Hands-On PDH/SONET/SDH Networks

Virtual Live Instructor-led or On-Site

Course Description

The Understanding PDH/SONET/SDH Networks course has been developed to quickly on-board those new to telecom transport. While PDH and SONET are the main focus of the course, SDH is also explored and compared, in cases where employees encounter the use of this standard in the field.

Plesiochronous Digital Hierarchy (PDH) circuits are discussed first, both for their legacy and ongoing role within the telecom network, and also for their basis as SONET's VT1.5 and STS-1 frames. Fiber optic networks are also discussed and compared to electrical signal transport, including the nature of synchronous and asynchronous circuits, and the need for a synchronous optical network. The SONET protocol is then looked at in more detail, including the use of overhead to provide alarm, pointer, DCC and other information as signals traverse different layers of the SONET model. Synchronous Digital Hierarchy (SDH) is then explained and compared to SONET, along with speed and frame differences.

Various test equipment is also demonstrated, such as PDH (DS1/DS3) and SONET test sets, as well as optical inspection and OTDR instruments. Finally, Laser safety, fiber optic routing, cleaning and care are also emphasized.

Students Will Learn

- **Asynchronous & PDH circuits like DS1 & DS3**
- **TDM, FDM, WDM, & DWDM**
- **How and where PDH circuits are used**
- **SONET Protocol & sublayers**
- **SONET Overhead including alarm, pointer, and DCC bits**
- **SDH Protocol**
- **Frame & speed comparisons**
- **Test & measurement equipment**
- **Using SONET features to troubleshoot**
- **How to clean, route and care for fiber**
- **Troubleshooting techniques**
- **And much more...**

Target Audience

Central Office and network installation techs, network support personnel in NOC/SCC, management, and others seeking an understanding and troubleshooting skills with PDH, SONET and SDH circuits.

Prerequisites

Due to the accelerated nature of the course, a general understanding of central office procedures or transport networks may be helpful, but are not necessary. Previous experience with transport-related test equipment may also be helpful.

Course Outline

Module 1: **PDH Circuits**

TDM, FDM, WDM, DWDM
Decibels, dBm, Power Measurements
ADC/DAC
Multiplexing
DS0, DS1, DS3
- Timing, Asynchronous vs. PDH
- Framing, Line Coding
- Alarm Types

PDH vs. SONET
Speed Comparisons
Cross-Connects, DSX, DACS, Transponders, Mux, ADM

Module 2: Fiber Optics

Terminology, Advantages, Disadvantages
Scattering Types, Rayleigh Scattering
Insertion Loss vs. Attenuation
Return Loss
EM Spectrum
- Optical windows, DWDM - Optical bands, windowless

Fiber Types
- MMF: OM1 thru OM5
- SMF

Transceiver Types
- GBIC, SFP, XFP, QSFP, CFP, etc.

Connector & Ferrule Types:
- PC, UPC, APC
- FC, ST, SC, LC, MPO/MPT
- Color Codes

FTTP
- AE, GPON, XGS-PON, NG-PON2

OTN

- OTU vs. OTUCn
- ITU-T Channel Grids - 12.5GHz thru 100GHz
- Concatenation, Wrappers, Multiplexing, FlexO

Module 3: SONET/SDH Circuits

Why SONET?
SONET vs. SDH
PDH vs. SONET/SDH Speeds
Layers & Sublayers
Interconnections:
- Paths, Lines and Sections
- PTE, LTE, STE

STS-1 & STM-1 Frames
- POH, LOH, SOH
- OH bits: framing, DCC, SDCC, Pointers, APS, timing, etc.

SONET/SDH Multiplexer Map
VT Mapping
Concatenation
Network Types:
- Linear, P2P, Ring

APS - Uni & Bidi
UPSR
BLSR
VCAT, LCAS
Stacked Rings
Performance Monitoring

Module 4: Test Equipment

Working on Broadband Systems
Safety, ESD
Test Equipment Types
- VFL, LFD
- Fiber Inspection Tools
- Optical Power Meters
- OTDRs
- Protocol Analyzers

Fiber Cleaning & Handling
- Cleaning, wet & dry, inspection
- Duty cycles
- Fiber routing & dressing

Labs
- Monitoring PDH (DS1,DS3)
- Monitoring SONET
- Examining OH bits

Delivery Method

Instructor-Led with numerous Hands-On exercises throughout.

Equipment Requirements

(This apply's to our hands-on courses only)

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It doesnt have to be just our Company.

I wont have 10 people per course (DMS 10/DMS100). Probably have 6-7 for DMS10 and 7 for DMS100 course.

Thanks,

Amanda

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

Course Length

2 Days