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Optical Transport Networks Training

09 - 13 Jun 2024
Online

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Ref.: 15114_303008 **Date:** 09 - 13 Jun 2024 **Location:** Online **Fees:** 2500 **Euro**

Introduction:

Optical Transport Networks Training: Optical Transport Networks are composed of a set of Optical Network Elements connected by optical fibre links to provide functionality of transport, multiplexing, routing, management, supervision and survivability of optical channels carrying client signals. Optical transport networks consist of the networking capabilities and the technology required to support them.

Course Content:
Unit 1: Optical Transport Networks & Technologies OTNT

- What is Optical transport network OTN?
- Strategies for handling growth in packet-switched traffic
- Packet-switched network based on multi-protocol label switching MPLS technology
- Switching in the core network occurs on a packet basis at every node
- A circuit-switched infrastructure based on an optical transport network OTN
- Metropolitan Optical Network MON

Unit 2: A Brief History of Optical Networking:

- Services, Transport, Framing and Optical
- Aggregation and Transport Technologies
- Current Trends in Transport Networks
- TDM Centric to Packet Centric Transport
- Convergence of Packet and TDM Transport
- SONET/SDH
- DWDM, CWDM
- First Gen DMDM Networks pre-OTN
- Optical Ethernet
- Resilient Packet Ring
- A-PON, B-PON, G-PON, and E-PON
- Optical networking using wavelength-division multiplexing WDM
- Interfaces for the optical transport network
- Transport Architecture Evolution
- Evolution of Transport Networks
- MPLS, OTN, and DWDM
- Optical OTN ROADM
- Electrical OTN
- PBB-TE
- MPLS-TP
- IP/MPLS
- MPLS-TP as a transport oriented packet aggregation technology
- MPLS-TP Building Blocks and Network Architectures

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Unit 3: Transport Architecture Principles:

- Metro
- Core
- Switch Node
- L3-services
- L2-services
- OTN, OC-x and Eth
- λ-service: Layer 0/1
- Packet, OTN and DWDM

Unit 4: Basic Capabilities in OTN Networks:

- The OTN Approach
- IP, OTN and DWDM
- Network View
- Electrical: Client Mapping,
- Connection Multiplexing
- Grooming, Monitoring
- OTN management
- OTN protection
- Protection/Restoration
- Optical Layer
- Add/Drop, Express, Protection/Restoration
- Basic signal structure
- OTN interface structure
- Multiplexing/mapping principles and bit rates
- Optical transport module
- What is an Optical channel OCh?
- Optical channel transport unit
- Optical channel data unit
- Optical channel payload unit
- OTM overhead signal OOS
- Maintenance signals
- Mapping of client signals
- Concatenation

Unit 5: Optical Transport Network OTN Basics:

- Information structure for OTN interfaces
- Multiplexing/mapping principles and bit rates
- Mapping
- Wavelength division multiplex
- Bit rates and capacity
- ODUk time-division multiplex
- OTN networking
- OTN management
- OTN protection

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Unit 6: Optical Transport Network OTN Architecture:

- Multi-Service Clients
- SONET/SDH
- GigE
- Ethernet
- SAN
- Digital Domain
- Interface for the optical transport network OTN
- Optical Channel OCh
- ITU G.694.1
- Assoc OH
- Optical Domain
- Non Assoc OH OSC
- Optical Multiplex Section OMS
- Optical Transport Section OTS
- Architecture of optical transport networks
- Network requirements and architectural framework of the Optical Transport Network Framing & Interfaces
- Framing structure digital wrapper, overhead bytes
- multiplexing, and payload mappings for all payload types
- Optical transport network physical layer interfaces
- Equipment Functions
- Characteristics of optical transport network OTN equipment functional blocks
- The control of jitter and wander within the
- Network Management
- Management aspects of the optical transport network element
- Optical transport network OTN protocol-neutral management information model for the network element view
- Optical transport network OTN management information model
- Generic framing procedure GFP
- Link capacity adjustment scheme LCAS for virtual concatenated signals
- Optical interfaces for intra-office systems
- Common equipment management function requirements
- Characteristics of transport equipment - Description methodology and generic functionality
- Automatic switched transport networks ASTN
- Architecture for the automatically switched optical network ASON
- SDH/SONET
- IP based services
- Ethernet services
- ATM services
- Frame Relay services
- Audio/Video services

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Unit 7: Convergence of Optical Transport Network OTN Layers:

- OTN Application
- OTN
- Switching
- OTN Multiplexing
- OTN DWDM Transport
- Control and OAM&P
- GMPLS
- ASON
- WSON

Unit 8: Optical Transport Network OTN Rates:

- Signal
- OTU1
- OTU2
- OTU2e
- OTU3
- OTU3e2
- OTU4

Unit 9: Optical Transport Networks Training - ODUk Rates:

- ODU0
- ODU1
- ODU2
- ODU2e
- ODU3
- ODU3e2
- ODU4
- ODUflex CBR

Unit 10: Optical transport module OTM-nm, OTM-nrm, OTM-m, OTM-mvn

- OTM with reduced functionality OTM-m, OTM-nrm, OTM-mvn
- OTM with full functionality OTM-nm
- Physical specification of the ONNI
- OTM-m
- OTM-nrm
- OTM-nm
- OTM-mvn
- Optical channel OCh
- OCh with full functionality OCh
- OCh with reduced functionality OChr
- Optical channel transport unit OTU
- OTUk frame structure
- Scrambling

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Unit 11: Optical channel data unit ODUk

- ODUk frame structure
- ODUk bit rates and bit-rate tolerances
- Optical channel payload unit OPUk
- OTM overhead signal OOS

Unit 12: Optical Transport Networks Training - Overhead Description:

- Types of overhead
- Trail trace identifier and access point identifier definition
- OTS OH description
- OMS OH description
- OCh OH description
- OTUk/ODUk frame alignment OH description
- OTUk OH description
- ODUk OH description
- OPUk OH description

Unit 13: Optical Transport Networks Training - Maintenance signals:

- OTS maintenance signals
- OMS maintenance signals
- OCh maintenance signals
- OTUk maintenance signals
- ODUk maintenance signals
- Client maintenance signal

Unit 14: Mapping of client signals:

- OPUk client signal fail CSF
- Mapping of CBR2G, CBR10G, CBR10G3 and CBR0G signals into OPUk
- Mapping of ATM cell stream into OPUk
- Mapping of ATM cell stream into OPUk k=0,1,2,3
- Mapping of GFP frames into OPUk k=0,1,2,3,,flex
- Mapping of a non-specific client bit stream into OPUk
- Mapping of other constant bit-rate signals with justification into OPUk
- Mapping a 1000BASE-X and FC-1200 signal via timing transparent transcoding into OPUk
- Mapping a supra-2 CBR Gbit/s signal into OPUflex
- FC-00 and FC-00
- FC-100
- Concatenation
- Mapping ODUj signals into the ODTU signal and the ODTU into the HO OPUk tributary slots
- OPUk tributary slot definition
- ODTU definition
- Multiplexing ODTU signals into the OPUk
- OPUk multiplex overhead and ODTU justification overhead
- Mapping ODUj into ODTUjk
- Mapping of ODUj into ODTUkts

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- NE Internals
- OTN DWDM Side
- OTN Bandwidth Management
- OTN Client Interfaces

Unit 15: Optical Transport Network OTN Layers End-to-End View

- OTS
- OMS
- OCh
- OTU
- ODU
- client Signal Mapping G.709
- ODU Multiplexing Hierarchy
- Tandem Connection Monitoring TCM
- Segment Protection/Restoration
- Control Plane in Optical Networks
- New Developments
- Auto discovery of topology
- Route computation
- Point-and-click provisioning
- Service restoration
- ODUflex
- Tributary Slot Allocation

Unit 16: MPLS/MPLS-TP OAM

- MPLS/MPLS-TP protection switching
- MPLS interworking
- MPLS-TP network architecture
- MPLS-TP equipment functional architecture
- MPLS-TP equipment network management
- MPLS-TP interface

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