Certified Optical Network Associate (CONA)

5 days

Planners course

This course introduces optical networking & covers network infrastructure, as well as transmission systems that use direct detection technology. These direct detection systems may be used to provide very high capacity (up to 1.6Tb/s) Ethernet channels within data centres & commonly 100 & 400Gb/s data rates for metro data centre interconnect (DCI). LAN & campus backbones, FTTA & 5G front haul also use direct detection, as do point-to-point FTTH, full fibre business connections & many transport & utility networks. Long haul OTN systems can use direct detection systems to provide capacity of 800Gb/s+ per fibre pair over thousands of km.

You will learn what is required for satisfactory system performance of such networks & how the performance can be affected by the properties and the quality of the physical fibre infrastructure including such issues as fibre type, reflections, attenuation, chromatic dispersion & polarisation mode dispersion. You will learn how to multiply the capacity of single channel systems using SDM (parallel fibres) or by applying appropriate WDM technologies including SWDM, WWDM, CWDM or DWDM. You'll be able to extend the reach of the systems to avoid regeneration by using amplifiers, (EDFAs, Raman, SOAs) & through optical dispersion management.

Through the use of design exercises and assignments, you will learn how to design optical networking systems to provide efficient & cost-effective solutions for many network applications.

Features

- ❑ scenario based
- ❑ exercises and ongoing case study
- ❑ uses OTT's unique WhizzieKit virtual optical network training system
- ❑ comprehensive course manual plus support materials online
- ❑ pass the assessment to gain Certified Optical Network Associate (CONA) status

Key outcomes

- ✓ design optical links that provide cost-effective solutions for many network applications
- ✓ specify the components that are required to build a transmission link and describe how they should be configured
- ✓ design links for performance and testability
- ✓ assess options for SDM and WDM transceivers including 100G and 400G Ethernet
- ✓ determine the optical power budget of different transmission systems
- ✓ calculate the optical loss budget for a transmission link
- ✓ decide when & where optical amplifiers are needed & identify suitable products
- ✓ calculate whether chromatic dispersion compensation is required for a link, & if so specify an appropriate dispersion management solution
- ✓ explain the role of an optical supervisory circuit & plan for its implementation in the network
- ✓ verify that a link design is viable in terms of power levels, chromatic dispersion limits & PMD levels
- ✓ consider options for CWDM, DWDM and Raman amplified solutions for lighting up dark fibre links

CONA is a great course if you need a broad foundation of knowledge of optical networks It suits job roles such as: planner, project manager, operations staff, network manager. It provides the foundation for the advanced Certified Optical Network Engineer (CONE) course which covers coherent systems.

OTT's CFCE course, which covers characterisation of dark fibres & analysis of results may be of interest to you or your colleagues.

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BECOMING A CONA
- ❑ What are optical networks?
- ❑ The different generations
- ❑ The role of standards

CASE STUDY
- ❑ Background, roles, project
- ❑ Introduction to WhizzieKit

UNDERSTANDING LIGHT
- ❑ Light as a wave
- ❑ Wavelengths & frequencies used in fibre optics
- ❑ Wave properties of light
- ❑ Using light to transfer information
- ❑ Interferometry

MANAGING LIGHT
- ❑ Using passive components to manage light
- ❑ Managing power levels
- ❑ Directing light
- ❑ Multiplexing light
- ❑ Managing different wavelengths of light

INTRO TO MULTIPLEXING
- ❑ Electronic TDM
- ❑ WDM
- ❑ WWDM / LAN-WDM
- ❑ SWDM
- ❑ CWDM
- ❑ DWDM
- ❑ SDM
- ❑ *Exercise: WDM v SDM Ethernet transceivers*

LIGHT IN OPTICAL FIBRES
- ❑ How fibres work
- ❑ Multimode & Singlemode
- ❑ Launch conditions
- ❑ Attenuation
- ❑ Bend loss performance
- ❑ Dispersion

INFRASTRUCTURE

OPTICAL FIBRES FOR TELECOMS NETWORKS
- ❑ Fibres for enterprise
- ❑ Fibres for telecoms
- ❑ Standards

SPECIFYING FIBRE OPTIC CABLES
- ❑ Sourcing cable links
- ❑ External and internal cable performance issues
- ❑ Typical constructions
- ❑ Cables for different environments

JOINTING EXTERNAL CABLES
- ❑ The challenges
- ❑ Scenarios
- ❑ Installation issues
- ❑ Splice closures

TERMINATING EXTERNAL CABLES
- ❑ The challenges
- ❑ Scenarios
- ❑ Termination location components
- ❑ Specifying an ODF

CONNECTORS
- ❑ Connector styles
- ❑ Connectors for transceivers
- ❑ Connector performance
- ❑ Pre-terminated assemblies
- ❑ Inspection and cleaning
- ❑ Inspection standards
- ❑ Performance requirements for joining fibres

POLARITY ISSUES
- ❑ Simplex installations
- ❑ Duplex installations
- ❑ Installations with array connectors

INFRASTRUCTURE TESTING
- ❑ Why test?
- ❑ What tests are needed
- ❑ Analysis and extracting relevant information
- ❑ Monitoring systems

SYSTEMS

SYSTEMS PERFORMANCE
- ❑ Requirements for good system performance
- ❑ Potential causes of performance problems
- ❑ designing for performance and testability

POWER LEVELS IN LOSS LIMITED SYSTEMS
- ❑ Target distances for Ethernet & OTN
- ❑ Loss budgets
- ❑ Transmitter power levels
- ❑ Receiver power levels

OPTICAL AMPLIFIERS
- ❑ Benefits & drawbacks
- ❑ EDFAs
- ❑ Raman amplifiers
- ❑ Amplifier types
- ❑ Configurations, Specs & performance
- ❑ Implementation checklist
- ❑ *Exercise: Backhaul*

TRANSCEIVERS
- ❑ Light sources & transmitters
- ❑ Receivers & detectors
- ❑ Transceiver modules
- ❑ Key parameters
- ❑ *Exercise: Transceivers for 5G*

DISPERSION

CHROMATIC DISPERSION
- ❑ What is it? & What causes it?
- ❑ Dispersion slope
- ❑ CD characteristics of common fibre types
- ❑ Dispersion limited systems

CD MANAGEMENT
- ❑ Optical v electronic DC
- ❑ DC fibre
- ❑ Bragg grating DCMs
- ❑ Tuneable DCMs
- ❑ Dispersion managed links

PMD
- ❑ What is PMD?
- ❑ Polarised light
- ❑ Polarisation in fibres
- ❑ PMD & system performance

OPTICAL NETWORKING

PHOTONIC NETWORKS
- ❑ Photonic network topologies
- ❑ Multiplexers
- ❑ Add drop technologies
- ❑ ROADMs
- ❑ *Exercise: Rail network*

PRACTICAL IMPLEMENTATION
- ❑ Equipment configurations
- ❑ What do I need?
- ❑ What type?
- ❑ Where does it go?
- ❑ Rules and constraints

ON SYSTEMS TESTING
- ❑ Tests for each project stage
- ❑ Test limits & acceptance criteria

ASSIGNMENT
- ❑ Case study assignment using WhizzieKit products to plan & cost a solution
- ❑ Theory assessment