



Republic of Rwanda
Ministry of Education

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RTB | RWANDA
TVET BOARD

NITWI301

WIRELESS NETWORK INDOOR INSTALLATION

SETUP WIRELESS NETWORK INDOOR

Competence

RQF Level: 3

Learning Hours



50

Credits: 5

Sector: ICT nd Multimedia

Trade: Networking And Internet Technologies

Module Type: Specific

Curriculum: ICTNIT3001 - TVET Certificate III in Networking and internet Technologies

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Issue Date: August2022

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Purpose statement	This module describes the skills knowledge and attitude required setup wireless network indoor. This module is intended to prepare students pursuing TVET Level 3 in Networking and internet technology. At the end of this module the student will be able to apply wireless network concepts, plan wireless network indoor installation, deploy wireless network indoor and maintain wireless network indoor.				
Delivery modality	Training delivery	100%	Assessment	Total 100%	
	Theoretical content	30%	Formative assessment	50%	
	Practical work:	70%			30%
	Group project and presentation				30%
	Individual project /Work	40%	70%		
	Summative Assessment			50%	

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Apply wireless network Concepts	1.1. Wireless technologies are properly identified based on their functionalities.
	1.2. wireless network standards are properly applied according to the network operation
	1.3. Wireless network components are properly identified according to their use.
	1.4. Wireless topology modes are properly identified according to the wireless standards.
2. Plan wireless network indoor installation	2.1. Wireless network indoor installation requirements are properly identified based on-Site survey findings.
	2.2. Wireless network indoor topology is correctly 2.2. designed based on wireless network indoor design standards.
	2.3. Cost is properly estimated as per wireless network indoor design.

3. Deploy wireless network indoor	3.1. Wireless network indoor equipment's are properly mounted based on Wireless network diagram.
	3.2. Wireless network indoor devices are properly connected based on Wireless network diagram.
	3.3. Administration settings are properly set according to the security policy.
	3.4. Basics wireless settings are properly set based on the wireless network topology
	3.5. Security modes are properly selected based on security level
	3.6. Access restrictions are properly applied according to the security policy.
	3.7. Wireless network testing is correctly conducted based on the deployed wireless network.
	3.8. Wireless network documentation is properly
4. Maintain wireless network indoor	4.1. Hardware and software functionalities are properly checked as per manufacturer's guidelines
	4.2. Features updates are properly installed based on manufacturer's guidelines
	4.3. wireless network indoor protection measures are properly checked in accordance with the installation design
	4.4. Wireless network signals are properly monitored based on network coverage area.
	4.5. Maintenance report is properly documented based on the work done

Course content

Learning outcomes

At the end of the module the learner will be able to:

1. Apply wireless network Concepts
2. Plan wireless network indoor installation
3. Deploy wireless network indoor
4. Maintain wireless network indoor

Learning outcome 1: Apply wireless network Concepts

Learning hours: 15 hours

Indicative content

- Introduction to Wireless network
 - ✓ Application
 - ✓ Benefits
- Identification of wireless network Types
 - ✓ Wireless PAN
 - ✓ Wireless LAN
 - ✓ Wireless MAN
 - ✓ Wireless WAN
- Identification of wireless network components
 - ✓ Wireless NICs
 - ✓ Wireless Router/Home router
 - ✓ Access point
 - ✓ Wireless Antennas
 - ✓ Wireless controller
 - ✓ Wireless bridges
- Application of Wireless technologies
 - ✓ Short range /Low power
 - ✓ Large range
- Classification of Wireless network standards

- Operation mode of Wireless network
 - ✓ Ad-hoc mode
 - ✓ Infrastructure mode

Resources required for the learning outcome

Equipment	<ul style="list-style-type: none"> - Router - Access point - Wireless antenna - Wireless Nic - Smart phone with NFC - Bluetooth Radio receiver - Bluetooth woofer - Remote control
Materials	<ul style="list-style-type: none"> - Internet bundles
Tools	<ul style="list-style-type: none"> - Software tools (packet tracer, GNS3, E-draw Max)
Facilitation techniques	Demonstration and simulation Individual Practical exercises Group discussion
Formative assessment methods /(CAT)	Written assessment Performance assessment

Learning outcome 2: Plan wireless network indoor installation

Learning hours: 10 Hours

Indicative content

- Identification of wireless network indoor installation requirements
 - ✓ Conduct physical environment visit
 -  Passive site survey
 -  Active site survey
 -  Spectrum analysis
 - ✓ Record site information
- Designing Wireless network Blueprint
 - ✓ Main Types of Wireless network topologies
 -  Logical topology
 -  Physical topology
 - ✓ Use Wireless network Designing tools
 -  Cisco packet tracer
 -  GNS3
 -  E-draw max
- Estimation of wireless network indoor installation cost
 - ✓ Item specifications
 - ✓ Identify Item cost
 - ✓ Calculate total cost

Resources required for the indicative content

Equipment

- Laptop
- Smart phones
- Access point
- Antennas

Materials

- Cables

	- Connectors
Tools	- Spectrum analyser - Cisco packet tracer - GNS3 - E-draw max
Facilitation techniques	- Demonstration and simulation - Individual and group work - Practical exercise - Trainer guided - Group discussion
Formative assessment methods //(CAT)	- Written assessment - Oral presentation - Performance assessment - Project based assessment

Learning outcome 3: Deploy wireless network indoor

Learning hours: 15 hours

Indicative content

- Mounting Wireless Network equipment
 - ✓ Selection of tools, Materials and equipment
 - ✓ Laying cables
 - ✓ Fixing equipment
 - ✓ Connecting devices
 -  Cable color coding
 -  Cable termination
 -  Cable testing
 -  Interconnection

- Basic Configuration of wireless network devices
 - ✓ Administration parameters setting

 gateway IP address

 username

 password

✓ Accessibility settings

 Radio mode selection

 Channel selection

 SSID

 Password/key

✓ Security mode setting

 WEP

 WPA

 WPA2

 WPA3

- Application of Access restrictions parameters
 - ✓ Mac address filtering
 - ✓ Parental control
 - ✓ Proxy setting
- Testing of deployed wireless network indoor
 - ✓ Connectivity
 - ✓ Configurations
 - ✓ Performance
- Documentation of deployed wireless network
 - ✓ Topology Diagram
 - ✓ IP address allocation table
 - ✓ Maintenance schedules
 - ✓ Software information (current versions, dates, licensing and support)
 - ✓ Network credentials F

Resources required for the indicative content	
Equipment	- Router, Access point, Wireless NIC, Rack, PoE injectors, Computers, Smartphones, wireless repeaters, UPS
Materials	- Network cables, internet bundles, connectors, cable ties
Tools	- Hardware tools: Drilling machine, multimeter, crimping tool - software tools: SolarWinds, Wifi Analyzer, Datadog, PRTG Network Monitor,
Facilitation techniques	- Demonstration and simulation - Individual and group work - Practical exercise - Individualized - Trainer guided
Formative assessment methods /(CAT)	- Written assessment - Oral presentation - Performance assessment - Project based assessment

Learning outcome 4: maintain wireless network indoor	Learning hours: 10 hours
Indicative content	
<ul style="list-style-type: none"> • Performing Preventive maintenance <ul style="list-style-type: none"> ✓ Software maintenance <ul style="list-style-type: none">  Regular change of network access credentials  Wireless network monitoring software Licensing  Updating and upgrading of network monitoring software and device firmware ✓ Hardware maintenance <ul style="list-style-type: none">  schedule regular cleaning  Check Physical devices condition  Check cables in good condition ✓ Signals stability maintenance 	

 Check and reduce interference

 Check obstacle

 Add a wireless repeater

- Performing Corrective maintenance

- ✓ Software maintenance

-  Identification of common problems and their causes

-  Fix identified errors

- ✓ Hardware maintenance

-  Identification of common problems and their causes

-  Repair/replace damaged devices

-  Repair/Replace damaged cables

- ✓ Signals stability

-  Replace router's antenna

-  Replace wireless adapter card

-  Change wireless channel

-  Upgrade wireless technology to the latest standard

- Elaboration of maintenance report

- ✓ Introduction to Maintenance report

- ✓ Elements of Maintenance report

-  Client information

-  Status before maintenance

-  Implementation of solution

-  Used Tools, materials and Equipment

-  Status after maintenance

-  Recommendations

Resources required for the indicative content

Equipment	Wireless Router, computer, access point, PPEs, Smartphone, wireless printer, UPS
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Materials	Wire rope spray, cable ties, internet bundles, nails, screws, cleaning foams
Tools	Cable tester, cleaning foams, soft clothes, multimeter, electrical Brower
Facilitation techniques	Individual and group work Practical exercise Group discussion
Formative assessment methods /(CAT)	Written assessment Oral assessment Performance assessment

Integrated/Summative assessment (For specific module)

Integrated situation

Balos Hotel is one of the best Hotels located in Rubavu district, Western province which has 7 VIP rooms. Due to the clients requests that they want to continue their work remotely and still communicate with other people outside of hotel. The Hotel management decided to hire a wireless technician for setting up the wireless network. For that network, only registered devices will be connected, the network standard should be IEEE 802.11n, The Network should assign addresses to hosts dynamically.

As a wireless technician you are hired to setup their wireless network. The task should be accomplished in 4 hours and the network document should be submitted to the Hotel manager.

Resources

Tools	Hardware tools: Ladder, Drilling machine, Tape measure, Hummer, Networking toolkit Software tools: Cisco packet tracer, GNS3, EdrawMax, SolarWing, Advanced IP scanner
Equipment	Wireless Router Wireless access point Wireless cards Computer RACK mount

Materials/ Consumables	Connectors (RJ 45), Network cables Cables ties Screws, Wall plugs
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Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
(15%)	Wireless technologies are properly identified based on their functionalities.	Wireless technology is selected			4
	Wireless network components are properly identified according to their use	Wireless router is selected			3
		Access points is selected			3
		Computers are identified			2
	Wireless topology modes are properly identified according to the wireless standards.	Topology mode is selected			3
(25%)	Wireless network indoor installation requirements are properly identified based on-Site survey findings.	Site information are recorded			3
		Tools are selected			5
		Materials are selected			3
		Cost is calculated			3
	Wireless network indoor topology is correctly designed based on wireless network indoor design standards.	Designing tools is selected			4
		Topology is designed			7
		Rack is mounted			1

Deploy wireless network indoor (40%)	Wireless network indoor equipment's are properly mounted based on Wireless network diagram.	Access point is mounted			1
		Wireless repeater is mounted			1
		Wireless router is mounted			1
	Wireless network indoor devices are properly connected based on Wireless network diagram.	Router is connecter			5
		Access point is connected			5
		Client devices are connected			4
	Administration settings are properly set according to the security policy.	Username is set			2
		Access key is set			2
	Basics wireless settings are properly set based on the wireless network topology	Radio mode is selected			2
		Chanel is selected			2
		SSID is correctly set			2
		Password is set			2
	Security modes are properly selected based on security level	Security mode is selected			2
	Wireless network testing is correctly conducted based on the deployed wireless network.	Connection is successes			4
		Configuration is correct			4
	Maintain wireless network indoor (20%)	wireless network indoor protection measures are properly checked in accordance with the installation design	Devices are protected		
Cables are protected					3
Access restriction is applied					5
Wireless network signals are properly		SSID is broadcasted			3

	monitored based on network coverage area.	Devices are getting strong signals			5
Total marks		100			
Percentage Weightage		100%			
Minimum Passing line % (Aggregate): 70%					

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Glossary

- **Ad -hoc** : Connecting two computers does not always require a centrally managed network. Instead, users can set up an ad hoc network between two computers. The two devices communicate through an ethernet cable or wireless cards. However, this connection is only temporary
- **License**: Is a permission to make, produce, or use something that has been created by or belongs to another person or company, usually by paying for it:
- **Spectrum** : Spectrum refers to the invisible radio frequencies that wireless signals travel over.
- **Wi-Fi**: wi-fi often thought to be short for Wireless Fidelity but there is no such thing. The term was created by a marketing firm because the wireless industry was looking for a user-friendly name to refer to some not so user-friendly technology known as IEEE 802.11
- **PoE**: (Power over Ethernet): is a technology for implementing wired Ethernet local area networks (LANs) that enables the electrical current necessary for operating each device to be carried by Ethernet data cables instead of standard electrical power cords and wiring.
- **interference** is any signal outside of the configured Wi-Fi network that impairs normal operation of the Wi-Fi network. Typically, network operators will detect slower speeds, higher latency, frequent disconnects and reconnects, and sometimes a complete inability to connect to a Wi-Fi signal.

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