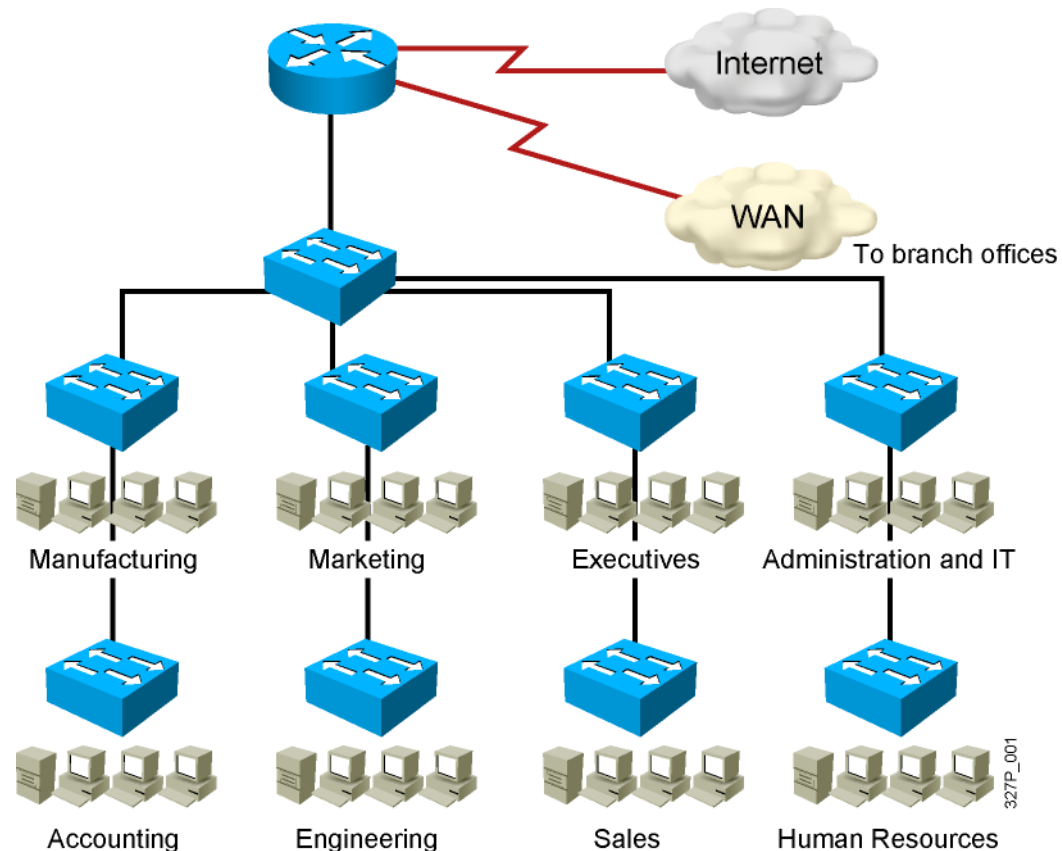




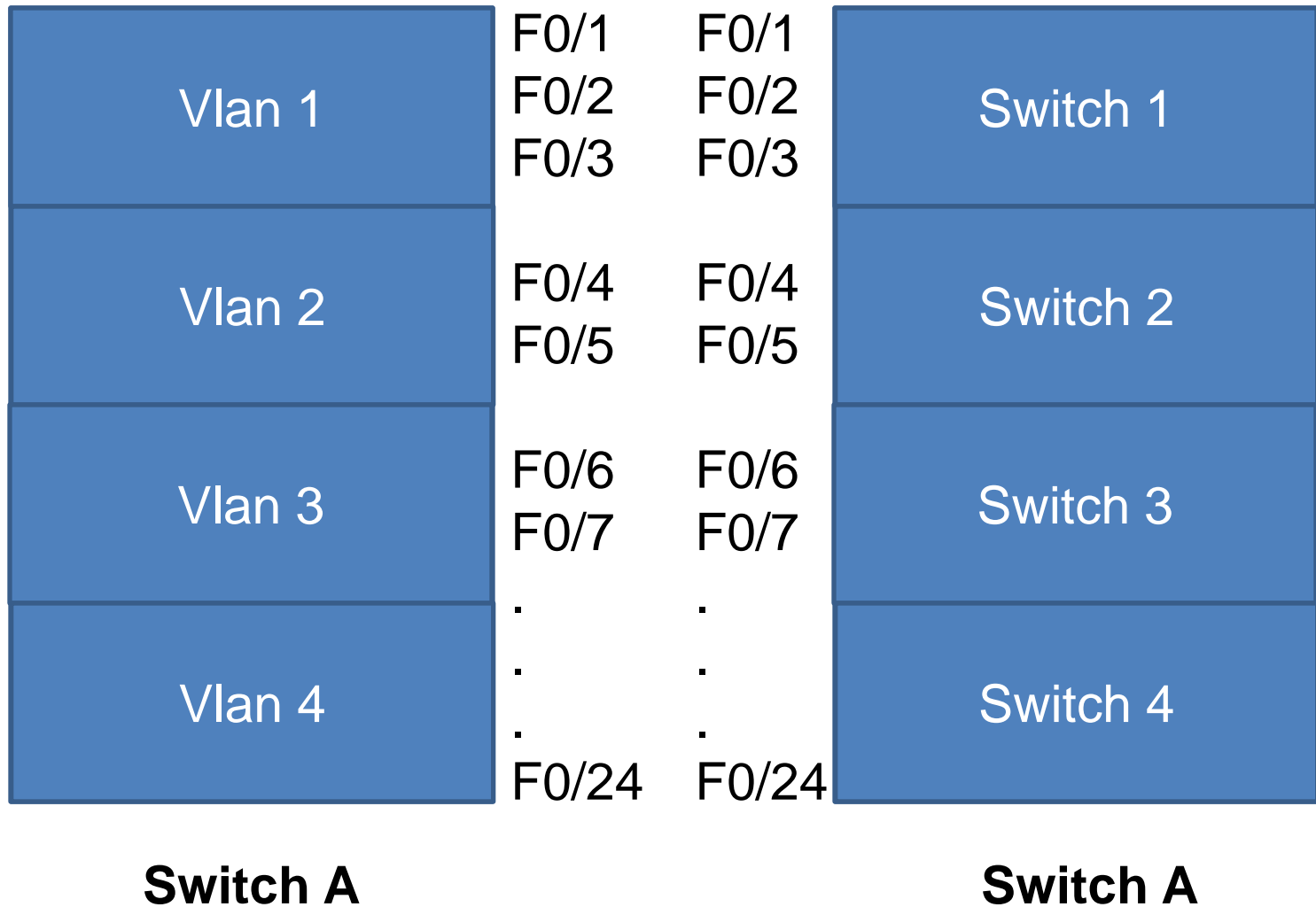
Implementing VLANs and Trunks

Issues in a Poorly Designed Network

- Unbounded failure domains
- Large broadcast domains
- Large amount of unknown MAC unicast traffic
- Unbounded multicast traffic
- Management and support challenges
- Possible security vulnerabilities

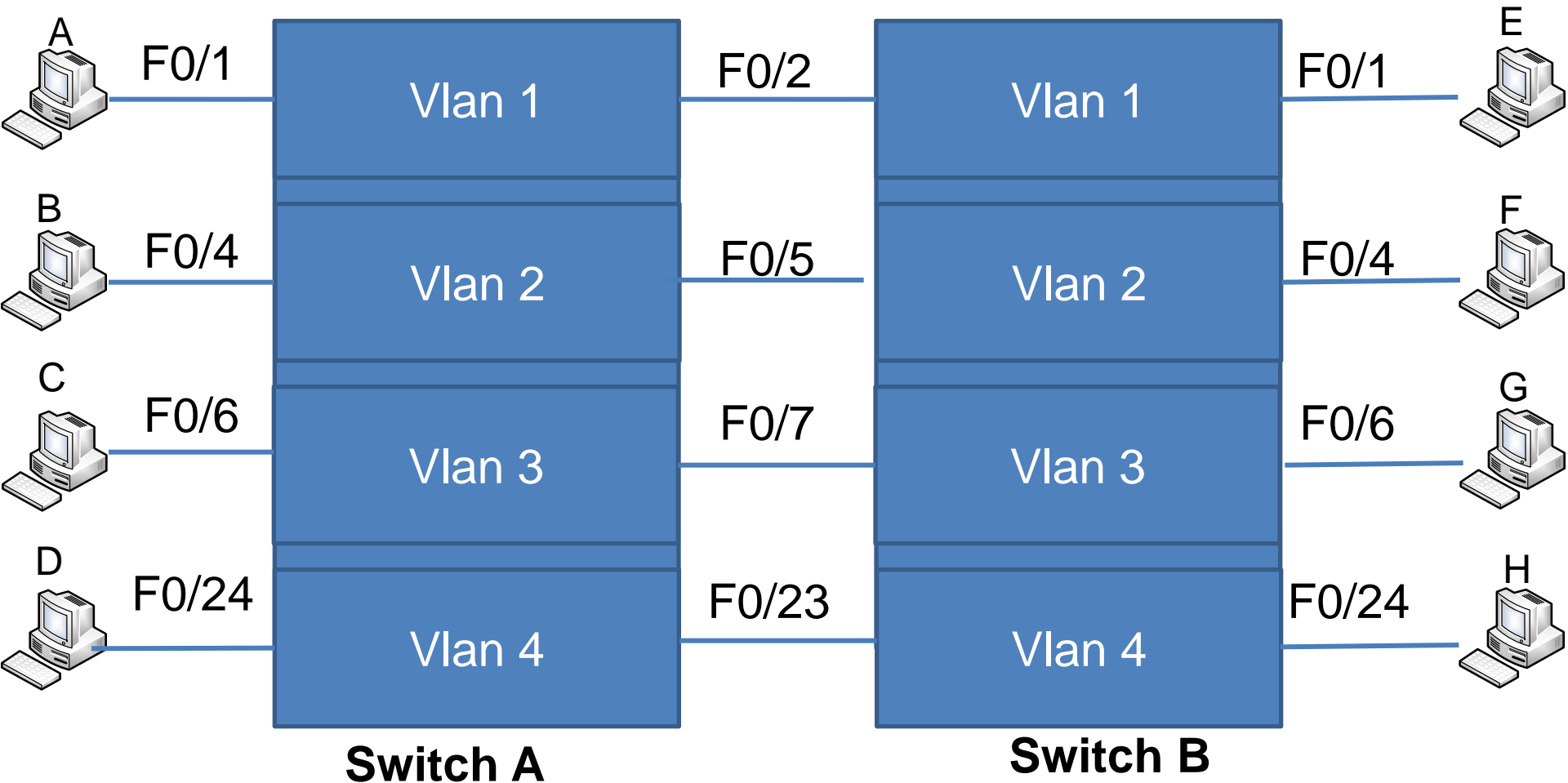


VLAN Overview



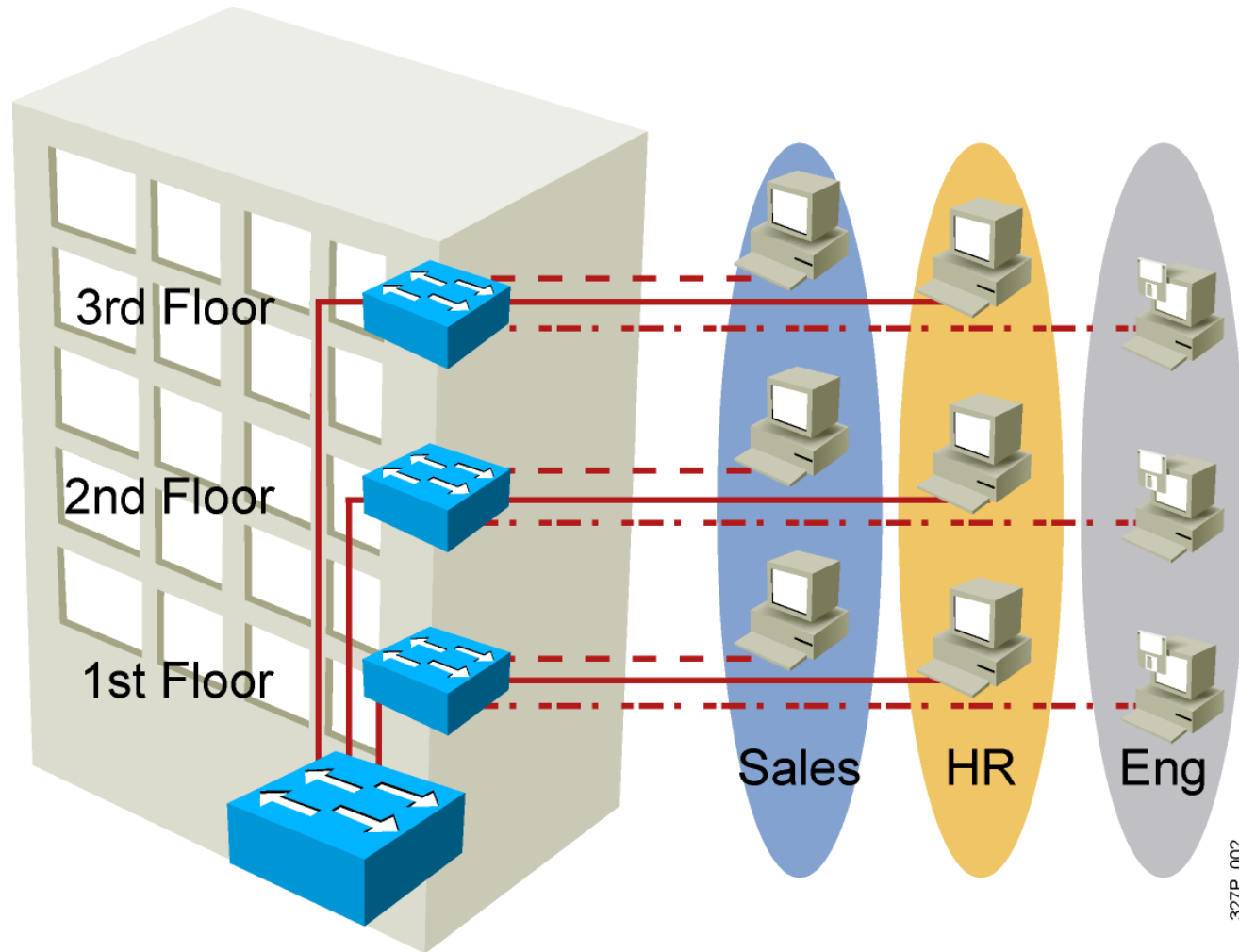
VLAN Overview

Vlan on Switching Network : 1 broadcast-domain



VLAN Overview

- Segmentation
- Flexibility
- Security

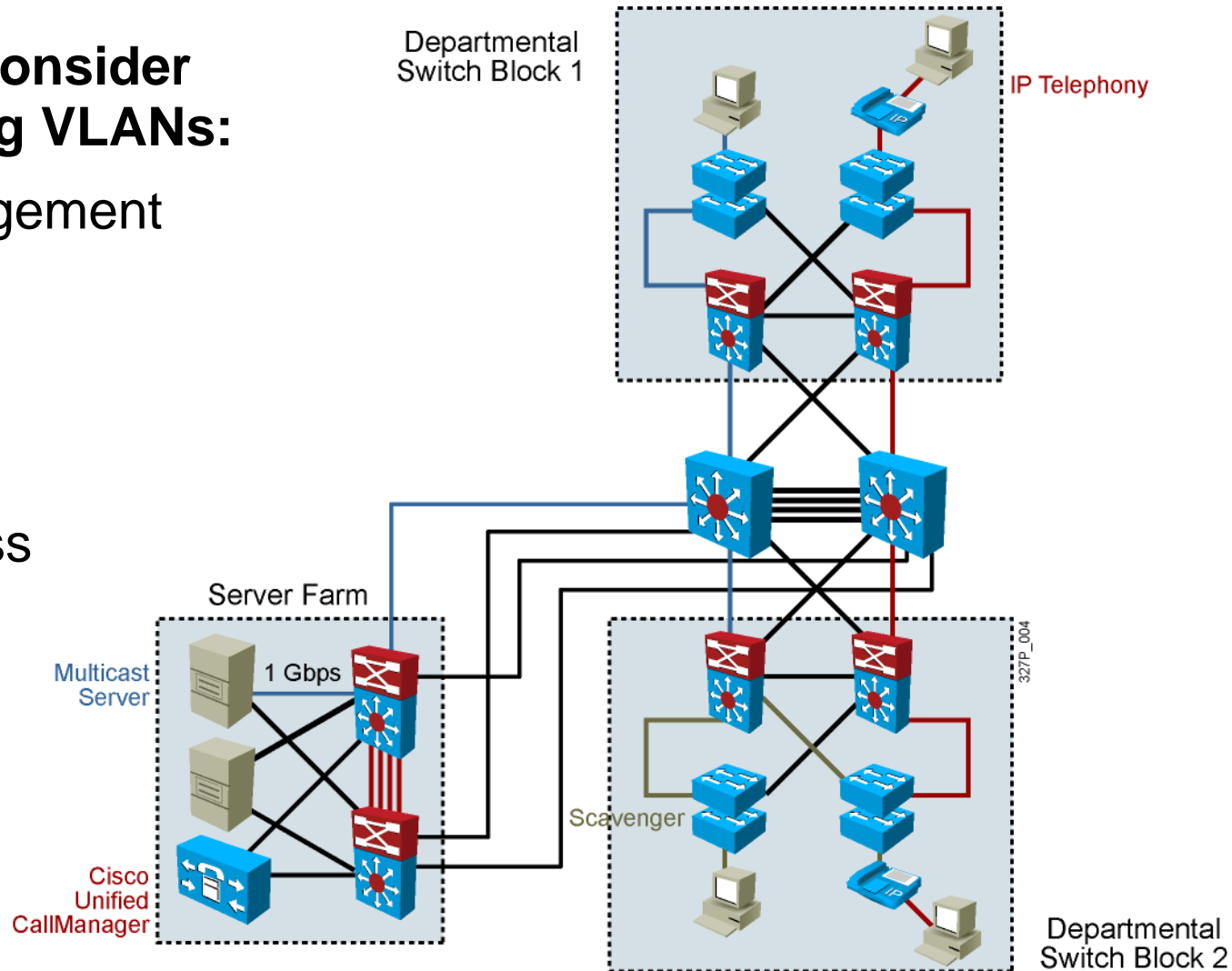


VLAN = Broadcast Domain = Logical Network (Subnet)

Network Traffic Types

Traffic types to consider when designating VLANs:

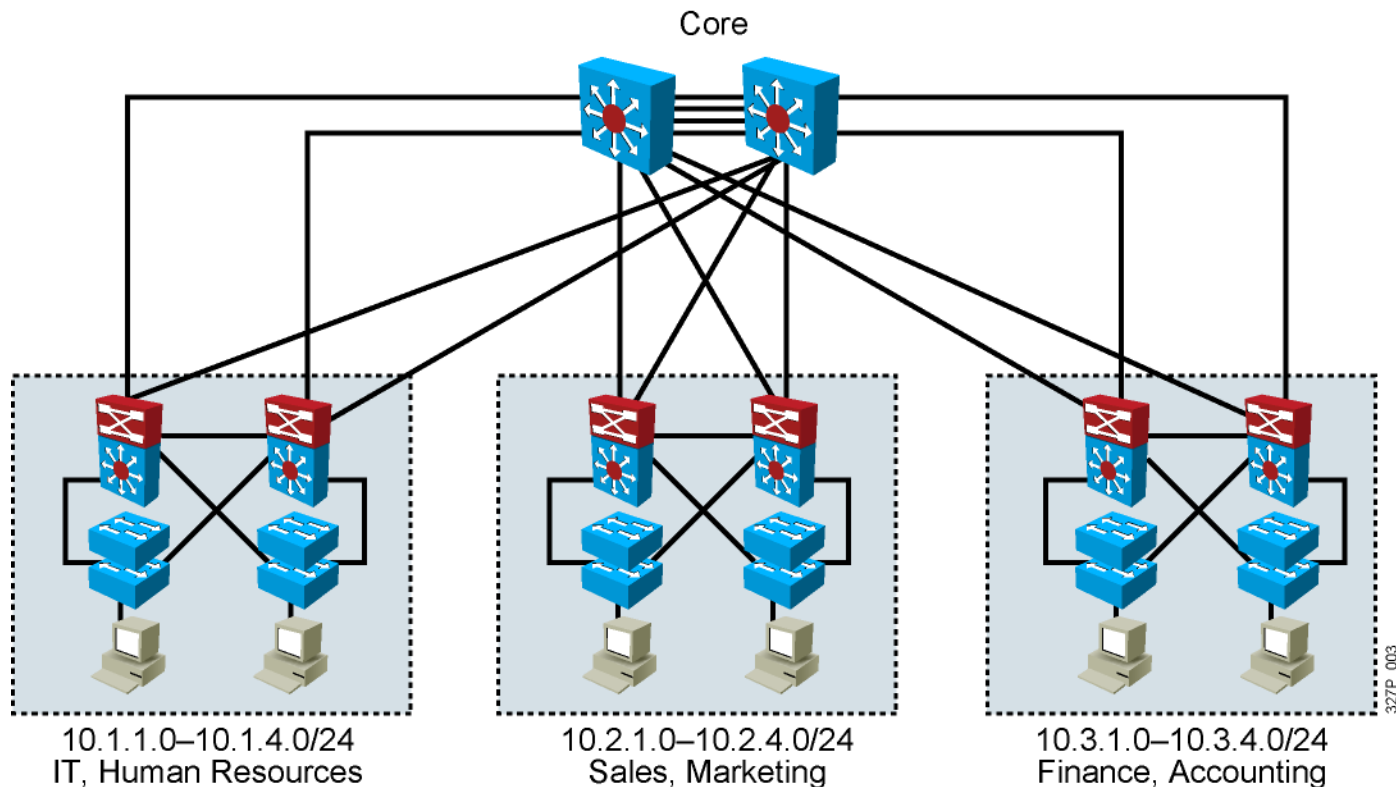
- Network management
- IP telephony
- IP Multicast
- Normal data
- Scavenger class



Designing VLANs for an Organization

- **VLAN design must take into consideration the implementation of a hierarchical network addressing scheme.**
- **The benefits of hierarchical addressing are:**
 - Ease of management and troubleshooting
 - Minimization of errors
 - Reduced number of routing table entries

Guidelines for Applying IP Address Space



- Allocate one IP subnet per VLAN.
- Allocate IP address spaces in contiguous blocks.

VLAN Creation Guidelines

- The maximum number of VLANs is switch-dependent.
- Most Cisco Catalyst desktop switches support 128 separate spanning-tree instances, one per VLAN.
- VLAN 1 is the factory default Ethernet VLAN.
- Cisco Discovery Protocol and VTP advertisements are sent on VLAN 1.
- The Cisco Catalyst switch IP address is in the management VLAN (VLAN 1 by default).
- If using VTP, the switch must be in VTP server or transparent mode to add or delete VLANs.

Adding a VLAN

```
SwitchX# configure terminal  
SwitchX(config)# vlan vlan-id  
SwitchX(config-vlan)# name vlan-name
```

Verifying a VLAN

```
SwitchX# show vlan [brief | id vlan-id || name vlan-name]
```

```
SwitchX# show vlan id 2
```

VLAN	Name	Status	Ports
2	switchlab99	active	Fa0/2, Fa0/12

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp
BrdgMode	Trans1	Trans2					
2	enet	100002	1500	-	-	-	-
0	0						

```
. . .  
SwitchX#
```

Assigning Switch Ports to a VLAN

```
SwitchX(config-if)# switchport access [vlan vlan# | dynamic]
```

```
SwitchX# configure terminal
```

```
SwitchX(config)# interface range fastethernet 0/2 - 4
```

```
SwitchX(config-if-range)# switchport access vlan 2
```

```
SwitchX# show vlan
```

VLAN Name		Status	Ports
-----		-----	-----
1	default	active	Fa0/1
2	switchlab99	active	Fa0/2, Fa0/3, Fa0/4

Verifying VLAN Membership

```
SwitchX# show vlan brief
```

```
SwitchX# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1
2	switchlab99	active	Fa0/2, Fa0/3, Fa0/4
3	vlan3	active	
4	vlan4	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

Verifying VLAN Membership (Cont.)

```
SwitchX(config-if)# show interfaces interface switchport
```

```
SwitchX# show interfaces fa0/2 switchport
```

```
Name: Fa0/2
```

```
Switchport: Enabled
```

```
Administrative Mode: dynamic auto
```

```
Operational Mode: static access
```

```
Administrative Trunking Encapsulation: dot1q
```

```
Operational Trunking Encapsulation: native
```

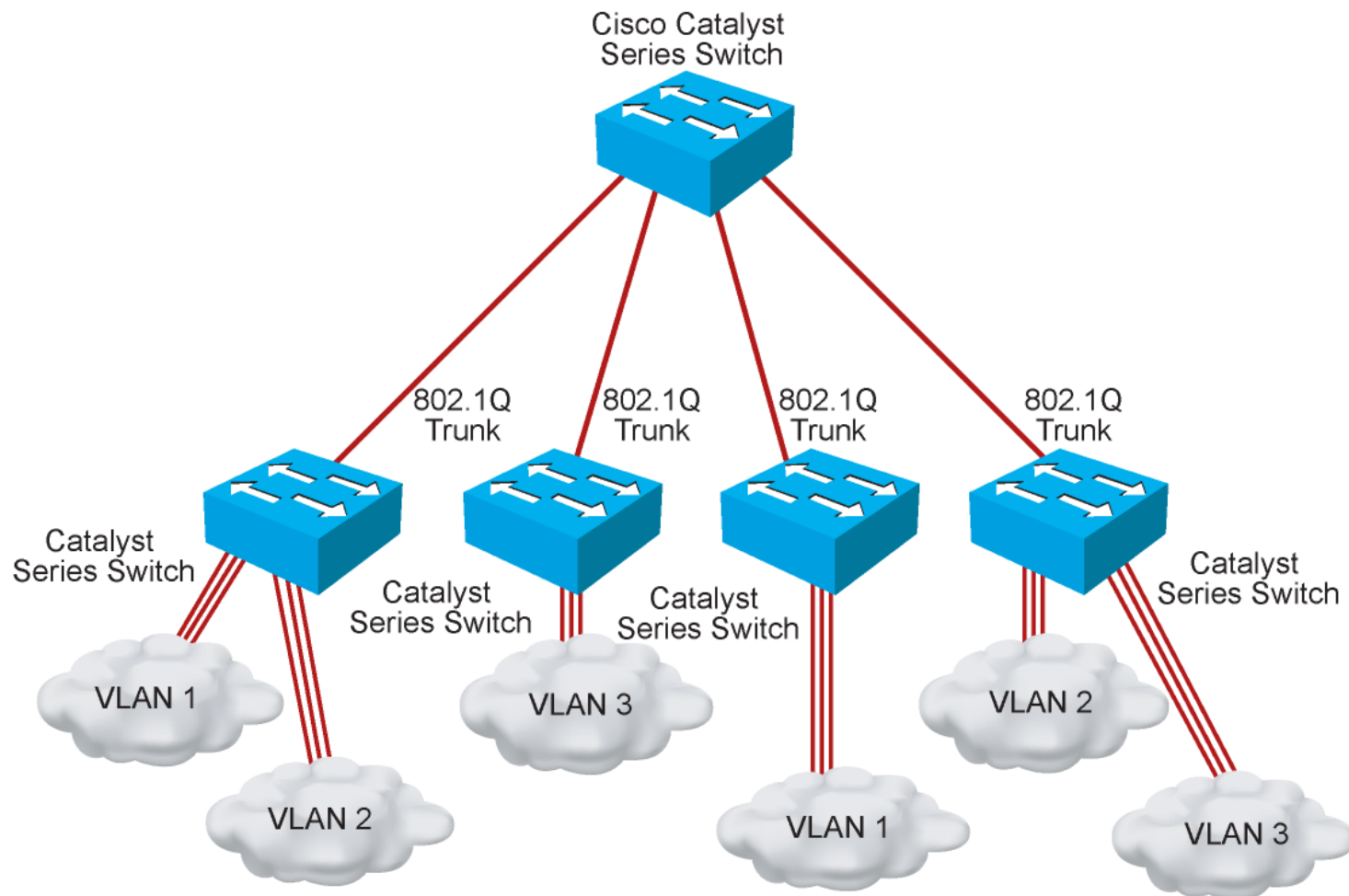
```
Negotiation of Trunking: On
```

```
Access Mode VLAN: 2 (switchlab99)
```

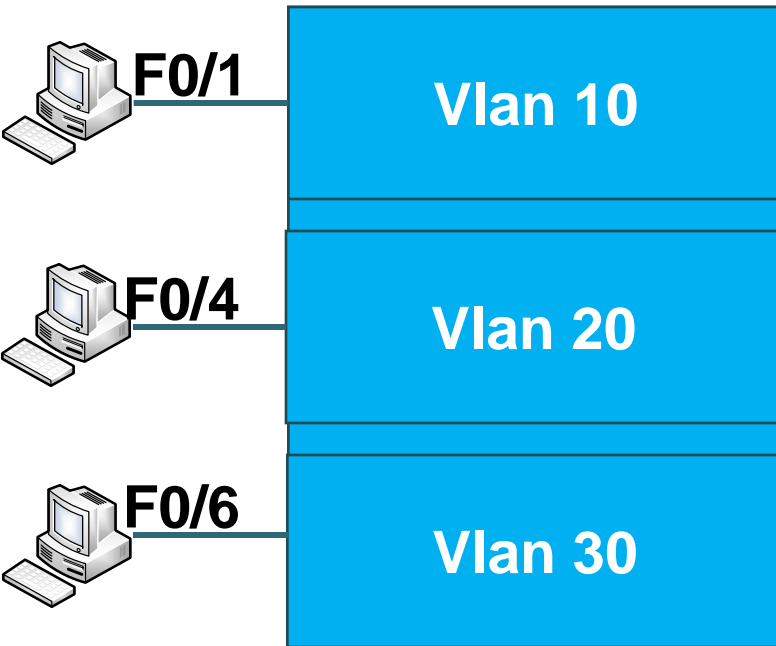
```
Trunking Native Mode VLAN: 1 (default)
```

```
--- output omitted ----
```

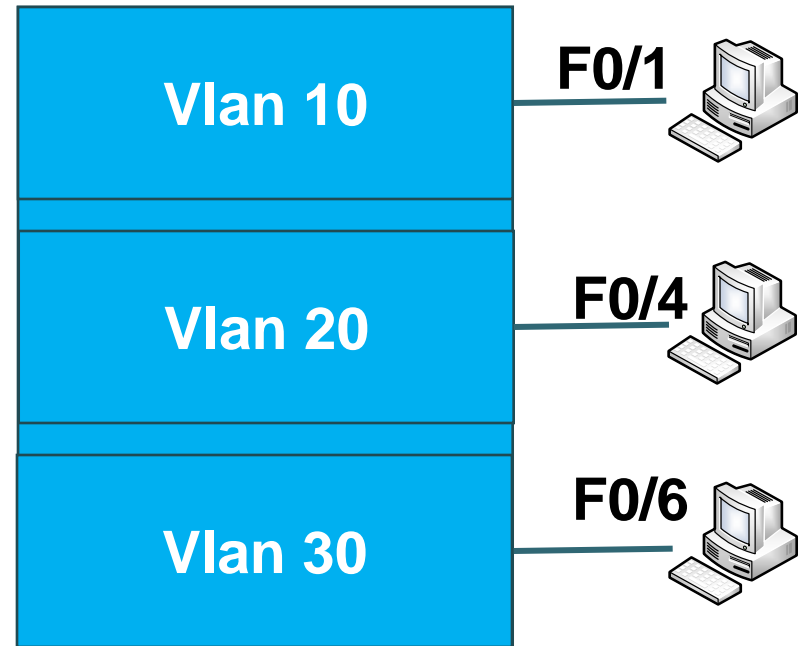
802.1Q Trunking



Trunking

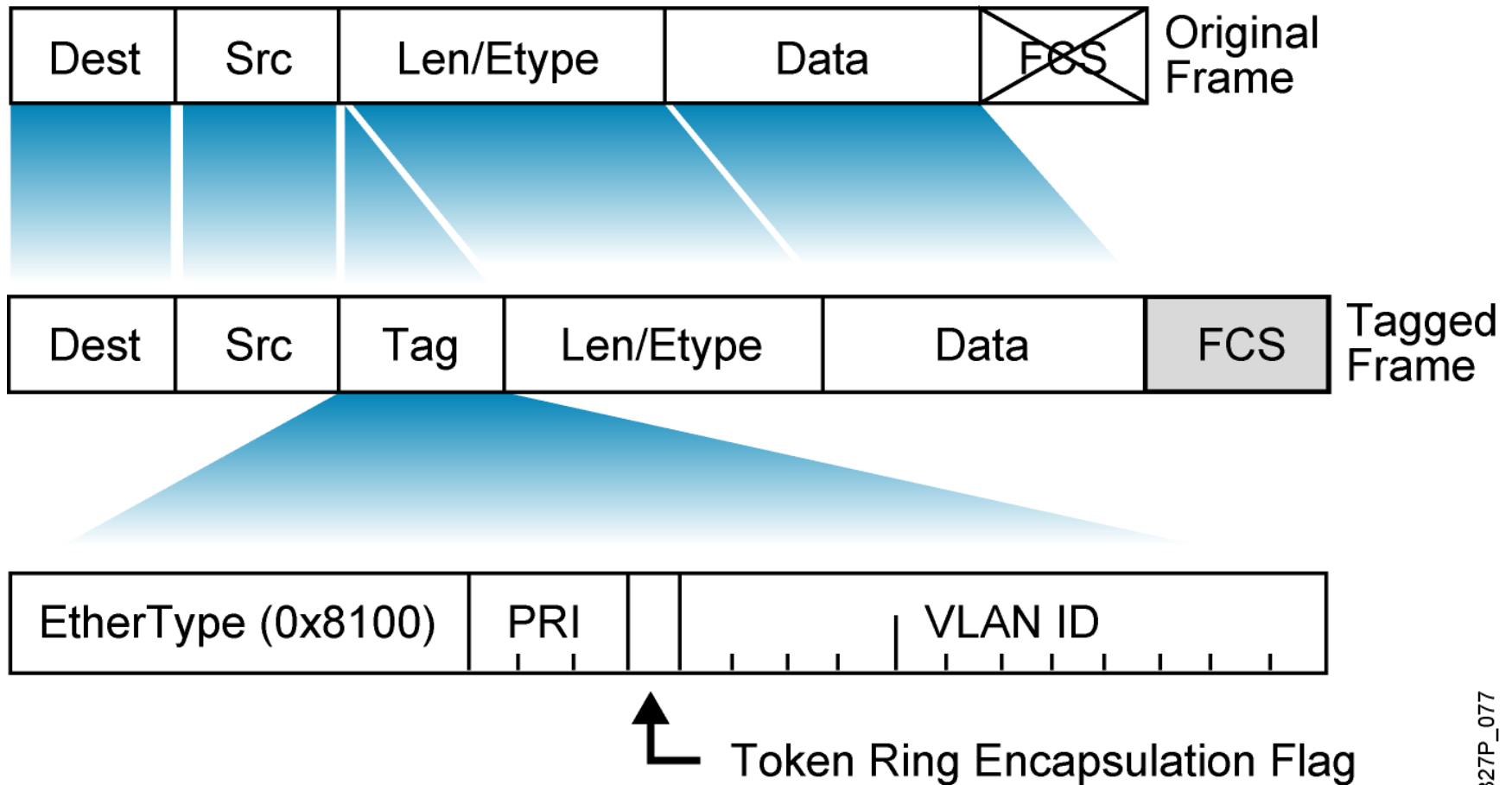


Switch A

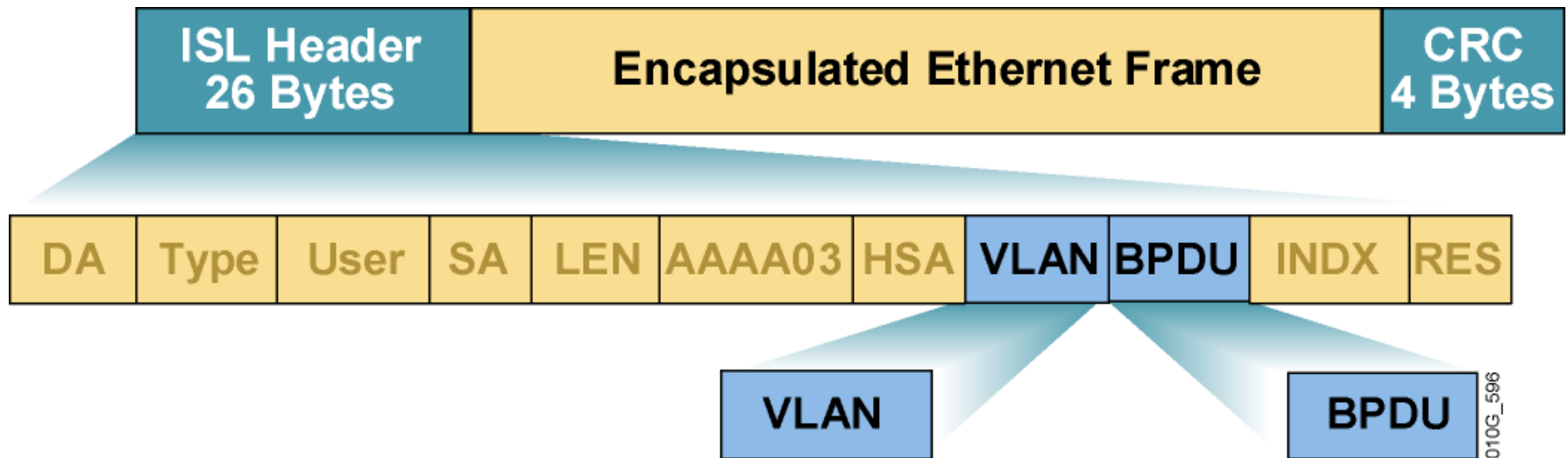


Switch B

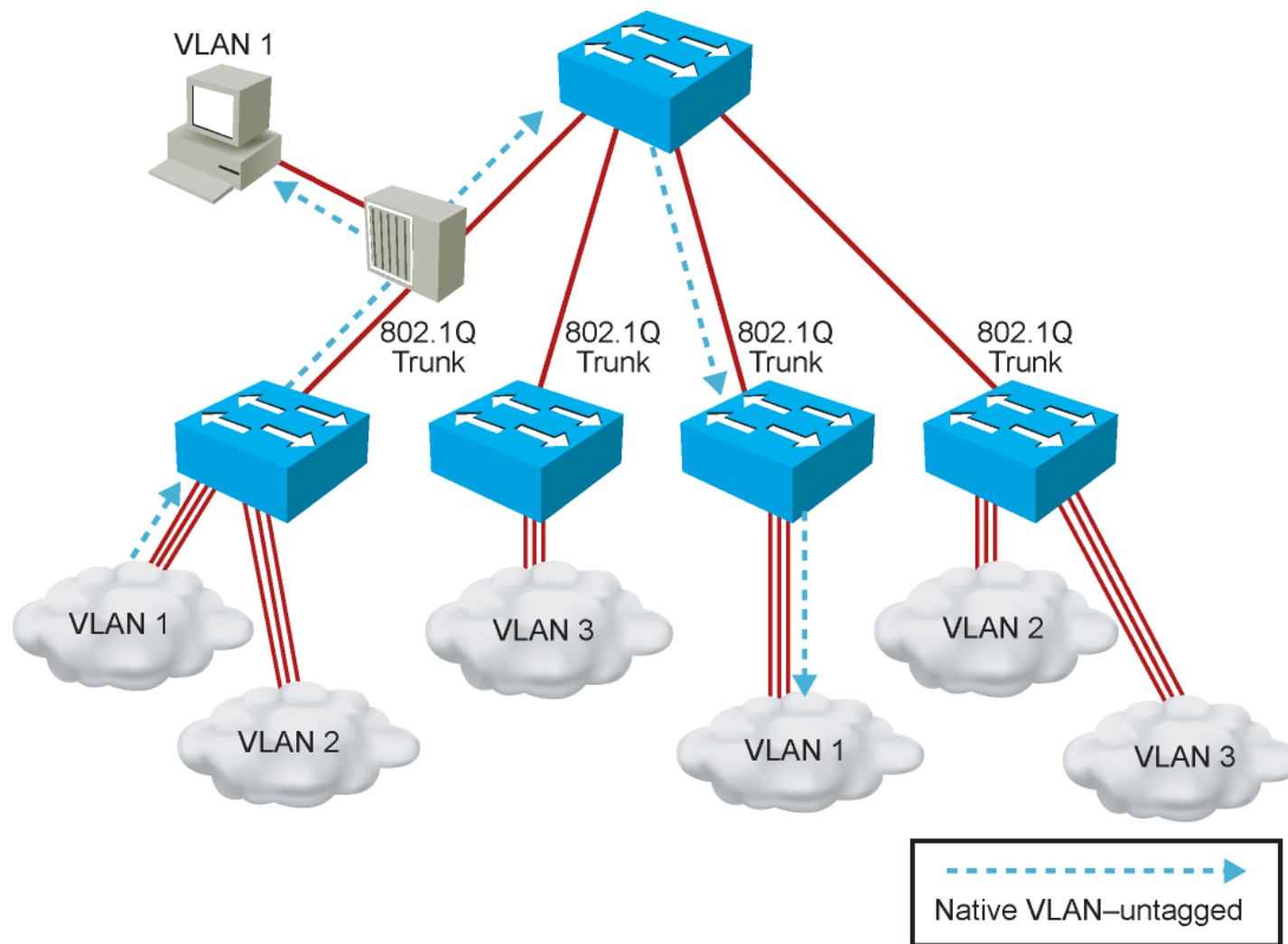
802.1Q Frame



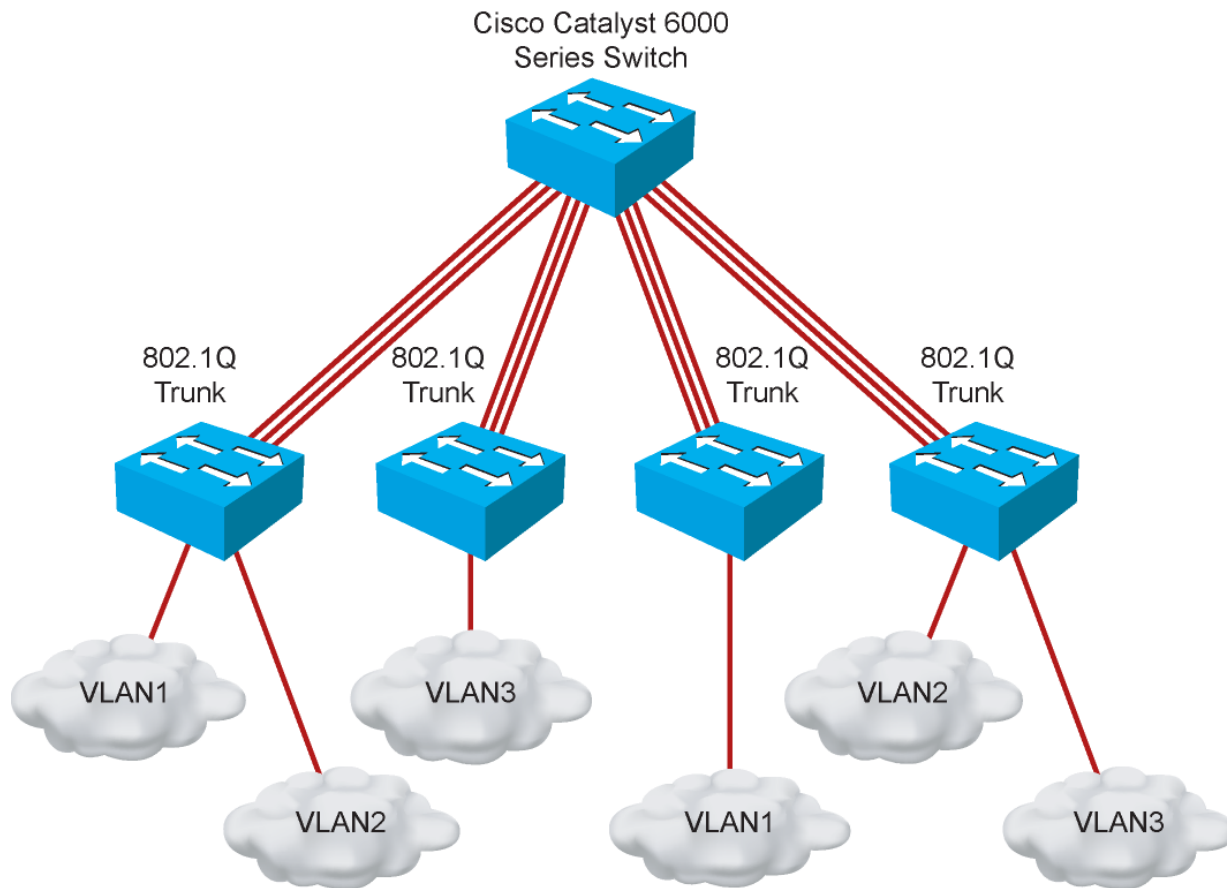
ISL Encapsulation



Understanding Native VLANs



802.1Q Trunking Issues



- Make sure that the native VLAN for an 802.1Q trunk is the same on both ends of the trunk link.
- Note that native VLAN frames are untagged.
- A trunk port cannot be a secure port.
- All 802.1Q trunking ports in an EtherChannel group must have the same configuration.

Configuring 802.1Q Trunking

SwitchX(config-if) #

```
switchport mode {access| dynamic{auto|desirable}| trunk}
```

- Configures the trunking characteristics of the port

```
SwitchX(config-if) #switchport trunk encapsulation {dot1q  
| isl}
```

```
SwitchX(config-if) #switchport mode trunk
```

- Configures the port as a VLAN trunk

Verifying a Trunk

```
SwitchX# show interfaces interface [switchport | trunk]
```

```
SwitchX# show interfaces fa0/11 switchport
Name: Fa0/11
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: down
Administrative Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
. . .
```

```
SwitchX# show interfaces fa0/11 trunk
```

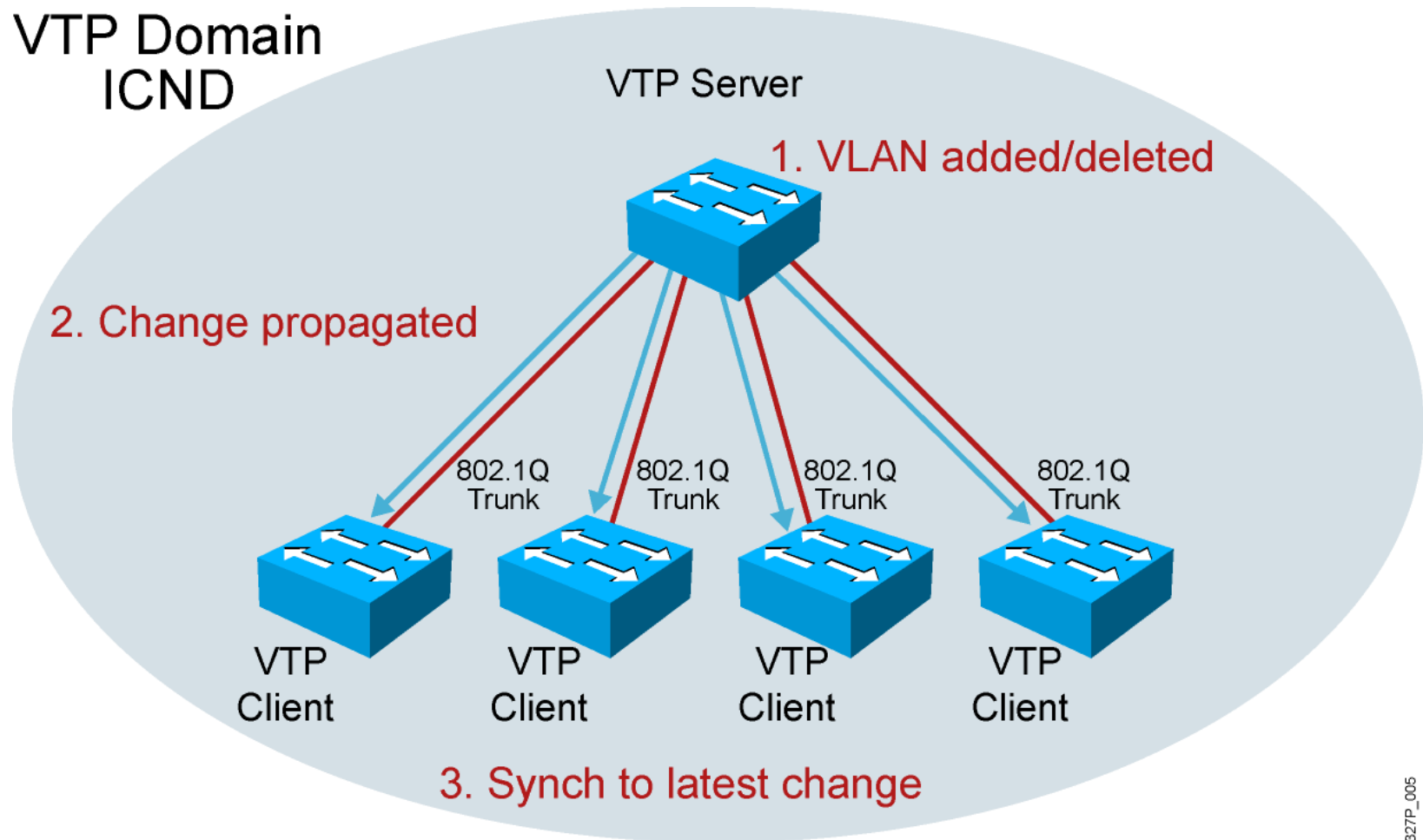
Port	Mode	Encapsulation	Status	Native vlan
Fa0/11	desirable	802.1q	trunking	1

Port	Vlans allowed on trunk
Fa0/11	1-4094

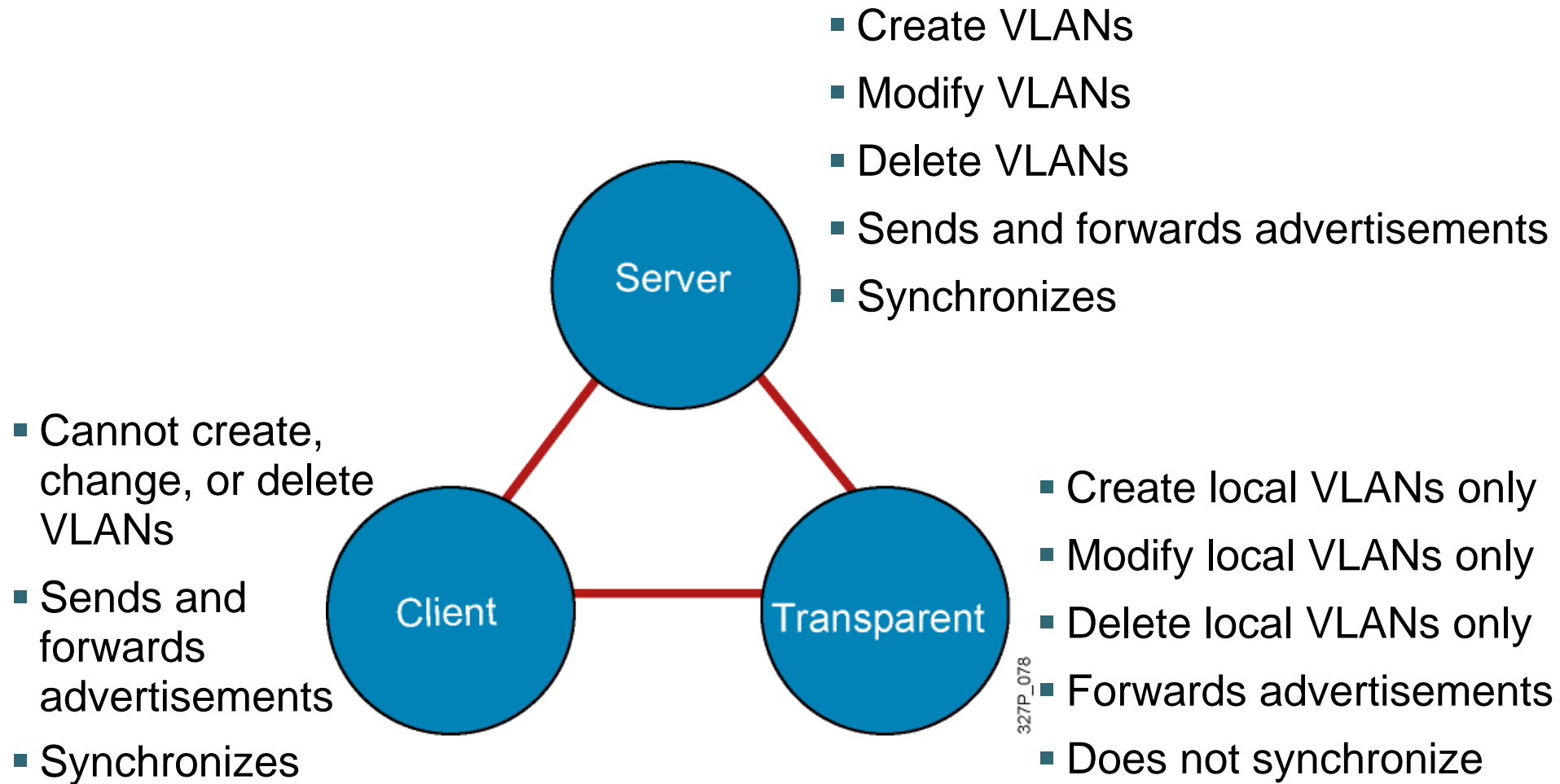
Port	Vlans allowed and active in management domain
Fa0/11	1-13

VTP Features

VTP Domain ICND

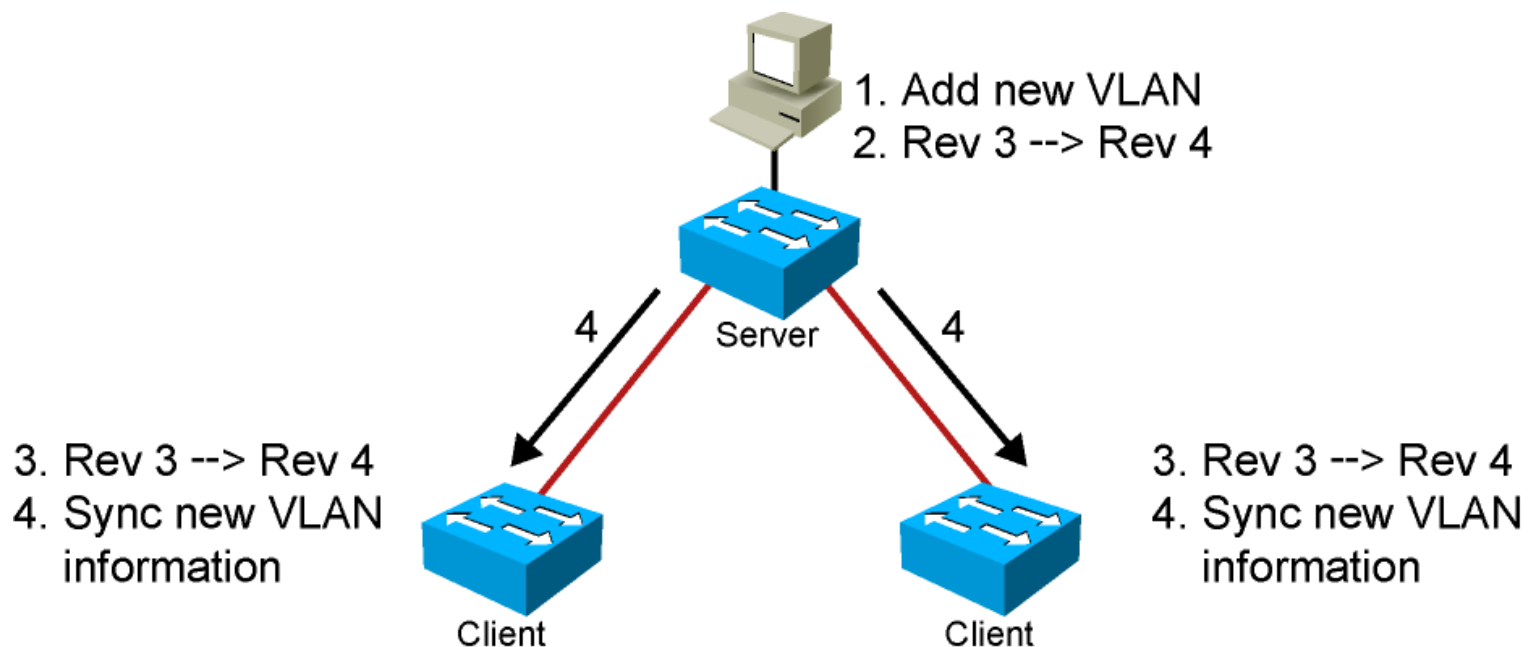


VTP Modes

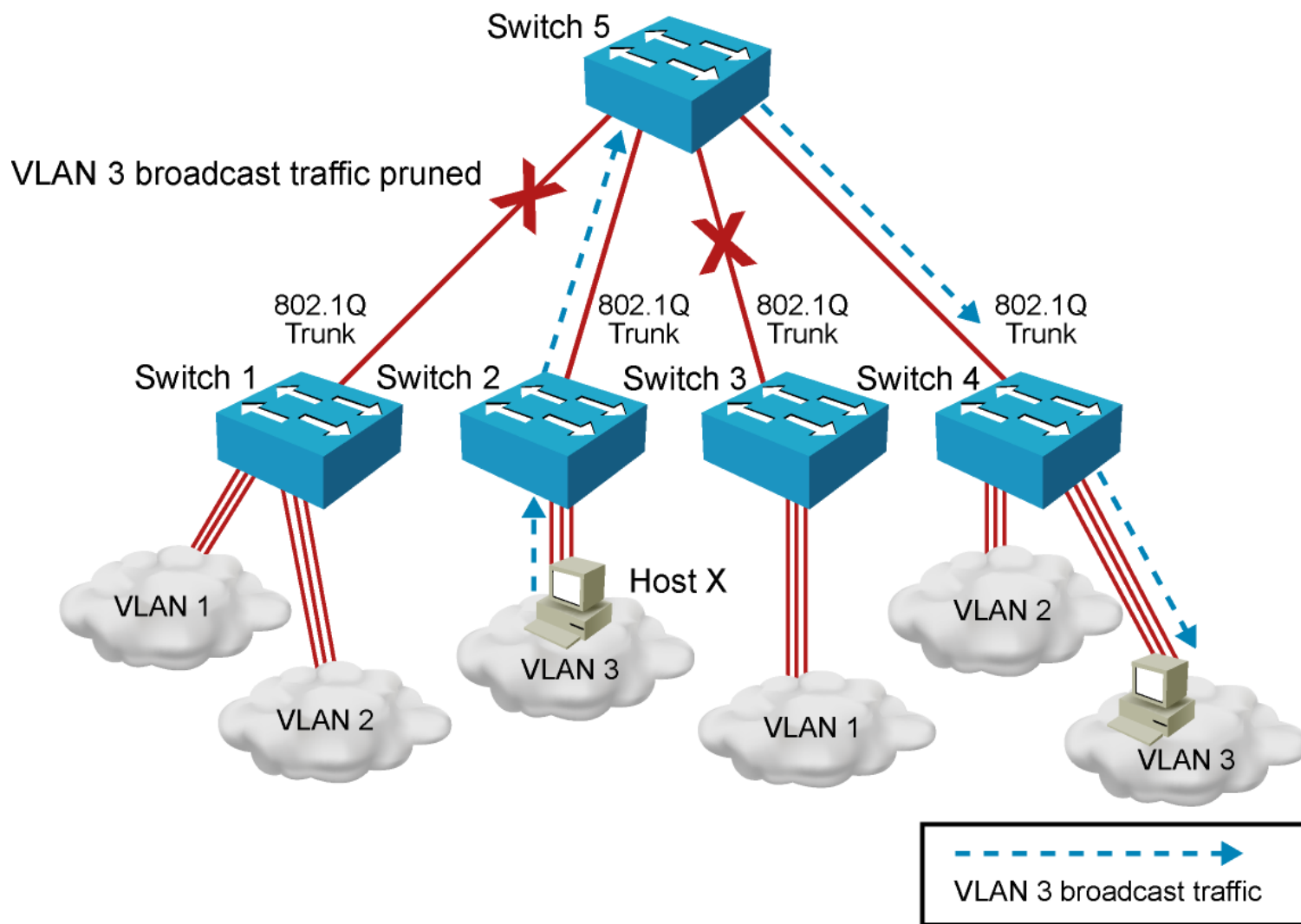


VTP Operation

- VTP advertisements are sent as multicast frames.
- VTP servers and clients are synchronized to the latest revision number.
- VTP advertisements are sent every 5 minutes or when there is a change.



VTP Pruning



VTP Configuration Guidelines

- VTP defaults for the Cisco Catalyst switch:
 - VTP domain name: None
 - VTP mode: Server mode
 - VTP pruning: Enabled or disabled (model specific)
 - VTP password: Null
 - VTP version: Version 1
- A new switch can automatically become part of a domain once it receives an advertisement from a server.
- A VTP client can overwrite a VTP server database if the client has a higher revision number.
- A domain name cannot be removed after it is assigned; it can only be reassigned.

Creating a VTP Domain

```
SwitchX# configure terminal
SwitchX(config)# vtp mode [server | client | transparent]
SwitchX(config)# vtp domain domain-name
SwitchX(config)# vtp password password
SwitchX(config)# end
```

Configuring VLANs and Trunks

1. Configure and verify VTP.
2. Configure and verify 802.1Q trunks.
3. Create or modify a VLAN on the VTP server switch.
4. Assign switch ports to a VLAN and verify.
5. Execute adds, moves, and changes.
6. Save the VLAN configuration.

VTP Configuration and Verification Example

```
SwitchX(config)# vtp domain ICND
Changing VTP domain name to ICND
SwitchX(config)# vtp mode transparent
Setting device to VTP TRANSPARENT mode.
SwitchX(config)# end
```

```
SwitchX# show vtp status
```

```
VTP Version                : 2
Configuration Revision      : 0
Maximum VLANs supported locally : 64
Number of existing VLANs    : 17
VTP Operating Mode          : Transparent
VTP Domain Name             : ICND
VTP Pruning Mode            : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation        : Disabled
MD5 digest                  : 0x7D 0x6E 0x5E 0x3D 0xAF 0xA0 0x2F
0xAA
Configuration last modified by 10.1.1.4 at 3-3-93 20:08:05
SwitchX#
```

Executing Adds, Moves, and Changes for VLANs

- When using VTP, the switch must be in VTP server or transparent mode to add, change, or delete VLANs.
- When you make VLAN changes from a switch in VTP server mode, the change is propagated to other switches in the VTP domain.
- Changing VLANs typically implies changing IP networks.
- After a port is reassigned to a new VLAN, that port is automatically removed from its previous VLAN.
- When you delete a VLAN, any ports in that VLAN that are not moved to an active VLAN will be unable to communicate with other stations.

