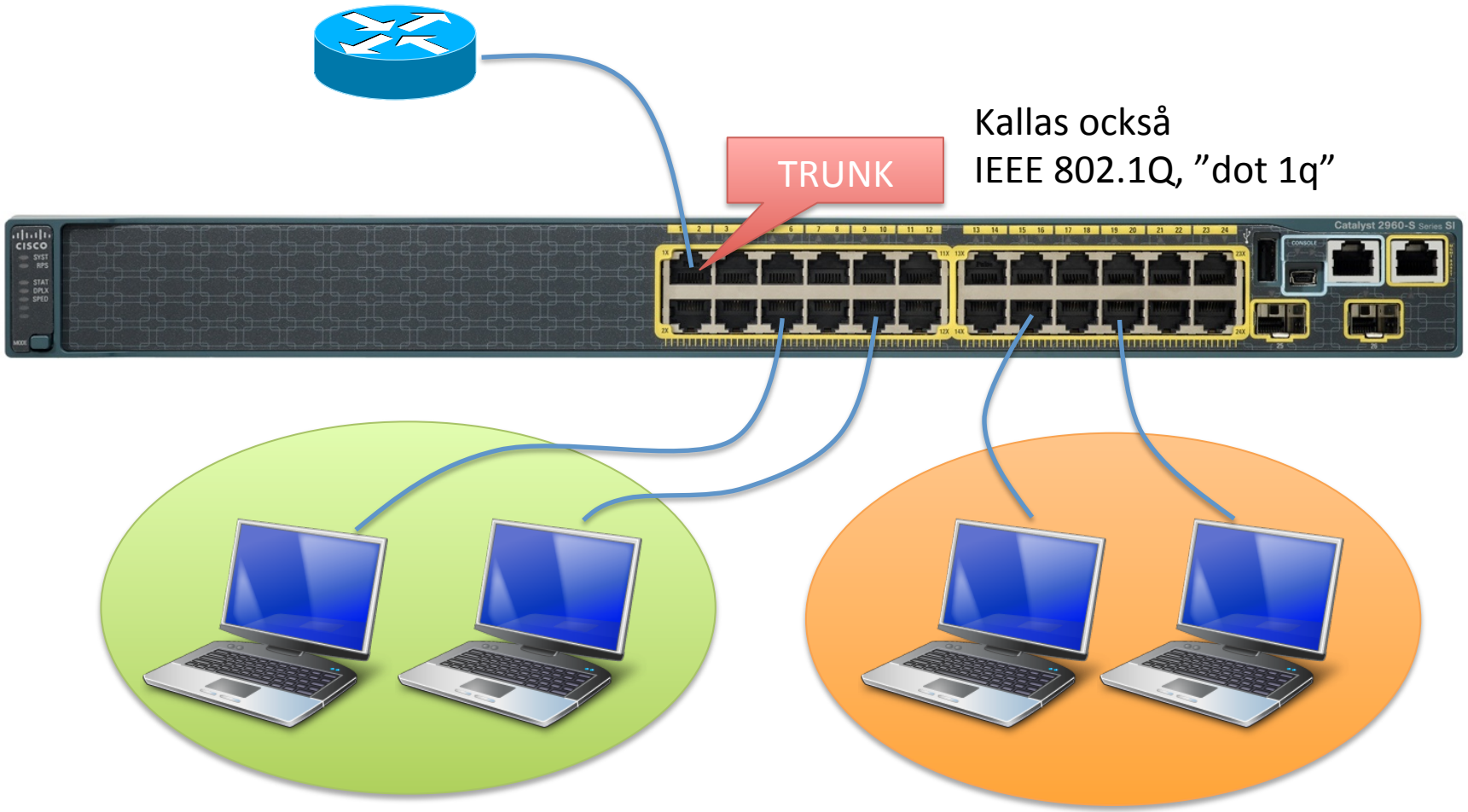
=



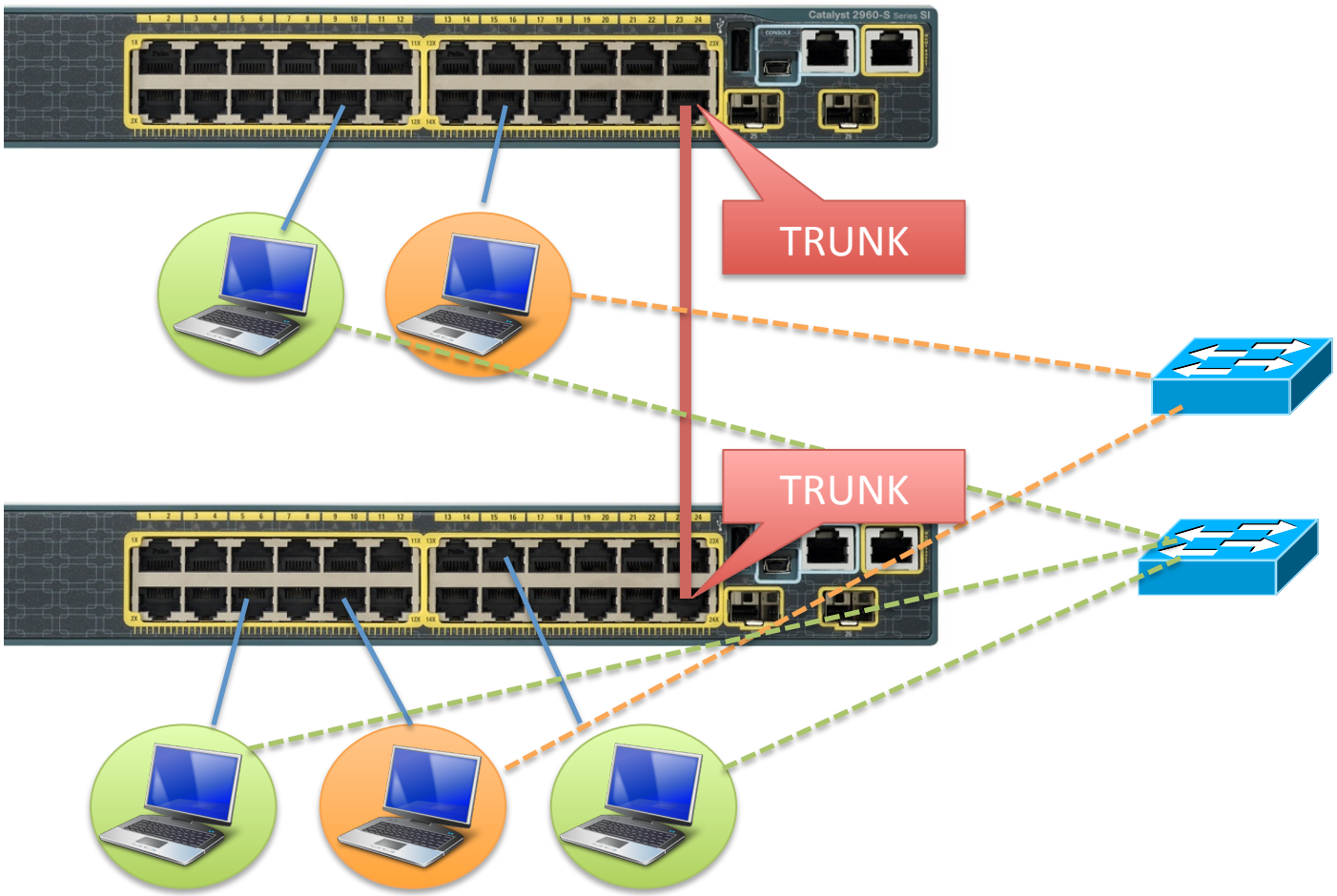
VLAN


?
192.168.20.1
192.168.10.1
VLAN 10
VLAN 10
192.168.10.0/24
VLAN 10
192.168.20.0/24
VLAN 20

VLAN

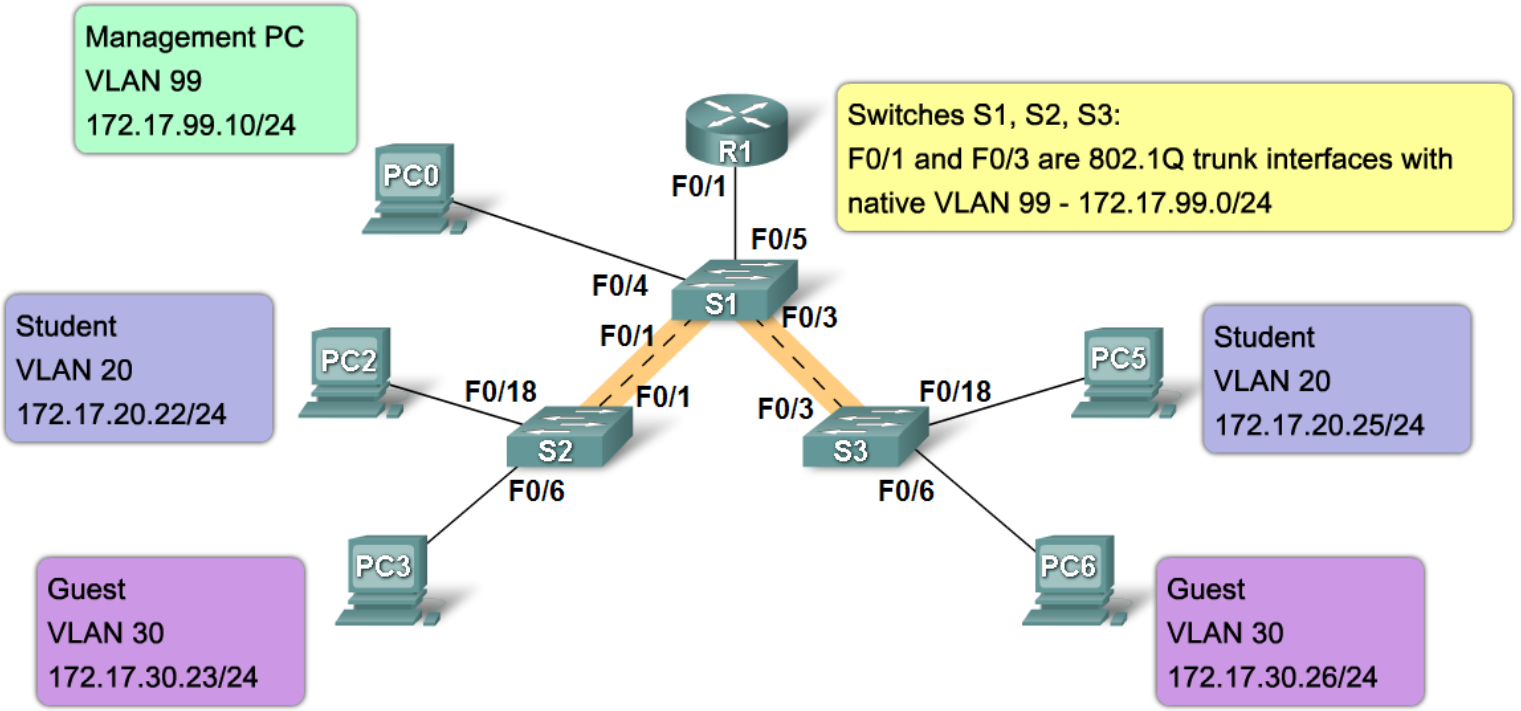

TRUNK
Kallas också
IEEE 802.1Q, ”dot 1q”
192.168.10.0/24
VLAN 10
192.168.20.0/24
VLAN 20

VLAN

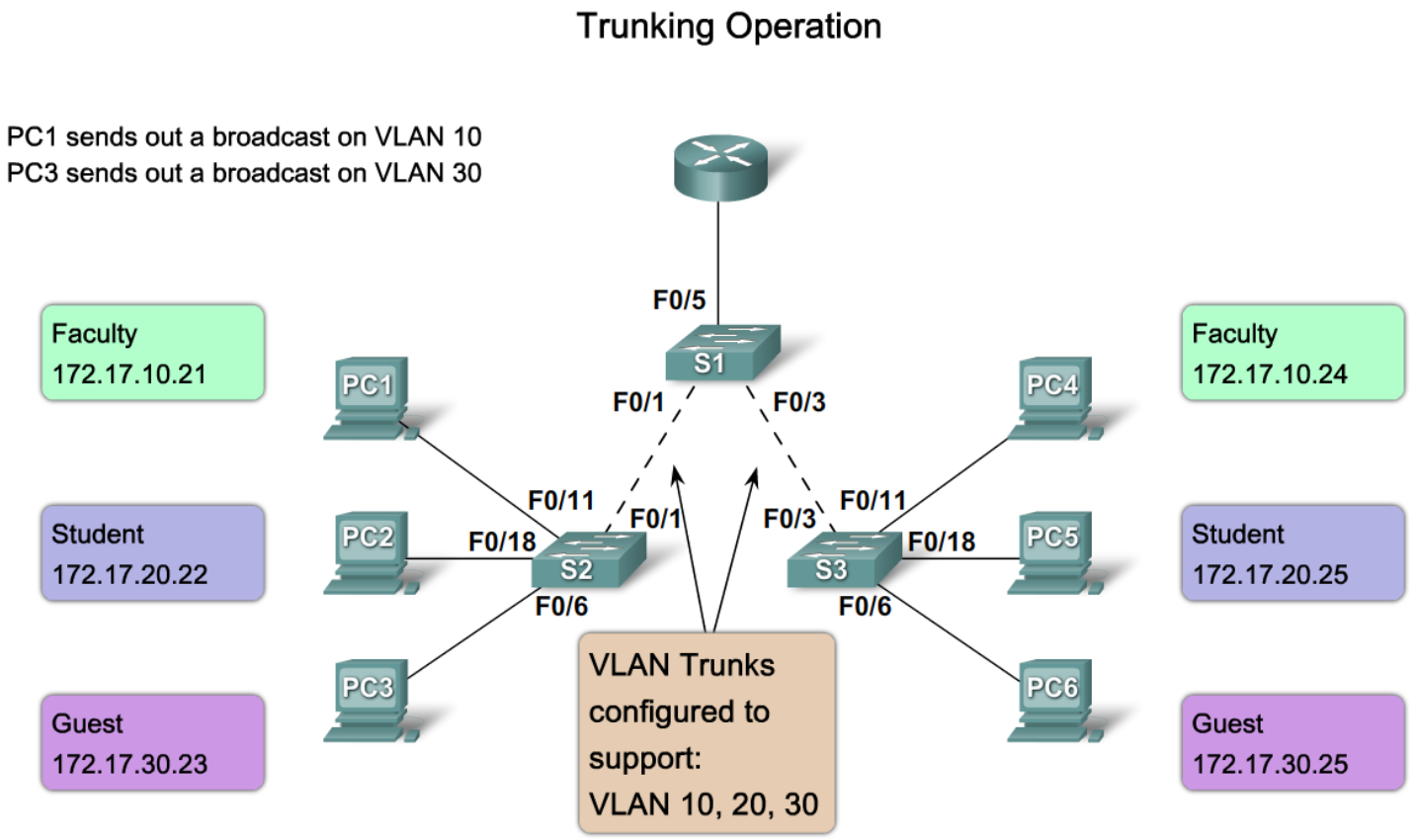


VLAN

- Extremt vanligt förekommande teknik för att segmentera nätverk som delar fysisk utrustning

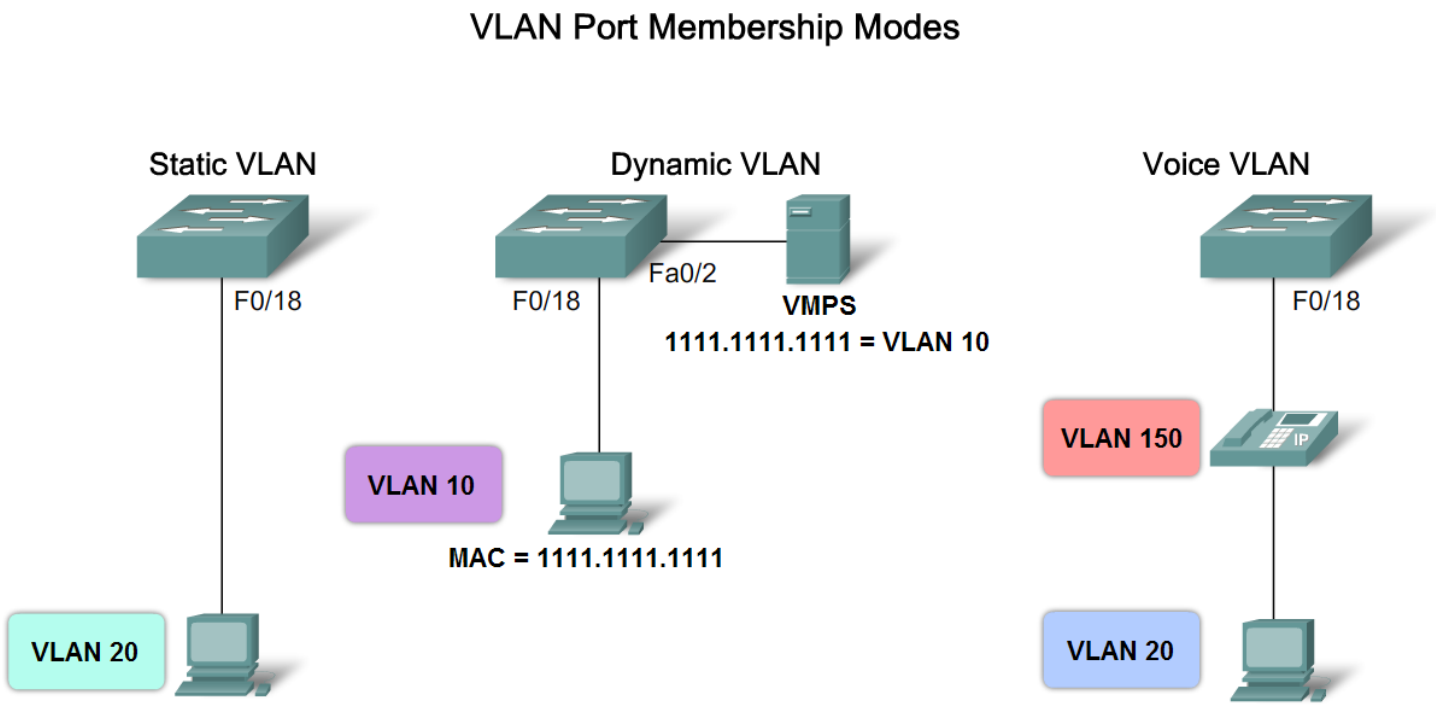


Broadcasts

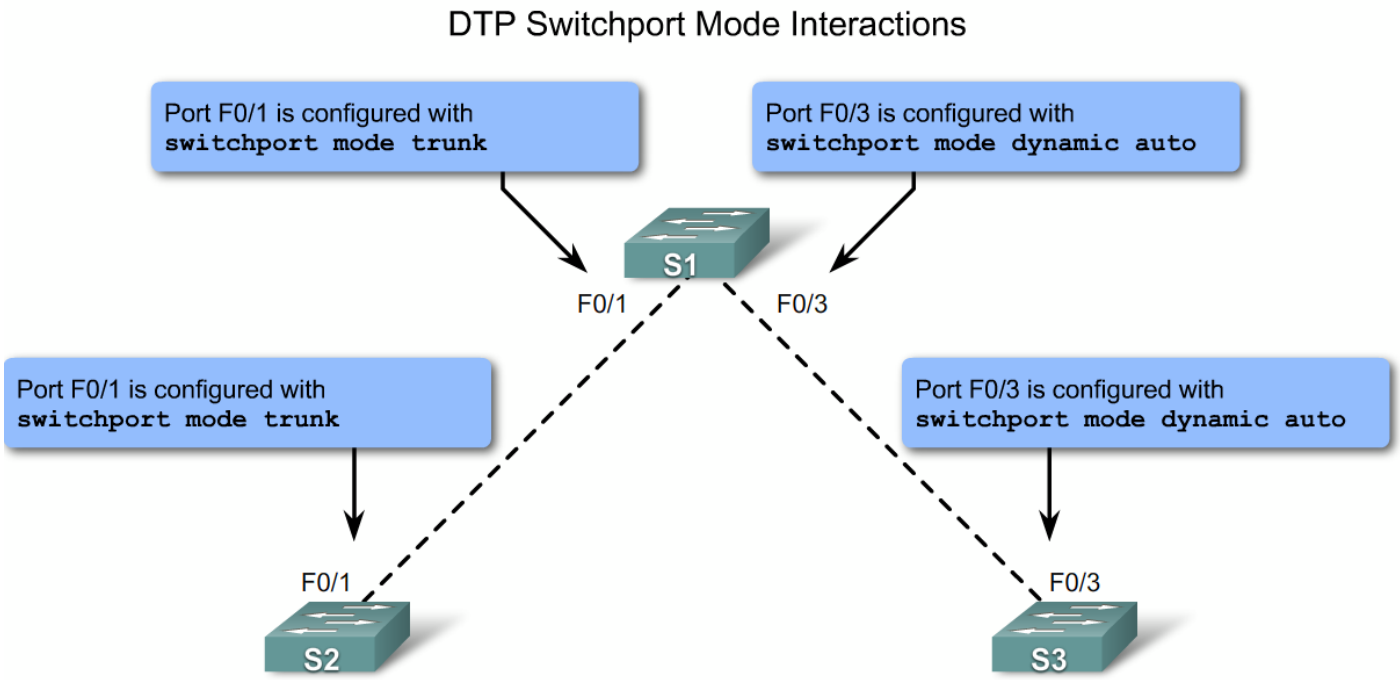

Trunking Operation
PC1 sends out a broadcast on VLAN 10
PC3 sends out a broadcast on VLAN 30
F0/5
S1
F0/1
F0/3
PC1
PC2
PC3
PC4
PC5
PC6
F0/11
F0/1
F0/18
S2
F0/6
F0/3
F0/11
F0/18
S3
F0/6
Faculty
172.17.10.21
Student
172.17.20.22
Guest
172.17.30.23
Faculty
172.17.10.24
Student
172.17.20.25
Guest
172.17.30.25
VLAN Trunks configured to support:
VLAN 10, 20, 30

Statiska VLAN, VMPS, Voice-VLAN

- VLAN Management Policy Server



DTP – Dynamic Trunking Protocol



DTP modes

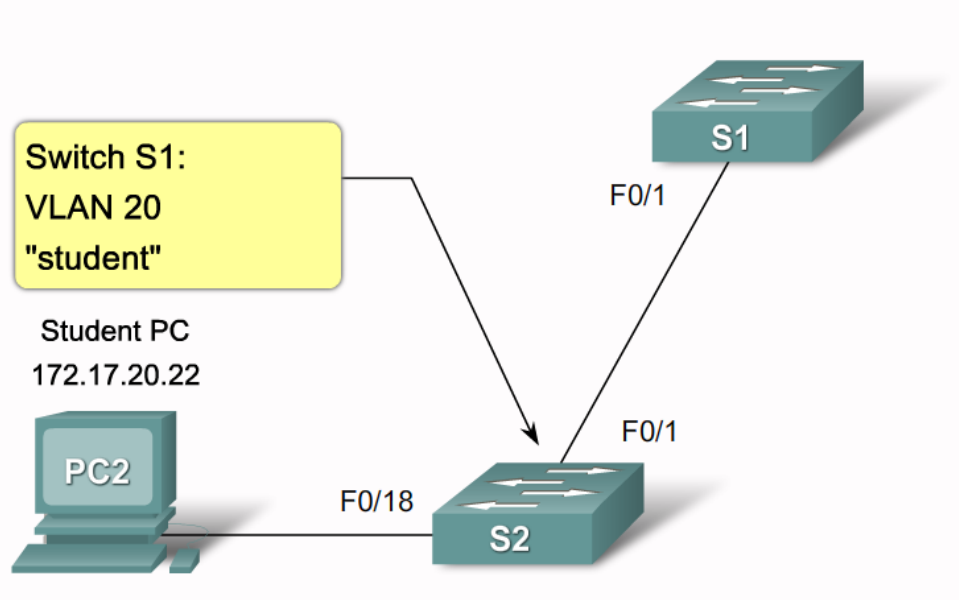
Kommando	Effekt
Switchport mode trunk	Porten är i trunkläge. Alltid.
Switchport mode dynamic auto *(default)*	Switchporten förhandlar om trunk men gör inte anspråk på att gå upp i trunkläge
Switchport mode desirable	Switchporten förhandlar om trunk och försöker övertyga motparten om att gå upp i trunk
Switchport nonegoriate	Stänger av DTP
Switchport mode access	Tvingar accessläge

	Dynamic auto	Dynamic Des.	Trunk	Access
Dynamic auto	Access	Trunk	Trunk	Access
Dynamic des.	Trunk	Trunk	Trunk	Access
Trunk	Trunk	Trunk	Trunk	-
Access	Access	Access	-	Access

DTP modes

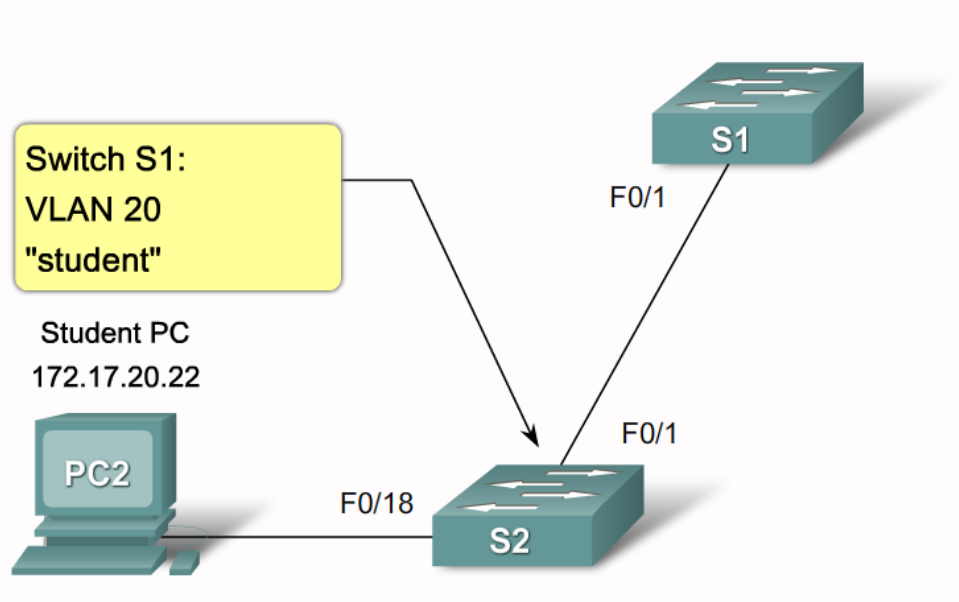
```
Switch#show int gi1/0/1 trunk

Port        Mode             Encapsulation  Status        Native vlan
Gi1/0/1     on               802.1q         other         1

Port        Vlans allowed on trunk
Gi1/0/1     none

Port        Vlans allowed and active in management domain
Gi1/0/1     none

Port        Vlans in spanning tree forwarding state and not pruned
Gi1/0/1     none

Switch#show run int gi1/0/1
Building configuration...

Current configuration : 61 bytes
!
interface GigabitEthernet1/0/1
 switchport mode trunk
end
```

Skapa VLAN



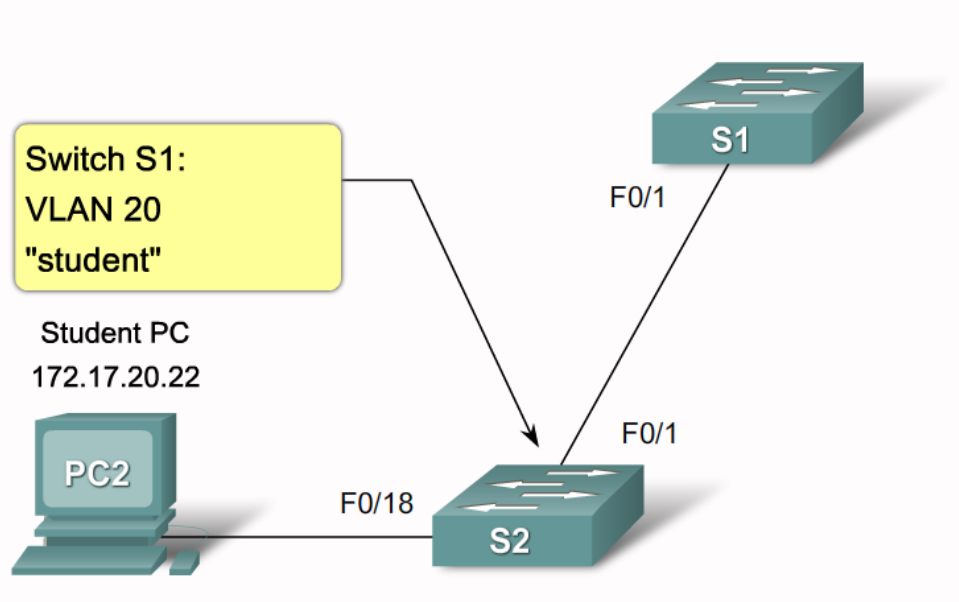

```
S1#configure terminal
S1(config)#vlan 20
S1(config-vlan)#name student
S1(config-vlan)#end
```

Tilldela VLAN till switchportar




```
S1#configure terminal
S1(config)#int f0/18
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 20
S1(config-if)#end
```

Konfigurera trunk




```
S1#configure terminal
S1(config)#int f0/1
S1(config-if)#switchport mode trunk
S1(config-if)#end
```

Trunk Encapsulation Protocol

- ISL (Cisco Proprietary, gammalt)
- IEEE 802.1Q (”dot1q”)
  - Standard

802.3 Ethernet frame structure

Preamble	Start of frame delimiter	MAC destination	MAC source	802.1Q tag (optional)	Ethertype or length	Payload	Frame check sequence (32-bit CRC)	Interframe gap
7 octets of 10101010	1 octet of 10101011	6 octets	6 octets	(4 octets)	2 octets	46–1500 octets	4 octets	12 octets
		64–1522 octets						
72–1530 octets								
84–1542 octets								

Kontrollera VLAN-konfiguration

```
Switch#show vlan brief

VLAN Name                                Status    Ports
---- ----------------------------------- --------- -------------------------------
1    default                             active    Gi1/0/1, Gi1/0/3, Gi1/0/4
                                                   Gi1/0/10, Gi1/0/11, Gi1/0/12
                                                   Gi1/0/13, Gi1/0/14, Gi1/0/15
                                                   Gi1/0/16, Gi1/0/17, Gi1/0/18
                                                   Gi1/0/19, Gi1/0/20, Gi1/0/21
                                                   Gi1/0/22, Gi1/0/23, Gi1/0/24
                                                   Gi1/0/25, Gi1/0/26, Gi1/0/27
                                                   Gi1/0/28
20   VLAN0020                            active    Gi1/0/2
30   servers                             active    Gi1/0/5, Gi1/0/6, Gi1/0/7
                                                   Gi1/0/8, Gi1/0/9
40   wireless                            active
1002 fddi-default                        act/unsup
1003 token-ring-default                  act/unsup
1004 fddinet-default                     act/unsup
1005 trnet-default                       act/unsup
```

Kontrollera VLAN-konfiguration

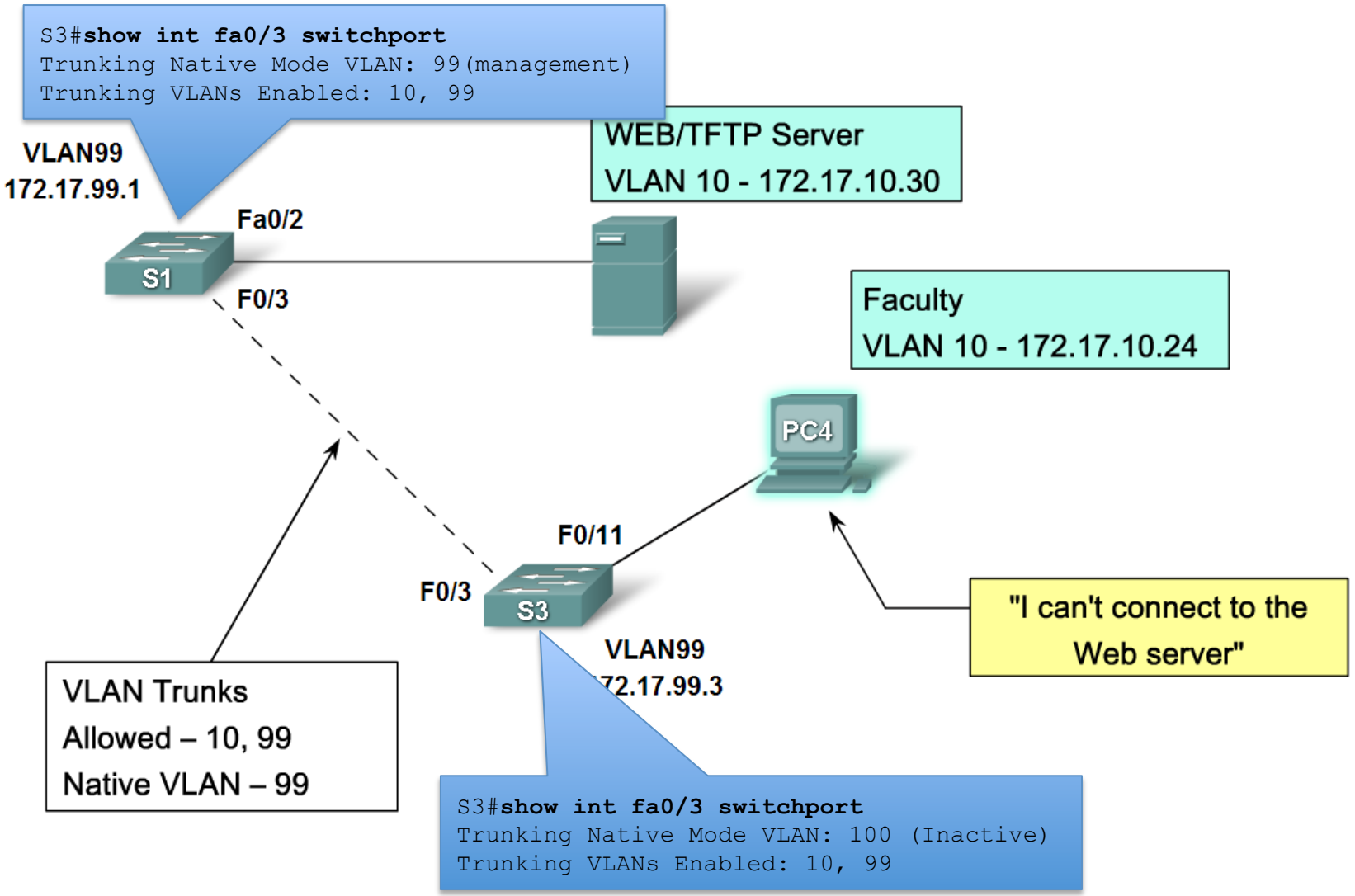
```
Switch#show int gi1/0/5 switchport
Name: Gi1/0/5
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: down
Administrative Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 30 (servers)
Trunking Native Mode VLAN: 1 (default)
Administrative Native VLAN tagging: enabled
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL

<output omitted>
```

Native VLAN

- Native VLAN är det VLAN som _inte_ taggas på trunken
- Standard är VLAN 1
- Native VLAN måste finnas
- Syfte: Viss trafik kan inte skickas taggad, t.ex. CDP, men vi vill ändå skicka det via en trunk.

```
S1#configure terminal
S1(config)#int f0/1
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 99
S1(config-if)#end
```

Native VLAN mismatch



Rensa confen på en switch

- Ta bort configurationen
  - `write erase`
  - `del flash:/config.text`
- Ta bort VLAN-databasen
  - `del flash:/vlan.dat`

Allowed VLAN

- De flesta switchar klarar upp till 4094 VLAN
- Alla VLAN tillåts som standard på en trunk
- Man kan specificera vilka VLAN som får använda en trunk

```
Switch#show int fa0/24 trunk

Port        Mode             Encapsulation  Status        Native vlan
Fa0/24      desirable        n-isl          trunking      1

Port        Vlans allowed on trunk
Fa0/24      1-4094
```

Allowed VLAN

```
Switch(config)#int fa0/24
Switch(config-if)#switchport trunk allowed vlan 10,20,30-35
Switch(config-if)#end
Switch#show int fa0/24 trunk

Port        Mode             Encapsulation  Status        Native vlan
Fa0/24      desirable        n-isl          trunking      1

Port        Vlans allowed on trunk
Fa0/24      10,20,30-35

<output omitted>

Switch#conf t
Switch(config)#int fa0/24
Switch(config-if)#switchport trunk allowed vlan add 55
Switch(config-if)#do show int fa0/24 trunk

Port        Mode             Encapsulation  Status        Native vlan
Fa0/24      desirable        n-isl          trunking      1

Port        Vlans allowed on trunk
Fa0/24      10,20,30-35,55
```

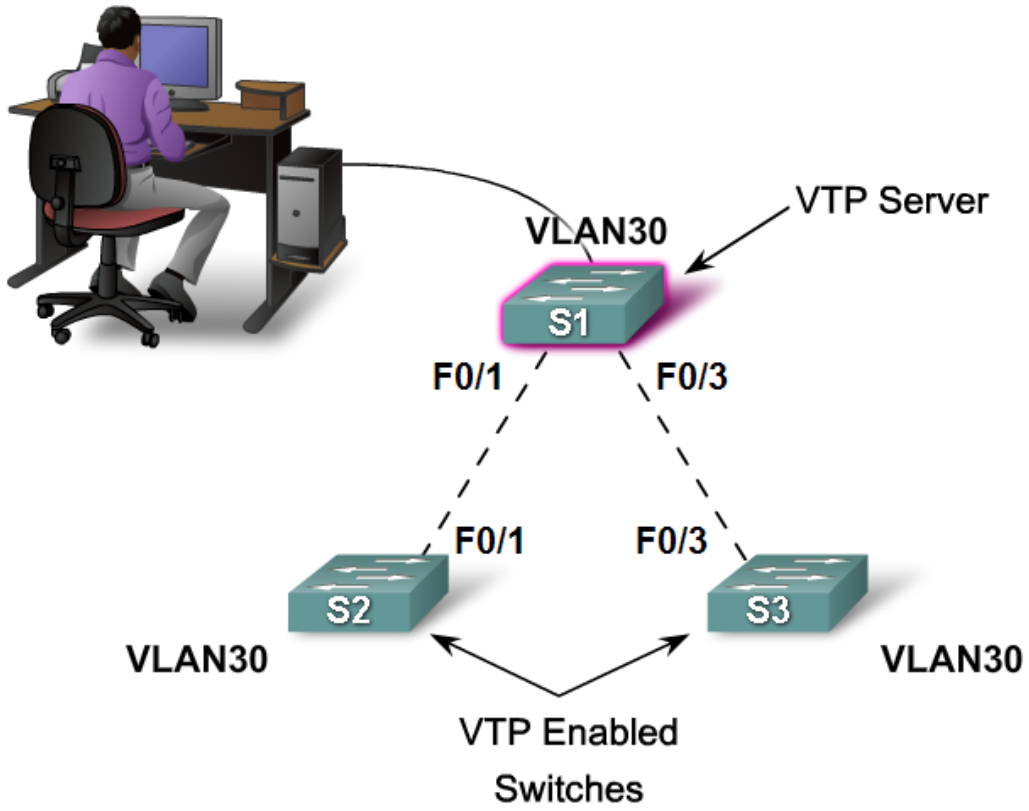
Kapitel 4

VTP

VTP

- VLAN Trunking Protocol
- Sprider information om VLAN mellan switcharna
- Man slipper skapa VLAN på varenda switch

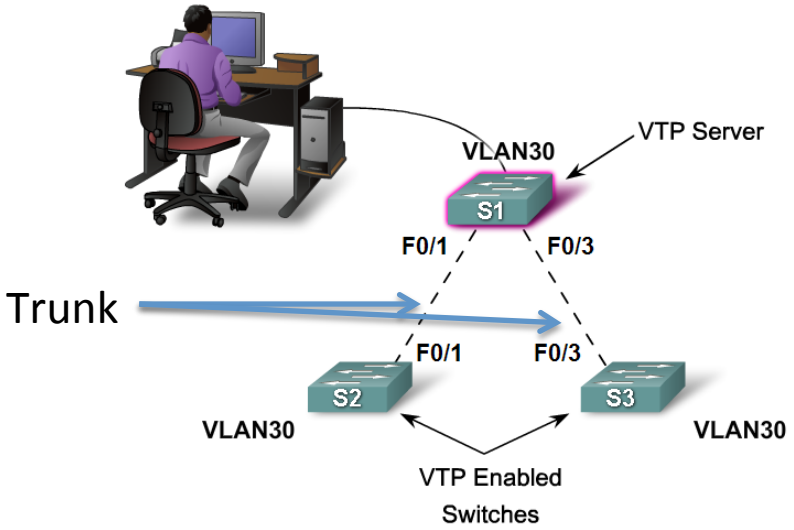
VTP


VLAN30
VTP Server
S1
F0/1
F0/3
F0/1
F0/3
S2
S3
VLAN30
VLAN30
VTP Enabled
Switches

Snälla…

VTP fungerar

ENDAST ÖVER TRUNK!



VTP

- VTP Version
- VTP domain
- VTP mode
- Configuration revision
- VLANs
- VTP Password

```
Switch#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
```

VTP - Version

- Finns version 1, 2 och 3
- Version 3 stöds inte av Cisco-switchar
- Standard är version 1, finns ingen anledning att köra version 2 i denna kurs.

- Version 2 stödjer Token Ring VLANs
- Version 3 är annorlunda. Stödjer bl.a. Extended VLANs, dvs VLAN-ID > 1005

VTP - domain

- En textsträng som identifierar switchar som hör ihop
- Endast switchar i samma VTP-domän utbyter information

```
Switch#conf t
Switch(config)#vtp domain dnlab.se
Changing VTP domain name from NULL to dnlab.se
Switch(config)#
*Mar  1 00:42:05.491: %SW_VLAN-6-VTP_DOMAIN_NAME_CHG: VTP domain name changed to dnlab.se.
```

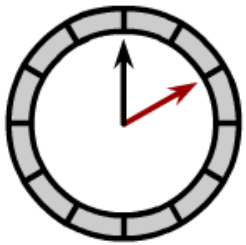
VTP - mode

- Server
- Client
- Transparent

```
Switch#show vtp status
VTP Version                     : running VTP1 (VTP2 capable)
Configuration Revision          : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 : dnlab.se
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xC1 0xBD 0x43 0x92 0x35 0x1F 0x7B 0xA6
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)

Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vtp mode client
Setting device to VTP CLIENT mode.
```

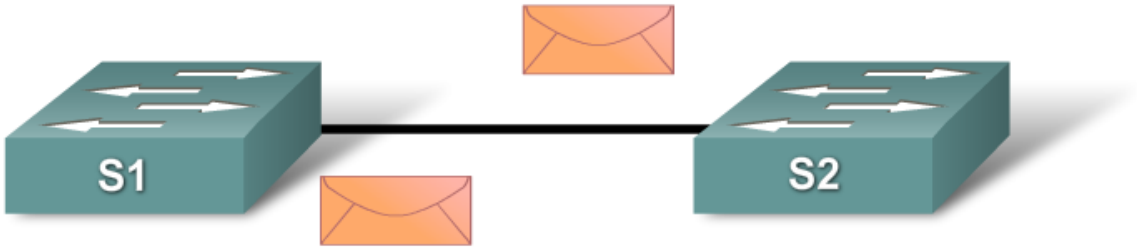
VTP

VTP Advertisements



Summary advertisements:

- Are sent every 5 minutes by a VTP Server
- Inform VTP enabled switches of the current VTP configuration revision number
- Are sent immediately after a configuration change



VTP – vanliga problem

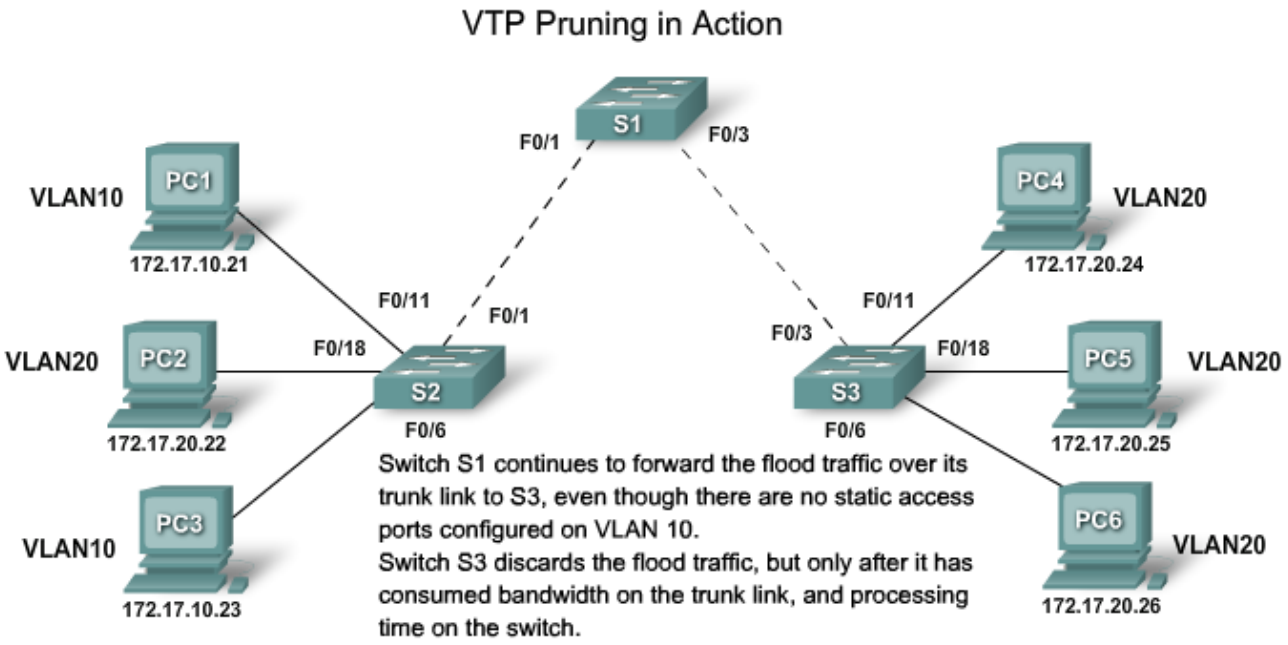
- Domain name stämmer inte
- VTP Password matchar inte
- Fel VTP-mode (båda är client)
- MD5 hash mismatch

```
*Mar  1 00:43:53.783: %SW_VLAN-4-VTP_USER_NOTIFICATION: VTP protocol user notification:
MD5 digest checksum mismatch on receipt of equal revision summary on trunk: Fa0/24
```

VARNING!

- Om en switch är konfigurerad med rätt Domain name och har högre revisionsnummer än switcharna i nätet den ansluts till kommer övriga switchar i nätet eventuellt ta bort VLAN som används!

VTP Pruning


VTP Pruning in Action
S1
F0/1
F0/3
PC1
VLAN10
172.17.10.21
PC4
VLAN20
172.17.20.24
F0/11
F0/1
F0/3
F0/11
PC2
VLAN20
F0/18
S2
S3
F0/18
PC5
VLAN20
172.17.20.22
F0/6
F0/6
172.17.20.25
Switch S1 continues to forward the flood traffic over its trunk link to S3, even though there are no static access ports configured on VLAN 10.
Switch S3 discards the flood traffic, but only after it has consumed bandwidth on the trunk link, and processing time on the switch.
PC3
VLAN10
172.17.10.23
PC6
VLAN20
172.17.20.26