



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks**

**Release: 1**

## ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks

### Modification History

Not Applicable

### Unit Descriptor

<b>Unit descriptor</b>	<p>This unit describes the performance outcomes, skills and knowledge required to specify the design of worldwide interoperability for microwave access (WiMAX) network architecture.</p> <p>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.</p>
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### Application of the Unit

<b>Application of the unit</b>	<p>ICT technical staff who design and operate WiMAX networks in wireless Core And Access Network implementation apply the skills and knowledge in this unit.</p> <p>Wireless convergence technology in telecommunications particularly applies to the deployment of fast wireless broadband access.</p>
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### Licensing/Regulatory Information

Refer to Unit Descriptor

### Pre-Requisites

<b>Prerequisite units</b>		

<b>Prerequisite units</b>	

## Employability Skills Information

<b>Employability skills</b>	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. Prepare to produce architecture designs for wireless broadband	1.1. Review WiMAX specification 802.16 protocol structure for point-to-point (backhaul) and point-to-multipoint (end user) topologies and identify <b>requirements</b> of the <b>network</b> 1.2. Assess <b>technical characteristics</b> and functions of <b>network elements</b> in a WiMAX network 1.3. Evaluate advantages of modulation techniques used in wireless access technologies 1.4. Compare characteristics and operating principles of <b>multiplexing techniques</b> used at the physical layer of wireless access technologies
2. Design architectures for a proposed fixed and a mobile WiMAX network	2.1. Develop a proposed network topology for a fixed (802.16d) WiMAX network showing the relationship of network elements 2.2. Develop a proposed network topology for a mobile (802.16e) WiMAX network showing the relationship of network elements 2.3. Evaluate <b>design considerations</b> between a fixed and mobile WiMAX network and produce <b>design specifications</b> 2.4. Determine appropriate <b>multiple-antenna system</b> in WiMAX design by considering their <b>benefits</b> 2.5. Produce a report on the architecture design for a WiMAX network
3. Evaluate network management products	3.1. Research, analyse and evaluate current <b>network management products</b> 3.2. Produce an evaluation report on the effectiveness of network management products that could be used to manage WiMAX network elements
4. Produce network designs for possible implementation	4.1. Compare WiMAX with other <b>competing wireless technologies</b> and their interoperability 4.2. Investigate inclusion of wireless fidelity (WiFi) in the design architectures as a complementary technology 4.3. Obtain latest technical <b>specifications</b> and pricing by contacting possible vendors 4.4. Determine support and training requirements needed 4.5. Produce an <b>implementation document</b> on WiMAX <b>architecture configurations</b> and designs and present to <b>appropriate person</b> for approval

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

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

#### Required skills

- analytical skills to evaluate documentation on competing wireless technologies
- communication skills to liaise with vendors
- numeracy skills to use financial modelling to evaluate a range of architecture design solutions
- literacy skills to read and interpret technical information
- problem solving skills for a defined range of anticipated problems:
  - when predicting line traffic
  - impact on input and output devices
  - processors from current and future demand requirements
- project planning skills to plan, prioritise and organise work required
- research skills to source, analyse and evaluate broad features of current security issues and best practice in security devices, products and procedures

#### Required knowledge

- client business domain
- current industry accepted network hardware and software products and their general features and capabilities
- detailed knowledge of:
  - current industry-accepted WiMAX network protocols
  - remote user issues
  - the management systems
  - WiMAX network design
  - WiMAX network traffic evaluation
- current industry security products, devices and procedures and their general features and capabilities
- theoretical concepts of current industry network development and design methodologies

## Evidence Guide

<b>EVIDENCE GUIDE</b>	
<p>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.</p>	
<b>Overview of assessment</b>	
<b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b>	<p>Evidence of the ability to:</p> <ul style="list-style-type: none"> <li>• apply knowledge of WiMAX communication architecture, hardware, protocols and networking systems</li> <li>• integrate other wireless technologies</li> <li>• analyse and evaluate competing wireless technologies</li> <li>• design viable WiMAX network solutions</li> <li>• assess network performance.</li> </ul>
<b>Context of and specific resources for assessment</b>	<p>Assessment must ensure:</p> <ul style="list-style-type: none"> <li>• documents detailing: <ul style="list-style-type: none"> <li>• IEEE 802.16 standards for WiMAX</li> <li>• client requirements</li> <li>• technical specifications</li> <li>• expected traffic volume</li> <li>• vendors and vendor offerings and pricing</li> <li>• information on a range of IT business solutions</li> <li>• future organisational business processes</li> <li>• budget for architecture designs for WiMAX networks.</li> </ul> </li> </ul>
<b>Method of assessment</b>	<p>A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:</p> <ul style="list-style-type: none"> <li>• direct observation of the candidate assessing network requirement</li> <li>• evaluation of implementation document prepared by the candidate outlining WiMAX architecture designs</li> <li>• oral or written questioning of the candidate to assess knowledge.</li> </ul>
<b>Guidance information for assessment</b>	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:</p>

**EVIDENCE GUIDE**

	<ul style="list-style-type: none"> <li>• ICTTEN6206A Produce an ICT network architecture design</li> <li>• ICTTEN5204A Produce technical solutions from business specifications.</li> </ul> <p>Aboriginal people and other people from a non-English speaking background may have second language issues.</p> <p>Access must be provided to appropriate learning and assessment support when required.</p> <p>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.</p> <p>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.</p> <p>Where applicable, physical resources should include equipment modified for people with special needs.</p>
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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.

***Requirements*** may refer to:

- application
- network
- people in the organisation
- system
- the business.

<b>RANGE STATEMENT</b>	
<b><i>Network</i></b> may include:	<ul style="list-style-type: none"> <li>• data and voice</li> <li>• local area network (LAN)</li> <li>• private lines</li> <li>• internet</li> <li>• use of the public switched telephone network (PSTN) for dial up modems only</li> <li>• wide area network (WAN)</li> <li>• wireless networks.</li> </ul>
<b><i>Technical characteristics</i></b> may include:	<ul style="list-style-type: none"> <li>• data rate</li> <li>• frequency bands and classes</li> <li>• modulation techniques</li> <li>• power requirements</li> <li>• range of coverage.</li> </ul>
<b><i>Network elements</i></b> may include:	<ul style="list-style-type: none"> <li>• access points</li> <li>• antenna arrays</li> <li>• base stations</li> <li>• gateways</li> <li>• USB adapters.</li> </ul>
<b><i>Multiplexing techniques</i></b> refer to:	<ul style="list-style-type: none"> <li>• orthogonal frequency division multiplexing (OFDM)</li> <li>• scalable OFDM access (SOFDMA).</li> </ul>
<b><i>Design considerations</i></b> may include:	<ul style="list-style-type: none"> <li>• capacity planning</li> <li>• cell planning</li> <li>• link budget</li> <li>• positioning and types of antennas</li> <li>• processors</li> <li>• required protocols and architecture</li> <li>• terminals.</li> </ul>
<b><i>Design specifications</i></b> may include:	<ul style="list-style-type: none"> <li>• antenna systems</li> <li>• channel sizes</li> <li>• convergence layer</li> <li>• duplex methods</li> <li>• modulation techniques</li> <li>• multiplexing techniques</li> <li>• standards</li> <li>• uploads and downloads.</li> </ul>
<b><i>Multiple-antenna system</i></b> may include:	<ul style="list-style-type: none"> <li>• diversity schemes</li> <li>• smart antenna systems (SAS), also known as adaptive antenna and multiple input-multiple output (MIMO) systems.</li> </ul>



<b>RANGE STATEMENT</b>	
<b>Benefits</b> may refer to:	<ul style="list-style-type: none"> <li>• array gain</li> <li>• diversity gain</li> <li>• interference reduction</li> <li>• power combination</li> <li>• spatial multiplexing.</li> </ul>
<b>Network management products</b> may include:	<ul style="list-style-type: none"> <li>• vendor products</li> <li>• open source (e.g. Netspan) products that could be used to manage WiMAX network elements.</li> </ul>
<b>Competing wireless technologies</b> may include:	<ul style="list-style-type: none"> <li>• 3G/4G cellular networks</li> <li>• WiFi and mobile broadband wireless access (MBWA - IEEE 802.20)</li> <li>• 802.11n</li> </ul>
<b>Specifications</b> may include:	<ul style="list-style-type: none"> <li>• current system functionality</li> <li>• technical requirements</li> <li>• user problem statement.</li> </ul>
<b>Implementation document</b> may include:	<ul style="list-style-type: none"> <li>• audit trails</li> <li>• European Conference of Postal and Telecommunications Administrations (CEPT) standards</li> <li>• client training</li> <li>• European Telecommunications Standards Institute (ETSI) standards</li> <li>• evaluation report</li> <li>• Institute of Electrical and Electronics Engineers (IEEE) standards</li> <li>• implementation plan</li> <li>• ISO standards</li> <li>• naming standards</li> <li>• network topologies</li> <li>• satisfaction reports.</li> </ul>
<b>Architecture configurations</b> may include:	<ul style="list-style-type: none"> <li>• point-to-point or back haul topology</li> <li>• point-to-multipoint or end user topologies.</li> </ul>
<b>Appropriate person</b> may include:	<ul style="list-style-type: none"> <li>• authorised business representative</li> <li>• client</li> <li>• network designer</li> <li>• network planner</li> <li>• project manager.</li> </ul>

**Unit Sector(s)**

<b>Unit sector</b>	Telecommunications
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**Co-requisite units**

<b>Co-requisite units</b>		

**Competency field**

<b>Competency field</b>	Radio frequency networks
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