



Australian Government

ICTOPN603 Design a dense wavelength division multiplexing system

Release: 1

ICTOPN603 Design a dense wavelength division multiplexing system

Modification History

Release	Comments
Release 1	This version first released with ICT Information and Communications Technology Training Package Version 2.0.

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) or 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 produce a DWDM system design	1.1 Obtain the planning document from appropriate person and determine site details 1.2 Obtain the service type and number of channels required between customer traffic sources and destinations and the type of protection required 1.3 Obtain specifications of optical fibre between sites 1.4 Determine fibre loss between sites

2. Calculate link budget for each wavelength path	2.1 Use vendor's engineering design rules, specifications and data to calculate link budget and link margin for each DWDM wavelength and path 2.2 Evaluate link budget and assess calculated margin and make recommendations for improvement if warranted 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 based on enterprise business strategy outcomes, service policy and compliance with relevant legislation 2.6 Discuss and confirm selected option with customer
3. Prepare detailed configuration documents for the DWDM system	3.1 Outline detailed requirements of the DWDM system for configuration document 3.2 Prepare a configuration document according to customer's 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 appropriate person for approval and sign off
4. Investigate upgrade options using 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	Performance Criteria	Description
Reading	2.1, 2.3, 2.5	Interprets textual information from relevant sources to identify and plan for all job requirements and adhere to procedures and standards

Writing	1.1, 2.2, 2.4, 3.1, 3.2, 3.4, 4.1	Accurately prepares project briefs, technical documentation and reports using clear and technically specific language, numerical data and diagrammatic information
Oral Communication	1.1, 2.2, 2.6, 4.1	Uses listening and questioning skills to confirm technical and operational requirements and participates in a verbal exchange of ideas and solutions and uses appropriate, detailed and clear language to address installation personnel, vendors, customers and contractors
Numeracy	1.4, 2.1, 2.2, 2.3	Uses mathematical equations to evaluate all relevant technical data
Navigate the world of work	2.5	Monitors adherence to legal and regulatory rights and responsibilities
Interact with others	3.4	Actively identifies requirements of important communication exchanges, selecting appropriate channels, format, tone and content to suit purpose and audience and monitoring impact
Get the work done	1.1-1.4, 2.2, 2.4, 2.5, 3.3, 4.1, 4.2	- Understands key principles and concepts underpinning the design and operation of digital systems and tools and applies these when seeking to understand the potential of new technology - Takes responsibility for defining key aspects of workload, balancing own needs and priorities with job requirements - Takes responsibility for high-impact decision in complex situations involving many variables and constraints - Recognises and addresses complex problems involving multiple variables

Unit Mapping Information

Code and title current version	Code and title previous version	Comments	Equivalence status
ICTOPN603 Design a dense wavelength	ICTOPN6128A Design a dense	Updated to meet standards for	Equivalent unit

Code and title current version	Code and title previous version	Comments	Equivalence status
division multiplexing system	wavelength division multiplexing system	Training Packages	

Links

Companion Volume implementation guides are found in VETNet -

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

Assessment Requirements for ICTOPN603 Design a dense wavelength division multiplexing system

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Performance Evidence

Evidence of ability to:

- determine fibre loss between sites
- calculate link budget and link margin
- prepare dense wavelength division multiplexing (DWDM) shelf configuration and specifications
- produce configuration documentation
- investigate an emerging DWDM technology.

Note: If a specific volume or frequency is not stated, then evidence must be provided at least once.

Knowledge Evidence

To complete the unit requirements safely and effectively, the individual must:

- explain the configuration of DWDM shelf
- outline operation principles of DWDM
- clarify electrostatic discharge
- identify features and operating requirements of test equipment including:
 - an optical time domain reflectometer (OTDR)
 - a hand-held optical power meter
 - a transmission test set
 - an optical spectrum analyser
- describe functions of an optical add-drop multiplexer (OADM)
- summarise functions of reconfigurable optical add-drop multiplexer (ROADM)
- explain internet protocol (IP) addressing, subnet mask, dynamic host configuration protocol (DHCP) and default gateway
- summarise International Telecommunications Union (ITU) wavelength grid for DWDM

- explain laser stability
- identify dispersion compensation devices
- describe the importance of a link budget and calculate a link margins
- identify optical fibre connector types and characteristics
- identify optical fibre types and characteristics
- discuss path protection and protection switching
- explain physical optical loopbacks and software loopbacks
- summarise traditional protocols and emerging Optical Transport Network (OTN) technologies used on optical DWDM systems
- describe ring topologies and linear network topologies
- explain specific work health and safety (WHS) requirements that impact the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems.

Assessment Conditions

Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the workplace. Noise levels, production flow, interruptions and time variances must be typical of those experienced in the Telecommunications – Optical Networks field of work and include access to:

- manufacturer's technical documentation
- relevant regulations
- system specifications.

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

Links

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