

VLANs and VTP

Malin Bornhager

Halmstad University



Objectives



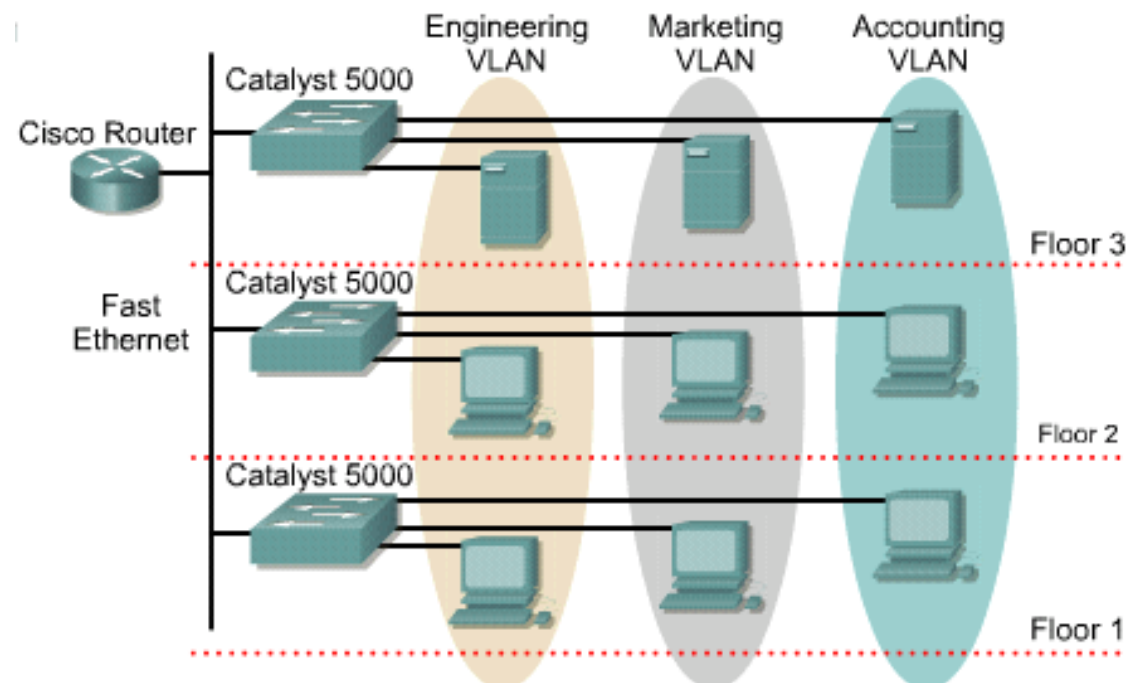
- **VLAN concepts**
- **Trunking**
- **VTP – VLAN Trunking Protocol**

Introduction to VLANs

- **Groups of ports or users in same broadcast domain, regardless of their physical location**
- **Based on port ID, MAC address, protocol or application**
- **LAN switches and network management software provide a mechanism to create VLANs and segments the network in broadcast domains**
- **Several VLANs on a single switch, and a VLAN can span multiple switches**
- **Frame tagged with VLAN ID**

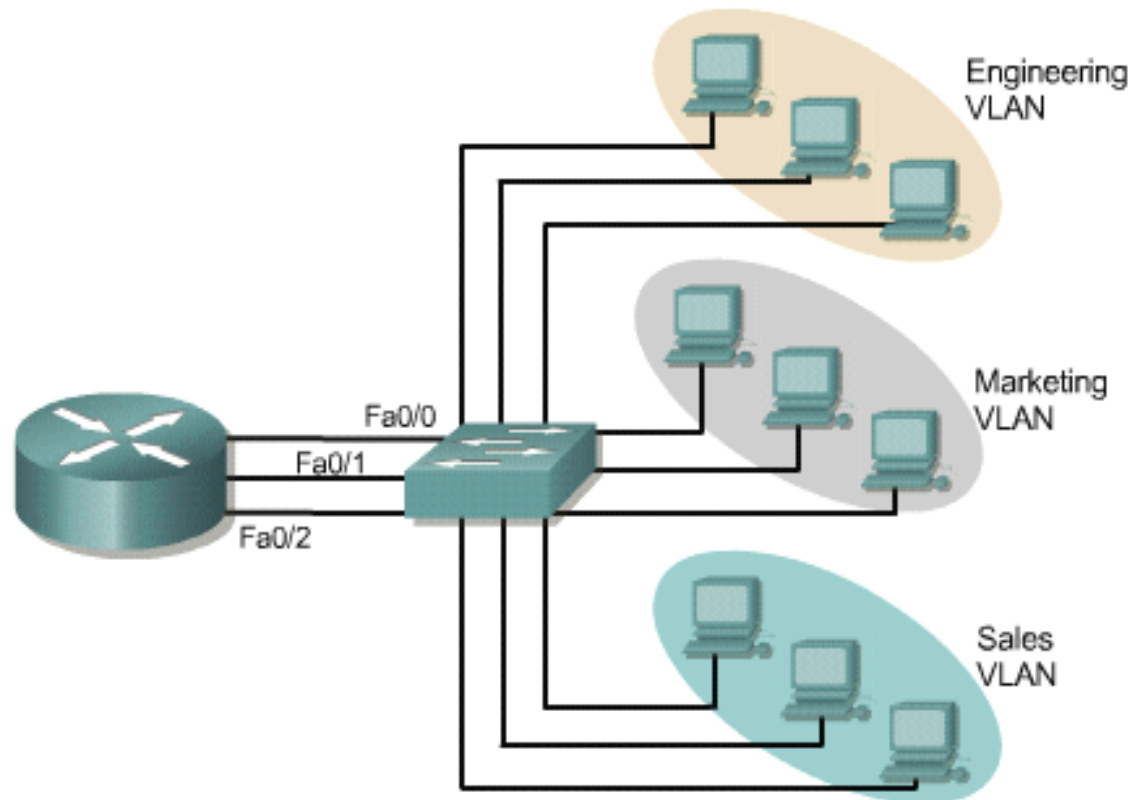
VLANs

- Logically segments based on:
 - Organization's functions
 - Project teams
 - Applications



Broadcast Domains

- 3 VLANs – 3 broadcast domains



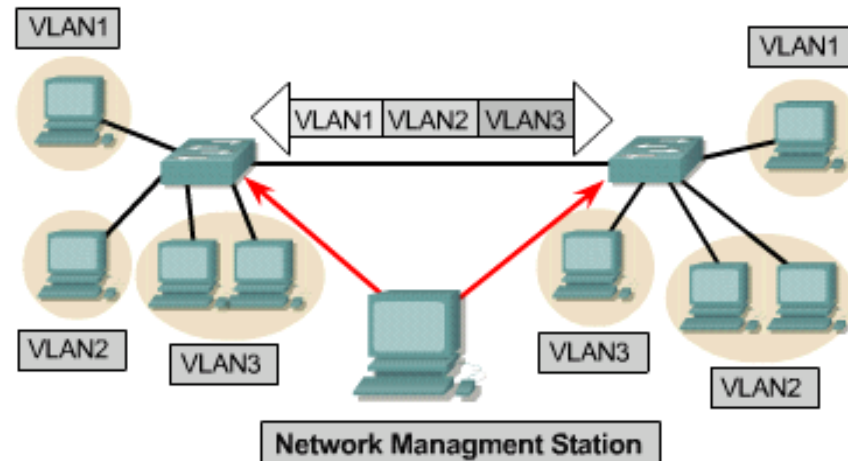
Benefits of VLANs

- **Easily move workstations on the LAN**
- **Easily add workstations to the LAN**
- **Change the LAN configuration easily**
- **Control network traffic, higher performance**
- **Reduce broadcast storms**
- **Improve security**

Types of VLANs

- **Default VLAN**
 - All switch ports are members, initial boot up
- **Data VLAN**
 - Carries only user-generated traffic
- **Native VLAN**
 - Supports traffic from many VLANs
- **Management VLAN**
 - Configured to access the management capabilities of a switch
- **Voice VLAN**
 - To priorities voice traffic and ensure voice quality

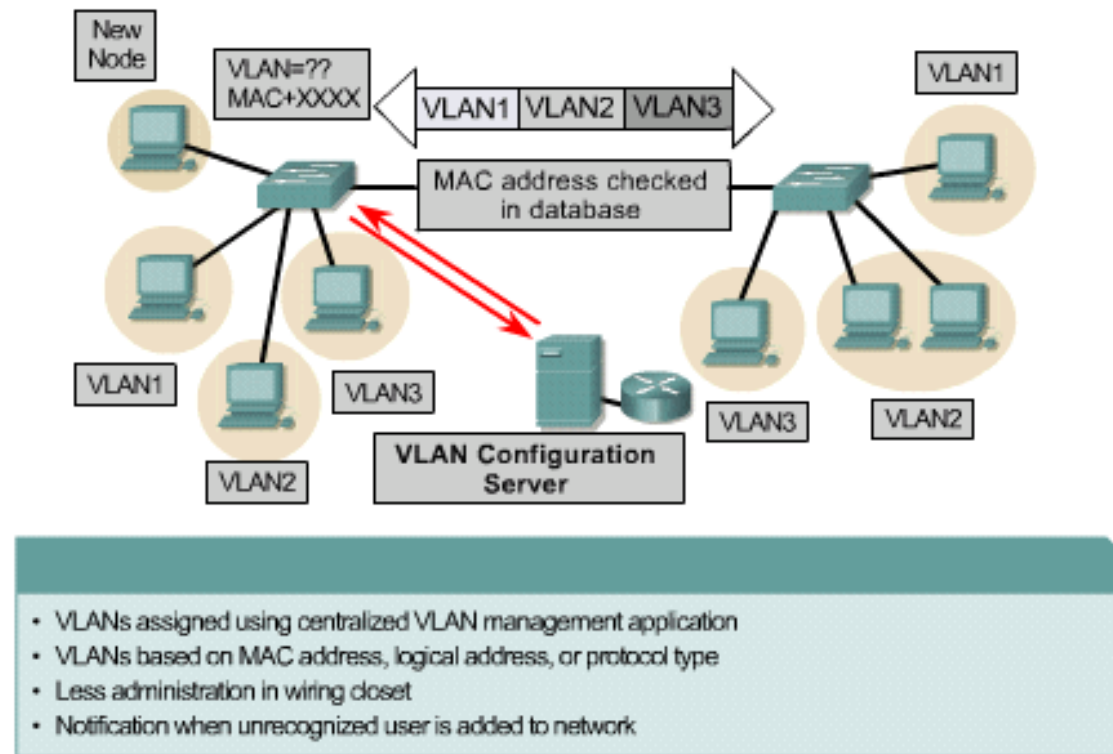
Static VLANs



- Assign ports (port-centric)
- Static VLANs are secure, easy to configure and monitor

- **Configured port-by-port**
- **Each port associated with specific VLAN**
- **Network administrator responsible for mapping**
 - **Moves are controlled and managed**

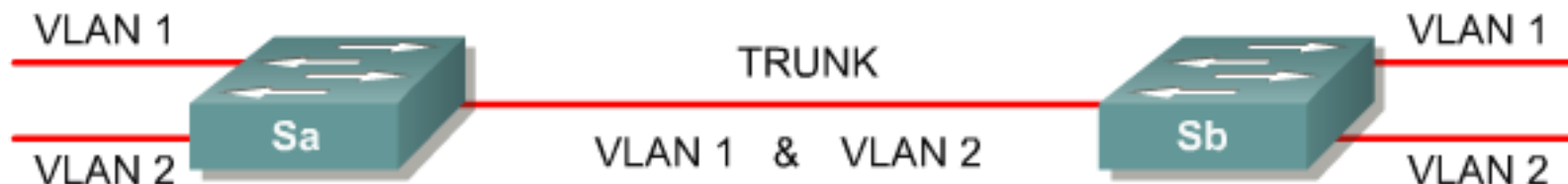
Dynamic VLANs



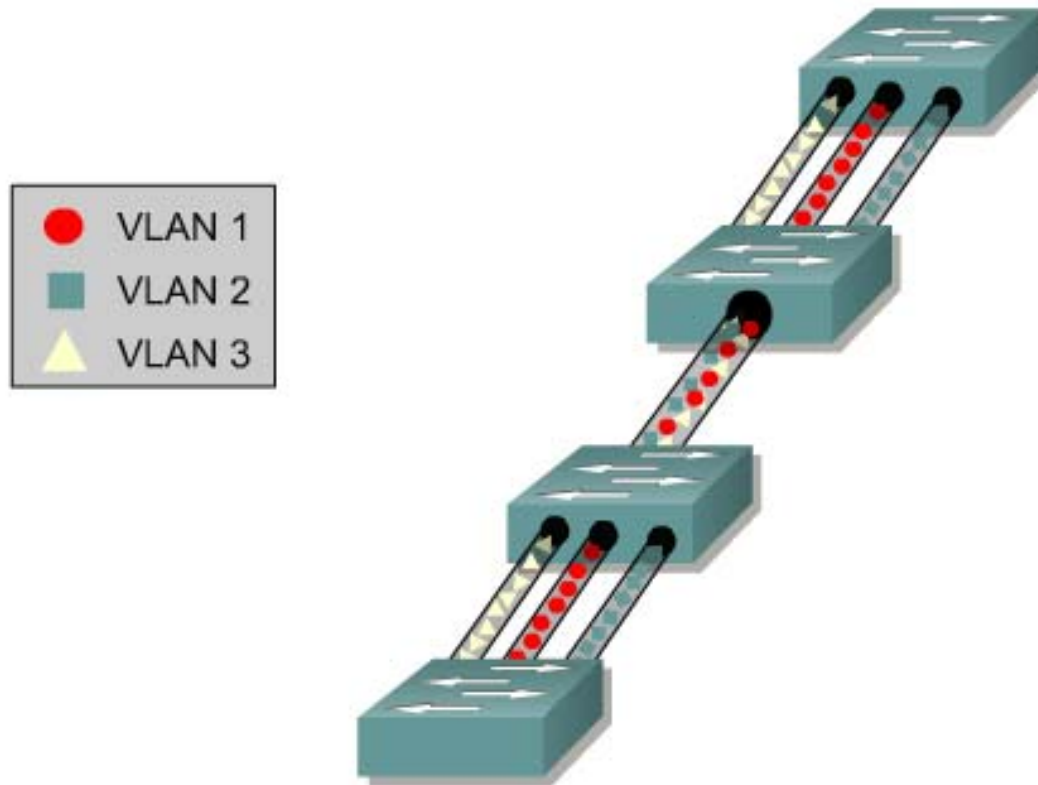
- **Ports dynamically assigned to VLAN**
- **Database of MAC addresses for mapping**

Trunking Concepts

- Point-to-point link between two network devices
- Carries traffic for more than one VLAN
- The trunk does not belong to a specific VLAN
- Reduces the number of switchports that are needed between two network devices



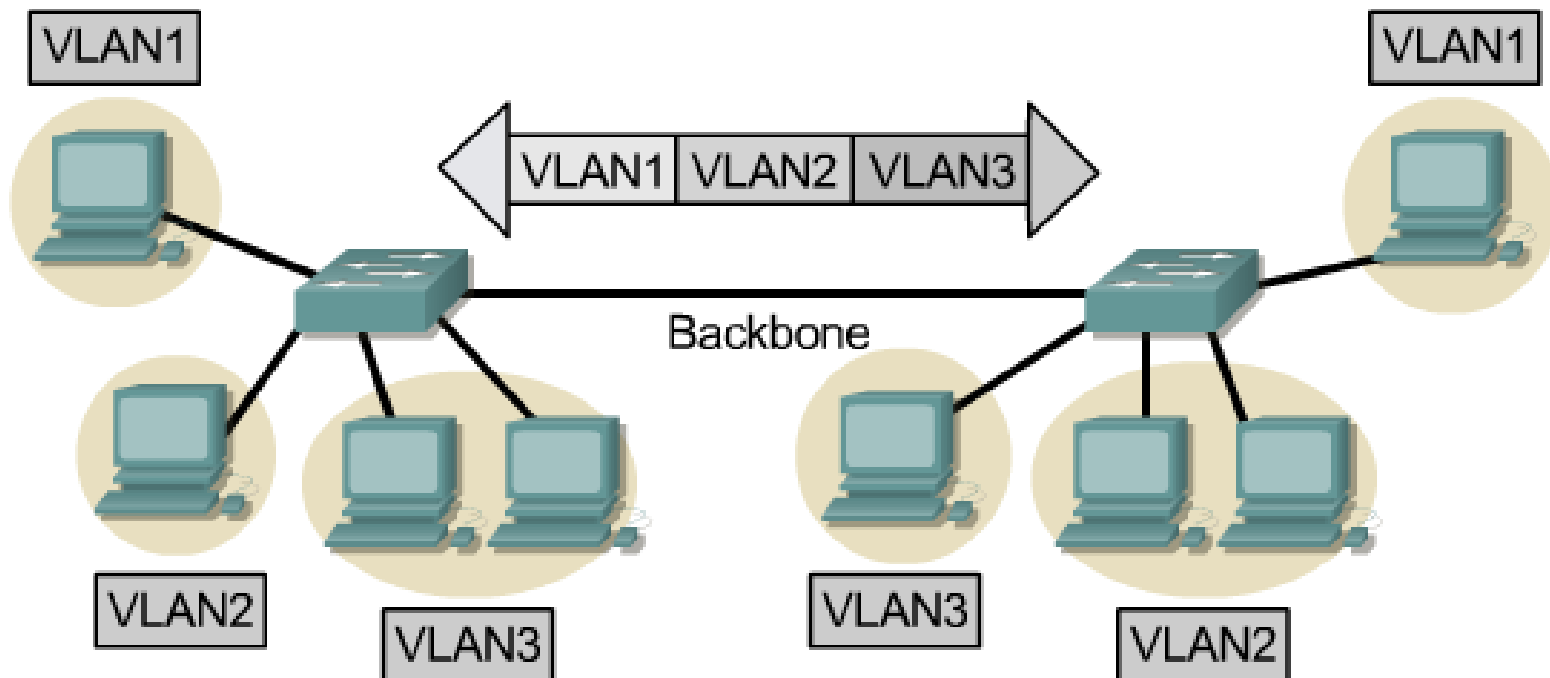
VLANs and Trunking



Trunking provides effective communication between switches in a network.

Frame Tagging

- A method to identify to which VLAN a frame belongs
- VLAN ID is tagged/inserted in the existing frame



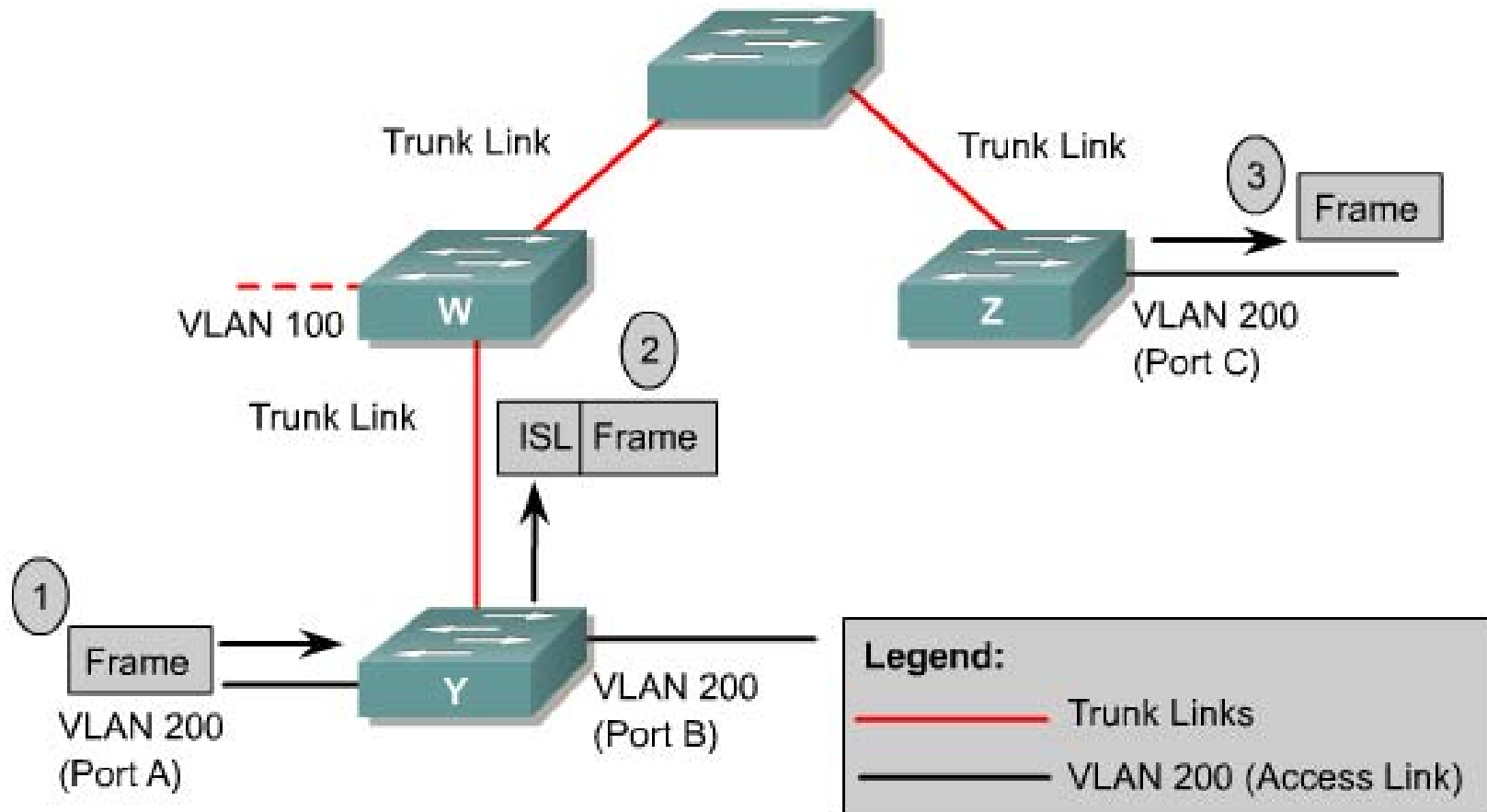
Frame Tagging and Encapsulation Methods

Identification Method	Encapsulation	Tagging (insertion into frame)	Media
802.1Q	No	Yes	Ethernet
ISL	Yes	No	Ethernet
802.10	No	No	FDDI
LANE	No	No	ATM

802.1Q Frame Tagging

- **Adds a tag to the Ethernet frame**
- **Specifying the VLAN to which the frame belongs**
- **All incoming traffic on the access ports will be tagged with the VLAN ID**
- **All untagged traffic on the trunk will be forwarded on the configured native VLAN**

Inter-Switch Link Protocol



VLAN Trunking Protocol - VTP

- **Protocol used between switches**
- **VLAN configuration is done on one switch**
 - VTP server
- **Propagate VLAN information to all switches in the domain**
 - VTP clients
- **Simplify the management of VLANs**

VTP Benefits

- VLAN configuration consistency across the network
- VLANs are trunked over mixed media. For example, an Ethernet VLAN is mapped to high-speed ATM LANE or FDDI VLAN
- Accurate tracking and monitoring of VLANs
- Dynamic reporting of added VLANs across the network
- "Plug-and-play" configuration when adding new VLANs

VTP Concepts

- **VTP Domain**
 - One or more interconnected switches
 - Share VLAN configuration details
- **VTP Advertisements**
 - Used to distribute and synchronize VLAN configuration across the domain
- **VTP Modes**
 - Server
 - Client
 - Transparent

VTP Concepts

- **VTP Server**
 - **Advertise the VLAN information across the domain**
 - **Create, delete, modify**
- **VTP Client**
 - **Stores the VLAN information from the server**
 - **Can not create, delete, modify**
- **VTP Transparent**
 - **Forwards VTP advertisements**
 - **Do not participate in VTP**

VTP Mode

Feature	Server	Client	Transparent
Source VTP Messages	Yes	Yes	No
Listen to VTP Messages	Yes	Yes	No
Create VLANs	Yes	No	Yes*
Remember VLANs	Yes	No	Yes*

*Locally Significant only

VTP Advertisements

- **Summary advertisement**
 - Contains VTP domain name, revision number, VTP configuration details
 - Every 5 minutes or if configuration changes
- **Subset advertisement**
 - VLAN information
 - Triggered when changes are made
- **Request advertisement**
 - Sent to server if information needed

VTP Pruning

- **Prevents unnecessary flooding of broadcast information from one VLAN across all trunks in a VTP domain**
- **Negotiate which VLANs are assigned to ports at the other end of a trunk**
- **Prune the VLANs that are not assigned to ports on the remote switch**
- **Does not send broadcast traffic for the VLAN on trunk links that are not connected to that VLAN**

Verifying VLAN Configuration

```
Cisco
SydneySwitch#show vlan

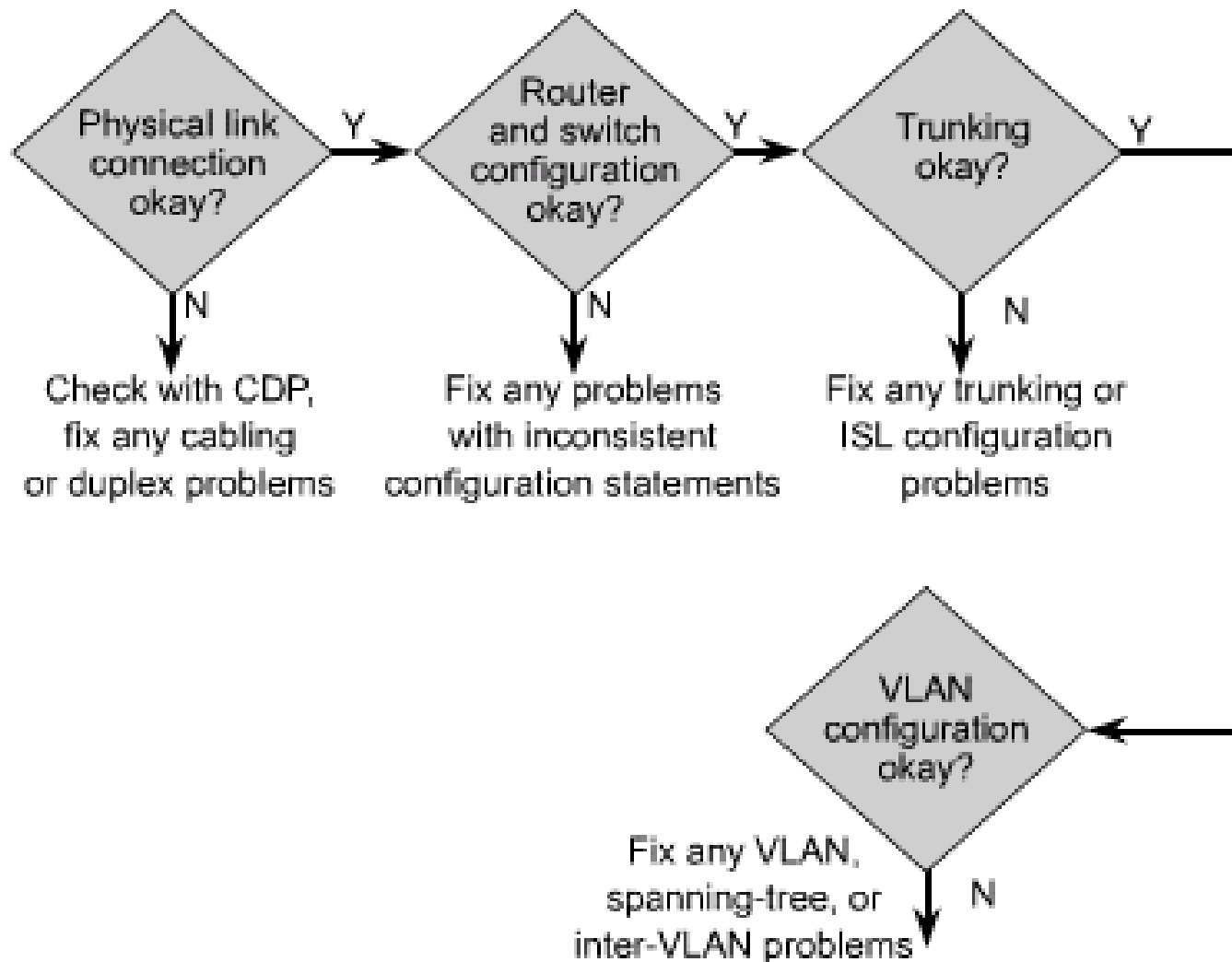
VLAN Name                Status    Ports
-----
VLAN Name                Status    Ports
-----
1    default                active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
2    VLAN2                  active    Fa0/5, Fa0/6, Fa0/7
3    VLAN3                  active    Fa0/8, Fa0/9, Fa0/10, Fa0/11,
                                Fa0/12
1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default       active
1005 trnet-default         active

VLAN Type SAID MTU   Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2
-----
1    enet 100001 1500 -     -     -     -     -
2    enet 100002 1500 -     -     -     -     -
```

```
Cisco
SydneySwitch#show vlan brief

VLAN Name                Status    Ports
-----
1    default                active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
2    VLAN2                  active    Fa0/5, Fa0/6, Fa0/7
3    VLAN3                  active    Fa0/8, Fa0/9, Fa0/10, Fa0/11,
                                Fa0/12
1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default       active
1005 trnet-default         active
```

VLAN Problem Isolation



Common Problems in Troubleshooting VLANs

Problem	Explanation and Possible Resolution
Trunk Ends in Different VLANs	Different ends of a trunk specify different VLANs. For example, vlan1, vlan2, and vlan3 are enabled on one end but not at the other end.
Protocol	Different ends of link specify different protocols. For example, this could occur on a Fast Ethernet link with Inter Switch Link (ISL) enabled on one end but not on the other end.
Single	Different ends of a single VLAN link specify different VLANs. (When the switches are not multi-VLAN capable when not running a trunking encapsulation protocol).
Name Conflict	Two disconnected sets of switches that have VLANs of the same name. Implications: The VLANs are broken into two or more disjoint parts. Packets from one part are not traveling to the other part. Possible Resolution Rename one of the VLANs.
VLAN Index Conflict	Same VLAN name on different switches with different VLAN Indexes or domains. Traffic from switches with one number for this VLAN will not go to ports on switches with a different number for this VLAN. Possible Resolutions Rename one of the VLANs
SAID Conflict	Indicates different SAID numbers on the same VLAN.

Catalyst IOS show vlan Command

```
Cat4000 (enable) show vlan
VLAN Name                Status    IfIndex Mod/Ports,
Vlans
-----
1    default                active    45      1/1-2
                                           2/9-29,2/31-34
100  VLAN0100                active    53      2/4-5
200  VLAN0200                active    54      2/6-7
300  VLAN0300                active    56      2/3,2/30
1002 fddi-default            active    46
1003 token-ring-default    active    49
1004 fddinet-default        active    47
1005 trnet-default         active    48

VLAN Type  SAID      MTU    Parent RingNo BrdgNo Stp  BrdgMode
Trans1 Trans2
-----
1    enet     100001  1500   -      -      -   -      -      0
0
```