



Australian Government

Department of Education, Employment and Workplace Relations

ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks

Release: 1

ICTTEN6169A Produce and evaluate architecture designs for convergent cellular mobile networks

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes, skills and knowledge required to specify the design of the required mobile cellular general packet radio service (GPRS), third-generation (3G) and fourth-generation (4G) network architectures. 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	Technical staff who design and operate mobile wireless systems that meet the industry implementation of wireless convergence in telecommunications apply the knowledge and skills in this unit. They would be employed in the ICT industry by companies deploying convergence technologies in their Core and Access networks to meet their business needs.
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Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units	
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Employability Skills Information

Employability skills	This unit contains employability skills.

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. Plan and prepare for the design of cellular mobile networks	1.1. Analyse the requirements of the mobile network 1.2. Examine technical characteristics of the GPRS systems 1.3. Develop network architecture for a GPRS network in addition to the circuit-switched domain of 2G 1.4. Review 3G structure and identify requirements of the network to provide a wide variety of services ranging from voice and paging services to interactive multimedia, including teleconferencing and internet access 1.5. Examine the technical characteristics, data rates, operating frequencies and multiplexing schemes of the 3G system 1.6. Establish the positioning and types of antennas, terminals, processors, required protocols and architecture, based on technical specifications and requirements
2. Design a GPRS (2.5G) cellular network	2.1. Investigate how 2.5G GPRS overlays the GSM network to transmit and receive transmission control protocol (TCP)/ internet protocol (IP) based data to and from GPRS mobile devices
3. Design a 3G cellular network	3.1. Develop the network architecture for a 3G network and explain the functions of the network elements 3.2. Integrate a 3G network with a wireless local area network (WLAN)
4. Research and evaluate design features of a proposed 4G cellular network	4.1. Investigate how a fully IP based 4G system will provide an end-to-end IP integrated solution for voice, data and streamed multimedia to end users roaming anytime and anywhere 4.2. Investigate access schemes of a 4G network 4.3. Investigate implication for IPv6. 4G support to greater number of IP based wireless devices with applications such as improved multicast, security and route minimisation capabilities 4.4. Investigate the use of advanced antenna systems to enable 4G with high rate, high reliability and long range communications
5. Produce reports for architectural design for cellular networks	5.1. Report on the impact of competing technologies on each other 5.2. Investigate the potential interoperability and global roaming issues that may be faced by GSM, 2.5G, 3G and 4G cellular technologies

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

- design skills to technically enhance cellular networks to include IP convergence
- group facilitation and presentation skills to transfer and collect information and gain consensus on concepts
- literacy and communication skills to analyse, evaluate and present information, when documenting network design and presenting it to senior managers, client users and sponsors for approval
- problem solving skills to predict traffic and the impact on input and output devices and processors from current and future demand requirements
- research skills to specify, analyse and evaluate broad features of current security issues and best practice in security devices, products and procedures
- technical skills to operate cellular networks

Required knowledge

- broad knowledge of the client business domain when designing network
- current industry accepted network hardware and software products and their general features and capabilities, and detailed knowledge when designing a GPRS (2.5G) and 3G network
- current industry security products, devices and procedures and their general features and capabilities, and detailed knowledge when finalising GSM, GPRS (2.5G) and 3G network design
- detailed knowledge of current industry accepted cellular mobile network protocols
- technical characteristics of GPRS systems:
 - capability classes and multi-slot classes
 - coding schemes
 - data rates
 - management systems when evaluating roaming features
 - operating frequencies and modulation schemes
 - remote user issues when establishing siting and types of antennas, terminals, processors, required protocols and GPRS (2.5G) and 3G network architecture, based on technical specifications and user requirements
- theoretical concepts of three or more current industry network development and design methodologies when designing networks

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: - design viable GPRS (2.5G) and 3G network solutions to meet particular business needs - research design features of 4G cellular networks.
Context of and specific resources for assessment	Assessment must ensure: - budget for designs for convergent cellular mobile networks - cellular mobile network structures - client requirements - expected traffic volume - information on a range of IT business solutions - technical specifications - vendors and vendor offerings and pricing.
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: - oral or written questioning to assess knowledge of current industry networks and design methodologies - review of report prepared by the candidate outlining evaluation process undertaken, including challenges faced and how these were addressed - direct observation of the candidate undertaking multiple antenna positioning - evaluation of network designed by the candidate in terms of performance and suitability of business needs.
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example: - ICTRFN6098A Monitor the capacity of and recommend changes to the mobile cellular network. - ICTRFN6171A Produce and evaluate architecture designs for WiMAX networks

EVIDENCE GUIDE

	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

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 include:	• application • network • system • the business.
Network may include:	• cellular mobile networks • internet • national WANs • public switched telephone network (PSTN): • data • voice.

RANGE STATEMENT	
Technical characteristics may include:	• capability classes • coding schemes • data rates • operating frequencies and modulation schemes.
Systems may include:	• hardware components that run a cellular mobile network • software components that run a cellular mobile network.
GPRS network may include:	• GGSN of 2.5G and 3G • SGSN of 2.5G and 3G.
Circuit-switched may include:	• GSM core network: • authentication centre (AUC) • equipment identity register (EIR) • home location register (HLR) • mobile services switching centre (MSC) • public switched telephone network (PSTN) and associated signalling.
Architecture may include:	• configuration of GPRS (2.5G), 3G and 4G topologies • network management: • global roaming issues faced by cellular technologies • interoperability.
Specifications may include:	• current system functionality • technical requirements • user problem statement.
Advanced antenna systems may include:	• adaptive antennas • multiple input multiple output (MIMO).
Report may include:	• audit trails • client training • ISO, European Telecommunications Standards Institute (ETSI) and Australian standards • maintaining equipment inventory • naming standards • project management templates and report writing • satisfaction report • technical report • version control.

RANGE STATEMENT

Competing technologies may include:

- 4G
- 802.11n
- worldwide interoperability for microwave access (WiMAX).

Unit Sector(s)

Unit sector	Telecommunications
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Co-requisite units

Co-requisite units	
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Competency field

Competency field	Telecommunications networks engineering
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