Hands-On

Fujitsu FLASHWAVE 9500 Operations and Maintenance

On-Site or Virtual Live Instructor-led

Course Description

This extensive Live Instructor-led course available for On-Site or Live Virtual delivery provides Fujitsu FLASHWAVE 9500 Operations and Maintenance Course that is designed to provide any student with a solid understanding of the 9500 platform, its role within a modern switching & transport network, and how to use and maintain the platform. The hardware design of the system and its versions (DCS, Packet ONP) are explained, along with optional port configurations, including various technologies supported like 10/100G Ethernet, SONET/SDH, and EoSONET. Optical switching and ROADM add/drop multiplexers are explained, plus QoS, waveshaping and policing concepts are introduced. Transaction Language 1 (TL1) has its own module, with sample commands and practice. Common maintenance functions like system health, clocking, and backups are discussed, along with tier-1 card level repair. SFP/XFP use and Laser safety is included, along with fiber optic best-practices (UPC & APC polish, cable routing, reflections, measurements).

The course is nominally set for 4 days, with actual course length and content flexible, depending upon the needs of a given class. In addition to supporting independent problem solving skills, the course helps provide an excellent background for NOC and TAC interaction.

Students Will Learn

- **Switching & Transport Foundations**
- **FLASHWAVE Theory of Operation**
- **TL1 Commands**
- **Documentation**
- **Maintenance and Trouble Clearing**
- **Block Diagrams & Job Aids**
- **And More...**

Target Audience

Technical staff such as Central Office Technicians, NOC/SCC, certain management personnel, and others responsible for the operation and maintenance of the FLASHWAVE system.

Prerequisites

A basic understanding of optical transport networking (OTN) and Ethernet principles may be helpful due to the accelerated nature of the course.

Course Outline

Module 1: Switching & Transport Foundations

- Signals Analog, Digital, telecomm transport circuits - Decibels (dB) & Power (copper, fiber)
- Analog vs. Digital: ADC & DAC, Nyquist Theorem
- PCM: incl. TDM, FDM

- Codecs uLaw, aLaw
- Carrier: DS1/DS3, D4 AMI, B8ZS SF/ESF, OC-x/STM-x
- 802.3 Ethernet: L2, MAC, frames, LAN, VLAN
- SONET: Protocol features, header/trailer, payload
- TCP/IP: L3, IP address, packets, L4 segments/ports
- QoS/CoS, waveshaping CIR, peak/burst, classmarks, etc.

Module 2: FLASHWAVE Theory of Operation

- Digital Cross-Connect Systems (DCS) DACS-Type vs. FLASHWAVE
Switching Different Protocols (Packet ONP)

- 9500 Functional Block Diagram - The FLASHWAVE 9500

What is a FLASHWAVE 9500? System Capabilities

- DWDM Optical Switching, non-blocking network, mapper functions
- Reconfigurable Optical Add/Drop Multiplexing (ROADM)
- ONT Cards: EoX, SONET, SDH, PDH switch any-to-any, G.709
- XFP/SFP/CFP Interface Modules

- TDM DCS (FLASHWAVE 4100ES) interface

- Minimum configuration & optional cards (10/40/100G)

- Features ITU Protection Switching (PS), 802.3ad Link Aggregation, etc. - Review

Module 3: TL1 Commands

- NETSMART Manager & Graphical Users Interface (GUI) - Command Line Interface (CLI)
- System Access:

Craft Interface cabling, settings, ACT/CANC-USER Log-On/Off
OSS Access LAN, Aliases, NLP Circuits

- Command Syntax
- Sample Commands: CANC, CHG, ED, OPR, RLS, RMV, RST, RTRV, etc.

Module 4: Documentation

- Maintenance & Provisioning Documentation
FNC-9500 Series docs: Maintenance, Operations, TL1, etc. NETSMART User Guide
Service Planning Guide, Fiber Cable Handling Guide

- Examples & Practice - Review

Module 5: Maintenance and Trouble Clearing

- NOC/SCC communication, LASER safety (Class I thru IV) - PM Reports PMREPT, RTRV-PM
- Loopbacks OPR/RLS-LPBK
- Connect (Test) CONN/DISC-TACC, TSTSIG

- Retrieve Attributes RTRV-ATTR, Conditions RTRV-COND - Protection OPR/RLS-PROT
- System backup example
- Restore Facility RST

- Trouble Indicators:
LED & Visual Indicators

Condition Codes & Status Messages Retrieve Alarms RTRV-ALM Clearing Alarms
Examples

- Optical Cables:
Small Form-factor Pluggable SFP/XFP/CFP
APC/UPC polish types, ferrule inspection & deformation Power measurements & reflections

- Student Topics
- Examples & Exercises

Module 6 : Block Diagrams & Job Aids

- Optical Switching Diagram
- ROADM Functional Block Diagram - Chassis Image

Delivery Method

Instructor-Led with numerous exercises throughout.

Equipment Requirements

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

Physical or remote Access to switch is required for non-intrusive 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