

# INCITS Fibre Channel (T11) Technical Committee (FC-TC) Annual Report

April 5, 2012 to March 18, 2013

INCITS Sub-group:

***INCITS Fibre Channel (T11) Technical  
Committee (FC-TC)***

## Links and contents:

- Link to [Website of FC-TC](#) (includes all documents, minutes, and member information)
- [Executive Summary](#)
- Link to [FC-TC area on the INCITS Projects Database](#)
- [Significant Accomplishments](#)
- [Significant Challenges](#)
- [Expected Challenges](#)
- [Previous year's meetings](#)
- [Next year's planned meetings](#)
- [Liaison Activities](#)
- FC-TC Membership and [Officers](#)
- [Future Trends](#)
- [Other Administrative Information](#)

## Informal Description of Work:

The Fibre Channel (T11) Technical Committee (FC-TC) is responsible for storage interconnect and networking families of standards, including Fibre Channel, Fibre Channel protocol mappings to higher level architectures, Fibre Channel mappings to alternate physical transports, SBICON, HIPPI, and a number of related management and API standards. FC-TC is co-TAG to ISO/IEC/JTC 1/SC 25/WG 4 along with INCITS TC T10. Fibre Channel is the main technology used to implement Storage Area Networks, allowing the many benefits from storage consolidation and remote storage access. Most standards development for FC-TC projects is actually performed within the TC.

## 1. Executive Summary:

The reporting period is marked by the completion of a several Fibre Channel standards and technical reports. Newly published standards and technical reports include FC-SP-2, FC-SCM, FC-DA-2, FC-BB-5 AM1, and FC-MI-3. FC-SCM describes how Fibre Channel operates in simplified configurations. FC-MI-3 and FC-DA-2 serve as industry profiles that enable Fibre Channel interoperability. In addition the FC security environment has been enhanced by the FC-SP-2 standard and FC-BB-5 has been clarified with the FC-BB-5 AM1 amendment. Newly completed standards include the SM-HBA-2 standard for HBA management and FC-SB-5 for the FICON environment.

Going forward T11 continues the development of both classical Fibre Channel, and the new Fibre Channel over Ethernet protocols. T11 is also considering the impact of green and energy efficiency as they relate to Fibre Channel. T11 maintains active liaison with a number of standards organizations and provides liaison for some organizations publishing standards through INCITS. Most of standards developed by FC-TC are later forwarded to ISO/IEC JTC1 SC25 WG4 for international standardization.

#### **Extended capability of the core standards:**

The core standards of Fibre Channel continue to be refined, clarifying implementation requirements and adding new capabilities. Work continues on the projects FC-BB-6, FC-SW-6, FC-GS-7, FC-LS-3, and FC-FS-4 that enhance both classical Fibre Channel and the Fibre Channel over Ethernet protocols.

#### **Physical layer:**

The physical layer technologies continue to improve in performance and cost-effectiveness. Work is nearing completion of the FC-PI-6 and FC-MSQS-2 projects that double the data rate of 16GFC to 32GFC Fibre Channel. Additionally, there are ongoing investigations for higher multi-lane speeds such as 128GFC.

#### **Remote access and alternate link technology:**

Fibre Channel is important as a high-performance secure mechanism for remote access to storage. To extend the already defined capabilities for transmitting Fibre Channel over SONET, TCP/IP, Generic Framing Protocol links, and Pseudo-Wire environments.

#### **FICON:**

To support the large system FICON environment, the FC-SB-5 specification was completed, passed T11 letter ballot, and is finishing up comment resolution.

#### **Security:**

The use of Fibre Channel links in more sensitive environments and outside secure computer rooms has increased the requirements for security. The FC-SP-2 standard extends the security protection for Fibre Channel environments already defined in FC-SP.

**Energy Efficiency:**

The FC-EE project has provided inputs into the core Fibre Channel standards (FC-FS-4, FC-SW-6, and FC-LS-3) that define the requirements and features for energy efficient Fibre Channel.

**HBA Management:**

The SM-HBA-2 specification was completed and forwarded to INCITS for further processing.

**As a result of these activities, the total program of work of FC-TC during the period of this annual report is summarized as follows:**

Family	Projects in Development	Projects in FC-TC or INCITS Approval	Published Standards	Total
FC-TC T11	1	1	0	2
FC Physical T11.2	2	0	0	2
FC Protocol T11.3	5	1	5	11
<b>TOTAL</b>	<b>8</b>	<b>2</b>	<b>5</b>	<b>15</b>

FC-TC work continues to be recognized and supported by the industry. FC-TC has 28 voting members and 15 advisory member organizations in April 2012, compared with 30 voting and 12 advisory member organizations in April of 2012. The total Emeritus members remain at seven. The lower number is principally associated with the continuation of the slow economic situation. The FC-TC is hopeful that this will improve this year.

The following is the outline of the task groups of FC-TC and the project allocation to the TC and TGs:

**FC-TC: Technical Committee for Fibre Channel Interfaces**

FC-TC is developing the SM-HBA-2 and FC-EE standards. The SM-HBA-2 standard has been completed and forwarded to INCITS for further processing.

Work completed in FC-EE has been proposed to FC-FS-4, FC-SW-6, and FC-LS-3 for inclusion in those standards.

FC-TC is one of the Technical Advisory Groups (TAGs) for ISO/IEC/JTC 1/SC 25/WG 4. Most of its TAG activity addresses standards and technical reports that FC-TC has first developed as ANSI/INCITS standards, including Fibre Channel, HIPPI, and IPI standards. It has provided and will continue to provide guidance on other WG 4 proposed standards as required. In addition, FC-TC provides support for the international standardization of certain standards fast-tracked by SNIA through INCITS.

### **TG T11.2: Physical Variants**

The projects currently allocated to this task group are: FC-MSQS-2 and FC-PI-6 (in development). Good progress is being made on both documents. These documents describe the 32GFC speeds and may describe the multi-lane 128GFC variant.

### **TG T11.3 Interconnection Schemes**

The projects currently allocated to this task group are: FC-BB-6, FC-SW-6, FC-FS-4, FC-LS-3, FC-GS-7, and FC-SB-5. FC-BB-6 and FC-SB-5 have completed T11 letter ballot and are in comment resolution. Good progress is being made on the other standards.

## **2. Significant Accomplishments**

The committee has published 5 standards/technical reports during this period as described in the executive summary. In addition, several hundred documents and presentations have been prepared supporting the technical and administrative activities of the committee in the period this report covers.

## **3. Significant Challenges**

The current economic situation is still having an impact on meeting attendance. Most companies have cut their travel budget and this is making it more difficult for representatives to participate in the meetings. In addition, the storage related area of the computer industry is continuing to consolidate. This consolidation reduces the membership of the committees and often changes the focus of the development projects. Meeting hosting by individual companies was minimal, but the Fibre Channel Industry Association (FCIA) provided assistance by hosting the T11 meetings during this period.

## **4. Expected Challenges**

Going forward the continuing challenge for T11 is the economy and the impact of mergers and acquisitions. To a lesser degree much of the current the technical work will be finishing up in the next couple of years prompting T11 to examine new areas of work. Work areas under study include Virtualization, Cloud, and SSD support.

## 5. Committee Activities

### 5.a Previous meetings for the reporting period

Apr 16-20, 2012	Nashville, TN
Jun 4-8, 2012	Lake Placid, NY
Aug 13-17, 2012	Chicago, IL
Oct 1-5, 2012	Boise, ID
Dec 3-7, 2012	Tucson, AZ
Feb 4-8, 2013	Palm Springs, CA

### 5.b Next 12 months of meetings

Apr 8-12, 2013	Albuquerque, NM
Jun 3-7, 2013	Coeur d'Alene, ID
Aug 5-9, 2013	Chicago, IL
Oct 7-11, 2013	Duluth, MN
Dec 2-6, 2013	Austin, TX
Feb 3-7, 2014	New Orleans, LA

Full details of these meetings can be found at [www.t11.org/t11/meet.nsf/sch](http://www.t11.org/t11/meet.nsf/sch). Currently the plenary meetings of the TC and TGs occur on Thursday of the meeting week. Typically a dozen or so ad hoc meetings are held during the meeting weeks. Related non-FC-TC such as the FCIA Board and Marketing meetings are often co-located with T11. Interim meetings and teleconferences, when necessary, are also announced on the FC-TC e-mail reflectors and posted on the FC-TC website.

## 6 Liaison Activities

FC-TC and its task groups maintain formal or informal liaison with the following organizations. Most liaison representatives are member organizations with representatives in both INCITS FC-TC and the liaison organization. Liaison relationships vary during the life of relevant projects and are strongest during the development and FC-TC review periods. While currently dormant, the IETF liaison has been maintained for the short term in case any new work items arise from the T11 work.

#### **INCITS T10:**

Liaison is maintained with INCITS TC T10 (Technical Committee on SCSI Interfaces). The SCSI command set and protocols are carried across the majority of Fibre Channel connections. The breadth of the work requires multiple liaison representatives. For more information about T10 see [www.t10.org/](http://www.t10.org/).

#### **IETF:**

Liaison is maintained with the IETF (Internet Engineering Task Force), especially the STORM (Storage Maintenance) working group and the pwe3 (Pseudo-wire emulation edge-to-edge) WG. Most recently T11 and the IETF worked to get the FC-BB-5 in sync with the appropriate IETF documents by completing the FC-BB-5 AM1 document.

For more information about IETF's working groups, see [www.ietf.org/](http://www.ietf.org/).

#### **FCIA:**

Liaison is maintained with the FCIA, the Fibre Channel Industry Association. The FCIA is a trade and technical organization that involves most of the manufacturers of products compliant with FC-TC standards. For FC-TC, one of the most important activities is its Fibre Channel Technology Road Map. The road map provides up-to-date guidance about user requirements for the technologies being standardized by FC-TC. As mentioned prior, the FCIA has also helped out by hosting the T11 meetings during this reporting period. For more information about FCIA, see [www.fibrechannel.org/](http://www.fibrechannel.org/).

#### **SNIA:**

Liaison is maintained with SNIA, the Storage Networking Industry Association. SNIA is a trade and technical organization that addresses the use of Fibre Channel and other technologies for the creation of large storage area networks (SANs). SNIA's technical committees provide many inputs into the FC-TC activities, especially with respect to SAN management functions and the security of SANs. Recently the Principals of

Cooperation (POC) between SNIA and T11 was updated. For more information about SNIA, see [www.snia.org/](http://www.snia.org/).

### **SFF Committee:**

Liaison is maintained with the SFF Committee, formerly named the "Small Form Factor" committee, but now known by its letters. The SFF is an industry organization that documents industry standards in areas typically avoided by accredited standards organizations. Such areas include optical transceiver modules used by Fibre Channel, mechanical standards for Fibre Channel and SCSI storage devices, and connectors for Fibre Channel. Formal liaison is maintained with three SFF Special Subject Working Groups; Transceivers, High Performance Electrical Interconnect, and High Speed Optical Interconnect. For more information about SFF, see [www.sffcommittee.org/ie/](http://www.sffcommittee.org/ie/).

### **IEEE 802.3**

Liaison is maintained with IEEE 802.3. Relevant projects include the definitions of the new Ethernet speeds and interfaces.

See [www.ieee802.org/3/](http://www.ieee802.org/3/).

### **DMTF**

Liaison is maintained with the DMTF (Distributed Management Task Force), an organization that develops management standards for computer systems and networks based on CIM (Common Information Model). FC-TC is involved with providing the necessary input to DMTF to properly represent and manage storage area networks. For more information about DMTF, see [www.dmtf.org/](http://www.dmtf.org/).

### **INCITS CS1**

Liaison is maintained with INCITS CS1. For more information about CS1 see [cs1.incits.org](http://cs1.incits.org)

### **IBTA**

Liaison is maintained with the IBTA (InfiniBand Trade Association). For more information on IBTA see <http://www.infinibandta.org/home>

### **OIF**

Liaison is maintained with the OIF (Optical Internetworking Forum). For more information on OIF see <http://www.oiforum.com/>

## Summary of liaisons

Liaison Organization	Representative
INCITS T10	John Lohmeyer
FCIA	Skip Jones
IETF	David Black
INCITS CS1	Eric Hibbard
SNIA	Craig Carlson
SFF	Dave Lewis
DMTF	Steve Wilson
IEEE 802.3	Adam Healey
IBTA	Craig Carlson
OIF	Tom Palkert

## 7 Membership and Officers

The membership lists for FC-TC are available on the T11 web site under the "members" button (see <http://www.t11.org/t11/mem.nsf>). The officers of FC-TC and its TGs are shown below:

### Officers

Position	Name	Appointed	Organization
T11 Chair	Steven Wilson	5/23/2009	Brocade 130 Holger Way. San Jose, CA 95134 Phone: 408-333-8128 Email: swilson at brocade dot com
T11 International Representative	Peterson, David A.	10/03/2006	Brocade 6000 Nathan Lane North Plymouth, MN 55442 US Phone: +1 612-802- 3299



			E-mail: david.peterson at brocade dot com
T11 Vice-Chair	DeSanti, Claudio	11/14/2003	Cisco Systems 170 West Tasman Drive San Jose, CA 95134 US Phone: +1 408-853- 9172 E-mail: cds at cisco dot com
T11 Secretary	Open (Richard Johnson Acting)	2/2/2013	Finisar 1389 Moffett Park Drive Sunnyvale, CA 94089 US Phone: +1 408-400- 1093 E-mail: richard.johnson at finisar dot com
T11.2 Chair	Palkert, Tom	05/23/2006	Luxtera 255 62nd St. West Excelsior, MN 55331 US Phone: +1 952 200 8542 E-mail: tpalkert at luxtera dot com
T11.2 Vice-Chair	Wallace, Dean	05/23/2006	QLogic CA, US Phone: +1 949-389- 6480 E-mail: dean.wallace at qlogic dot com
T11.2 Secretary	Richard Johnson	08/05/2008	Finisar 1389 Moffett Park Drive Sunnyvale, CA 94089 US Phone: +1 408-400- 1093 E-mail: richard.johnson at finisar dot com
T11.3 Chair	Carlson, Craig	02/01/2001	QLogic 4601 Dean Lakes Blvd

			Shakopee, MN 55379 US Phone: +1 952-687-2431 E-mail: craig.carlson at qlogic dot com
T11.3 Vice-Chair	Erik Smith	02/02/2013	EMC 176 South St. Hopkinton, MA 01748 US Phone: +1 508-249-1593 E-mail: smith_erik at emc dot com
T11.3 Secretary	Landon Curt Noll	06/05/2008	Cisco Systems 170 West Tasman Drive San Jose, CA 95134 US Phone: +1 408-424-1102 E-mail: chongo at cisco dot com

## 8. Future Trends and Related Technical Activities

The work of FC-TC remains very important because of the requirements of the changing economy and the requirement to protect corporate data. The implementation of Fibre Channel based systems for Storage Area Networks (SANs) has demonstrated that more efficient use can be made of computer and storage resources in many environments. At the same time, the long-distance capabilities provided by Fibre Channel allow high performance mirroring and backup to assure the continuation of normal business in the event of natural or man-made damage to a part of the system. It is likely that both these requirements will continue to build the marketplace for FC-TC technology over the next several years.

The work is also very important because of the very high bandwidth and transmission efficiency achieved by Fibre Channel implementations. As computing resources grow more powerful and are distributed across more processors, Fibre Channel is the principal technology capable of meeting the performance and connectivity requirements for storage devices in large enterprise data processing environments. Virtualization and Cloud computing will further drive the need for very high bandwidth and transmission efficiency.

Fibre Channel has proven itself a very "green" technology. Power consumption of high bandwidth optical transceivers and the relatively simple switch and host bus adapter implementations enabled by Fibre Channel are generally lower in power and smaller in footprint than competitive technologies of comparable performance. The consolidation of storage and servers that Fibre Channel allows additionally provides power savings. The FC-EE project addresses the general energy efficiency aspects of Fibre Channel.

Fibre Channel has proven itself a relatively secure technology. The simple structures, optical interconnects, and the inability to access the data paths from the control paths create an environment where good security policies are relatively easy to implement. Additional security tools are now being made available in Fibre Channel environments. The Fibre Channel specific portions of this work are being done in FC-TC. Some of the complementary standards are also being developed in IEEE, IETF, and INCITS CS1.

Other technologies, including TCP/IP and SONET connections, are used to extend SANs even beyond the 80 km distance supported by FC-TC-defined Fibre Channel links. Definition of these technologies will be done within other standards organizations, including the IETF and the IEEE, although Fibre Channel specific portions of the work will be done within T11.3 or by liaison with FC-TC.

For the class of servers that use Ethernet as an I/O convergence technology, FCoE is proving to be an exciting new technology. It is likely to significantly increase the marketplace for Fibre Channel SANs and provide significant cost/performance and power/performance benefits for a large number of computational environments. It has already drawn significant interest and several new members to the FC-TC.

The management of SANs will continue to become an increasingly important activity. While it is likely that significant parts of the work will be carried forward within FC-TC, other parts of the work may be carried forward in other standards organizations or industry consortia, including IETF, T10, SNIA, and DMTF. Much of the work specific to Fibre Channel for these broader organizations will be carried on with liaison with FC-TC.

The FC-SCM (Simplified Configurations and Management) project describes the requirements for FC in a small business environment. This adds to the FC deployment spectrum by supporting low end and low cost configurations.

Industry consortia remain an important source of new standards activities. There is a strong desire by many organizations to create more formal standards based on those standards activities. INCITS will continue to be an important mechanism for carrying such documents forward into the standards world.

## **9. Other Administrative Information**

### **Financial Statement:**

FC-TC meeting activities are financed and hosted by volunteer organizations. The individual participants and their member organizations finance all travel, room, and related business expenses. FC-TC has no direct financial activities.

### **Public access policy:**

FC-TC has discovered that the simplest way to meet the goal of a fair and equal opportunity for participation of interested parties is to maintain a public participation policy. The FC-TC allows the participation of all directly and materially affected parties in any meeting with very few exceptions. Any interested party may access the documents provided during the development process, the agenda and minutes of the meetings, and the draft of standards in development. Any interested party may join the announcement and discussion e-mail reflectors. For those documents from other organizations that are being considered as part of a liaison activity, the contributing organization may request that the FC-TC protect these documents with a password. Any interested party may attend the FC-TC meetings. Constructive contributions from non-member companies, including papers and meeting participation, are welcomed by the committee, since such contributions often provide technical review, unique insights, and expertise not available within the committee. All frequent participants are encouraged to become voting members of the committee and most actually do become members. Voting and advisory membership is closely monitored to be sure that only fully qualified members participate in voting. The public access to development documents enables member organizations to communicate with their suppliers and customers about the optimum technical content in a developing standard. A public access policy simplifies e-mail reflector management, web-site management, and meeting logistics reducing load on officers and staff.

FC-TC believes that maintaining a public participation policy is vital to the continued success of the committee. In August 2009 the T11 Website was modified to support the public access policy.

### **Web-based procedures:**

FC-TC made a major transition in 1998 from paper-based operating procedures to completely web-based, interactive procedures. The web-based system has been improved continuously since that time such that it now provides, among others, the following critical capabilities. These capabilities require wireless access at all meeting venues.

An online document register allows documents to be numbered automatically, submitted via ftp or web-based utilities, and linked into the register for web access. Documents distinguished as agendas or minutes are given special forms and simplified access procedures. The documents and document database may be accessed through a number of different indexes. Automated procedures are in place for preparing document mailings, accessing archives, and performing backups.

A database provides access to contact information for all attendees of any FC-TC plenary meeting and for all representatives of TC or TG member organizations. Individuals may update their access information on line using password protected procedures. Representatives of member organizations may update their representation information, but only officers may change the status of a member organization. Update information is automatically transmitted to INCITS.

Letter balloting and comment collection is performed using an automated procedure.

Meeting announcements are submitted to a special data base, from which schedules and automated notifications are prepared.

Attendance for all meetings is taken electronically. If network access is not available, meeting attendance may be taken using a special java-enabled USB storage device.

Documents are distributed during meetings by Wi-Fi network access and by USB storage device.

Special capabilities are provided for the officers, the administrator, and INCITS to facilitate access to particular sets of required information. As an example, access to all annual reports is provided at the webpage <http://www.t11.org/t11/docreg.nsf/ar>

All FC-TC documents are provided electronically in accordance with guidelines established by the TC.

The website and e-mail reflectors are presently administered entirely by volunteers and financed by corporate donations. If the required functionality and a smooth cost effective transition can be provided, we look forward to INCITS providing support for hosting our web-site and mail reflectors in the future.