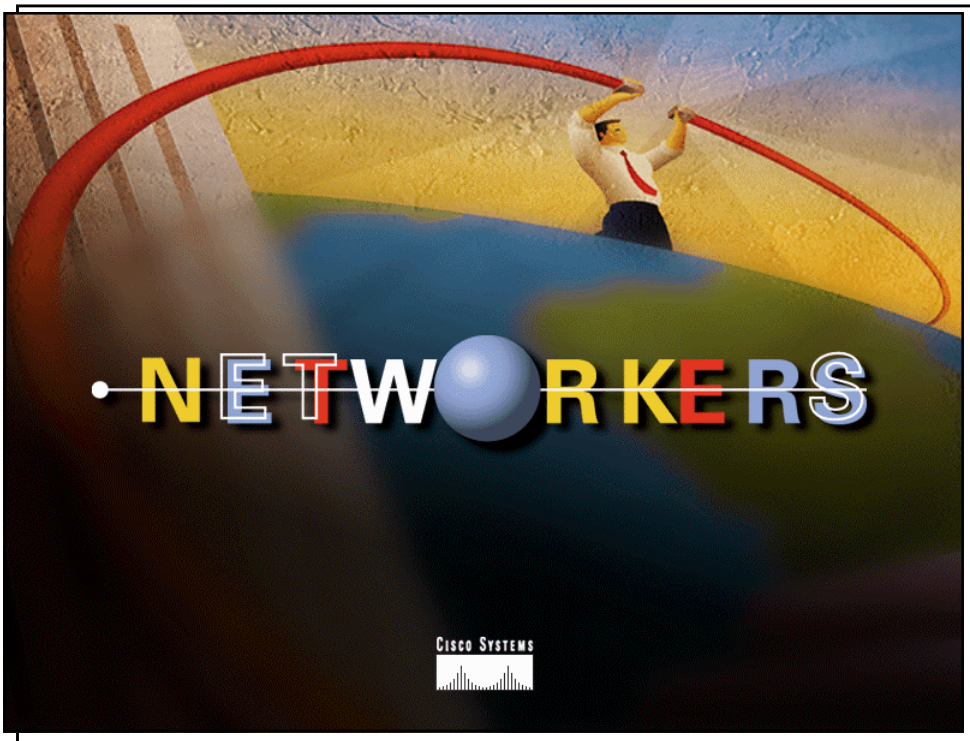

Agenda

- Introduction to Stacking
- Switch Clustering
- Summary

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Traditional Stacking Definition

- **Hardware**—a dedicated high performance bus interconnecting desktop switches in a single wiring closet
- **Software**—a single point of authentication and management of desktop switches (single IP address)

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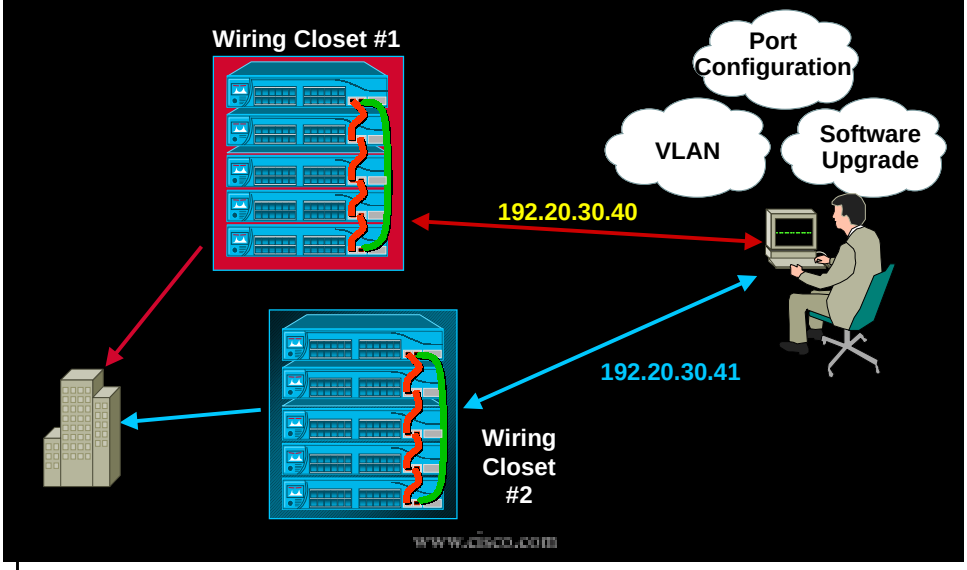
Traditional Stacking Example



Benefits and Limitations of Traditional Stacking

- Low price per port and high performance
- Single IP address management
- Embedded management
- Reduces total cost of ownership (TCO)

- Isolated to a single wiring closet
- No support for legacy systems
- Simplistic embedded management
- No flexibility and redundancy in stacking design

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Traditional Stacking Issue

- Popular and effective wiring closet technology but has many limitations

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Switch Clustering Definition

- **Hardware**—logical collection of up to 16 switches independent of hardware interconnect
- **Software**—a single point of authentication and management using embedded web software with no physical boundary

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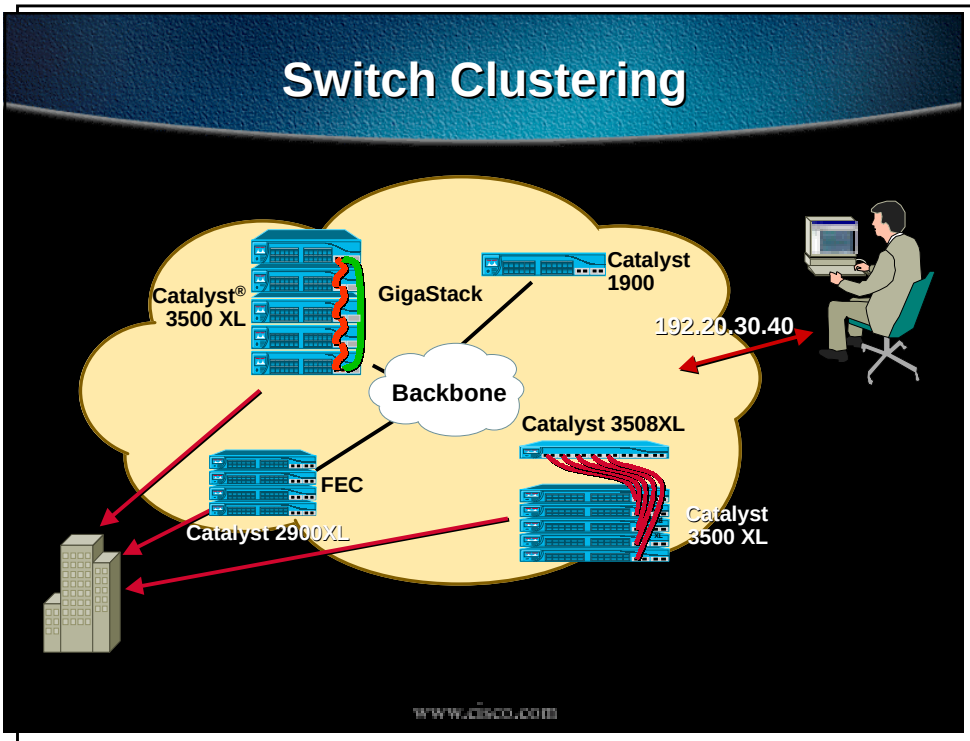
Switch Clustering



Clustering vs. Stacking

Clustering

- Extend beyond wiring closet
- Full investment protection
- Full function web based management
- Different methods of physical connections
- Redundancy in H/W and S/W

Stacking

- Isolated to a single wiring closet
- No support for legacy systems
- Simplistic embedded management
- No flexibility and redundancy in stacking design

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Switch Clustering Details

- Choice of GigaStack dedicated stacking bus, FEC port groups or normal fast Ethernet links for interconnection
- Catalyst 3500XL, 2900XL and 1900 can be part of the switch cluster
- Management via HTTP, telnet, SNMP and console connection

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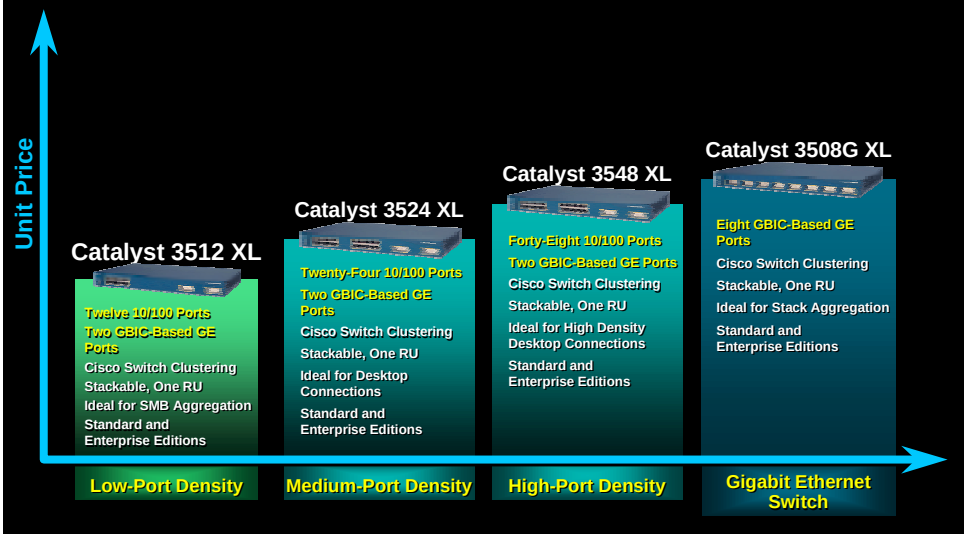
Catalyst 3500 XL Series



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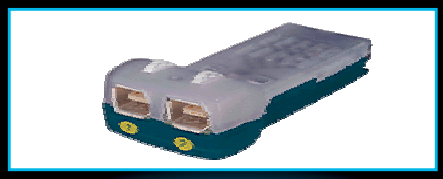
GigaStack Stacking GBIC

- Inexpensive GBIC for stacking
- Cable length of up to 1m
- Operates in two modes



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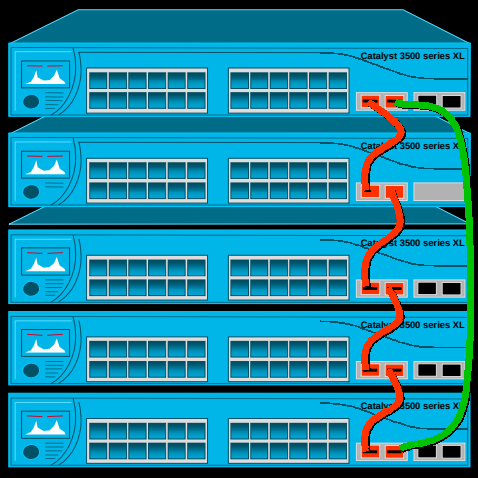
GigaStack Daisy Chain

- Low cost daisy chain option
- Creates a 1 Gbps shared bus
- Redundant loopback save GBIC ports for uplinks and provides high availability
- Up to nine units



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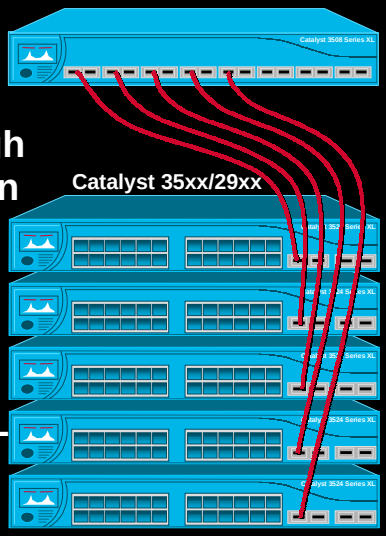
GigaStack Point to Point

- Allows upgrade to high speed, high redundancy option while protecting past investment
- Uses 5 Gbps backplane of Catalyst 3508G XL as “stack”



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Software Versions

- Minimum release Cisco IOS® version 11.2(8) SA6
- Command switch version needs to run on Catalyst 3500 XL or Catalyst 2900XL with 4Mb flash
- Member switch version runs on all Catalyst 2900XL and Catalyst 1900 switches
- Free download from www.cisco.com

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Building a Switch Cluster

- A switch cluster consists of a command switch and up to 15 member switches
- Candidate switches are switches that have not joined the switch cluster
- There can be multiple clusters per network

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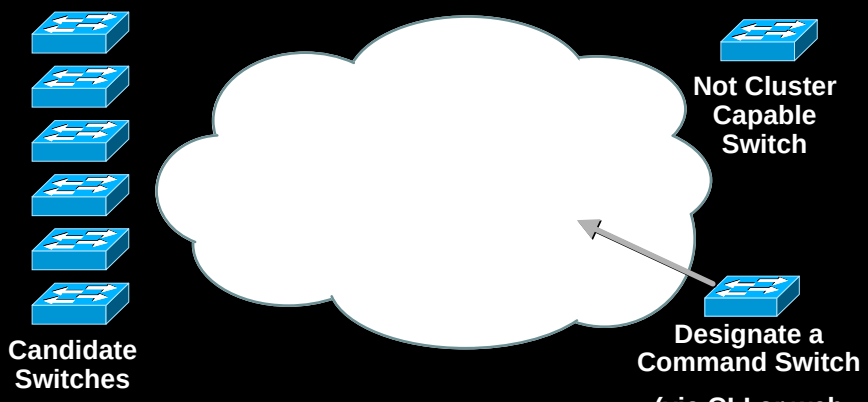
Switch Cluster Formation Step #1



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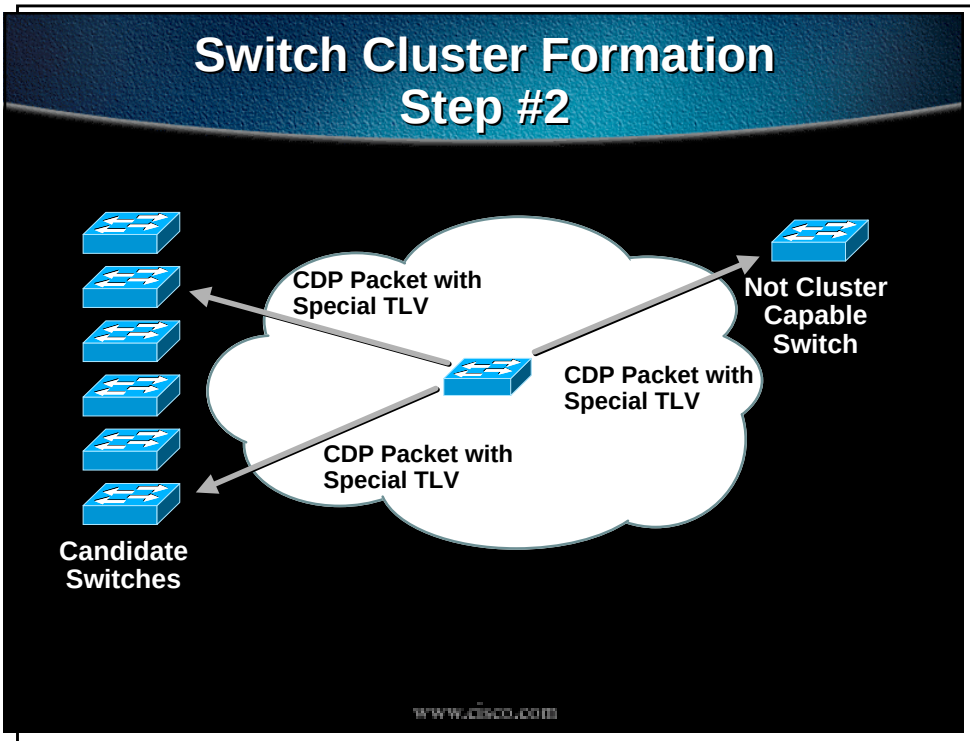

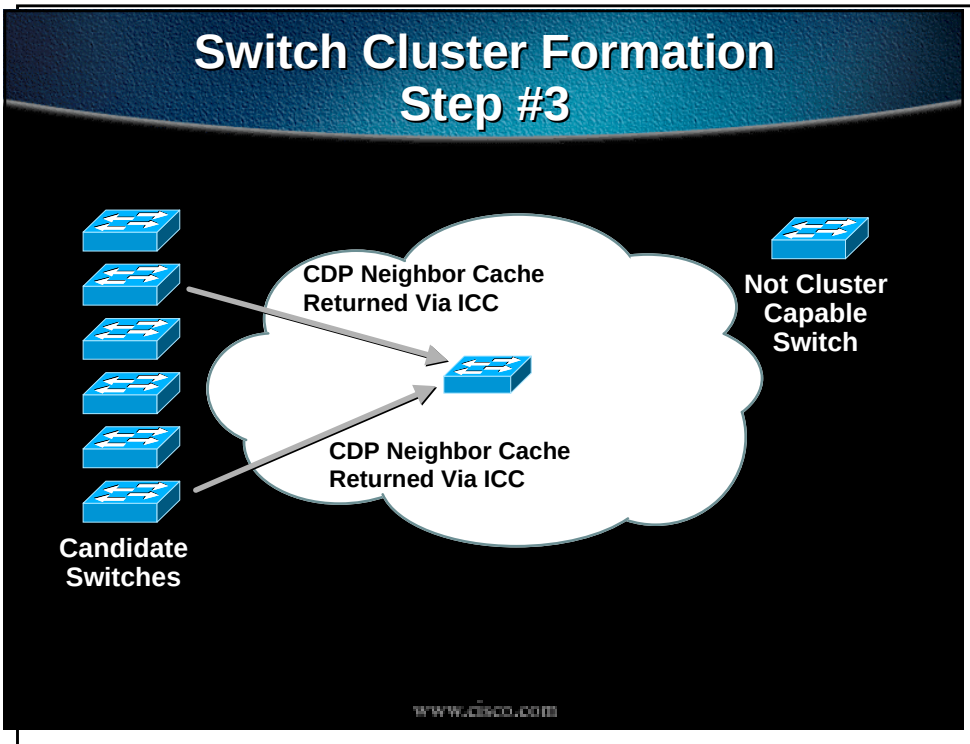

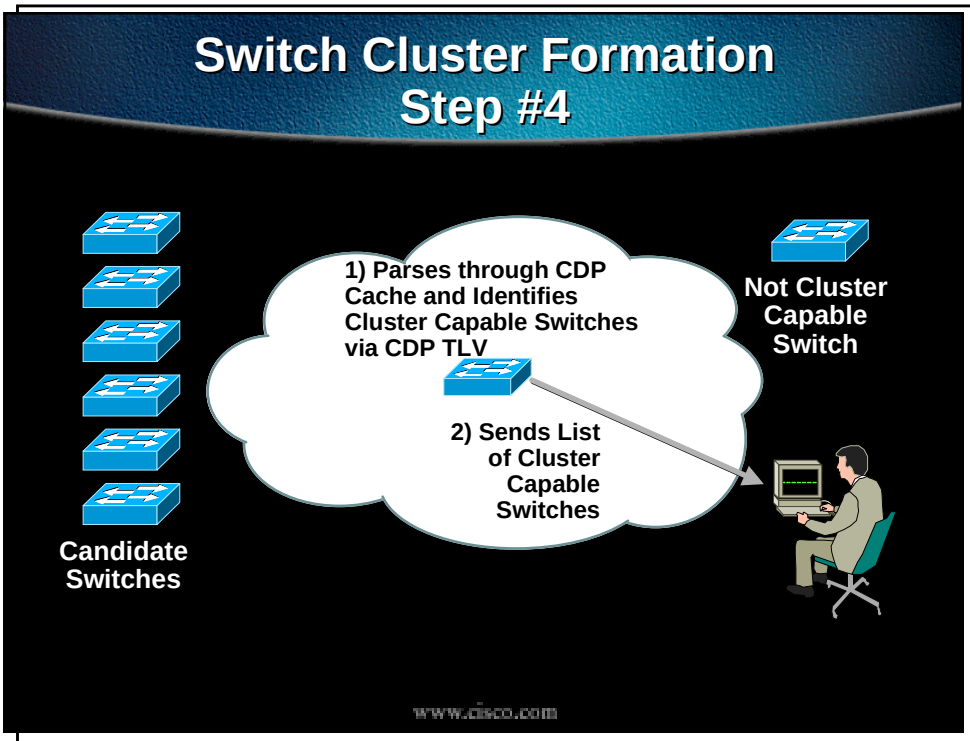

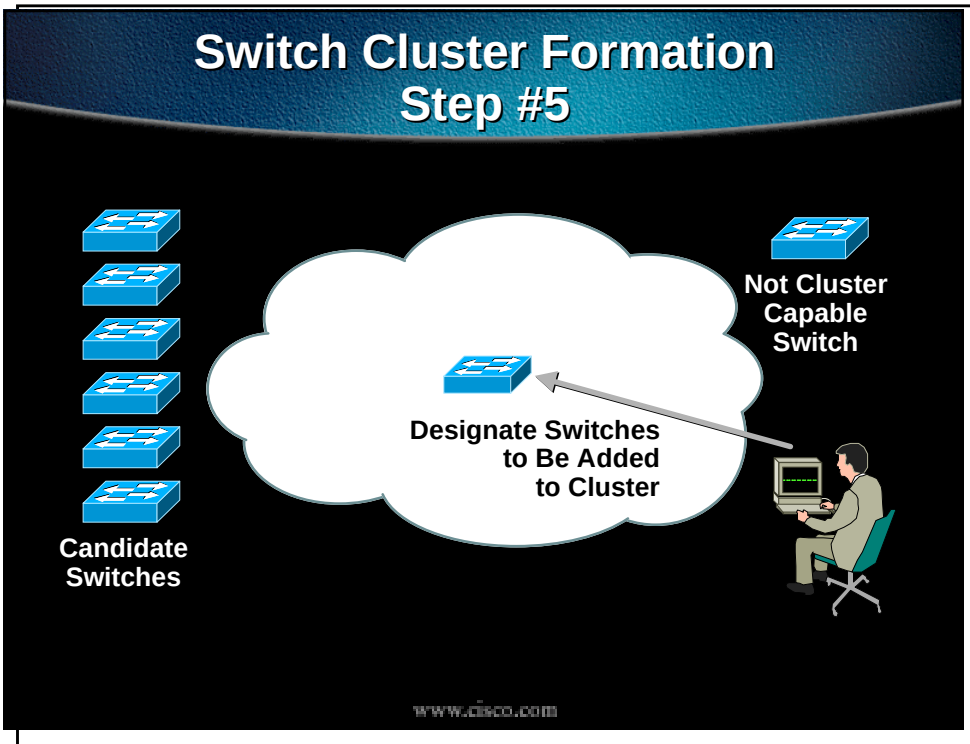

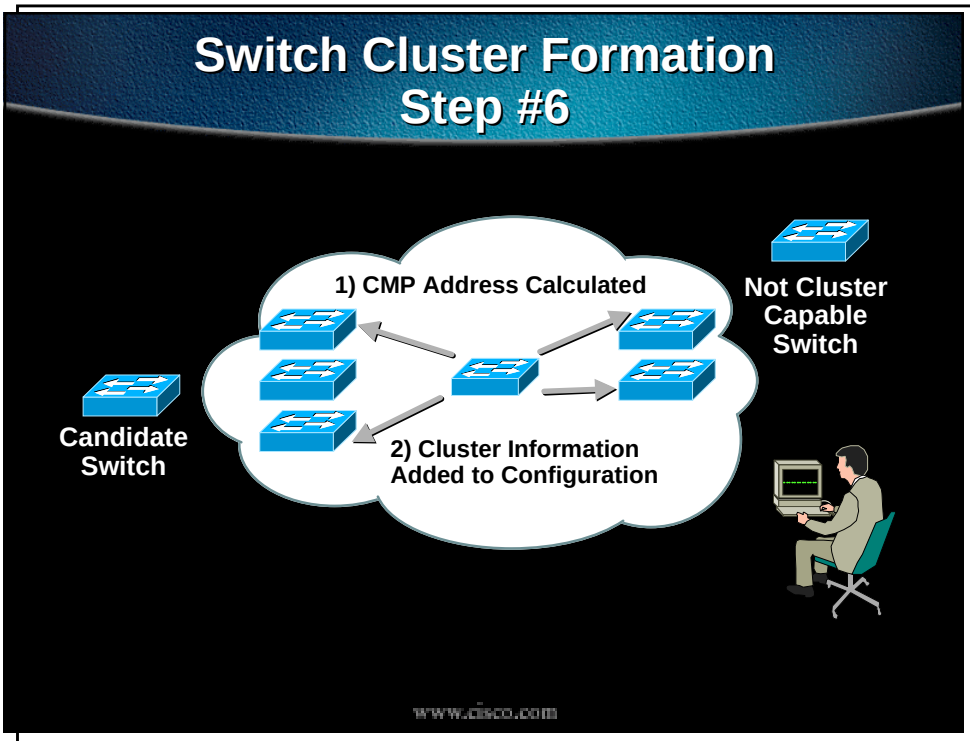

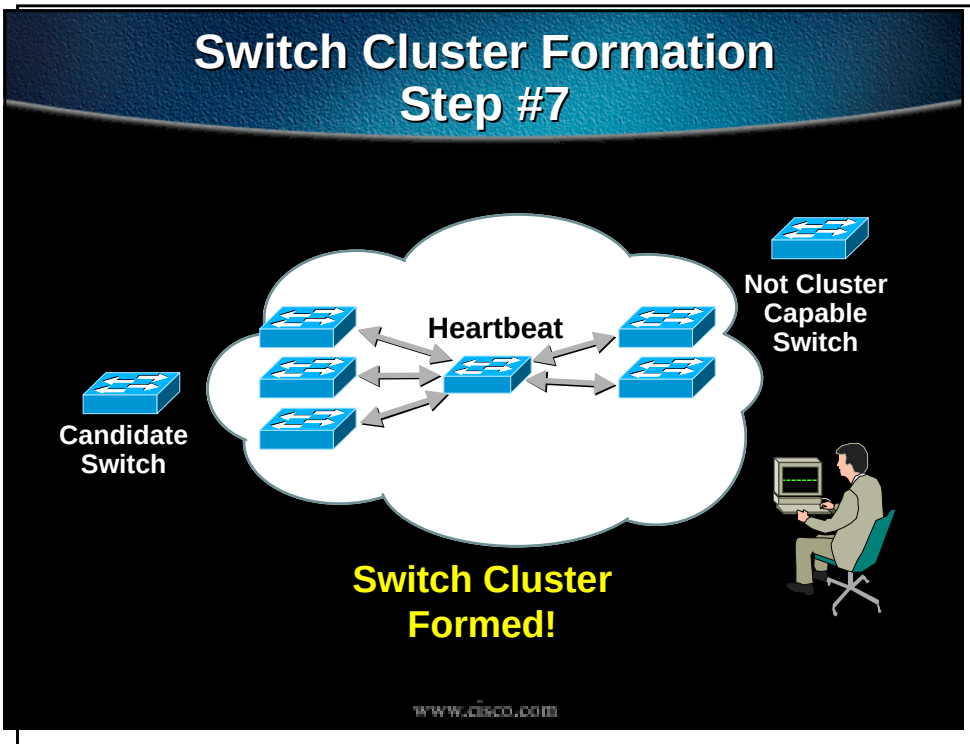

Command Switch Description

- Once switch cluster is created, all management is sent via the command switch and redirected to members
- With the 12.0(5)XU release, there can be multiple redundant command switches in a switch cluster

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Command Switch Roles

- Discovers candidate switches
- Redirects commands, SNMP and HTTP traffic from outside cluster
- Provides NAT translation for CMP/IP to TCP/IP communication
- Sends heartbeat through switch cluster

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Switch Clustering Technologies Used

- Existing: Cisco IOS, CDP, HTTP server, NAT
- New: CDP protocol “hello”, HTTP redirection, cluster management protocol (CMP)
- Full integration in Cisco IOS
  - Cluster commands can be issued via Cisco IOS command line or HTTP interface

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Cluster Management Protocol (CMP)

- IP like address based on MAC address of switch (10.x.y.z)
- SNAP header
- Does not respond to ARP (static ARP entries)
- Built-in address conflict resolution mechanism

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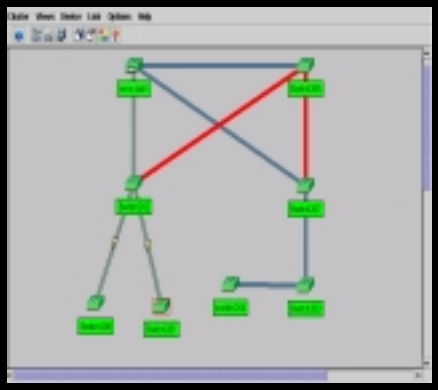
Cluster Builder

- Used to initially build cluster
- Provides topology view of the cluster
- Identifies redundant command switches and connections
- Can collapse view and see other clusters



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Cluster Manager

- Manage entire cluster from a single view
- Drop-down menus
- Port-status indicators
- Updated using user configurable timer

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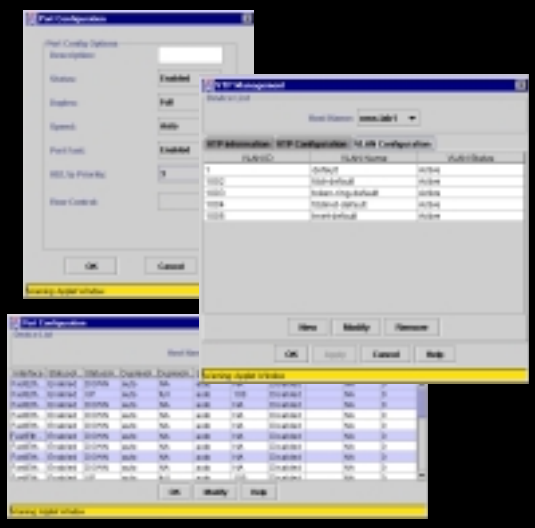
Cluster-Wide Management

- Global changes for
  - Port configuration (speed, duplex, etc.)
  - Port and console security
  - VLAN
  - NTP
  - STP
  - Firmware download
  - QoS (802.1p)



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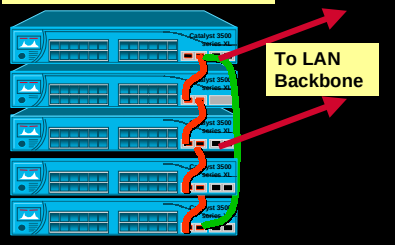
High-Availability Clusters

- Redundant command switch
  - Active and back-up command switches configured via HSRP
  - Auto-suggest HSRP Group Members for ease of use
- Circular link on GigaStack daisy chain
  - Withstands single link failure in stack daisy chain



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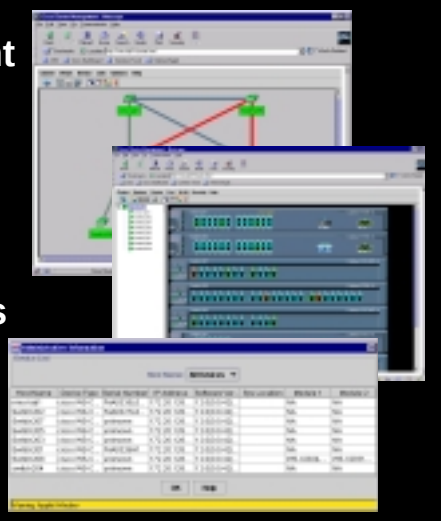
Enhanced Cluster Management in Software Release 12.0(5)XU

- Configurable management VLAN
- Extended discovery of switches in the stack
- VTP pruning to limit broadcasts on VTP trunks
- Cluster-wide inventory report
- Traps (HSRP fail-over)



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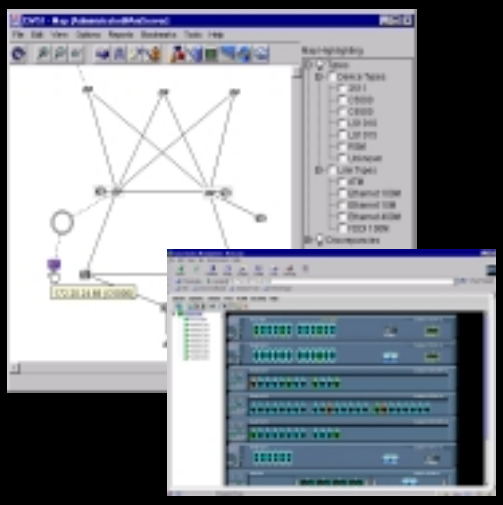
Integration with CiscoWorks2000

- Campus topology recognizes switch cluster via cluster MIB
- Launch CVSM from campus topology map
- Continue to use CVSM to manage with or without IP address per switch
- Available Q2 CY ’00



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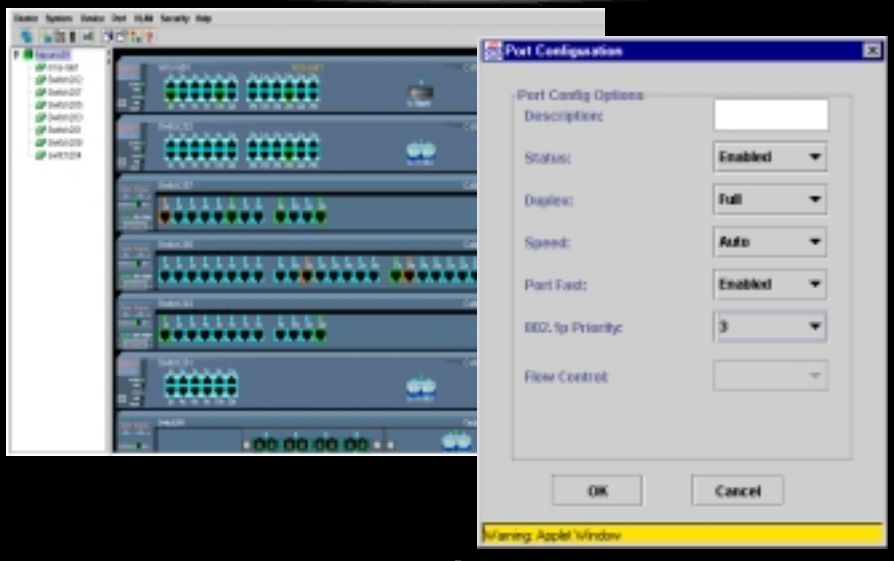
Multiport Configuration



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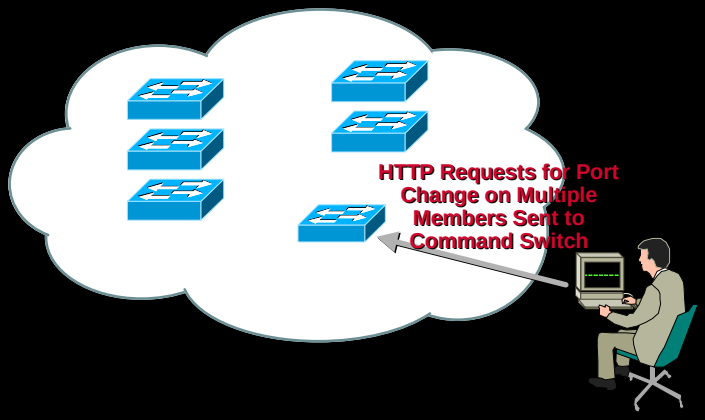
Port Configuration Step #1



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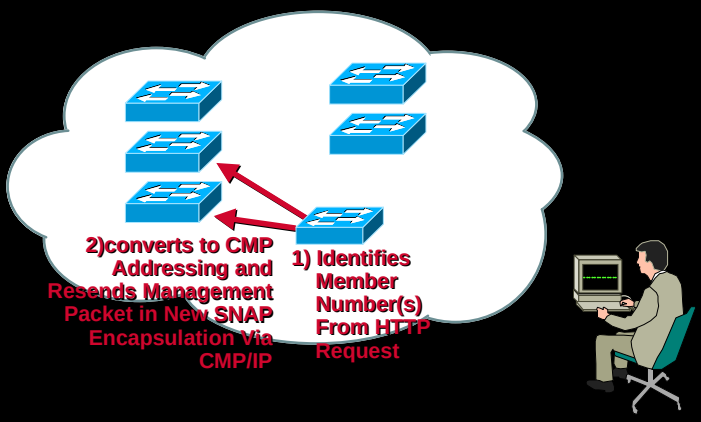
Port Configuration Step #2



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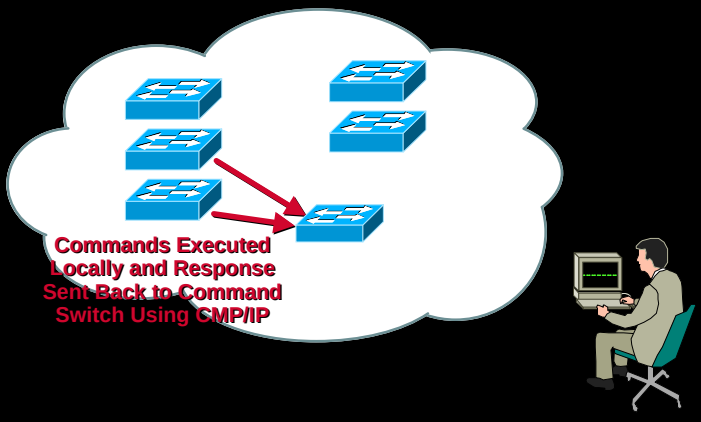
Port Configuration Step #3



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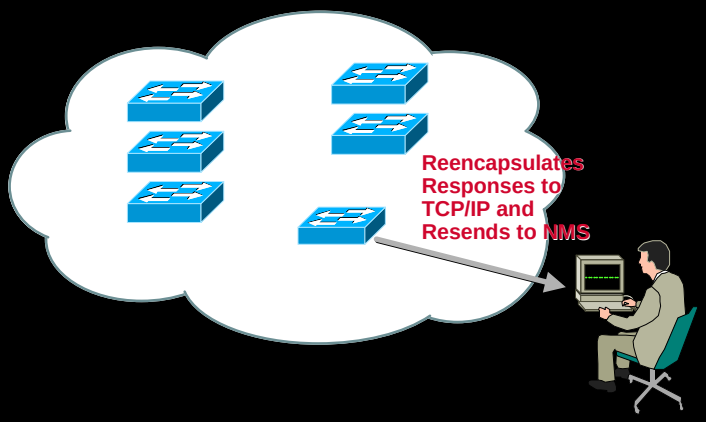
Port Configuration Step #4



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Management via CLI

- Telnet to the command switch
- Use the rcommand x command to access switches within cluster
- Commands are executed locally

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Troubleshooting Switch Clusters

- Fully integrated into Cisco IOS
- **show cluster?** commands
- **debug cluster?** commands
- All switch-cluster information stored in CONFIG.TEXT file in FLASH

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Where Can Switch Clusters Be Implemented?

- Traditional stacking on a per wiring closet basis
- Multistory building
- Management of remote sites from a central location

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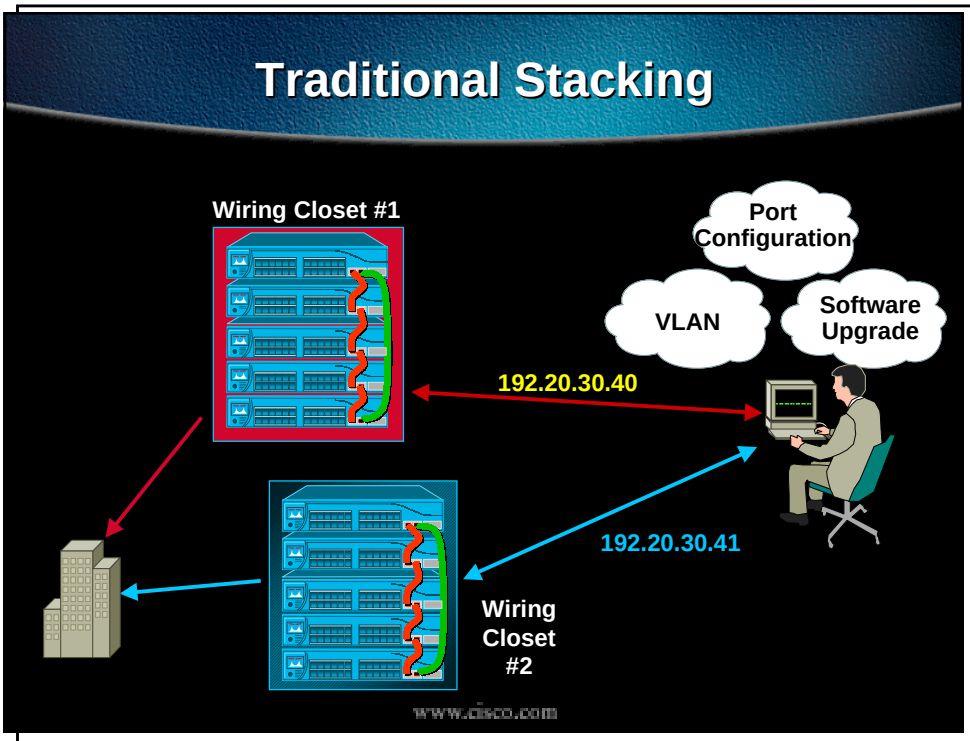
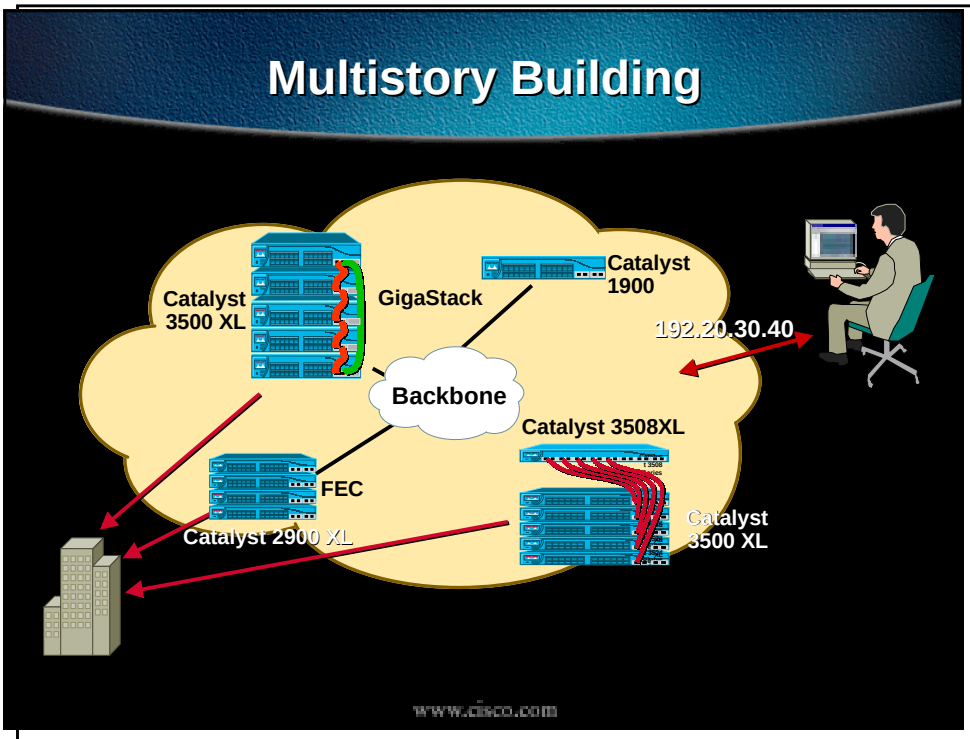
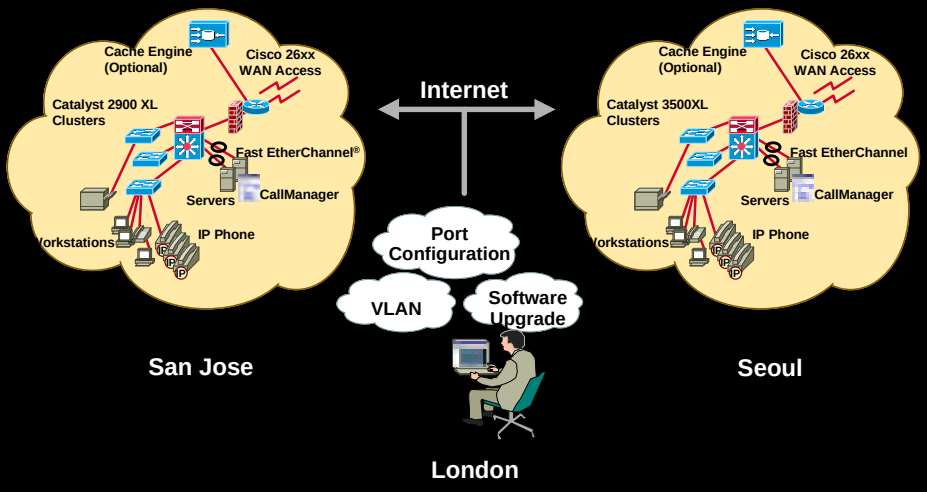




Remote Sites



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Summary

- Switch clustering provides all the benefits of traditional stacking and addresses all of its weaknesses
- Switch clustering reduces the total cost of ownership (TCO)
- Switch clustering provides investment protection and flexibility in designing high availability wiring closets

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