



Australian Government

ICTOPN607 Design dense wavelength division multiplexing systems

Release: 1

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Modification History

Release	Comments
Release 1	This version first released with ICT Information and Communications Technology Training Package Version 7.0.

Application

This unit describes the skills and knowledge required to design a high capacity, dense wavelength division, multiplexing (DWDM) optical network suitable for a metropolitan area network (MAN) and long-haul applications.

It applies to individuals who are skilled technicians and excellent communicators who use optical technologies for the deployment of high capacity networks. The work involves link budget design and providing specification details for configuration and commissioning teams.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Unit Sector

Telecommunications – Optical Networks

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Prepare to design DWDM systems	1.1 Obtain and review planning documents, required legislation, codes, company work practices, regulations and standards, work health and safety (WHS) and environmental requirements, personal protective equipment, and hazard identification tools for scoped work 1.2 Obtain the service type and number of channels required between customer traffic sources, destinations and the type of required protection 1.3 Obtain specifications of optical fibre between sites 1.4 Determine fibre loss between sites

2. Calculate link budget for each wavelength path for DWDM system design	2.1 Calculate link budget and link margin for each DWDM wavelength and path 2.2 Evaluate link budget, assess calculated margin and make recommendations for improvements 2.3 Analyse specifications of installed optical fibre and determine if dispersion will limit the maximum traffic data rate 2.4 Generate options for system design that are realistic for the enterprise and network 2.5 Evaluate and select preferred option in consideration of enterprise business strategy outcomes, service policy and compliance with required legislation 2.6 Discuss and confirm selected option with customer
3. Prepare detailed configuration documents for DWDM system	3.1 Outline detailed requirements of the DWDM system for configuration document 3.2 Document the DWDM systems performance, functional and physical attributes according to the customers traffic needs 3.3 Prepare an internet protocol (IP) address allocation for all DWDM shelves and associated routers and gateways 3.4 Submit documentation to relevant personnel for approval and sign off
4. Investigate upgrade options with emerging technologies	4.1 Investigate option of using a reconfigurable optical add-drop multiplexer (ROADM) and make recommendations, outlining benefits 4.2 Investigate feasibility of a future upgrade up to 100 Gbps system using optical transport network (OTN) - DWDM technology

Foundation Skills

This section describes language, literacy, numeracy and employment skills incorporated in the performance criteria that are required for competent performance.

SKILL	DESCRIPTION
Numeracy	Uses mathematical equations to evaluate all required technical data
Oral communication	- Uses listening and questioning skills to confirm technical and operational requirements - Participates in verbal exchanges of ideas and solutions and uses required, detailed and clear language to address installation personnel, vendors, customers and contractors
Reading	Interprets textual information from required sources to identify and plan for all job requirements and adhere to procedures and standards

SKILL	DESCRIPTION
Writing	Prepares project briefs, technical documentation and reports using clear and technically specific language, numerical data and diagrammatic information
Teamwork	Identifies requirements of important communication exchanges, selecting required channels, format, tone and content to suit purpose and audience and monitoring impact
Problem solving	Understands key principles and concepts underpinning the design and operation of digital systems and tools and applies these when seeking to knowledge the potential
Self-management	Monitors adherence to legal and regulatory rights and responsibilities

Unit Mapping Information

Supersedes and is equivalent to ICTOPN603 Design a dense wavelength division multiplexing system.

Links

Companion Volume Implementation Guide is found on VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=a53af4e4-b400-484e-b778-71c9e9d6aff2>

Assessment Requirements for ICTOPN607 Design dense wavelength division multiplexing systems

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Performance Evidence

The candidate must demonstrate the ability to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including evidence of the ability to:

- design at least two dense wavelength division multiplexing systems (DWDM).

In the course of the above, the candidate must:

- document an internet protocol (IP) addressing scheme that is suitable for DWDM shelf configuration
- determine fibre loss between sites
- calculate link budgets and link margins
- prepare dense wavelength division multiplexing (DWDM) shelf configuration and specifications
- produce detailed configuration documents
- investigate an emerging DWDM technology.

Knowledge Evidence

The candidate must be able to demonstrate knowledge to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including knowledge of:

- features of configuration of DWDM shelf
- operation principles of DWDM systems
- required formats for configuration documents for DWDM system
- functions and features of electrostatic discharge
- features and operating requirements of the following test equipment:
 - an optical time domain reflectometer (OTDR)
 - a hand-held optical power meter
 - a transmission test set
 - an optical spectrum analyser

- functions of an optical add-drop multiplexer (OADM)
- functions of reconfigurable optical add-drop multiplexer (ROADM)
- International Telecommunications Union (ITU) wavelength grid for DWDM
- features of laser stability
- characteristics of dispersion compensation devices
- the importance of a link budget and calculate link margins
- optical fibre connector types and characteristics
- optical fibre types and characteristics
- path protection and protection switching requirements
- physical optical loopbacks and software loopbacks
- traditional protocols and emerging Optical Transport Network (OTN) technologies used on optical DWDM systems
- ring topologies and linear network topologies
- specific work health and safety (WHS) requirements that impact management of DWDM systems
- required legislation, codes, company work practices, regulations and standards and environmental requirements for scoped work.

Assessment Conditions

Skills in this unit must be demonstrated in a workplace or simulated environment where the conditions are typical of those in a working environment in this industry.

This includes access to:

- manufacturer technical documentation
- required regulations
- system specifications.

Assessors of this unit must satisfy the requirements for assessors in required vocational education and training legislation, frameworks and/or standards.

Links

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