# Medusa Labs Training

## Fibre Channel Protocol (ML250_16G.2014.10)

### Come investigate the inner workings of the Fibre Channel protocol, the core storage area networking (SAN) technology.

Get concrete, detailed answers to your questions: how does flow control work? What is a node? How does a node login with a switch? How does Fibre Channel handle SCSI? You'll learn all these things and more with comprehensive Fibre Channel protocol training.

Based on the latest standards documents and the latest real-world test findings from our testing services, Fibre Channel protocol training covers the 16G FC standard as well as legacy data rates. Each protocol class includes lab time.

Our classes are designed for engineering-minded individuals such as test engineers, design engineers, technical product/field support, and SAN administrators who address low-level protocol issues.

## Medusa Labs

Viavi Solutions Medusa Labs is a leading provider of testing and training services. We focus on server, storage, and networking interfaces and protocols. Our engineers and trainers are experts in SAS, SCSI, RAID, iSCSI, SATA, SAS, and FCoE.

We helped develop some of the industry's key technologies and continue to have a vigorous passion for improving products and sharing the knowledge. This experience and enthusiasm translate into the highest quality testing and training services possible.

We further set ourselves apart by bringing the lab to the classroom through the use of Viavi Xgig® analyzers in every class.

**4 Day Course Outline**

- Fundamental Elements of FC
- FC-2 Fibre Channel Framing and Signaling
- Point-to-Point Topology
- Switched Fabric
- FC Arbitrated Loop
- FCP-SCSI
- Inter-Switch Links and Other Switch Options
- SCSI Fundamentals
- Fundamentals of Trace Analysis

**What to Expect**

- Never pay extra to look at trace captures
- Insight into the standard based on our real world testing experience
- Instruction from experts with over 20 years of experience in storage and networking

## Fundamental Elements of Fibre Channel

This section identifies the basic features of and the premises upon which Fibre Channel technology has been designed. Fibre Channel specific objects and terminology are defined. Upon completion, students are able to:

- Identify the basic features of Fibre Channel
- Identify the physical options for a Fibre Channel SAN (FC-0 Layer)
- Identify the encoding scheme used in Fibre Channel (FC-1 Layer)
- Identify the special character used in Fibre Channel including when and how it is used
- Define the three ordered sets (primitive signals, primitive sequences, and frame delimiters) and explain their usage
- Identify three topologies which may be created with Fibre Channel
- Define the nodes and ports used in Fibre Channel
- Explain how the port types and topologies are related


## FC-2 Fibre Channel Framing and Signaling

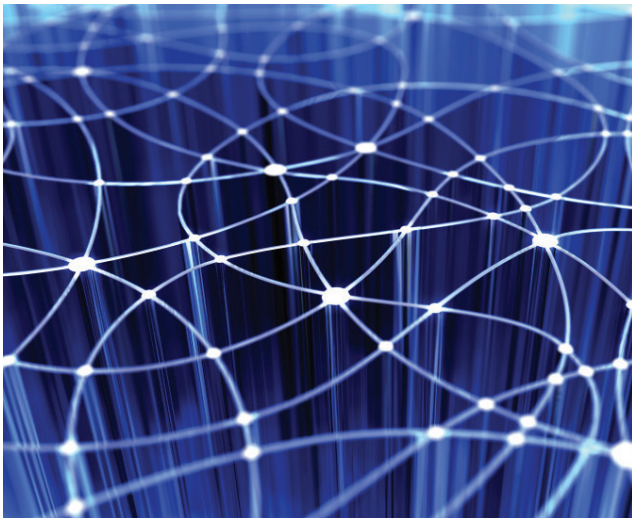
This section introduces the format and usage of the Fibre Channel frame as defined by the FC-2 layer of the Fibre Channel protocol. Fibre Channel flow control and management including available credit models are also introduced and illustrated. Upon completion, students are able to:

- Define and illustrate the usage of exchanges, sequences and frames
- Describe all classes of service defined by the Fibre Channel standard
- Identify the features and benefits of the most common class of service used in Fibre Channel implementations
- Define and explain the differences between the buffer-to-buffer credit model and the end-to-end credit model
- Identify the layout of a Fibre Channel frame
- Identify the fields of the Fibre Channel frame header

## Fibre Channel Point-to-Point Topology

This section details the behaviors of a Fibre Channel point-to-point (node to node) topology. Basic link initialization as well as proper login steps are covered. Trace analysis is used to demonstrate a real-world login between two devices. Upon completion, students are able to:

- Diagram the initialization steps required to bring up a link between two nodes
- Describe how FLOGI is used in the point-to-point login and explain why it is used
- Explain how the nodes determine the source of the PLOGI
- Describe how PLOGI is used to determine the addresses of the two nodes



## Fibre Channel Switched Fabric

This section details the behaviors of a Fibre Channel switch as defined by the latest FC-SW standard. Fibre Channel naming and addressing are covered along with the initialization steps for logging in with a switch. Connections between two or more inter-switch links (ISL) are also discussed and illustrated. Trace analysis is used to demonstrate both real-world login between a node and a switch and the initialization of an ISL. Upon completion, students are able to:

- Describe the features of the Fibre Channel world wide name and discuss when it is exchanged
- Identify three well-known servers and their function on the Fibre Channel switch
- Diagram the initialization steps required to bring up a link between a node and the switch
- Define what information is exchanged during FLOGI, PLOGI, and PRLI
- Describe the process for registering for state change notifications and identify what types of devices typically register to receive notifications
- Define the usage of RSCN frames
- Describe the differences between zoning types
- Discuss the industry complications surrounding zoning between different switch vendors
- Discuss node port identification virtualization (NPIV)
- Diagram the process of initializing an ISL between two switches from two different vendors
- List the variables which help determine which switch becomes the principle switch during ISL creation
- Describe the delivery methods for 10 G FC


## Fibre Channel Arbitrated Loop Topology

This section covers the behavior of a Fibre Channel loop as defined by the latest FC-AL standard. Basic loop architecture and subsequent behavior is investigated. Trace analysis is used to further examine the loop initialization process. Upon completion, students are able to:

- Identify the address structure for a loop device
- Explain the difference between a public loop and a private loop
- Explain the LIP process including all stages of loop initialization (LISM, LIFA, LIPA, LIHA, LISA, LIRP, LILP)
- Explain how fairness may be built into the loop
- Describe the overall process for sending frames including the open/close functions and credit distribution on the loop

## FCP-SCSI — SCSI over Fibre Channel

This section covers the actual mapping of SCSI commands, data and status into Fibre Channel frames as defined by FCP-SCSI. Trace analysis covers various SCSI commands (for example, read, write, inquiry, test unit ready) carried over Fibre Channel as a transport layer. Upon completion, students are able to:

- Describe what SCSI information is supplied during process login
- Describe the three phases of a basic SCSI operation and how they are mapped into Fibre Channel information units
- Identify the contents of FCP_CMD, FCP_DATA, FCP_RSP and FCP_CONF frames
- Explain the significance of the FCP_XFR_RDY frame including when it is used
- Map and diagram SCSI read, write and task management functions to Fibre Channel exchanges

## SCSI Fundamentals

This section covers the basic concepts of SCSI. Upon completion, students are able to:

- Define initiator and target roles
- Describe how SCSI exchanges are tracked
- Define read and write workflows
- Define relevant frames for each phase

## Fundamentals of Trace Analysis

This section covers the basic concepts of trace analysis. Upon completion, students are able to:

- Know how an analyzer works
- Know what an analyzer captures and what files are created
- Understand how to search for information
- Describe effective strategies for maximizing analysis time

## Viavi Xgig® Analyzers

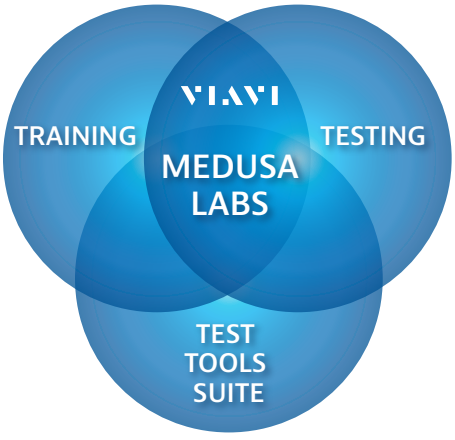
Medusa Labs was the first training company to recognize the importance of using test analysis equipment in the classroom. Today we insist that not only the instructor but also the students use analyzer software during class. We believe there is no better way to reinforce the concepts discussed in a lecture than by "seeing" them in a trace capture. Using the Viavi Xgig analyzer, we'll show you how the protocol works. Whether onsite at your location, or at one of our own facilities, every core training course includes lab time.


## Medusa Labs Testing

Our testing service tests customers' products quickly and thoroughly in an enterprise environment to ensure that products will survive the rigorous demands of mission-critical applications. Customers come to us for our fast turnaround, superior analysis, excellent results, competitive prices, and, of course, 100% confidentiality. We work hand-in-hand with our customers' engineers to provide solutions, not just information. We provide not only the results of our tests, but also the debug, analysis, and regression tests that are needed to ensure that the products we test perform as expected—not by our customers, but by *your* customers.

## Medusa Labs Test Tool Suite

Viavi Medusa Labs brings its years of hands-on expertise and knowledge in the test and validation arena and puts it directly into the Medusa Labs Test Tool Suite. Medusa Labs Test Tool Suite was specifically designed to find elusive data corruptions, I/O timeouts, I/O loss, system lockup scenarios, and data integrity susceptibility. The tools are rich in debug and logging information to allow for rapid analysis of any found issues. They are designed to stress hardware and signal integrity and function on Linux, Solaris, and Windows so that familiarity on one platform leads to familiarity on all others. The suite was designed specifically for engineers that work with DVT, validation, bring-up, design validation, and quality assurance.




Contact Us **+1 844 GO VIAVI**
(+1 844 468 4284)

To reach the Viavi office nearest you,
visit viavisolutions.com/contacts.


medusafc-ds-san-tm-ae
30162807 901 1114