NEW ZEALAND INSTITUTES OF TECHNOLOGY AND POLYTECHNIC QUALIFICATIONS IN INFORMATION & COMMUNICATIONS TECHNOLOGY

PRESCRIPTION: NW610 LAN SWITCHING AND WIRELESS NETWORKS

AIM OF MODULE:	To provide students with the knowledge and skills to describe, configure and troubleshoot LAN switches, VLANs and WLANs in a converged network.
CREDITS:	14
KNOWLEDGE ASSUMED FROM:	NW500 Networking Principles (CCNA Exploration 1)
STUDENT LEARNING HOURS:	140
CONTENT REVISED:	2008
PRESCRIPTION EXPIRY DATE:	Nov 2011
NOTE:	The content of this module is based on Cisco Networking Academy CCNA Exploration 3 V4.0 course content and is cognisant of the Plan for Academy Student Success (PASS)

Level and Assessment Schedule

TOPICS	Highest Skill Level R	C	A	P	Suggested Assessment Percentage
1. Switched LAN Architecture		*			10
2. Basic Switch Concepts and Configuration			*		20
3. Wireless LANs (WLANs)			*		10
4. Spanning-Tree Protocol (STP)		*			10
5. Virtual LANs (VLANs)				*	15
6. VLAN Trunking Protocol (VTP)			*		15
7. Case Study				*	20
					100

LEARNING OUTCOMES

The student will:

C	1.	Describe the features of the hierarchical network model and considerations for switches in this model and in small to medium businesses (SMB)
A	2.	Describe the concepts of LAN switching, configure a switch for basic operation and describe switch attacks
A	3.	Describe WLAN operation, protocols, topologies and configure a basic WLAN
C	4.	Describe the purpose and the operation of STP and variants of STP
P	5.	Describe the concepts of VLANs and configure and troubleshoot VLANs
A	6.	Describe, configure and troubleshoot VTP and Inter-VLAN routing
P	7.	Complete a case study on switches, VLANs and WLANs as prescribed by Cisco

CONTENT

1. Switched LAN Architecture

- A description of the hierarchical network model includes:
  - The functions of the access, distribution and core layers
  - Benefits of the model
  - Principles of 'network diameter' and 'bandwidth aggregation'
  - Definitions and features of a converged network
  - Considerations for hierarchical network switches
  - Comparing Layer 2 and Layer 3 switches
  - Switch features in:
    - A hierarchical network
    - Small and medium businesses

2. Basic Switch Concepts and Configuration

- A description of the concepts of LAN switching include:
  - Elements, communication and design of an Ethernet/802.3 network:
    - Bandwidth and throughput
    - Broadcast domains
    - Network latency and congestion
    - LAN segmentation and collision domains
  - Switch forwarding methods (Store and forward and cut-through)
  - Switch memory buffering techniques (port-based and shared)
  - Symmetric and Asymmetric switching
  - Switch boot-up sequence and light emitting diodes signals
- A basic configuration of a switch includes:
  - User and privileged modes

- GUI based alternatives to the Command Line Interface (CLI)
- Using the CLI help and command buffer functions
- Configuring port duplex and speed
- Configuring the web interface
- Managing the Media Access Control (MAC) address table
- Backup and erasing switch configuration files
- Configuring the passwords (encrypted and unencrypted)
- Creating Login banners
- Configuring and using Telnet and Secure Shell (SSH)
- Configure and verify port security and violations

➢ A description of switch attacks includes:
- MAC address flooding
- Spoofing
- Cisco Discovery Protocol (CDP) attacks
- Telnet attacks
- Brute force password attack
- Denial of Service (DoS) attacks

3. Wireless LANs

➢ A description of WLANs includes:
- Features of WLANs
- Comparing wired and wireless LANs
- Wireless LAN standards (IEEE 802.11 a,b,g and n), protocols and Wi-Fi certifications
- WLAN devices:
  - Wireless Network Interface Card, Access Points and Routers
- WLAN security:
  - Encryption
  - Authentication
  - Mac-address filtering
  - Service Set Identifier (SSID)
- Identifying common access point and firmware problems and solutions

➢ A configuration of WLAN includes:
- Integration of wireless access point into wired topology for wireless access
- Configuration of a wireless access point using a web-interface for basic and security settings
- Configure a wireless network interface card
- Verify wireless host connectivity
- Troubleshoot the wireless network

4. Spanning-Tree Protocol (STP)

➢ A description of the purpose and the operation of STP includes:
- Concepts and issues of redundant switch topologies
  - Broadcast storms
  - Layer 2 loops
  - Broadcast unicast frames
- Spanning tree algorithm (STA)
- Selecting the root bridge
- STP port roles and stages of STP port states

- Cisco port-fast technology
- Topology change and broadcast notification

➢ A description of STP variants include:
  - Rapid Spanning tree protocol (RSTP)
  - Per-VLAN Spanning tree Protocol (PVSTP)
  - Per-VLAN Spanning tree Protocol plus (PVSTP+)
  - Rapid Per-VLAN Spanning tree Protocol (RPVSTP+)

5. Virtual LANs (VLANs)

➢ A description of the concepts of VLANs includes:
  - VLAN types, benefits and operation
  - Broadcast domains with VLANs and routers
  - VLAN trunk ports and frame tagging
  - Network traffic types
  - Configuring and troubleshooting a VLAN and trunk ports involves:
    - Configuring, verifying, saving and deleting static VLANs
    - Experiencing VLAN troubleshooting scenarios
    - Common trunk problems

6. VLAN Trunking Protocol (VTP)

➢ A description and configuration of the VTP includes:
  - VTP concepts, operation, implementation and configuration
    - VTP domains
    - Summary and subset advertisements
    - VTP modes (server, client and transparent)
    - VTP pruning
    - Managing VLANs on a VTP server
    - Identifying common VTP problems

➢ A description and configuration of the Inter-VLAN routing includes:
  - Inter-VLAN routing operation, implementation and configuration
    - Identify common issues and solutions
  - Physical and logical interfaces and dividing physical interfaces into sub-interfaces
  - Configuring inter-VLAN routing for the router-on-a-stick configuration and when using separate physical interfaces on a router
  - Verifying and troubleshooting VTP and inter-VLAN routing

7. Case Study

➢ The completion of a case study on Switches, VLANs and WLANs will require a group of students to:
  - Use the resources provided, diagram and narrative, to set up the physical network
  - Configure the routers as required
  - Set up and configure the switches, VLANS and VTP as required
  - Configure a wireless access point in the network as required
  - Verify and troubleshoot all connections
  - Provide detailed documentation in the appropriate format
  - Provide a written final report

NOTES FOR TUTORS

A typical assessment strategy should include:

- practical skills tests
- laboratory exercises
- group activities
- progressive on-line tests (CISCO Web Portal)
- summative (final) on-line test (CISCO Web Portal)
- a final practical test
- kinaesthetic activities
- Students are to maintain individual Engineering Journals

LEARNING RESOURCES

- CISCO Networking Academy Programme:
    - LAN Switching and Wireless, CCNA Exploration Companion Guide
    - LAN Switching and Wireless, CCNA Exploration Labs and Study Guide
    - CCNA 3 and 4 Engineering Journal and Workbook 4th Edition