IN05-TBD, Annual Report for: INCITS TC T11

Covering the Period from Jan 1, 2004 to May 31, 2005

Title of INCITS Technical Committee: Fibre Channel Interfaces

Quick Links:

- Link to *Website of T11* (includes all documents, minutes, and member information)
- *See Executive Summary*
- Link to *T11 area on the INCITS Projects Database*
- *See Significant Accomplishments*
- *See Significant Challenges*
- *See Expected Challenges*
- *See previous year's meetings*
- *See next year's planned meetings*
- *See Liaison Activities*
- T11 Membership and *Officers*
- *See Future Trends*
- *See Other Administrative Information*

Informal Description of Work:

T11 is responsible for storage interconnect and networking families of standards, including Fibre Channel, Fibre Channel protocol mappings to higher level architectures, SBCON, HIPPI, and a number of related management and API standards. T11 is co-TAG to ISO/IEC/JTC 1/SC 25/WG 4 along with INCITS TC T10 and the IEEE MSC. Fibre Channel is the technology used to implement Storage Area Networks, allowing the many benefits of storage consolidation and remote storage access.

Executive Summary:

The reporting period has been a time of consolidation for the definitions of the core functions of Fibre Channel. It has also been a time of significant expansion of the scope of the Fibre Channel standards, including improvements and cost reductions in the physical layer definitions, extensions into new functional areas, new management features, and active liaison with organizations defining associated management tools. Projects that have reached publication include FC-GS-4, FC-MJSQ, FC-DA, FC-SWAPI, and FC-HBA, all of which complete the definition of a generation of Fibre Channel functions. New projects and projects under consideration include FC-GS-5, SM-HBA, FC-MSQS, FC-DA-2, 10 GFC Amendment, FC-IFR, FC-UTP-3, FC-SATA, and SNPing, all of which extend Fibre Channel in new directions. Active liaison projects that are complete include IPv4/IPv6 over FC, SM-FAM and SM-FSM, with three other projects almost complete.

About half of the T11 developed standards are later forwarded through 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. Special attention has been focused on methods of expanding the addressing and routing capabilities of Fibre Channel switches. FC-FS-2, FC-IFR, FC-LS, FC-SW-4, and FC-GS-5 are standards treated in these discussions.

Interoperability:

Interoperability remains a key requirement, and technical reports defining the requirements of interoperability (FC-MI-2 and FC-DA-2) are major standards development projects.

Physical layer:

The physical layer technologies continue to improve in performance and cost-effectiveness, making the FC-PI-3 and FC-PI-4 standards the focus of intense concentration by organizations bringing these new technologies to the industry. Most recently, there has been increased interest in even lower cost links based on CAT-5 and CAT-6 cabling. The tools for qualifying and testing these technologies are provided in the FC-MSQS and FCSM-2 technical reports.

Remote access:

Fibre Channel is becoming important as a high-performance secure mechanism for remote access to storage. As a result, the FC-BB-3 standard developments are bringing the telecommunication organizations and Fibre Channel switch and gateway manufacturers together to further improve long distance connection technology. Liaison has been established with ATIS OPTXS OHI and with ITU-T to communicate about the application of the Generic Framing Protocol to Fibre Channel. In addition, a contribution has been prepared to support the IETF standardization of the transmission of IPv4 and IPv6 information over Fibre Channel.

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 standard is being developed to provide security protection for Fibre Channel environments.

Management and programming interfaces:

Fibre Channel environments are growing in sophistication and complexity. To provide management and application support for such environments management and application programming interfaces, including SM-HBA, FAIS, and SNPing. In addition, contributions defining MIBS for Fibre Channel management (SM-RTM, SM-VFM, and SM-FSM) are being prepared for standardization by the IETF.

As a result of these activities, the total program of work of T11 during the period of this annual report is as follows:

Family	Projects in Development	Projects in T11 or INCITS Approval	Published Standards	Total
FC T11	1			1
FC Physical T11.2	4	1	1	6
FC Logical T11.3	12 + 1 Liaison	2	2 + 1 Contribution	16 + 1 Liaison + 1 Contribution
Mgmt T11.5	3 + 3 Contribution	0	2 + 2 Contribution	5 + 5 Contribution
TOTAL	20 + 1 Study + 4 Contribution	3	5 + 2 Contribution	28 + 1 Study + 6 Contribution

T11 work continues to be recognized and supported by the industry. For this reason, 9 new standards have been brought into the committee during this period. T11 had 53 member organizations in April of 2005, a decrease from 55 in February 2004. This represents a relatively stable membership over this period. An additional 18 organizations participate in the T11 Task Groups, as compared with 17 in February of 2004, with the additional members principally in the T11.2 and T11.5 Task Groups.

The following is the outline of the three task groups of T11 and the project allocation to the TC and TGs:

T11: Technical Committee for Device Level Interfaces

T11 is preparing the Amendment to 10GFC.

TG T11.2: Physical Variants

The projects currently allocated to this task group include: FC-MSQS, FC-PI-2, FC-PI-3, FC-PI-4, and FCSM-2. A project proposal for FC-UTP-3 is under consideration.

TG T11.3 Interconnect topologies and protocol mapping

The projects currently allocated to this task group include: FC-AE-1553, FC-AE-ASM, FC-AE-RDMA, FC-BB-3, FC-DA-2, FC-FS-2, FC-GS-5, FC-IFR, FC-LS, FC-MI-2, FC-SP, and FC-SW-4. In addition, there is one liaison activity reviewing Fibre Channel conformance documents. There is one contribution project defining IPv4 and IPv6 over Fibre Channel. A project proposal for FC-SATA is under consideration.

TG T11.5 Storage Management Interfaces:

The projects currently allocated to this group are FAIS and SM-HBA. In addition, there are three contribution projects (SM-FSM, SM-RTM, and SM-VFM) preparing draft MIBs for Fibre Channel, and the contributions from two such projects (SM-FAM & SM-NSM) are presently in the approval process at the IETF. A project proposal for SNPing is under consideration..

Significant Accomplishments

The committee has forwarded 6 new project proposals (3 more are scheduled for forwarding in the June meeting) and published 6 standards or technical reports during this period as described in the executive summary.

Over 1250 documents and presentations have been prepared supporting the technical and administrative activities of the committee in the 17 month period this report covers.

Significant Challenges

The most significant challenge this period, as during the last, has been the broadening applicability of Fibre Channel and storage networking technologies. Most recently, this has evidenced itself in requirements for new Fibre Channel functionality, including security protocols, application programming interfaces, and inter-fabric routing capabilities. At the same time, the economy has forced the computer industry to remain very cost conscious. Organizations are controlling carefully the resources that are made available to perform standardization activities. The very high quality of participants in the Fibre Channel activity has kept this from damaging the standardization activities, but workloads on individual representatives are still very high.

In addition, we have encountered a number of administrative requirements which have proved very interesting.

OID

The FC-SP standard defining security tools for Fibre Channel has made it necessary for Fibre Channel to obtain an Object Identifier (OID) for certain of its variables. INCITS is in the process of obtaining the necessary OID value from ANSI which can be further developed by any INCITS committee and standard that requires an OID.

ISO IP disclosures

The intellectual property disclosure statement required by INCITS and ANSI is inconsistent with the ISO/IEC intellectual property disclosure statement. As a result, a separate disclosure must be created by each company claiming intellectual property in standards that are destined for the international standards arena. This is creating significant delays in the internationalization of many of our standards. We have noted this problem to INCITS and ANSI, but have not yet been able to create a satisfactory resolution.

Expected Challenges

As stated in the last annual report, the economy continues to be a challenge. Member organizations continue to be very careful with their spending, and standards development, while viewed as an important task, is often also viewed as a lower priority task than the many other activities of an organization. The effects of the economy appear to have stabilized, and membership is no longer declining, though levels of participation by representatives are being carefully metered.

A second major challenge is the effect of the gradual emergence of additional storage networking technologies and functions. These force member organizations to participate in other standards venues in addition to TC T11, including INCITS T10, INCITS T13, IEEE 802.3, SNIA, and the IETF. These alternative technologies sometimes point toward areas where Fibre Channel technology can be improved, resulting in several new and exciting projects.

Another interesting challenge is identifying a long-term host for our web-site activities. We are presently working with INCITS to see if we can eventually transfer this hosting support to INCITS. This would be a significant opportunity for INCITS to provide improved service to all technical committees.

Committee Activities

Previous meetings for the reporting period

Jan 31-Feb 4, 2004	Dana Point	T11 #61, T11.2 #34, T11.3 #41, T11.5 #9
Apr 5-9, 2004	Monterey	T11 #62, T11.2 #35, T11.3 #42, T11.5 #10
Jun 7-11, 2004	Chicago	T11 #63, T11.2 #36, T11.3 #43, T11.5 #11
Aug 2-6, 2004	Keystone	T11 #64, T11.2 #37, T11.3 #44, T11.5 #12
Oct 4-8, 2004	Austin	T11 #65, T11.2 #38, T11.3 #45, T11.5 #13

Dec 6-10, 2004	Indian Wells, CA	T11 #66, T11.2 #39, T11.3 #46, T11.5 #14
Feb 7-11, 2005	Dana Point	T11 #67, T11.2 #40, T11.3 #47, T11.5 #15
Apr 4-8, 2005	San Diego	T11 #68, T11.2 #41, T11.3 #48, T11.5 #16

Next 12 months of meetings

Jun 6-10, 2005	Saint Paul, MN
Aug 8-12, 2005	Ottawa, Ontario Canada
Oct 3-7, 2005	San Francisco, CA
Dec 5-9, 2005	Garden Grove, California
Feb 6-10, 2006	Dana Point, CA
Apr 3-7, 2006	Santa Fe, NM
Jun 12-16, 2006	Anchorage, AK

Full details of these meetings can be found at *www.t11.org/t11/meet.nsf/sch*. Currently the plenary meetings of the TC and TGs occur on Thursday of the meeting week. Typically 15 to 20 ad hoc meetings are held during the meeting weeks. Related non-T11 meetings are often co located. Interim meetings and teleconferences, when necessary, are also scheduled on the T11 website.

Liaison Activities

TC T11 and its task groups maintain liaison with the following organizations. Most liaison representatives are member organizations with representatives in both INCITS TC T11 and the liaison organization.

INCITS:

Liaison is maintained with INCITS (INternational Committee for Information Technology Standards) to keep the committee informed of the actions of the INCITS organization and the progress of our projects within INCITS. See *www.incits.org/* for further information.

TC 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. For more information about T10 see *www.t10.org/*.

IETF:

Liaison is maintained with three parts of IETF (Internet Engineering Task Force), the ips (TCP/IP for storage) working group, the imss (Internet and Management Support for Storage) working group, and a more general liaison with the security and transport activities of IETF. The IETF ips working group has two projects key to TC T11. One of those projects, FCIP, is used in the FC-BB-2 standard. The second, iFCP, uses IP infrastructure to support Fibre Channel Fabric capabilities. The IETF imss working group has several projects that are relevant to TC T11, including a definition for transmitting IPv4 and IPv6 information across Fibre Channel and several management information block (MIB) definitions. The FC-SP project makes use of much of the work of the security working groups, particularly the ipsec working group. For more information about IETF's ips and security working groups, see *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 TC T11 standards. For T11, 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 TC T11. Another key activity is the SANMark Qualified Program that provides tests and a qualification program examining Fibre Channel interoperability and compliance. For more information about FCIA, see *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 TC T11 activities, especially with respect to SAN management functions and the security of SANs. For more information about SNIA, see *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/*.

OPTX OHI:

Liaison is maintained with OHI, a working group of Technical Sub-Committee OPTXS, a committee sponsored by the Alliance for Telecommunications Industry Solutions and accredited by the American National Standards Institute. The Optical Hierarchical Interfaces Working Group prepares technical reports

related to telecommunications network technology pertaining to optical network hierarchical structures. One such activity involves the encapsulation of Fibre Channel communications across optical networks using GFP, the Generic Framing Protocol. For more information about OHI, see *www.atis.org/0240/ohi.asp*.

ITU-T SG-15 Question 11/15

Liaison is maintained with ITU-T SG-15 Q.11/15, a Study Group sub-group of the International Telecommunication Union, Telecommunication Standardization Section. The group maintains liaison with TC T11 to verify that the Generic Framing Protocol properly supports Fibre Channel. For more information about ITU-T SG-15, see *www.itu.int/ITU-T/studygroups/com15/index.asp*

OIF

Liaison has been initiated with the Optical Internetworking Forum (OIF), an industry consortium that develops interoperability agreements for data switching and routing using optical networking technologies. The OIF is working on the Common Electrical Interface (CEI) specification that specifies electrical/jitter requirements for 5/10G short reach and long reach copper interconnects. Their work is relevant to FC-PI-2, FC-PI-3, and FC-PI-4. See *www.oiforum.com/*.

IEEE 802.3

Liaison is maintained with IEEE 802. Relevant projects include:

IEEE P802.3ap, Ethernet Backplanes.

Additional work on 1 Gb/s and 10 Gb/s technologies is being followed within the IEEE. See *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). TC T11 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/*.

Membership and Officers

The membership lists for TC T11 are available on the *T11 website* under the members button. The officers of TC T11 and its TGs are shown below.

Officers

TC T11 Chair: (appointed 02/1/2002)

Robert Snively

Brocade Communications Systems, Inc.

1745 Technology drive
San Jose, CA 95110
Phone: (408) 333-8135
E-mail: rsnively@brocade.com

TC T11 Vice-Chair: (appointed 11/14/2003)

Claudio DeSanti

Cisco Systems
170 West Tasman Drive
San Jose, CA 95134
USA
Phone: 408-853-9172
E-mail: cds@cisco.com

TC T11 International Representative: (appointed 6/1/2001)

Gary Robinson

EMC CORPORATION
Apt. 18C
85 East India Row
Boston, MA 02110
USA
Phone: 617-300-7242
E-mail: robinson_gary@emc.com

TC T11 Secretary (appointed 2/1/94)

Neil Wanamaker

Finisar
10624 Icarus Ct.
Austin, TX 78726
USA
512.917.9712
E-mail: ntw20@earthlink.net

TG T11.2 Chair (appointed 8/06/1997)

Schelto Van Doorn

INTEL CORPORATION
PCI-104-E2
44235 Nobel Drive
Fremont, CA 94538
USA
Phone: 510 497 7770
E-mail: schelto.vandoorn@intel.com

TG T11.2 Vice-Chair (appointed 11/25/2003)

Tom Palkert

Xilinx
2511 Highway 7
Excelsior, MN 55331
USA
Phone: 952 401 7997
E-mail: tpalkert@xilinx.com

TG T11.2 Secretary (appointed 8/06/1997)

Bill Ham

Hewlett Packard
165 Dascomb Road
MS:DAS01-2/E13
Andover, MA 01810
USA
Phone: 978-828-9102
E-mail: bill_ham@ix.netcom.com

TG T11.3 Chair (appointed 02/2001)

Craig W. Carlson

QLogic
6321 Bury Drive
Eden Prairie, MN 55346
USA
Phone: 952-932-4064
E-mail: craig.carlson@qlogic.com

TG T11.3 Vice-Chair (appointed 1/06/2005)

William Martin

Sierra Logic
7213 Marblethorpe
Roseville, CA 95747
USA
Phone: 916-772-3658
E-mail: bill_martin@sierralogic.com

TG T11.3 Secretary (appointed 2/01/2005)

Bob Nixon

Emulex

3333 Susan Street
Costa Mesa, CA 92626
USA
Phone: 714-885-3525
E-mail: bob.nixon@emulex.com

TG T11.5 Chair (appointed 8/5/2002)

Roger Cummings

Veritas Software
HRO3/3007
400 International Parkway
Heathrow, FL 32746
Phone: 407-357-7257
E-mail: roger.cummings@veritas.com

TG T11.5 Vice-Chair (appointed 10/8/2002)

Robert Pulley

Crosswalk, Inc.
11000 Westmoor Drive, Suite 300
Westminster, CO 80021
USA
Phone: (831) 662-2673
E-mail: robert.pulley@crosswalkinc.com

TG T11.5 Secretary (appointed 2/01/2005)

Vinod Bhat

Hewlett Packard
MRO1-2/K24
200 Forest Street, Bldg MRO1-2
Marlborough, MA 01752
USA
Phone: 508-467-3204
E-mail: vinod.bhat@hp.com

Future Trends and Related Technical Activities

The work of T11 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 T11 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 of large enterprise data processing environments.

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

The work of T11 has also become important because of its contributions to other technologies. It is the basis of 1 Gb/s Ethernet, SATA, SAS, and other technologies. TC T11's physical layers and signal integrity measurement techniques have been used by a number of technologies in the range of 1 to 8 Gb/s and also at the 12 Gb/s rate achieved by 10 Gb/s Fibre Channel's more efficient coding technology.

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 T11, 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 within T11.5 or by liaison with T11.

Bandwidth increases beyond 10 Gb/s have been discussed within T11.2. A back-compatible 8 Gb/s Fibre Channel implementation is in development and 16 Gb/s links are also being considered.

A number of low-cost extensions to Fibre Channel are now either in development or under consideration. These include low-cost long-distance copper implementations as well as encapsulations of the SATA command set.

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. We have seen at least one case recently that elected to use INCITS fast-track standardization as the primary mechanism for carrying the documents forward into the standards world. We have seen a second case that elected to use T11 instead of a consortium because T11 has gained a reputation for fairness and reasonably fast action.

The heavy workloads and highly technical environments associated with our activities seem tailor made for interim electronic meetings. We are now making Wi-Fi network access available at most meetings for the convenience of the participants. We have not yet been able to fully exploit electronic meetings, because of restrictions implemented by some corporate firewalls.

Other Administrative Information

Financial Statement:

T11 meeting activities are financed and hosted by volunteer organizations. The individual participants and their member organizations finance all travel, room, and related business expenses. T11 has no direct financial activities.

Web-based procedures:

T11 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 capabilities.

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 T11 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.

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 *www.t11.org/t11/docreg.nsf/ar*.

With the near-universal availability of wireless interconnections, the following additional capabilities have become available. When a hotel does not provide wireless interconnection, the committee can usually set up its own local wireless connection to support these functions.

Electronic attendance mechanisms with password protected registration procedures are provided for all meetings during the plenary week.

Distribution of documents required during the meeting is performed using wi-fi access.

All T11 documents are provided electronically in accordance with guidelines established by the TC. Additional procedures have been established for T11.3 to fully exploit the capabilities of electronic distribution. These procedures, documented in *T11/02-223v0* are being considered as procedures for T11 and its other task groups as well.

The website and e-mail reflectors are presently administered entirely by volunteers and financed by corporate donations. We look forward to INCITS providing support for hosting our web-site and mail reflectors in the future.

Recommendations:

We hope that INCITS will pick up web-site and mail reflector hosting responsibilities in the future.

We hope that an intellectual property process compatible with ISO will be created in the future.

We expect that the present INCITS policies allowing open participation in TC and TG activities will not be changed. Any change from those policies would be very detrimental to the success of our standards activities.