



Australian Government

ICTTEN4241A Design network projects

Release 1

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Modification History

Release	Comments
Release 1	This version first released with <i>ICT10 Integrated Telecommunications Training Package Version 3.0</i> .

Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to plan and design projects for access, building and core telecommunications networks.

The unit includes legacy, current and emerging technologies and practices. It also includes use of access network deployment data, technology, equipment, capacity management and network management information sources.

The project may be for a new installation or to upgrade the technology or the capacity of an existing network or subsystem to facilitate convergence to the next generation network (NGN).

Application of the Unit

Technical staff and their subcontractors from private and public organisations apply the skills and knowledge in this unit. They combine technical planning and design skills with broader organisational skills to plan and design projects for a service provider, such as a major carrier or other communications service providers.

Technical officers, communications workers or engineers may be responsible for small projects or parts of larger projects on NGN in the deployment of copper, wireless, hybrid fibre coaxial (HFC), fibre to the x (FTTx) and fibre networks.

Licensing/Regulatory Information

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.

Pre-Requisites

Nil

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements	Performance Criteria
<i>Elements describe the essential outcomes of a unit of competency.</i>	<i>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.</i>

Elements and Performance Criteria

1. Analyse different types of network technologies	1.1 Determine network characteristics using network information sources 1.2 Select techniques to provide service to greenfields, brownfields and rehabilitation projects for access networks 1.3 Select techniques to provide for new service, capacity expansion and equipment recovery projects for building and core networks 1.4 Produce a brief on how network architecture components relate to the larger network and their impact on the work 1.5 Develop an installation activity schedule that complies with relevant regulations and standards to minimise disruption to the workplace 1.6 Evaluate availability of equipment and technologies and establish compatibility with existing network equipment
2. Apply deployment and construction practices for network technologies	2.1 Review conduit and jointing chamber standards and practices for the access network 2.2 Examine standards, practices and requirements for locating telecommunications infrastructure in the access network 2.3 Examine standards, practices and requirements for locating and standing racks, cabinets and supporting infrastructure 2.4 Examine capacity and practices for cabling and patching twisted-pair, coaxial and fibre distribution frames
3. Review network standards and prepare a draft design	3.1 Review customer's network deployment rules and apply to a network design 3.2 Produce a preliminary plan or design on the deployment of the network that maintains integrity of access, building and core networks 3.3 Establish a solution for anticipated constraints through discussions with appropriate personnel 3.4 Review plan to ensure that it complies with requirements of applicable legislation, codes, regulations and standards required when working on network, and where appropriate make adjustments 3.5 Produce final project design that includes recommendations agreed with the customer

Required Skills and Knowledge

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

Required skills

- analytical skills to:
 - evaluate different types of technical data
 - interpret data results
 - interpret technical and non-technical documentation and write summary reports in required formats
 - select and compare benefits and limitations of access equipment
- communication skills to:
 - liaise with internal and external personnel on technical and operational matters
 - negotiate approvals and contract arrangements with suppliers, contractors, customers and consultants
 - negotiate with customers, stakeholders and colleagues
 - work in a team environment for organisational objectives
- literacy skills to:
 - document technical requirements and procedures
 - interpret technical specifications and related documentation
 - read technical reports and incorporate findings in designs
- numeracy skills to:
 - calculate hazardous induction and earth potential rise (EPR) zones
 - calculate transmission requirements and link budgets
 - develop accurate costing for designs
 - make engineering calculations for designs
- planning and organising skills to:
 - balance priorities of conflicting demands
 - develop cost-effective designs
 - plan workload
 - prioritise and monitor own work
 - schedule and coordinate activities of other parties
- problem-solving skills to account for unexpected variations to requirements
- technical skills to:
 - apply customer practices and procedures to project designs
 - apply network code systems
 - assign activity coding
 - produce CAD or other electronic drawings
 - read plans.
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Required knowledge

- access network issues and challenges
- commercial considerations of access network deployment

- common network topologies
- compatibility issues of technology and equipment
- criteria for exemption processes
- enterprise deployment rules and rationale
- major equipment components of modern access architecture
- monitoring techniques to manage the access network
- network architectures and geographical categorisation
- network capacity and capability management
- network capacity limitation of various platforms
- network information sources
- network technology and equipment
- product capability and availability
- telecommunications legislation, Acts, regulations and their sources.

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: • identify and document the most suitable network technology to be deployed for a given requirement • apply established planning, design and management techniques for the deployment of a project • produce a project design that complies with the techniques, rules and standards of the deployed network.
Context of and specific resources for assessment	Assessment must ensure: • network planning and design documentation and other site-related documentation • equipment specifications • live network or training facilities with simulated network • organisational guidelines • access to relevant standards and practices 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 planning, designing and managing the deployment of access network architecture • review of reports completed by the candidate for differing examples of access networks • review of final deployment plan prepared by the candidate outlining recommendations for the customer • oral or written questioning to assess knowledge of equipment and technologies as used within the access network • presentation by candidate of their considerations of the standards and practices relevant to the design.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

	• ICTNPL4109A Evaluate the capability of access networks. Aboriginal people and other people from a non-English speaking background may have second language issues. Access must be provided to appropriate learning and 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

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.

Network may refer to:	• broadband: • wireless fidelity (WiFi) • world interoperability for microwave access (WiMAX) • copper: • coaxial • hybrid fibre coaxial (HFC) • twisted-pair • digital services: • asymmetrical digital subscriber lines (ADSL) • digital subscriber lines (DSL) • next generation network (NGN): • broadband access • data transfer • internet protocol (IP) based systems • internet protocol private branch exchange (IP PBX) • internet protocol TV (IPTV) • mobile data • mobile telephony • multimedia • video • voice over internet protocol (VoIP) • optical: • fibre to the node (FTTN) • fibre to the premises (FTTP) • FTTx • HFC • wireless networks: • cellular • microwave • radio • satellite.
Network information	• network management databases for:

<i>sources</i> may include:	• capacity assessment data • network performance data • traffic dimensioning data • network management tools.
<i>Network architecture components</i> may include:	• copper network: • copper cable • lead-in • lightning protection • line power supply • loading coils • main distribution frame • pair gain system • ethernet broadband remote access server (EBRAS) • HFC network • IP edge • optical: • add/drop multiplexer • broadband passive optical network (BPON) • cross connect unit • distribution/lead-in multi-port (DLM/LM) • fibre access points • fibre distribution hub (FDH) • dense wavelength division multiplexing (DWDM) systems • cloud network • gigabit passive optical network (GPON) • high density/optical fibre distribution frame (HD/OFDF) • home optical network terminal • optical distribution network • optical fibre • optical receiver • packet optical line terminal (P-OLT) • video optical line terminal (V-OLT) • wave division multiplexing (WDM) • wireless network: • antennae • dish • headend • hubs and nodes

	• radio frequency (RF) amplifier • radio towers and huts • RF transmitters and receivers • satellite • tap • waveguide • video service centre.
Equipment may include:	• digital • IP-based • optical: • add/drop multiplexers • amplifiers • filters • receivers • splitters/combiners • switches • transmitters • wireless: • amplifiers • filters • microwave • receivers • RF broadband • satellite • transmitters.
Technologies may include:	• digital subscriber lines: • ADSL • DSL • IP broadband: • IPTV • VoIP • WiFi • WiMAX • mobile radio • optical transmission systems: • DWDM • gigabit ethernet passive optical network GEAPON • GPON • WDM.

Network deployment rules may relate to:	• exemption process criteria • restricted site access: • financial institutions • government offices • rail corridor • research establishments • separation from other services: • electricity • fire equipment • gas • other telecommunications service providers • water.
Applicable legislation, codes, regulations and standards may include:	• AS Communications Cabling Manual (CCM) Volume 1 • AS/ACIF S008:2006 • AS/ACIF S009:2006 • AS/NZS 3000:2007 • AS/NZS 3080:2003 • AS/NZS 3084:2003 • AS/NZS 3085.1:2004 • AS/NZS IEC 61935.1:2006 • AS/NZS IEC 61935.2:2006 • AS/NZS ISO/IEC 14763.3:2007 • AS/NZS ISO/IEC 15018:2005 • AS/NZS ISO/IEC 24702:2007 • Australian building codes and regulations • Australian Communications Industry Forum (ACIF) standards and codes • cabling security codes and regulations • EPA, waterways, rail, land access, and national parks • federal, state and local regulations • fire regulations • industry drafting codes of practice • mining legislation • noise abatement and heritage legislation • Telecommunications Act 1998 • Telecommunications code of practice • WHS Acts and relevant codes and standards.

Unit Sector(s)

Telecommunications - Telecommunications networks engineering