

## Q: What is Fibre Channel?

A: Fibre Channel is a high-speed network technology primarily used to connect computer storage to servers and workstations. Fibre Channel is an open standard technology defined by ANSI and the T11 INCITS committee and is based on the OSI model. It is a block-level protocol which has very little overhead making it extremely fast with very low latency and high reliability.

## Q: What are the nominal data throughput rates for the different Fibre Channel line rates?

NAME	LINE RATE (Gbps)	LINE ENCODING	LINK EFFICIENCY (%)	DATA THROUGHPUT (MBytes/sec)
1Gb	1.0625	8b/10b	77.7	100
2Gb	2.125	8b/10b	77.7	200
4Gb	4.25	8b/10b	77.7	400
8Gb	8.5	8b/10b	77.7	800
16Gb (Gen 5/6)	14.025	64b/66b	94.2	1600
32Gb (Gen 6)	28.05	64b/66b	94.2	3200
128Gb (Gen 6)	4 x 28.05	64b/66b	94.2	12,800

## Q: Are Fibre Channel host bus adapters (HBAs) backward compatible?

A: Each Fibre Channel speed maintains interoperability and backward compatibility to at least two previous generations.

NAME	BACKWARD COMPATIBILITY
1Gb	N/A
2Gb	1Gb
4Gb	2Gb and 1Gb
8Gb	4Gb and 2Gb
16Gb	8Gb and 4Gb
32Gb	16Gb and 8Gb
128Gb	32Gb and 16Gb

## Q: What physical connection does Fibre Channel support?

A: Today's Fibre Channel uses LC style small form-factor pluggable (SFP) transceivers to convert the electrical signals on the Fibre Channel devices to fiber optics. Multi-mode or single-mode fiber optic cable is used to connect the Fibre Channel devices. Shortwave SFPs must be used with multi-mode fiber optic cables. Longwave SFPs must be used with single-mode fiber optic cables.

Multi-mode fiber optic cables are generally referenced by their optical mode (OM) and their core width in  $\mu\text{m}$ . The following table shows cable distances for the different Fibre Channel transmission rates and different types of multi-mode cables available.

1310 nm longwave lasers used with LC-L single-mode cables can go up to 10km between Fibre Channel devices.

	62.5 $\mu\text{m}$ OM1	50 $\mu\text{m}$ OM2	50 $\mu\text{m}$ OM3	50 $\mu\text{m}$ OM4
32Gb	N/A	20m	70m	100m
16Gb	15m	35m	100m	125m
8Gb	21m	50m	150m	190m
4Gb	70m	150m	380m	400m

## Q: How are Fibre Channel devices connected together?

A: There are three major Fibre Channel topologies that define how host adapter, switch and storage device ports are connected together.

- Point to Point – Two devices are directly connected to each other. Very simple, but offers very little flexibility.
- Arbitrated Loop – Multiple devices (between 2 and 127) are connected in a loop, similar to Token Ring networking. Adding or removing a device on the loop results in all activity on the loop to be interrupted. Only two devices on the loop can be communicating at any point in time. Arbitrated loop is not commonly used anymore. It was originally implemented with “hubs” and was often found in Fibre Channel JBODS, because Fibre Channel drives only supported arbitrated loop connections. Gen 5 16Gb/s Fibre Channel drives were the last generation to support arbitrated loop.
- Switched Fabric - A Fibre Channel fabric is a topology that requires one or more switches to interconnect host computers with storage devices. With a fabric, the bandwidth is not shared. Each connection between ports on the switch has dedicated bandwidth. The switch will manage the state of the fabric and optimize interconnections. Failure of a port or connection is isolated and will not affect operation of other ports. Multiple pairs of ports may communicate simultaneously in a fabric, and these connections can be a mix of different link rates. A fabric will support up to 16,777,216 (224) devices. Fabric switches can be interconnected together for redundancy as well as scalability.

**Q: What is a SAN?**

A: SAN (storage area network) is a configuration of one or more servers and workstations that are connected to the same pool of shared storage in a flexible, scalable, high performance, high capacity managed environment.

**Q: How do I choose between Fibre Channel and SAS technology?**

A: Fibre Channel is the preferred technology to use if the same pool of external storage is to be shared by multiple servers or workstations in a SAN. Serial attached storage (SAS) is a direct-attached technology designed to have dedicated storage connected to a server or workstation. SAS is often used to connect drives inside of a server while Fibre Channel is more often used for external storage. Fibre Channel provides for longer cable distances, lower overhead and better scalability. However, it is typically more costly than SAS.

**Q: How do I choose between a Fibre Channel SAN and Ethernet NAS for my organization?**

A: Choosing between a Fibre Channel SAN and Ethernet network attached storage (NAS) infrastructure for your data center ultimately comes down to the criticality of data delivery to support your users. If your organization has applications that require low latency and guaranteed delivery of data then Fibre Channel is your best option. Fibre Channel is a purpose-built, dedicated technology with very little overhead and low latency. Data delivery is fast, in-order, lossless and predictable. Ethernet networks are more flexible and can support very high bandwidth, but it is a file-based protocol that comes with considerably more overhead and latency in order to provide that flexibility.

**Q: Do Fibre Channel Host Bus Adapters support virtualized environments?**

A: Yes. Fibre Channel host bus adapters (HBAs) are ideal for virtual environments because they allow for multiple virtual

servers to divide up and share the same pool of virtual storage. It is very easy to migrate virtual functionality from one physical server to another when they are connected to the same storage devices via a SAN. In addition, Fibre Channel host adapters feature N-Port ID Virtualization (NPIV), which enables each Fibre Channel HBA to define multiple “virtual ports.” These virtual ports can then be assigned to different virtual machines, providing secure connections to the data for multiple virtual hosts sharing the same host adapter. NPIV lets administrators manage storage on behalf of the virtual machine in much the same way they manage storage attached to physical machines, leveraging familiar best practices and existing SAN management tools.

**Q: What types of management tools are required for SANs?**

A: With a SAN, multiple computers have full access to the same storage devices. There is no dedicated server to manage the file system and access to the shared blocks of storage. There are two common methods to resolve this challenge:

- Zoning – zones can be created that consist of one host (or more if a clustering application is used) and one or more storage ports or storage LUNs. Zoning can either be managed from the switch, the storage device or the host adapter. Zoning provides security and eliminates the possibility of corrupting data but it removes the ability for multiple hosts to share the same storage devices.
- Volume or file management software – There are multiple applications available today that manage the file system and access to the data on a volume, file or block level. Multiple computers can see the same storage but must first be granted permission before accessing the data. This is all done by the file system management application and usually does not require user intervention.

**Q: Does ATTO offer any management tools for Celerity™ HBAs?**

A: ATTO has a set of remote or local GUI-based monitoring, management and diagnostic tools, including ConfigTool™ for non-virtualized configurations, and vConfigTool™ and Latency Scout™ for use with VMware®. There is also a full set of CLI tools that allow you to customize the settings of your ATTO Celerity



# Fibre Channel FAQ

Fibre Channel host adapters to maximize the performance of your storage connection in physical and virtual environments. These tools will minimize downtime by monitoring the status of your devices and connections. Centralized driver and firmware updates make updating your devices simple and convenient. These tools are available for download on the ATTO web site, <https://www.atto.com/downloads/>.

**Q: How can the exact model of the Fibre Channel host bus adapter be determined for a unit previously purchased?**

A: There are a variety of ways to determine the model of the host bus adapter. There is usually an imprint of the model number directly on the adapter. If the host adapter is installed in a workstation or server and is not visible, launch the ATTO ConfigTool. Locate and double-click the application icon. The main page has three windows: Device Listing, Configuration Options and Status. The Device Listing window at the left of the display page lists local and remote hosts found on the network, as well as currently connected devices. You are required to log in to manage any host. Once you log in, the device tree will expand to reveal additional details on connected storage controllers. Lastly, you can always enter into the system BIOS to obtain the model information.