

## Course Description

This highly intense, vendor neutral, Hands-On 5-day course provides an in depth exploration of Wide Area Networking Transport Protocols. It compares existing transport protocols with respect to design and performance considerations. This class is an in depth analysis of the design and performance consideration of building Wide Area Networks built upon TCP/IP Gigabit Ethernet, SONET/ATM and Fibre Channel transport protocols.

Using a Real-World projects and case studies, you will evaluate an existing infrastructure, create logical designs based upon TCP/IP Gigabit Ethernet, SONET/ATM and Fibre Channel, create a physical design based upon Ethernet Passive Optical Networking or ATM Passive Optical Networking and then optimize the design for performance.

## Students Will Learn

- The fundamentals of storage over the Wide Area Network
- including
  - Direct Attached Storage
  - Network Attached Storage
  - Storage Area Networking
- The need for off site disaster recovery
- Synchronous and asynchronous remote disk imaging
- Hierarchical Wide Area Network design methodologies
- The fundamentals of the transport protocol alternatives
- including
  - Fibre Channel
  - ATM
  - SONET

- o Gigabit Ethernet
- The design and performance considerations of the different WAN
- transport protocols
- By participating in a WAN design Lab based upon a real customer case study
- How to walk away with a demonstrated confidence and competence to go
- forward and design Wide Area Optical Networks
- And More

## Target Audience

This class is directed at Systems Engineers, Sales Support Engineers, IT Managers and Network Engineers who are responsible for the design, maintenance, troubleshooting or Selling an Wide Area Network.

## Prerequisites

A basic understanding of telecommunications and basic fiber optics, splicing, terminating and testing. This information can be obtained in our course(s)

-Hands-On Fiber Optic ISP/LAN - Inside Plant/Local Area Cable Networks

-Hands-On Fiber Optic OSP - Outside Plant

or

-Hands-On Fiber ISP/OSP Combo-Tech

## Course Outline

Module I: Introduction to Wide Area Networking Concepts

o Evolution of Wide Area Networking

o Small Computer System Interface SCSI

- SCSI-3 Standards Documents
  - o SONET Fundamentals
  - o ATM
  - o Ethernet Concepts
  - o SAN Concepts
  - o NAS Concepts
- File Systems
  - o SAN verses NAS

## Module II: TCP/IP Overview

- o Concepts
  - ISCSI
  - FCIP
  - IFCP
  - Infiniband
  - Gigabit Ethernet
    - Terminology
    - 10 Gigabit Ethernet Standards
    - Optical Media
    - Gigabit over Copper
    - Loss Budgets
    - Gigabit Ethernet MAN
    - Gigabit Ethernet over SONET
  - o Internet Protocol Logical Constructs
    - iSCSI
    - Framing
    - PDU Formats
  - o Naming and Addressing
    - World Wide names
    - IEEE 48 bit MAC Addressing

- o Query & Registration Services
- iSCSI Session Login
- Microsoft iSNS
- o Memory Management
- iSCSI Session Management
- o Error Handling
- iSCSI Format Errors
- o Protocol Offload Engines
- o Standards
- o IP 2Gb Host Bus Adapter Installation & Integration
- Adaptec ASA 7211F
- Qlogic 4010

### Module III: Create a Logical Design

- o Topological Design Considerations
- Naming and Addressing
- Point to Point
- IP Switching
  - Multi Stage
  - Mesh
- o iSCSI versus Fibre Channel Transport Protocol Design Considerations
- o Campus approaches
- o Enterprise approaches
- o Wide Area Network attachment
- Bandwidth Utilization
- Via SONET
  - OC-1 Frame

- Synchronous Payload Envelope
- Via IP
- Via WDM

- o Hierarchical Design

- Access Layer
- Distribution Layer
- Core Layer

- o Students will be given a fictitious company that owns multiple platforms with existing direct attached storage

- o Students will design a Storage Area Network using IP transport protocol.

#### Module IV: Performance and Optimization

- o Command Queuing
- o iSCSI vs. Fibre Channel Frames
- o SONET Frame
- o ATM Cell
- o Adjusting Flow Control

- Fibre Channel Flow Control
- IP Flow Control

- o Interrupts
- o Performance Metrics

- Command Time
- Effective Data Rate
- Input/Outputs Per Second

- o Switch Latency

- Fibre Channel Switches
- Gigabit Ethernet Switches
- Full Mesh Throughput
- Full Mesh Latency

- o Optimize Device Cache
- o Device Driver Tuning
- o Benchmarking Tools

## Module V: Transport Protocol Design & Performance Considerations

- o Full vs. Half Duplex
- o Command Queuing
- o Frames
- Fibre Channel Frames over an IP Network
  - o iSCSI Initiator Options
- iSCSI Microsoft Initiators
- Ethernet NIC verses HBA Cards
  - o TCP/IP Protocol Offload Engines
  - o Infiniband

## Module VI: WAN Security

- o Security Standards
- o IP Security
- Encapsulating Security Payload (ESP)
- Internet Key Exchange (IKE)
  - o IP verses Fibre Channel Security Concerns
- Spoofing
- Sniffing
- Denial of Service
- Physical Assault
- Security Tools
- FCIP Security

- IFCP Security
- ISCSI Security
  - o Policies
- Physical
- Logical
- Authentication
- Data at Rest
- Data in Flight
  - o Access Control
- Content Based
- Behavior Based
  - o Antivirus
  - o Implementing Zoning
  - o Soft Zoning Security Risks
  - o Zoning Security Tools
  - o Logical Unit Masking
  - o Surrogate Security
  - o Topology Security
  - o Multi Element Topological Zoning
  - o Frame payload encryption
  - o Configuration change control

## Module VII: Disaster Recovery over the WAN

- o Transmission latency
- Latency Impact on Disk Performance
  - Synchronous
  - Asynchronous
- Latency Impact on Tape Performance
  - o Command Queuing
  - o Data Integrity

- o Bandwidth Utilization
- Gigabit Ethernet flow control
- Fibre Channel flow control
- End to end credits
  
- o FCIP
- o iFCP
- o ISCSI
- o ATM/SONET
  
- Synchronous Payload Envelope
  
- o Gigabit Ethernet
- o WDM Wave Division Multiplexing
  
- Virtual Fiber

## Delivery Method

Instructor led with numerous Hands-On labs and exercises.

## Equipment Requirements

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

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