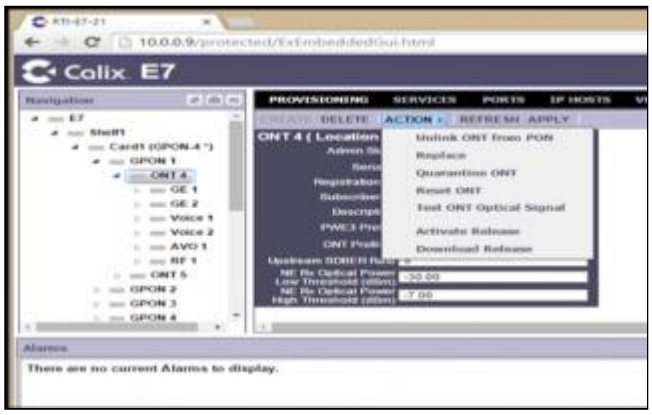
Hands-On

Calix E7 Maintenance and Troubleshooting Virtual

On-Site or Virtual Live Instructor-led

Course Description



This extensive Live Instructor-led course available for On-Site or Live Virtual delivery provides the skills required to perform detailed maintenance and troubleshooting on the Calix E7 optical network, including the various OLTs and ONTs within a typical network. It also discusses the theory and general system architecture used by various broadband systems such as AE, GPON, VDSL, and Ethernet-over-Fiber.

The GR-303 TDM Gateway interface for a traditional TDM switch is also explained, where examples can be shown for switches like a DMS-100 or GTD-5. Primary network elements are discussed including the OLT types, ONT types (SFU, SBU, MDU), plus various ONT options found within Calix's P-Series like the GX and GE, along with devices like Erbium-Doped Fiber Amplifiers (EDFA's), filters, splitters, transceivers, and different fiber cable and connector types. Various OLT interface cards are also described (AE & GPON, SCP, power & fan). Features like Ethernet, POTS, T1, and video, including RF-RTN from the Set-Top Box are explained, along with typical testing and use scenarios.

System management connection interfaces are described, and well as various administrative options, like the Web GUI Interface, Command Line Interface, CMS, etc. ONT activation and status is shown via local-PC connections, RONTA, Web CUI, and CLI, etc. along with discussion on provisioning of profiles, services, and VLANs, with reference to various system documents. System backup and recovery is also described, via external FTP/TFTP servers.

Symptom investigation and troubleshooting is demonstrated using previous trouble examples, and through actual troubles which may exist in the network. Common fault types and best practices are also presented, to help prevent troubles from occurring in the first place.

Our non-intrusive exercises equip the student to conduct day-to-day maintenance activities and show how to perform troubleshooting procedures, including aspects of problem isolation, cabling and provisioning, which helps prepare students for higher-tier support interaction. The course is flexible, allowing the most important content for a particular group of students to be emphasized.

Students Will Learn

- **Optical Fundamentals**
- **Copper & Optical Carrier & Protocols**
- **TDM Gateway Interface**
- **E7 FTTP Network Elements**
- **ONT Types & Features like POTS, ENET, RF-RTN, and T1**
- **How to use commands in CLI and Web GUI**
- **Find various types of OEM and third-party documents**
- **How to find the physical location of a fault**
- **How to change cards in the OLT or change ONTs**
- **How to backup configuration files**
- **Basic service order processing**
- **And much more**

Target Audience

Technical staff such as Central Office Technicians, combo-techs, and those who are responsible for the maintenance and troubleshooting of FTTP/VDSL systems, plus NOC/SCC personnel who must respond to alarms. No previous background is required, although some familiarity with optical or ONT equipment would be beneficial. Certain management and provisioning personnel will also benefit, providing a greater understanding of the resources needed for the system, and how to support it.

Prerequisites

A basic understanding of telecommunications and networking principles is helpful due to the accelerated nature of the course. Any of our BTS fiber optic courses or our TDM Switching Fundamentals Course are available for students with little or no previous telecom background.

Course Outline

Module 1 : Optical & Switching Fundamentals

- Optical Safety

  Laser Power Levels & Class System

  Visible & Non-Visible Wavelengths

- T&R, Lines & Trunks

- Electrical vs. Optical Power

- Decibels

logarithmic scale

copper & optical measurements

- Digital: A/D & D/A Conversion

- Time Division Multiplexing (TDM)

Pulse Code Modulation (PCM)

DS0, VoIP

- Frequency Division Multiplexing (FDM)

Wavelength Division Multiplexing (CWDM, DWDM)

- Carriers & Protocols

Triple-Play Services

Line Coding & Transmission Protocols

DS0, DS1, DS3

VT1.5, OC-1, OC-3

STS-1, STS-3

SONET, Ethernet-over-Fiber

Digital Subscriber Line - Asymmetric and Vectored

VoIP: H.248, SIP, etc.

- Interconnections

UTP, Coax, Fiber

MMF, SMF

Connectors (SC, LC, MTP, etc.) and Polish (PC, UPC, APC)

SFP, XFP, QFP, GBIC

- OSI Model

Layers 1-4 in the CO

Layers 5-7 in the CPE

- Quality of Service

Speed vs. Latency

QoS vs. CoS

Timing & Jitter

- Carrier Signal Comparison
- A Converged PSTN

Module 2 : E7 Theory of Operation

- FTTP: AE & GPON Comparison
- Network Components:
    - OLT, ONT, power, OAM
    - Filters, Splitters, EDFAs
    - RF-Return, Set-Top-Box (STB)
    - Interconnections & Terminations
    - Servers: DHCP, DNS, NTP, FTP, TFTP
- Calix TDM Gateway (CTG) Interfaces
    - GR-303, SIP, TDMG, H.248, MGCP
    - TDM Trunking/Links
    - Virtual/Pseudo DNs & Lines
- Hardware Modules:
    - E7 System (compare to B6, C7, E9)
    - E7-2, E7-20 Chassis Types
    - Optical Line Cards: AE, GPON, GE, VDSL
    - Switch Control Processor (SCP)
    - Intelligent Power Supply
    - BITS, NTP, Alarm connections
    - Optical Network Terminals: P-Series, T-Series
- ONT Feature Comparison
    - SFU, SBU, MDU
    - POTS, Ethernet/GE/10G, RFoG, RF RTN, MoCA, T1
- End-to-End Call

Module 3 : System Access

- I/O Methods
    - CLI
    - Calix Management System (CMS)
    - ONT Configuration Manager (OCM)
    - Web GUI
    - MGT-x/RS-232C Ports
    - Ethernet
    - HTML Browser
    - Authentication Servers (RADIUS)
- Basic Command Structure
- CLI Commands
    - Login, Logout, Version
    - Status & Trouble
- GUI Login
    - Login, Logout
    - Initial Views, Menu Options
- Telnet, FTP, TFTP
    - Configuration Files

Module 4 : Commands

- AXOS/Calix OS Overview
- Command Line Interface
    - E7 CLI Reference Document
    - add, clear, create, delete, disable, enable, remove, show, set, test, help commands
    - Options: alarms, eth-port, gpon-port, ont, ont-port, pots-svc, sip-gw, system, etc.
- Sample CLI Commands
    - Login, Alarms, Status, Connected ONTs, Power Measurements, etc.

- Web GUI

    Navigation Menu, Capabilities

    Status & Alarms

    Activation Options

    Backups (OLT, ONT config files)

- Sample Web GUI Commands

    Login, Alarms, Navigation, ONT Features, ONT Profiles, measurements, etc.

Module 5 : Documentation

- Document Types, Numbering & Revisions

    - Calix E7 Documents

    E7-2 & E7-20 Installation Guides

    E7 User Guide

    E7 Applications Guides (AE, GPON, xDSL)

    E7 Services Guides (AE, GPON, xDSL)

    E7 Software Upgrade Guide & Release Notes

    E7 Engineering & Planning Guide

    E7 Maintenance & Troubleshooting Guide

    Product Data Sheets

    Transceiver/SFP Documents

    Third-Party Documents (splitter, filter, EDFA specs)

- Calix Website, Calix Community

Module 6 : Administration & Maintenance

- OLT Status

    VLANs - management, service-based VLANs

    STP

- ONT Boot Process

System Messages

LEDs - CPU, Transport, Off Hook, S-Power, RF-Return, ENET Link

- Activation:

Calix & FSAN Numbering

CLI

Web GUI

Local PC Connection

RONTA

- Firmware

Automatic Loading

Local PC Loading

.bin, .rto files

Firmware Equivalencies (AE, GPON, OLT type)

- Configuration Files

FTP/TFTP Servers

Manual Configuration (CLI, Web GUI)

.provdb files

- Provisioning

Initial System Setup - DHCP, Access Identifiers, CoS & GoS Profiles

Adding SFPs - GPON, AE, optical, copper

Uplinks & Trunks - Service VLANs

System Profiles - Service Match List, Service Tag Action

GPON Ports

Linking to Provisioning Record

Ethernet Service - Bandwidth profile, Port setup, Data Service creation

Voice Service - Dial Plan, GW profile, SIP service, Port setup

RF-Video/RF-Return - RF Overlay profiles

- Others Features

Module 7 : Troubleshooting

- NOC/SCC Interaction, ESD Precautions
- Tools & Resources
    - Troubleshooting Documents
    - OTDR, Optical Power Meters
    - Internal System Meter
- Alarms & Faults
    - OLT vs. ONT
    - LED States
    - SFP & Cabling - reflections, bend radius, abrasion
    - Overdriving/underdriving
    - Alarm Definitions: battery failed/missing/low, RF RTN, NTP, link down, etc.
    - show alarms (CLI, GUI)
- Maintenance and Troubleshooting Guides
    - Testing an OLT Line Card
    - Testing an ONT
    - OLT Restart
    - Other Alarm Clearing
- System Logs
- System Backup & Restore
    - FTP/TFTP Server
    - Authentication/Passwords
- Troubleshooting Examples
    - Missing ONT/kinked fiber
    - Bad ONT CPU
    - Bad port (POTS, ETH)
    - Provisioning/Activation Issues

Module 8 : Diagrams & Glossary

Notes

The course runs in a 5 day format, but can be combined or integrated with other topics like TDM Switching courses or Wi-Fi Best Practices for a full end-to-end training program.

The course is designed to run in ether a Live Instructor-Led Virtual Classroom or In-Person On-Site Classroom setting. Virtual Field Trips can be added to allow students an opportunity to see and understand where all the parts of the system are found, what they do, and provide a better end-to-end understanding of the network.

Delivery Method

LIVE Virtual and On-Site Live Instructor-led delivery available. With a flexible approach that adjusts content most relevant to students. Includes various non-intrusive labs, demonstrations, and exercises to help students focus on and retain the material presented.

Equipment Requirements

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

Students must have Virtual and/or remote-access to a Calix E7 OLT for this training.

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

5 Days