



*Where IT perceptions are reality*

# Industry Brief

## 16Gb Fibre Channel Eases Data Center Traffic Jams

### Featured Applications

- All Flash Storage Systems
- Data Warehousing
- Real-Time 4K Video Editing
- Replication & Backup
- High Performance Computing



# 16Gb Storage Finally Arrives

## Joining Networking Infrastructure Which Has Been Available Since 2011

Storage networking vendors announced 16Gb Fibre Channel adapters and switches as early as 2011. Since then, data center managers with I/O-intensive workloads have been future-proofing their SANs in anticipation of 16Gb Fibre Channel HDD, SSD, and tape storage systems.

That time has finally arrived. By early 2014, 16Gb Fibre Channel storage systems will be generally available from all leading storage vendors. Since 2011, data center managers with 16Gb networks have been anxiously waiting to add 16Gb storage to their 16Gb networks.

## Just Another Bump in the Fibre Channel Speed Road Map

Fibre Channel storage networking is trusted in the data center for its reliability and performance. Storage architects should rest assured their investment in 16Gb Fibre Channel has a safe future. The next generation of faster 32Gb technology is arriving soon in 2015.

**Fibre Channel Speed Roadmap — Source: FCIA ([Version 1.8](#))**

Product Naming	Throughput (MBps)	Line Rate (GBaud)	T11 Spec Technically Completed	Market Availability
1GFC	200	1.0625	1996	1997
2GFC	400	2.125	2000	2001
4GFC	800	4.25	2003	2005
8GFC	1600	8.5	2006	2008
<b>16GFC</b>	<b>3200</b>	<b>14.025</b>	<b>2009</b>	<b>2011</b>
32GFC	6400	28.05	2013	2015
128GFCp	25600	4x28.05	2014	2015
64GFC	12800	TBD	2016	Market Demand
128GFC	25600	TBD	2019	Market Demand
256GFC	51200	TBD	2022	Market Demand
512GFC	102400	TBD	2025	Market Demand
1TFC	204800	TBD	2028	Market Demand

# 16Gb

Fibre Channel is purpose-built, data center network infrastructure for storage that provides reliability, scalability and up to 16 Gbps performance.

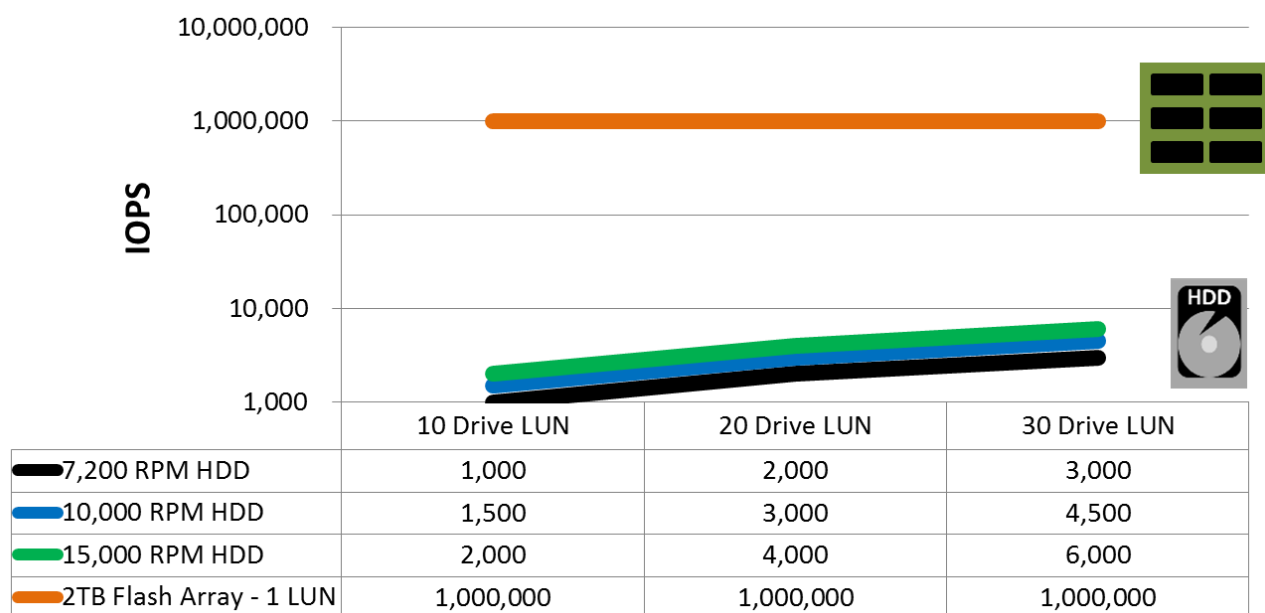
# Killer App: All Flash Storage

## All Flash Arrays Move the Bottleneck Back to the Server or Network

A single tray of 30 HDDs, with each drive rated at 150 IOPS, can muster only 6,000 IOPS. That's why entire racks of disk drives are needed to support enterprise applications. It also explains why 4Gb Fibre Channel is sufficient for most applications — the aggregate throughput of dozens of HDDs won't use the capacity of a 4Gb Fibre Channel link.

Flash memory and SSDs have changed that. A single tray with 2TB of flash memory can handle 1 million IOPS, over 150x the IOPS capacity of an HDD storage array in the same form-factor. End-to-end 16Gb Fibre Channel links are essential components for storage architects who want their server farms to realize the full potential of their all flash arrays.

### IOPS Performance— All Flash Array vs. All HDD Array



4Gb Fibre Channel SANs have the capacity to support I/O to storage systems handling few thousand IOPS. 16Gb Fibre Channel is needed to exploit the full potential of all flash storage arrays that can handle a million IOPS each.

## NAND Flash

SLC for fastest throughput. MLC for Twice the density of SLC NAND at a lower cost-per-bit. TLC for higher density in the same space, at a lower cost than SLC or MLC NAND.

# Killer App: Data Warehouses

## Millions of People Accessing Hundred-Terabyte Databases is a Formula for 16Gb

IT professionals in many sectors of the Healthcare, Banking, Retail, Travel, Entertainment, and Insurance industries share one thing in common: the need to provide fast response times to millions of users hitting massive databases (data warehouses) stored in SANs.

### The Need Today

For the biggest companies in these sectors, these huge data warehouses range in size from hundreds of terabytes to petabytes, and the need for 16Gb bandwidth already exists (watch the video).

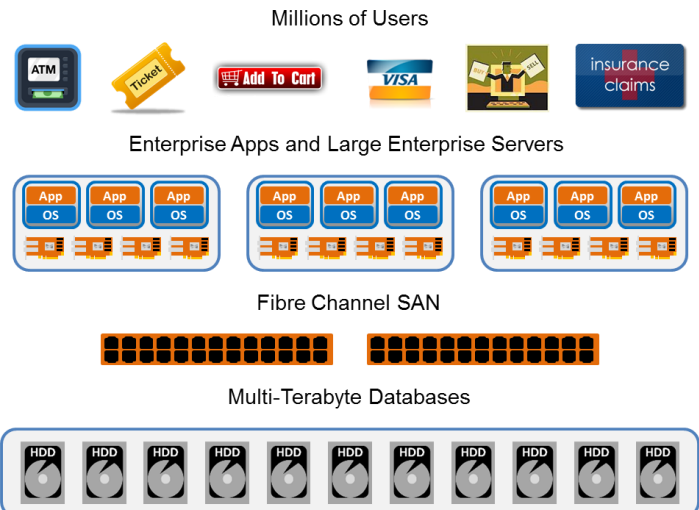
### The Need Tomorrow

In the industries mentioned above, the need for 16Gb Fibre Channel is exploding as a completely new class of data, such as user location, is being captured from mobile devices.

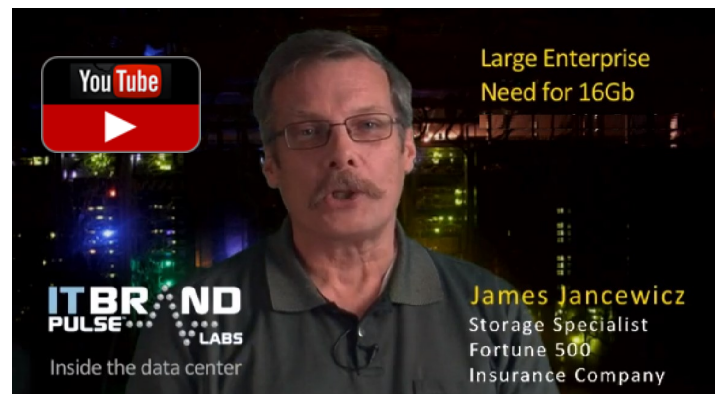
Farther into the future, the Internet of Everything, including wearable devices, will create yet another explosion of new data.

### 16Gb Fibre Channel is a Key Part of the Solution

The architecture being deployed most to ensure fast response times to millions of users is centered on large enterprise servers loaded with Fibre Channel adapters. With double the I/O capacity of the previous generation of 8Gb high performance SANs, the availability of 16Gb storage now provides data warehousing storage specialists the head room they need in the future.



Businesses with millions of customers rely on large enterprise servers, loaded with Fibre Channel adapters, to provide the IOPS and bandwidth needed for simultaneous access to multi-terabyte databases.



[Watch](#) this video to learn about why this storage specialist in a Fortune 500 insurance company needs 16Gb Fibre Channel for data warehousing.

## Data Mart

A data warehouse focused on a specific area. The main source of the data is cleaned, transformed, cataloged and made available for data mining, online analytical processing, market research and decision support.

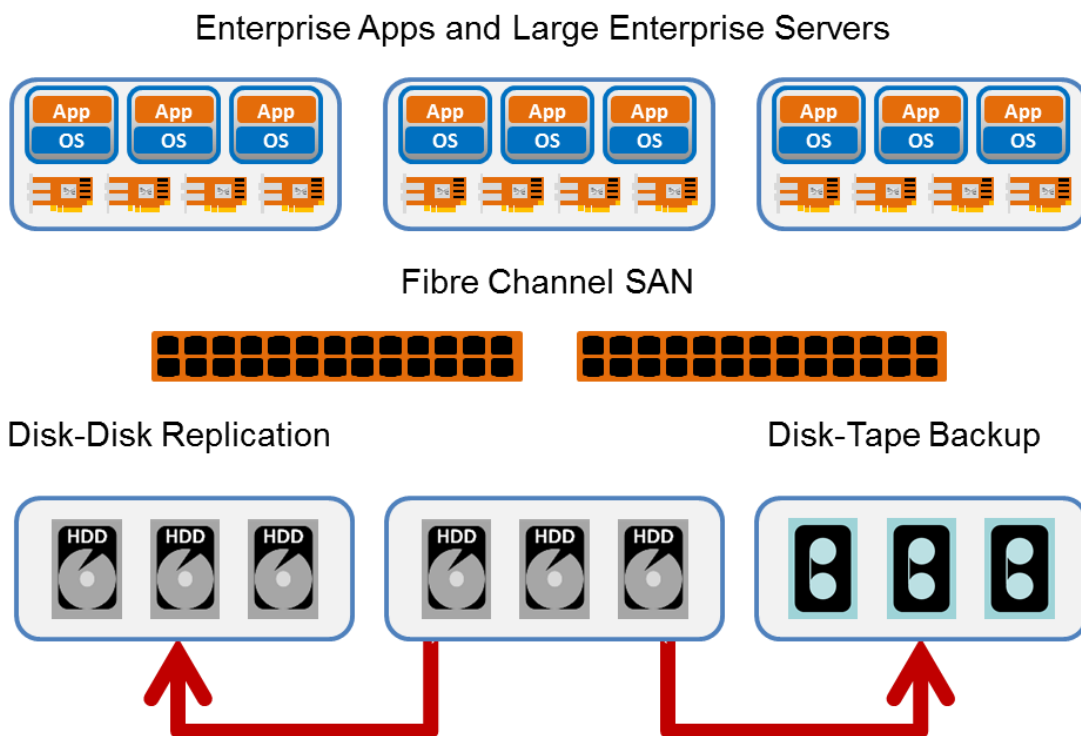


# Killer App: Backup & Replication

## 16Gb Fibre Channel Closes the Disk-to-Disk Replication and Disk-to-Tape Backup Window

According to a recent IT Brand Pulse survey, 21% of installed Fibre Channel SAN ports are at 1Gb or 2Gb, 31% are at 4Gb and 31% are at 8Gb. With 16Gb Fibre Channel, the connections between disk storage systems for replication, and between disk storage systems and tape libraries for backup, will be up to 16 times faster. For business, that means the replication and backup windows of vulnerability and disruption will be up to 16 times shorter.

### Typical Enterprise Replication and Backup Environment



In a typical large enterprise, data is replicated to disk for fast recovery, and eventually backed-up to tape for cold storage. If either operation disrupts the performance of the network, or represents a window of vulnerability, 16Gb Fibre Channel will close that window.

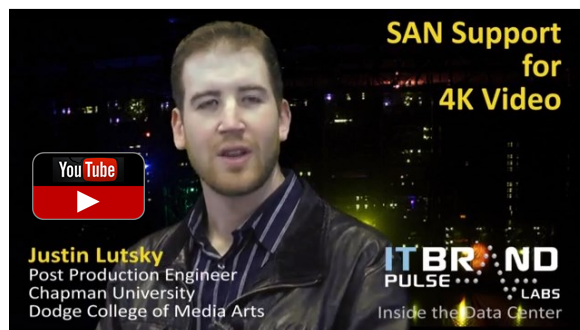
## De-dup & Compression

Deduplication and compression are technologies that can in some cases drastically reduce the amount of data that needs to be replicated and backed-up.

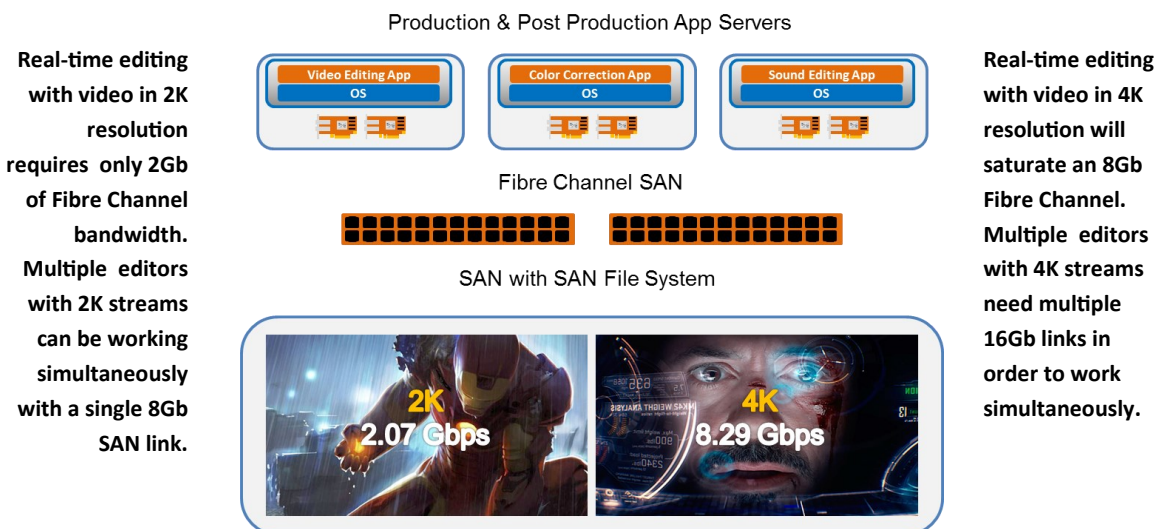
# Killer App: Real Time 4K Editing

## Do the Math: 16Gb Mandatory for Real-Time Editing

The state of the art for HDTV for many years has been 1080P which offers 2K resolution (1920 pixels x 1080 pixels = 2,073,600 pixels). Without factoring in frame rates and other considerations, real-time editing of 2 million pixels every second requires a 2Gb Fibre Channel SAN. With 4x the number of pixels, 4K real-time editing of 4K video requires over 8Gb per second for a single stream. 16Gb Fibre Channel technology is required for any SAN expected to support real-time editing of 4K video. In fact, the storage system will require a dedicated link for each video editing, color correction or sound editing server working with 4K digital video in real-time.



4K video is 4x the resolution because it is double the resolution of 2K video on the vertical and horizontal axis. [Watch](#) a post production engineer talk about why 16Gb Fibre Channel is needed for real-time editing of 4K video.



## 4K Resolution

The HDTV 1080P format delivers 2K resolution, with a horizontal resolution of 1920 pixels, and a vertical resolution of 1080 pixels. 4K doubles resolution on both axis for a 4x increase in pixels.

# Killer App: HPC

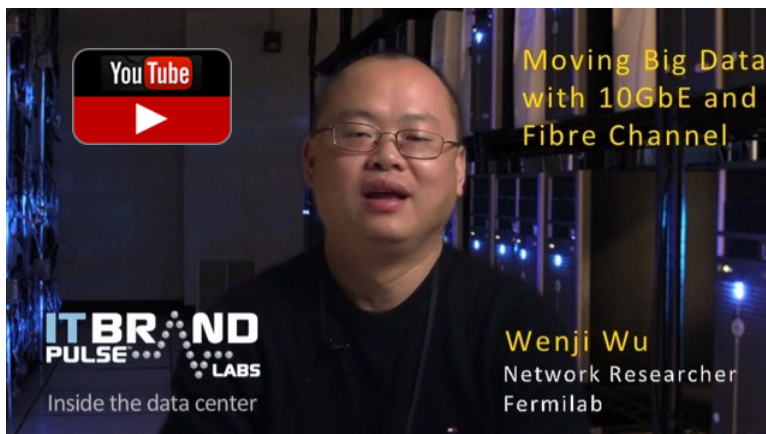
## HPC Applications Move Petabytes of Data

In CERN Switzerland, the Large Hadron Collider (LHC) Project pumps out over 20 petabytes of data each year to primary and secondary sites around the world. There the data is stored on tape using the open-source Encore tape library application.

When researchers need access to the data, the open-source dCache application is used to bring the data from tape to disk.

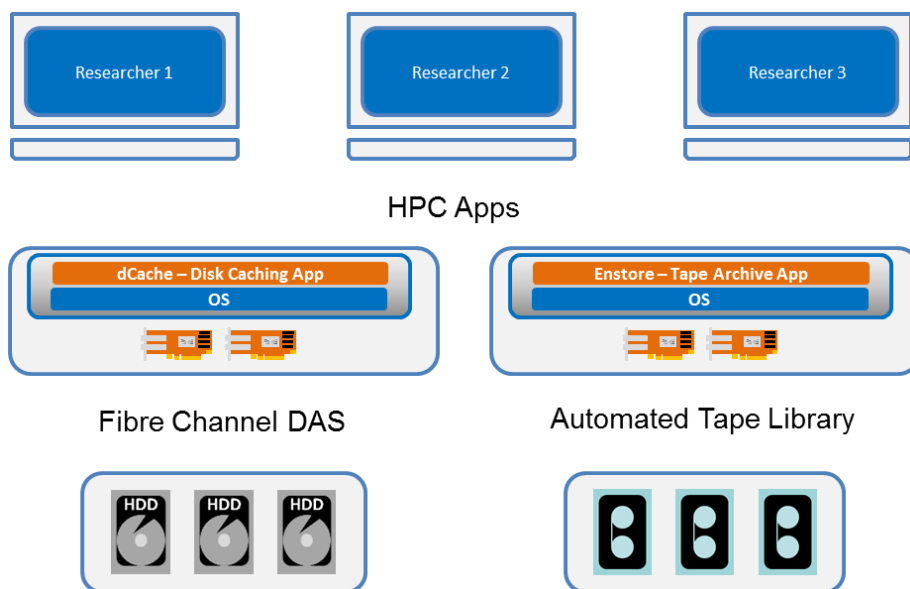
The time needed to transfer these massive data sets from tape to a researcher can take hours, days or even weeks (watch video).

Even if state-of-the-art 8Gb Fibre Channel is being used, 16Gb Fibre Channel will cut the time required to move Enstore and dCache data in half.



Click the [video link](#) to hear why 16Gb Fibre Channel would be a welcome addition to the Dcache HPC application environment.

### dCache and Enstore HPC Environment



# dCache

dCache is designed as a front-end for a set of Hierarchical Storage Managers (HSMs), Enstore, EuroGate and DESY.



# Resources

## Related Links

[FCIA Fibre Channel Speed Road Map](#)

[IT Brand Pulse](#)

[World's Top Data Centers](#)

## About the Author



Frank Berry is founder and senior analyst for IT Brand Pulse, a trusted source of data and analysis about IT infrastructure, including servers, storage and networking. As former vice president of product marketing and corporate marketing for QLogic, and vice president of worldwide marketing for the automated tape library (ATL) division of Quantum, Mr. Berry has over 30 years experience in the development and marketing of IT infrastructure. If you have any questions or comments about this report, contact [frank.berry@itbrandpulse.com](mailto:frank.berry@itbrandpulse.com).

