

**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) NW600 Routing Protocols and Concepts (CCNA Exploration 2)
STUDENT LEARNING HOURS:	140
CONTENT REVISED:	2010
PRESCRIPTION EXPIRY DATE:	November 2013
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				Suggested Assessment Percentage
	R	C	A	P	
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
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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