



Australian Government

Department of Education, Employment and Workplace Relations

ICTTEN4050A Install and configure a wireless mesh network

Release: 1

ICTTEN4050A Install and configure a wireless mesh network

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to install and configure a wireless mesh network comprised of radio nodes organised in a mesh topology. Wireless mesh networks provide users with secure wireless roaming beyond traditional wireless local area network (LAN) boundaries and are readily deployed in areas that lack wired backhaul. The mesh topology and ad-hoc routing give mesh networks stability, offer redundancy and have the ability to self form and self heal. Mesh networks enable local communities and those in remote areas to participate in a distributed shared network without the need for centralised management. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.
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Application of the Unit

Application of the unit	Technicians and technical officers from private and public organisations who install and test wireless networking equipment or radio communications equipment apply the skills and knowledge in this unit.
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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.
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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Configure wireless mesh nodes and wireless access points	1.1. Determine internet protocol (IP) addressing schemes from design plan obtained from appropriate person 1.2. Confirm compatibility of factory installed firmware in wireless routers with mesh routing requirements, otherwise install upgrade firmware 1.3. Configure wireless router settings and wireless fidelity (WiFi) wireless access point settings for inclusion in mesh network 1.4. Connect mesh node and access node back-to-back via a straight LAN cable according to design plan
2. Connect separate mesh networks via backbone	2.1. Configure routing software on mesh and backbone nodes to enable mesh traffic to reach backbone 2.2. Connect mesh node and backbone node back-to-back via a straight LAN cable 2.3. Configure gateway server and gateway node and add required services to the network
3. Test connectivity within mesh network	3.1. Assemble all wireless mesh routers with configuration sheets attached and power up the routers 3.2. Connect PC to a wireless mesh router and confirm that an IP address is provided automatically by dynamic host configuration protocol (DHCP) 3.3. Confirm connectivity to mesh nodes and the gateway by pinging individual IP addresses, and rectify faulty nodes if required
4. Test network connectivity via wireless backbone	4.1. Install mesh nodes according to design plan 4.2. Install and align directional antennas on wireless backbone path according to installation instructions and occupational health and safety (OHS) procedures 4.3. Confirm connectivity between mesh clusters at either end of wireless backbone
5. Clean up work site and complete administrative work	5.1. Remove waste from work site, dispose of according to environmental requirements and restore work area to customer's satisfaction 5.2. Update documentation records and make recommendations according to the enterprise policy 5.3. Notify the customer of job completion and obtain sign off

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

- communication skills to liaise with vendors and installation personnel on technical and operational matters
- literacy skills to interpret technical documentation and write reports in required formats
- numeracy skills to perform calculations, interpret results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and that of others
- problem solving and contingency management skills to:
 - adapt testing procedures to requirements of particular situations
 - modify activities depending on operational contingencies, risk situations and environments
- technical skills to:
 - install software
 - select and specify appropriate performance tests and test equipment
 - set up IP addresses and subnet masks
 - use IT networking skills

Required knowledge

- 802.11 wireless protocols
- allocation of IP addresses and subnet masks
- antenna gain, polarisation
- cable loss
- calculation of effective isotropic radiated power (EIRP)
- calculation of line of site radio range
- decibels and related units
- network topologies
- radio frequency (RF) frequency bands
- routing protocols
- transmission control protocol (TCP)-IP protocols
- wireless networking hardware, access points, wireless routers, gateway

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Evidence of the ability to: • configure wireless mesh nodes • install wireless mesh nodes, access point nodes and gateway • test nodes for connectivity.
Context of and specific resources for assessment	Assessment must ensure: • sites on which configuring and installing wireless mesh network may be conducted • technical documentation.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: • direct observation of the candidate configuring wireless mesh routers • direct observation of the candidate installing wireless mesh nodes, access point nodes and gateway • direct observation of the candidate testing nodes for connectivity • oral or written questioning to assess required knowledge.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: • ICTTEN5217A Plan a wireless mesh network • ICTRFN3055A Install a radio communications antenna and feedline. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and

EVIDENCE GUIDE

	assessment support when required. Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed. In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. Where applicable, physical resources should include equipment modified for people with special needs.
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Range Statement**RANGE STATEMENT**

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

<i>Appropriate person</i> may include:	• network engineer • project designer • project manager.
<i>Upgrade firmware</i> may include:	• OpenWrt Linux based firmware • Freifunk firmware • MIT Roofnet.
<i>Wireless router settings</i> may include:	• LAN settings: • firewall usage • LAN IP address and subnet mask • LAN protocol • routing protocol:

RANGE STATEMENT	
	• optimised link state routing (OLSR) • system settings: • country • host name • wireless settings: • basic service set identifier (BSSID) • channel number/frequency • extended service set identifier (ESSID) • wireless LAN (WLAN) IP address • WLAN IP address and subnet mask • WLAN mode • WLAN protocol.
WiFi wireless access point settings may include:	• settings: • DHCP settings: • maximum number of DHCP users • starting IP address • DHCP type • router IP address • router name • wireless settings: • wireless channel number or frequency • wireless network name (SSID).
Straight LAN cable may include:	• Category 5 • Category 5e • Category 6.
Gateway server may include:	• connection to another network • connection to the internet • via asymmetrical digital subscriber line (ADSL).
Services may include:	• domain name system (DNS) • mail server • web proxy.
Configuration sheets may include:	• host name • LAN settings • routing protocol • software or firmware version • WAN settings • wireless router details

RANGE STATEMENT	
	• wireless settings.
<i>Align</i> may include:	• azimuth angle • elevation angle • set antenna polarisation: • horizontal • vertical.
<i>Documentation records</i> may include:	• configuration details: • access point • gateway • router • IP Addresses • signal levels.

Unit Sector(s)

Unit sector	Telecommunications
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Co-requisite units

Co-requisite units		

Competency field

Competency field	Telecommunications networks engineering
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