



Standards Watch

LAN Standardization

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Overview

The annual standards development and meeting cycle for 2012 is complete. This edition of Standards Watch reviews the status of the current cabling standards projects underway this year. This review also provides an outlook and identifies key projects that will comprise the cabling standards work in 2013.

2012 had a surge in standards development activity particularly in the field of information communications technology (ICT) connectivity. In addition to new cabling components and related infrastructure upgrades, several new application spaces projects are underway or under preliminary investigation.

Both essential LAN cabling media types, OM4 multimode optical fiber and Category 6A twisted-pair, went under consideration for performance upgrades in 2012. The cabling committees have started drafting specifications for supporting the new respective Ethernet standards under development for 100G over multimode optical fiber and 40G over twisted pair.

Bandwidth demand growth continues. Future LAN applications drivers are convergence and multimedia. IEEE and other groups are conducting preliminary investigations for new applications of existing PHYs, and for rates beyond 100G toward terabit links. The emerging standards will be covered in the next Standards Watch covering the outlook for 2013.

LAN Applications Standards

Next Generation 40 Gb/s and 100 Gb/s Ethernet over Twisted-Pair and Copper cabling

- IEEE 802.3 Next Generation BASE-T Study Group work is approved and is underway.

In July the IEEE 802.3 committee completed the preliminary stage of the Next Gen BASE-T project with a successful Call-for-Interest.

In September and November, IEEE 802.3 held the first and second Next Gen BASE-T study group meetings. The study group will set the project objectives. The group has agreed on the rate objective of 40 Gb/s, and the reach objective remains to be set, while the generally favored range has narrowed to about 20-30 m. The next bi-monthly study group meeting is in January.

- IEEE 802.3bj Task Force for 100 Gb/s Backplane and Copper Cable, which started in September 2011, has processed three task force drafts in 2012. The first working group ballot should be circulated in 2013.

IEEE 802.3bj objectives:

Two 4-lane 100 Gb/s PHYs for backplanes, are for operation at 12.9 GHz and 7.0 GHz.

4-lane 100 Gb/s PHY for copper twin-axial cables; reach up to at least 5m.

- IEEE P802.3bm 40 Gb/s and 100 Gb/s Operation Over Fiber Optic Cables Task Force, also has one CU objective:
4-lane 100 Gb/s Re-timed PHY for electrical interface, e.g. chip-to-module apps.
- All of the above implementations have optional Energy-Efficient Ethernet.

Next Generation 100 Gb/s Ethernet over Multimode Optical Fiber cabling

- IEEE P802.3bm Task Force for 40 Gb/s and 100 Gb/s Operation Over Fiber Optic Cables project development stage started in September 2012, which has multiple MMF, SMF, and CU objectives underway among 3 ad hoc groups.

IEEE P802.3bm MMF objectives:



4-lane 100 Gb/s PHY for MMF; reach up to at least 100 m

4-lane 100 Gb/s PHY for MMF; reach up to at least 20 m

- INCITS T11.2, 32G FC PI-6, Fibre Channel Physical Interfaces-6, MMF objective:
25.6 Gb/s per lane, PHY for OM4 MMF; reach up to 100 m

Next Generation 40 Gb/s and 100 Gb/s Ethernet over Single-mode Optical Fiber cabling

- IEEE P802.3bm Task Force for 40 Gb/s and 100 Gb/s Operation Over Fiber Optic Cables Task Force
IEEE P802.3bm SMF objectives:
40 Gb/s PHY for SMF; reach up to at least 40 km
100 Gb/s PHY for SMF; reach up to at least 500 m

New Cabling Components Standards

Next Generation Twisted-pair Cabling standards in support of 40Gb/s Ethernet

- TIA TR42 has its next generation twisted pair cabling project underway, draft TIA-568C.2 Addendum 1, Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 1: Specifications for 100Ω Category 8 Cabling, which extends category cabling operation up to 2000 MHz and is intended to support the Next Gen BASE-T up to 40 Gb/s.

Subcommittee TR42.7 has prepared five working drafts of TIA-568C.2-1 during 2012. Current draft 0.5 is the first to have placeholders for all transmission parameters values completed. The current investigation stage will continue into 2013, while the values

will remain subject to change. In October, the new cabling generation was designated “Category 8”.

The former preliminary stage task groups’ investigations of components and applications were completed by mid year. Another ad hoc task group for channel modeling, focused on channel return loss (RL), had its results applied to new proposed cable and connector RL specs. Another task group was recently formed to investigate connector shield termination.

The international cabling committee, ISO/IEC SC25 WG3, has also started work on a related draft Technical Report, TR11801-99-1, which covers channel requirements for two new specifications sets. These are based on the respective extended performance of Category 6A type and Category 7A type components. The Category 6A type cabling channel is intended to be harmonized with TIA’s Next Gen TP, while the Category 7A type cabling channel is expected to provide additional reach.

- The revision of ANSI/TIA-1183, Twisted-pair cabling components 1000 MHz testing standard, will be further extended for measurements up to 2000 MHz. The upgrade is intended to fully cover the bandwidth range needed for the Next Gen BASE-T developments.
- Draft TIA-TSB-1197, Twisted-pair cabling components Mode Conversion Parameters measurement guidelines. The measurement and analysis guidelines cover the differential-mode to common-mode coupling and reverse coupling parameters. This more complex measurement approach, which utilizes 4-port network analyzer technology, is intended to supplement alien crosstalk characterization.



OM4 Multimode Optical Fiber Cabling standard projects in support of 40 Gb/s (4X10G) Ethernet enhanced links

- Multimode optical fiber cable assembly testing is currently undergoing intense scrutiny. Large data center applications use compound links and channels composed of multiple cable assemblies, which must conform to very narrow margin requirements. Laser optimized fiber insertion loss measurement is highly dependent on the precise alignment of the optical source launch conditions. Field testing is particularly sensitive to the associated measurement uncertainty.

TIA-TSB-4979, Encircled Flux (EF) measurement guidelines are currently under development. Optical source encircled flux measurements are used to characterize the launch conditions for cable assemblies' insertion loss measurements. OM4 Multimode fiber performance verification is dependent upon strictly defined launch conditions. This technical report provides additional guidance for transferring standard lab test procedures to field testing procedures, e.g. TIA-526-14-B: 2011, which is an adaptation of IEC 61280-4-1: 2009, 2nd edition.

Optical fiber connector standards measurement procedures continue under development for enhanced performance and reliability. Fiber end-face geometry and related measurements for multi-fiber connectors are under study. Statistical performance parameters are under consideration for very low insertion loss MMF channels.

- BIMMF (bend insensitive multimode fiber) standards continue in development. BIMMF impacts three standard MMF specifications

parameters and respective measurements: Core Diameter (fiber geometry), Numerical Aperture, and Differential Mode Delay (DMD). Specifying BIMMF depends on improving these three parameters' specifications within the fiber standards, and updating the three respective test procedures; all are underway in 2012.

OM4 or OM4+ Multimode Optical Fiber Cabling standard projects for supporting 25 Gb/s transmission.

- TIA-TSB-172-A, High Data Rate Multimode Fiber Transmission Techniques, revision is underway. This technical report is in its preliminary stage for updating. The original report covered laser optimized MMF technology for OM4 to support 10 Gb/s; the revision will cover the improved technology for OM4 and OM4+ for 25 Gb/s.

Generic Cabling Systems Standards

TIA-568 Cabling Standards, "D" series revision

TIA TR42 has started the revision process of its TIA 568C series, which will begin on the Generic cabling standard (568.0), and the Enterprise cabling standard (568.1); then move on to the three current components standards, Twisted-pair (568.2), Optical fiber (568.3), and Coax (568.4). Following these updates will be amendments or revisions to harmonize and update the other three basic application spaces standards, Residential (570C), Industrial (1005A), and Datacenter (942A). The whole process will take a few years. Along the way some decisions will also be needed for harmonizing and integrating some related standards, such as building automation systems (862A), and outside plant (758B).



Parallel to TIA, the international cabling standards committee also has launched a complete revision of its cabling systems standards. The international cabling standards are comprised by the ISO/IEC 11801 series standards.

ISO/IEC SC25 WG3, 11801 series revision project preliminary work is underway: The parts are, Generic cabling standard (11801-1), and Enterprise cabling standard (11801-2), plus three parts for the other three basic application spaces standards, Industrial (11801-3) currently 24702, Residential (11801-4) currently 15018, and Datacenter (11801-5) currently 64754.

ISO/IEC only covers cabling systems, e.g. channels and links, whereas the cabling components standards are covered by IEC committees, which will begin respective preliminary component standards revisions and amendments: Twisted-pair (IEC SC46C, 48B), Optical fiber (IEC SC86A, B, C), and Coax (IEC SC46A, F).

Network Security project, defining a scope and its relation to structured cabling.

Network security, in the context of cabling systems, covers the security of the telecommunications cables, pathways, spaces, and other elements of the physical infrastructure. Specifications will include design guidelines, installation practices, administration, and management. Installation guidelines with an integrated security approach for implementing premise security systems cabling are the primary consideration.

Network Security is among the TIA priority topics for standards development, which include Cloud Computing and Machine-to-Machine (M2M), Energy Management and STEP (see below).

Cabling Automated Infrastructure Management (AIM) systems

The AIM project covers functional guidelines for automated or intelligent patch-panels.

The intelligent cabling systems standards under development are primarily related to cabling administration and documentation systems standards. The topic is currently under study for inclusion in TIA-606B.

The AIM systems standard is also planned to be covered in an amendment to the respective ISO/IEC 14763-2 standard covering Cabling Administration.

Intelligent cabling systems, which also integrate cable and pathway metrics, will impact Building Information Modeling (BIM) systems, which include cabling pathways. Common application interfaces are under consideration for AIM and BIM, which may also be integrated with network security systems.

Sustainability Technology Environments Program (STEP),

TIA TR42 Building Cabling Systems Committee added Subcommittee TR42.10, to cover the sustainability topic:

Information communication technology (ICT) solutions, applied to intelligent building systems (IBS).

Sustainable Technology Environments Program (STEP) is designed to be a supplement to the Leadership in Energy and Environmental Design (LEED) “green building” program. STEP will provide a rating system for quantifying the benefits from ICT as they are applied to an intelligent, green building. TIA has been chartered to formulate the STEP standard, to develop the points and rating system according to the 12 ratings topics, as related to an intelligent building life cycle



TIA-862A, revision of Intelligent Building Systems (formerly Building Automation Systems, BAS)

TIA TR42.1 has opened a new project to revise TIA-862A with an expanded scope.

- **IBS Relationship to Industrial Cabling**

Intelligent building systems are moving to IP based communication systems, however traditional process control systems continue to be used where they are most practical, e.g. for very low bandwidth or in uninterruptible links. The industrial cabling standard TIA-1005A and building automation have similar accommodations for control bus cabling.

- **Direct attach implementation**

Another similarity of TIA-1005A and TIA-862A are their implementations of the automation outlet, which has greater implementation freedom compared to the information outlet implementation covered in TIA-568C.0

Cabling Implementation Standards

ANSI/TIA-569-C-2012, 1st addendum, Cabling Pathways and Spaces standard; the new addendum covers Temperature and Humidity Classes for equipment environments and adopts the new ASHRAE requirements.

ANSI/TIA-607-B-2012, Grounding and Bonding Systems cabling standard; has its first addendum published covering Building External Grounding requirements; a new second addendum covers bonding to structural metal.

ANSI/TIA-606-B, Cabling Administration standard, is undergoing preliminary study for introduction of AIM and BIM.

- Automated Infrastructure Management (AIM) systems focus on network security.
- Building Information Management (BIM) systems focus on intelligent building.

Cabling Application Spaces Standards

ANSI/TIA-942-A-2012, Data Center Cabling standard, has its first addendum nearly completed, Data Center Fabrics (informative).

ANSI/TIA-1005-A-2012, Industrial Cabling standard, has two new preliminary topics under study.

- MICE levels review to accommodate Gigabit Industrial Ethernet upgrade from Fast Ethernet,
- End-to-end link implementation of the permanent link, requirements and testing. The end-to-end link model is a generic version of the direct attach implementation.

TIA-4966, Education Facility cabling standard; a new standard is under development. Education Facility key features are structured cabling support for:

- Audio/Video systems,
- Security systems, cabling update
- Wireless access points (WAP) cabling update
- Distributed Antenna Systems (DAS). New cabling standard

Large Building cabling, TIA TR42.1 subcommittee is continuing its preliminary study for creating a standard for large “places of assembly” e.g. airports, arenas, and convention centers.

Emerging Standards

2012 saw many new cabling standards developments.

IEEE and other LAN standards groups are continuing investigations for new applications of 1G, 10G and 40G wired links, and for rates beyond 100G toward terabit data links.

Emerging standards will be covered in the next Standards Watch outlook for 2013.



Data Communications Competence Center

Nexans' Data Communications Competence Center, located at the Berk-Tek Headquarters in New Holland, Pennsylvania, focuses on advanced product design, applications and materials development for networking and data communication cabling solutions. The Advanced Design and Applications team uses state-of-the-art, proprietary testing and modeling tools to translate emerging network requirements into new cabling solutions. The Advanced Materials Development and Advanced Manufacturing Processes teams utilize sophisticated analytical capabilities that facilitate the design of superior materials and processes. The Standardization and Technology group analyzes leading edge and emerging technologies and coordinates data communication standardization efforts to continuously refine Nexans' Technology Roadmap. An international team of experts in the fields of cable, connectors, materials, networking, standards, communications and testing supports the competence center. The competence center laboratories are a part of an extensive global R&D network.