

## **5570- BCMSN (Building Cisco® Multilayer Switched Networks v3.0)**

### **1. Introduction to Campus Networks**

- Course Introduction
- Campus Networks as part of an Enterprise Network
- Devices in a Nonhierarchical Network
- Layer 2 Network Issues
- Routed Network Issues
- What is a Multilayer Switch
- Issues with Multilayer Switches and VLANs in a Nonhierarchical Network
- The Enterprise Composite Model
  - Building Access
  - Building Distribution
  - Server Farm Module
  - Campus Core
  - Network Management
- Benefits of the Enterprise Composite Model
- Campus Infrastructure Module

### **2. Defining Virtual Networks (VLANs)**

- Best Practices for VLAN Topologies
  - Issues in a Poorly Designed Network
  - Grouping Business Functions into VLANs
  - Interconnection Technologies
  - Determining Equipment and Cabling Needs
  - Mapping VLANs in a Hierarchical Network
  - Considering Traffic Source to Destination
  - Reviewing Switch Configuration Interfaces
- Implementing VLANs
  - Benefits of VLANs in an Enterprise Network
  - Local VLANs
  - End-to-End VLANs
  - VLAN Configuration Modes
  - VLAN Access Ports
  - VLAN Implementation Commands
  - Implementing a VLAN
- Implementing Trunks
  - VLAN Trunks
  - ISL Trunking
  - 802.1Q Trunking
  - 802.1Q Native VLANs

- Issues with 802.1Q Native VLANs
- VLAN Ranges
- Trunking Configuration Commands
- Configuring Trunking
- Setting Dynamic Trunking Protocol (DTP)
- Propagating VLAN Configurations with VTP
  - VTP Domains
  - VTP Protocol
  - VTP Modes
  - VTP Pruning
  - VTP Operation
  - VTP Configuration Commands
  - Configuring a VTP Management Domain
  - Adding New Switches to an Existing VTP
- Correcting Common VLAN Configuration Errors
  - Issues with 802.1Q Native VLANs
  - Resolving Trunk Link Problems

### 3. Implementing Spanning Tree

- Spanning Tree Protocol
  - Transparent Bridges
  - Identifying Traffic Loops
  - Loop Free Network
  - 802.1D Spanning Tree Protocol
  - Root Bridge
  - Port Roles
  - Enhancements to STP
- Preventing STP Forwarding Loops
  - Unidirectional Link Detection
  - Loop Guard
  - Preventing STP Failures Due to Unidirectional Links
  - Configuring UDLD and Loop Guard
- Implementing Rapid Spanning Tree Protocol (RSTP)
  - RSTP
  - RSTP Port States
  - RSTP Port Roles
  - Edge Ports
  - RSTP Link Types
  - RSTP BPDU
  - RSTP Proposal and Agreement Process
  - RSTP Topology Change
  - RSTP Implementation Commands
  - Implementing RSTP Commands

- Implementing the Multiple Spanning Tree Protocol (MSTP)
  - MSTP
  - MSTP Regions
  - Extended System ID
  - Interacting between MSTP regions and 802.1Q
  - MSPT Implementation Commands
  - Configuring and Verifying MSTP
- Configuring Link Aggregation and EtherChannel
  - EtherChannel
  - PAgP and LACP Protocols
  - EtherChannel Configuration
  - Configuring Port Channels using EtherChannel
  - Configuring Load Balancing over EtherChannel

## 4. Implementing InterVLAN Routing

- Routing Between VLANs
  - Multilayer Switching
  - Layer 2 Switch Forwarding Process
  - Inter-VLAN Routing using an External Router
  - Inter-VLAN Routing using External Router Configuration Commands
  - Configuring Inter-VLAN Routing using an External Router
- Deploying CEF-Based Multilayer Switching
  - Layer 3 Switching
  - CEF-Based Multilayer Switches
  - Multilayer Switch Packet Forwarding Process
  - CEF Configuration Commands
  - Enabling CEF-Based Multilayer Switching
  - Common CEF problems and Solutions
  - CEF Troubleshooting Commands
  - Troubleshooting CEF-Based Multilayer Switching
- Enabling Routing Between VLANs
  - Layer 3 Switch Virtual Interfaces
  - Routed Interfaces on a Multilayer Switch
  - Configuration Commands for Inter-VLAN Communication on a Multilayer Switch
  - Configuring Inter-VLAN Routing on a Multilayer Switch

## 5. Implementing High Availability in a Campus Environment

- Configuring Layer 3 Redundancy with HSRP
  - Router Redundancy Process
  - Routing Issues
  - HSRP
  - HSRP Operations
  - HSRP States

- HSRP Configuration Commands
- Enabling HSRP
- Configuring Layer 3 Redundancy with VRRP and GLBP
  - Virtual Router Redundancy
  - VRRP Operations Process
  - Gateway Load Balancing Protocol
  - GLBP Operations Process
  - VRRP and GLBP Configuration
  - Enabling VRRP and GLBP
- Implementing Hardware and Software Redundancy in Modular Switches
  - Virtual Router Redundancy
  - Supervisor Redundancy
  - Redundant Supervisor Engine Configuration Commands
  - Implementing Redundant Supervisor Engines
  - Cisco Catalyst 6500 Switch
  - Single and Dual Router Mode
  - Stateless Switchover
  - Failover with SRM and SSO
  - Configuring and Verifying SRM and SSO
  - Nonstop Forwarding
  - NSF Aware Protocols
  - Failover with NSF and SSO
  - Configuring NSF
- Redundant Power Supply Configuration Commands
  - Configuring Redundant Power Supplies
  - Verifying High Availability Configurations
  - Load Sharing
  - HSRP Optimization Options
  - Tuning HSRP Operations
  - HSRP Debug Commands
  - Debugging HSRP Operations

## 6. Wireless Client Access

- Introducing Wireless LANs (WLANs)
  - WLANs
  - Similarities Between A LAN and a WLAN
  - Differences Between a LAN and WLAN
  - WLAN Components
  - WLAN Technology Implementations
  - Building Blocks of AP WLAN Topologies
  - Building Blocks of Bridging WLAN Topologies
  - Topology Implementations
- Wireless Theory and Standards

- Radio Frequency (RF) Basics
- WLAN Math
- Types of Antennas
- Regulatory Agencies Governing WLANs
- Operational Standards of IEEE 802.11
- IEEE 802.11 Standards in the 2.4GHz Band
- IEEE 802.11a
- Comparing the 802.11 Standards
- Implementing WLANs
  - 802.11b/g Channel Reuse
  - 802.11a Channel Reuse
  - WLAN as a Shared Medium - Best Practices
  - Bridging Path Considerations
  - Power Implementation
- Cisco WLAN
  - Enterprise WLAN Issues
  - Overview of Cisco WLAN
  - Comparing Autonomous and Lightweight WLAN
  - Comparing Core and Advanced Feature Roaming
  - Split MAC Architecture
  - LWAPP AP Association
  - Mixing WLAPP with Autonomous APs
- Cisco Wireless Clients
  - Wireless Client Association
  - Open Authentication
  - Pre-Shared Key Authentication (WEP)
  - Introducing WLAN Security
  - Cisco Client Cards
  - Cisco Compatible Extensions Program
- Configuring Basic WLAN
  - Available Interfaces for WLAN Configuration
  - Connect to Controller
  - Configuring the Controller
  - Verify Controller Configuration

## 7. Configuring Campus Switches to Support Voice

- Planning for Implementation of Voice in a Campus Network
  - Converged Network Benefits
  - VoIP Network Components
  - Traffic Characteristics of Voice and Data
  - VoIP Call Flow
  - Auxiliary VLANs
  - Quality of Service (QoS)

- Importance of High Availability for VoIP
- Power Requirements in Support of VoIP
- Accommodating Voice Traffic on Campus Switches
  - QoS Trust Boundaries
  - LAN-Based Classification and Marking
  - Basic Switch Commands to Support Attachment of a Cisco IP Phone
  - Configuring a Switch for the Attachment of a Cisco IP Phone
  - What is AutoQoS VoIP?
  - Configuring AutoQoS VoIP on a Catalyst Switch

## 8. Minimizing Service Loss and Data Theft in a Campus Network

- Switch Security Issues
  - Overview of Switch Security Concerns
  - Switch Attack Categories
  - MAC Flood Attack
  - Port Security
  - Port Security Configuration
  - Configuring Port Security on a Switch
  - Port Security with Sticky MAC Addresses
  - Unauthorized Access by Rogue Devices
  - 802.1x Port-Based Authentication
- Protecting Against VLAN Attacks
  - VLAN Hopping
  - Mitigating VLAN Hopping
  - VLAN Access Control Lists (VACLs)
  - Configuring VACLs
  - Private VLANs (PVLANS)
  - Configuring PVLANS
- Protecting Against Spoof Attacks
  - DHCP Spoof Attack
  - DHCP Snooping
  - DHCP Snooping Configuration Commands
  - Configuring DHCP Snooping
  - MAC Spoof Attack
  - Address Resolution Protocol
  - Commands to Configure Dynamic ARP Inspection
  - Protecting Against ARP Spoofing Attacks
- Securing Network Switches
  - Vulnerabilities in the Cisco Discovery Protocol
  - Vulnerabilities in the Secure Shell Protocol
  - Vulnerabilities in the Telnet Protocol
  - VTY ACLs
  - Commands to Apply ACLs to VTY

- STP Security Mechanisms
  - Protecting the Operation of STP
  - BPDU Guard Configuration
  - BPDU Filtering Configuration
  - Root Guard
  - Root Guard Configuration Commands
  - Configuring Root Guard