Optical Transport Networks & Technologies
Standardization Work Plan

Issue 5.1, December 2004

1. General

Optical Transport Networks & Technologies Standardization Work Plan is a living document. It may be updated even between meetings. The latest version can be found at the following URL.

http://www.itu.int/itudoc/itu-t/com15/otn/index.html

Proposed modifications and comments should be sent to:

Hiroshi Ohta
ohta.hiroshi@lab.ntt.co.jp
Tel: +81 422 59 3617
Fax: +81 422 37 8519

2. Introduction

Today's global communications world has many different definitions for optical transport networks and many different technologies that support them. This has resulted in a number of different Study Groups within ITU-T, e.g. SG 4, 11, 13, 15 developing Recommendations related to optical transport. Moreover, other standards bodies, fora and consortia are also active in this area.

Recognising that without a strong coordination effort there is the danger of duplication of work as well as the development of incompatible and non-interoperable standards, the WTSA 2000 designated Study Group 15 as Lead Study Group on Optical Technology, with the mandate to:

- study the appropriate core Questions (Question 9, 11, 12, 14, and 16/15),
- define and maintain overall (standards) framework, in collaboration with other SGs and standards bodies),
- coordinate, assign and prioritise the studies done by the Study Groups (recognising their mandates) to ensure the development of consistent, complete and timely Recommendations,

Study Group 15 entrusted WP 3/15, under Question 3/15, with the task to manage and carry out the Lead Study Group activities on Optical Technology. To maintain differentiation from the standardized Optical Transport Network (OTN) based on Recommendation G.872, this Lead Study Group Activity is titled Optical Transport Networks & Technologies (OTNT).

3. Scope

As the mandate of this Lead Study Group role implies, the standards area covered relates to optical transport networks and technologies. The optical transport functions include:

- multiplexing function
- cross connect function, including grooming and configuration
- management functions

- physical media functions.

The outcome of the Lead Study Group activities is twofold, consisting of a:

- standardization plan
- work plan,

written as a single document until such time as the distinct pieces warrant splitting it into two.

Apart from taking the Lead Study Group role within the ITU-T, Study Group 15 will also endeavour to cooperate with other relevant organizations, such as ETSI, Committee T1, ISO/IEC etc.

4. Abbreviations

ASON	Automatically Switched Optical Network
ASTN	Automatically Switched Transport Network
ETSI	European Telecommunications Standards Institute
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MON	Metropolitan Optical Network
OTN	Optical Transport Network
OTNT	Optical Transport Networks & Technologies
SDH	Synchronous Digital Hierarchy
SONET	Synchronous Optical NETwork
WTSA	World Telecommunication Standardization Assembly

5. Definitions & Descriptions

One of the most complicated factors of coordinating work of multiple organizations in the area of OTNT are the differences in terminology. Often multiple different groups are utilising the same terms with different definitions. This section includes definitions relevant to this document. See Annex A for more information on how common terms are used in different organizations.

5.1 Optical Transport Networks & Technologies (OTNT)

The transmission of information over optical media in a systematic manner is an optical transport network. The optical transport network consists of the networking capabilities and the technology required to support them. For the purposes of this standardization and work plan, all new optical transport networking functionality and the related technologies will be considered as part of the OTNT Standardization Work Plan. The focus will be the transport and networking of digital payloads over fiber optic cables. Though established optical transport mechanisms such Synchronous Digital Hierarchy (SDH) may fall within this broad definition, only standardization efforts relating to new networking functionality of SDH will be actively considered as part of this Lead Study Group activity.

5.2 Optical Transport Network (OTN)

An Optical Transport Network (OTN) is composed of a set of Optical Network Elements connected by optical fibre links, able to provide functionality of transport, multiplexing, routing, management, supervision and survivability of optical channels carrying client signals, according to the requirements given in Recommendation G.872.

A distinguishing characteristic of the OTN is its provision of transport for any digital signal independent of client-specific aspects, i.e. client independence. As such, according to the general functional modeling described in Recommendation G.805, the OTN boundary is placed across the Optical Channel/Client adaptation, in a way to include the server specific processes and leaving out the client specific processes, as shown in Figure 5-1.

NOTE - The client specific processes related to Optical Channel/Client adaptation are described within Recommendation G.709.

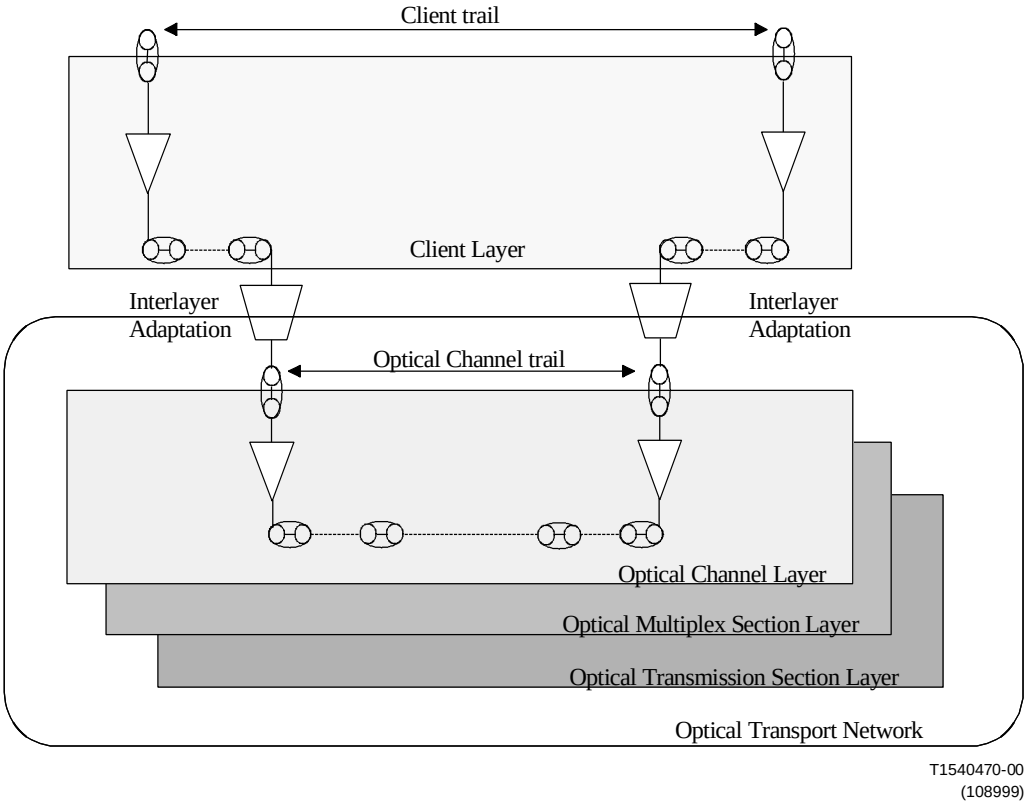

FIGURE 5-1/OTNT: Boundary Of An Optical Transport Network And Client-Server Relationship

5.3 Metropolitan Optical Network (MON)

A metropolitan optical network is a network subset, often without significant differentiation or boundaries. Therefore an explicit definition is under study. As a result, this section offers more of a description than a formal definition for those who wish to better understand what is commonly meant by “metropolitan optical networks.”

While the existence of metropolitan networks is longstanding, the need for identification of these networks as distinct from the long haul networks in general, as well as the enterprise and access networks is recent. The bandwidth requirements from the end customers have been increasing

substantially and many are implementing high bandwidth optical access connections. The resulting congestion and complexity has created a growing demand for higher bandwidth interfaces for inter office solutions. This aggregation of end customer traffic comprises a Metropolitan Optical Network (MON). MONs now have the technology to be optical based and thus, in theory, use the same technology over the fibres as other portions of the network. However, this is not always the case as there are various market forces that drive which technologies will be deployed in which part of the network. As a result, it is appropriate to describe the MON in a way that is agnostic to the various technology approaches. In spite of the many similarities, there are several distinctions between metropolitan and long haul optical networks (LHONs) that result from the aggregation of traffic from enterprise to metro to long haul networks as shown in Figure 5-2.

- The first distinction is that MONs are inherently designed for short to medium length distances in metropolitan areas. That is, typically, within the limits of a single optical span and often less than 200km distance. As a result, topics such as signal regeneration, in-line amplification and error correction are of lesser importance than in LHONs.
- Secondly, the driving requirement for MONs is maximized coverage commensurate with low cost connectivity (as opposed to grooming for performance with LHONs). As a result, for example, standardization focuses on the adaptation of local area network technologies to be effectively managed by service providers, on 'insertion loss' amplification to recover from all the connection points, and on ring deployment to leverage existing fibre plant.
- Another key difference is that of service velocity. The demand for fast provisioning results in the circuit churn rate being generally higher in MONs than LHON. That combined with the wider variety of client signals is a key driver for flexible aggregation (e.g., 100Mb-1Gb rate, all 8B/10B formats with one card).
- A final distinction is that in the MON there are service requirements (e.g., bandwidth-on-demand services, and multiple classes-of-services) that lead to further topology and technical considerations that are not a priority for LHONs.

While there are many combinations of technologies that can be used in MONs, the following are common examples:

- SONET/SDH
- DWDM, CWDM
- Optical Ethernet
- Resilient Packet Ring
- A-PON, B-PON, G-PON, and E-PON

As a result of the importance of MONs, SG15 has redefined several of its Questions work programs to specifically include metro characteristics of optical networks.

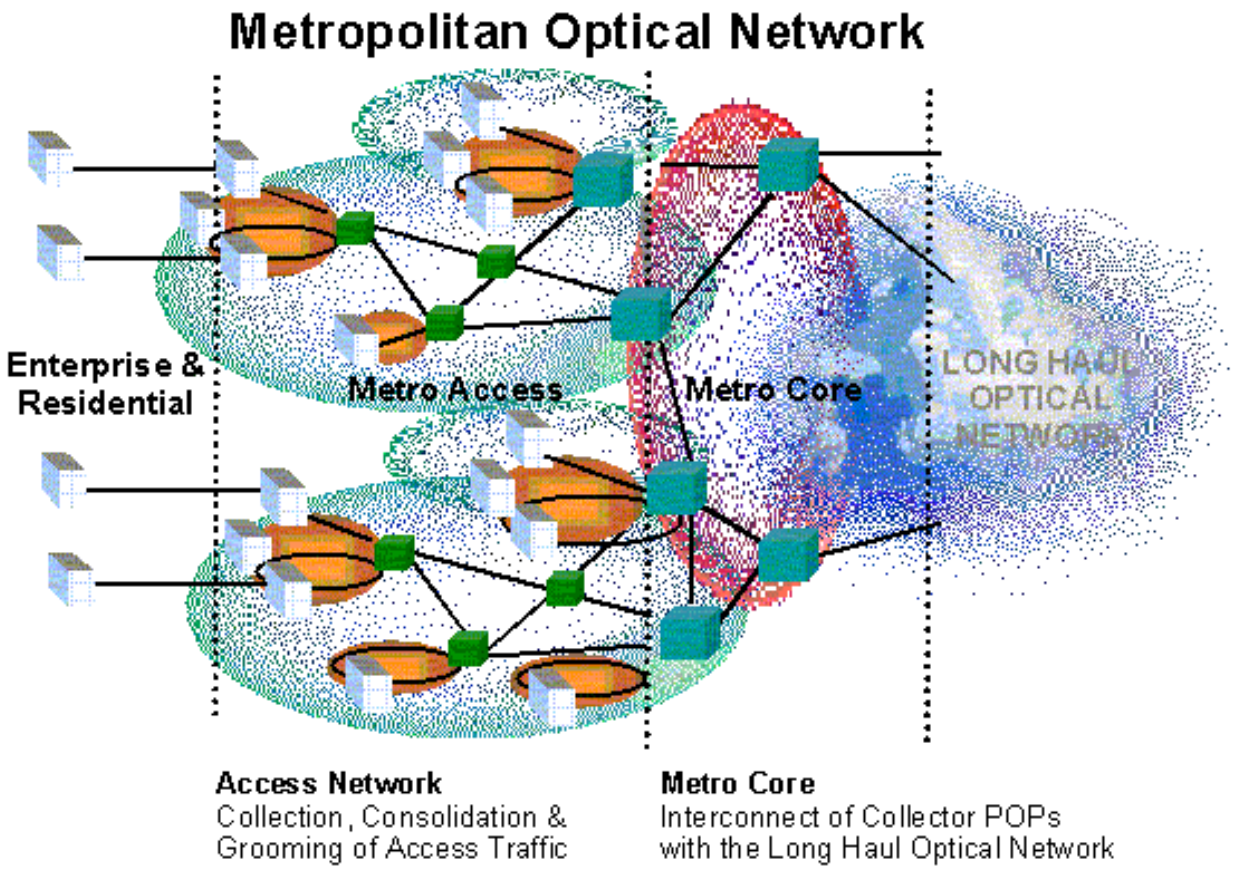

FIGURE 5-2/OTNT: Possible Relationship of MON and LHON

5.4 Ethernet Frames over Transport

Ethernet is today the dominant LAN technology in the private and enterprise sector. It is defined by a set of IEEE 802 standards. Emerging multi-protocol/multi-service Ethernet services are also offered over public transport networks. Public Ethernet services and Ethernet frames over transport standards and implementation agreements are being debated in the ITU-T and other organizations. Specifically, the ITU-T SG15 is focused on developing Recommendations related to the support and definition of Ethernet services over traditional telecommunications transport, such as PDH, SDH, and OTN. Ethernet can be described in the context of three major components: *services aspects*, *network layer*, and *physical layer*. This description is meant to provide a brief overview of Public Ethernet considering each of the above aspects.

The Public Ethernet *services aspects* (for service providers) include the different service markets, topology options, and ownership models. Public Ethernet services are defined to a large extent by the type(s) of topologies used and ownership models employed. The topology options can be categorized by the three types of services they support: Line services, LAN services and Access services. Line services are point-to-point in nature and include services like Ethernet private and virtual lines. LAN services are multi-point-to-multi-point (such as virtual LAN services). Access services are of hub-and-spoke nature and enable single ISP/ASP to serve multiple, distinct, customers. (Due to the similar aspects from a public network perspective, Line and Access services may be essentially the same.)

The services can be provided with different service qualities. A circuit switched technology like SDH provides always a guaranteed bit rate service while a packet switched technology like MPLS can provide various service qualities from best effort traffic to a guaranteed bit rate service. Ethernet services can be provided for the Ethernet MAC layer or Ethernet physical layer.

The Ethernet *network layer* is the Ethernet MAC layer that provides end-to-end transmission of Ethernet MAC frames between Ethernet end-points of individual services, identified by their MAC addresses. Ethernet MAC layer services can be provided as Line, LAN and Access services over circuit switched technologies like SDH VCs and OTN ODUs or over packet switched technologies like MPLS and RPR. For the Ethernet LAN service Ethernet MAC bridging might be performed within the public transport network in order to forward the MAC frames to the correct destination. Ethernet MAC services can be provided at any bit rate. They are not bound to the physical data rates (i.e. 10 Mbit/s, 100 Mbit/s, 1 Gbit/s) defined by IEEE.

IEEE has defined a distinct set of *physical layer* data rates for Ethernet with a set of interface options (electrical or optical). An Ethernet physical layer service transports such signals transparently over a public transport network. Examples are the transport of a 10 Gbit/s Ethernet WAN signal over an OTN or the transport of a 1 Gbit/s Ethernet signal over SDH using transparent GFP mapping. Ethernet physical layer services are point-to-point only and are always at the standardized data rates. They are less flexible compared to Ethernet MAC layer services, but offer lower latencies.

6. OTNT Correspondence and Liaison Tracking

6.1 OTNT Related Contacts

The ITU - Telecommunications Standardization Sector (ITU-T) maintains a strong focus on global OTNT standardization. It is supported by other organizations that contribute to specific areas of the work at both the regional and global levels. Below is a list of the most notable organizations recognised by ITU-T and the contact points for more information about their activity.

TABLE 6-1/OTNT: Contacts for OTNT Related Standards Organizations and Fora

Organization	Web Homepage	Contact	Status/Notes
ITU-T SG4 Telecommunication management, including TMN	http://www.itu.int/ITU-T/studygroups/com04/index.html	Mr. David J. Sidor Nortel Networks (USA) 4008 East Chapel Hill-Nelson Highway MS D15000B6 Research Triangle Park North Carolina 27709 USA Tel: +1 919 997 3628 Fax: +1 919 991 7085 Email: djsidor@nortelnetworks.com	
ITU-T Working Party 1/4 Designations, Performance and Test equipment)		Mr. Wolfgang Miller (Acting) Acterna Germany GmbH Muehleweg 5 D-72800 Eningen Germany Tel.: +49 7121 86 1328 Fax: +49 7121 86 2029 Email: wolfgang.miller@acterna.com	
ITU-T Q.3/4(WP1) Transport network and service operations procedures for performance and fault management		Leen Mak Lucent Technologies Nederland B.V. Larenseweg 50 1221 CN Hilversum The Netherlands Tel. +31 35 687 4143 Fax. +31 35 687 5833 E-mail: lmak@lucent.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q.4/4(WP1) Test and measurement techniques and instrumentation for use on telecommunications systems and their constituent parts		Wolfgang Miller Acterna Germany GmbH Mühleweg 5, D-72800 Eningen Germany Tel. +49 7121 861328 Fax. +49 7121 862029 E-mail : wolfgang.miller@acterna.com	
ITU-T WP3/4 Telecommunications management information models and protocols		Nobuo Fujii NTT Laboratories 1-1 Hikarino-oka Yokosuka-shi, 239-0847 JAPAN Tel.: +81-46 859 3510 Fax.: +81 46 855 1282 E-mail: fujii.nobuo@lab.ntt.co.jp	Oct-Nov03 SG4 meeting decided to combine previous WP3 and WP4.
ITU-T Q12/4(WP3) Management interface methodology and infrastructure management information models		Knut Johannessen Telenor Telecom Solution/N.ELA Pb. 6701 St. Olavsplass N-0130 OSLO NORWAY Tel.: + 47 23 25 09 29 Fax.: + 47 23 25 05 06 E-mail: knut-hakon.johannessen@telenor.com	M.3100 series: Information Models, M.3020: TMN methodology

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q14/4(WP3) Application specific management information models		Lakshmi Raman Radisys 5445 NW Dawson Creek DRIVE Hillsboro CA 97124 USA Tel.: +1 503 615 1751 E-mail: lakshmi.raman@radisys.com	Q.834 series: BPON management. Q.837 series: SDH-DLC management Q.83X series: EPON management
ITU-T Q18/4(WP3) Protocols for management interfaces		Lakshmi Raman (Acting) Radisys 5445 NW Dawson Creek DRIVE Hillsboro CA 97124 USA Tel.: +1 503 615 1751 E-mail: lakshmi.raman@radisys.com	Q.811, Q.812: TMN protocols

Organization	Web Homepage	Contact	Status/Notes
ITU-T SG13 Multi-protocol and IP-based networks and their internetworking	http://www.itu.int/ITU-T/com13/index.html	Chairman: Mr. B.W. Moore Lucent Technologies 6 Scott Drive Colchester Essex C03 4JD United Kingdom Tel.: +44 1206 76 23 35 Fax: +44 1206 76 23 36 E-mail: moore@bwmc.demon.co.uk	
ITU-T Working Party 2/13 Architectures and Internetworking Principles		Chairman: Mr. C.-S. Lee Korea Telecom Geneva Liaison Officer 64 Chemin Auguste Vilbert, 1218 Grand-Saconnex, Geneva Switzerland Tel: +41 22 788 44 60 Mobile: +41 79 248 2207 Fax: +41 22 788 44 61 E-mail: chae-sub.lee@ties.itu.int	
ITU-T Q.10/13(WP2) Core Network Architecture and Interworking Principles		Rapporteur: Mr. N. MORITA NTT 3-9-11, Midori-Cho, Musashino-Shi Tokyo 180-8585 Japan Tel.: +81 422 59 7464 Fax: +81 422 59 4646 Email: morita.naotaka@lab.ntt.co.jp	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Working Party 3/13 Multi-protocol Networks and Mechanisms		Chairman: Yoichi MAEDA Head, supervisor Access system Evolution Group & Business Access System Group Optical Access Systems Project Access Network Service Systems Laboratories NTT Corporation 1-6, Nakase, Mihama-ku, Chiba-shi, Chiba 261-0023 Japan Tel: +81 43 211 3274 Fax: +81 43 211 8282 E-mail: maeda@ansl.ntt.co.jp	
ITU-T Q.11/13(WP3) Mechanisms to Allow IP-Based Services Using MPLS to Operate in Public Networks		Rapporteur: Mr. M. CARUGI France Telecom FTR&D/DAC 2 avenue Pierre Marzin 22300 Lannion Cedex France Tel: +332 9605 3617 Fax: +332 9605 1852 Email: marco.carugi@francetelecom.com	
ITU-T Working Party 4/13 Network Performance and Resource Management		Chairman: Mr. N. Seitz US Dept. of Commerce NTIA/ITS.N 325 Broadway Boulder, Co. 80303-3328 United States Tel.: +1 303 497 3106 Fax: +1 303 497 5969 E-mail: neal@ntia.its.bldrdoc.gov	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q.8/13(WP4) Transmission Error and Availability Performance		Rapporteur: Mr. G. GARNER Lucent Technologies 101 Crawfords Corner Rd Room 3C-511 Homdel, NJ 07733 USA Tel: +1 732 949 0374 Fax: +1 732 949 3210 Email: gmgarner@lucent.com	
ITU-T SG15 Optical and other transport networks	http://www.itu.int/ITU-T/com15/index.html	Chairman: Mr. Yoichi MAEDA NTT Corporation 1-6, Nakase, Mihama-ku, Chiba-shi, Chiba 261-0023 Japan Tel: +81-43-211-3274 Fax: +81-43-211-8282	
ITU-T Working Party 1/15 Network Access		Chairman: Mr. Andrew Nunn BT 1, Andrew Close Leiston Suffolk, IPI6 4LE United Kingdom Tel: +44 1728 83 04 62 Fax: +44 1728 83 04 62 Email: andrew.nunn@btinternet.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q.2/15 Optical systems for access networks (WP1)		Rapporteur: Mr. Dave Faulkner BtexaCT Adastral Park Martlesham Heath Ipswich IP5 3RE United Kingdom Tel: +44 1473 64 2085 Fax: +44 1473 64 6445 Email: dave.faulkner@bt.com	
ITU-T Working Party 3/15 OTN Structure		Chairman: Mr. Stephen J. Trowbridge Lucent Technologies 11900 N. Pecos St. Room 31G56 Denver, Co. 80234 USA Tel: +1 303 920 6545 Fax: +1 303 920 6553 Email: sjtrowbridge@lucent.com	
ITU-T Q.3/15 General characteristics of optical transport networks (WP3)		Rapporteur:	
ITU-T Q.9/15 Transport equipment and network protection/restoration (WP3)		Rapporteur: Mr. Ghani Abbas Marconi Communications Ltd. Technology Drive Beeston, Nottingham United Kingdom Tel:+44 115 906 4036 Cellular: +44 410 370 367 Fax:+44 115 906 4346 E-mail: ghani.abbas@marconi.com	
ITU-T Q.11/15 Signal structures, interfaces and interworking for transport networks (WP3)		Rapporteur:	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q.12/15 Technology Specific Transport Network Architectures (WP3)		Rapporteur: Mr. Malcolm Betts Nortel Networks Canada Tel: +1 613 763 7860 Fax: +1 613 763 6608 email: betts01@nortelnetworks.com	
ITU-T Q.13/15 Network Synchronization and Time Distribution Performance (WP3)		Rapporteur: Jean Loup Ferrant Alcatel Centre de Villarceaux 91625 Nozay France Tel: +33 1 6449 2307 Fax: +33 1 6449 2956 Email: jean-loup.ferrant@alcatel.fr	
ITU-T Q.14/15 Network management for transport systems and equipment (WP3)		Rapporteur: Mr. Hing Kam Lam Lucent Technologies 101 Crawford Corner Road, Room 4C-616A Holmdel, NJ 07733 USA Tel: +1 732 949-8338 Fax: +1 732 949-5055 Email: hklam@lucent.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Working Party 2/15 OTN Technology		Chairman: Mr. Gastone Bonaventura Telecom Italia Via Crescenzio 19 00193 Rome Italy Cell: +39 335 382905 Tel: +39 06 3687 5740 Fax: +39 06 3687 5115 Email: gastone.bonaventura@telecomitalia.it	
ITU-T Q.5/15 Characteristics and test methods of optical fibres and cables (WP4)		Rapporteur: Mr. William B. Gardner OFS Fitel 2000 NE Expressway, 1H31 Norcross, GA, 30071 USA Tel: +1 770 798 2674 Fax: +1 770 798 4654 Email: wbgardner@ofsoptics.com	
ITU-T Q.6/15 Characteristics of optical systems for terrestrial transport networks (WP4)		Rapporteur: Mr. Jerry Shrimpton Ciena Corporation USA P.O. Box 208 Evergreen, CO 80437 USA Tel: +1 303 674 0981 Fax: +1 303 674 0982 Email: shrimpton@worldnet.att.net	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q.7/15 Characteristics of optical components and subsystems (WP4)		Rapporteur: Mr. James Matthews III Corning Inc. 8 E. Denison Pkwy Corning, NY M831 USA Tel: +1 607 974 7608 Fax: +1 607 974 4941 Email: matthewsje@corning.com	
ITU-T Q.8/15 Characteristics of optical fibre submarine cable systems (WP4)		Rapporteur: Mr. Masaharu Ohashi NTT Access Network Service Systems Labs 1-7-1, Hanabatake, Tsukuba, Ibaraki, 306-0805 Japan Tel:+81 29 287 7263 Fax:+81 29 287 7389 E-mail: ohashi@ansl.ntt.co.jp	
ATIS - Alliance for Telecommunications Standards	http://www.atis.org		
OPTXS - Optical Transport and Synchronization Committee	http://www.atis.org/0240/index.asp	Chair: Mr. Ken Biholar Alcatel USA Inc. 1000 Coit Road, MS PB7-026 Plano, Texas 75075 Tel: +1 972 477-9148 Fax: +1 972 519-2460 ken.biholar@alcatel.com	
OPTXS-SYNC - Synchronization Subcommittee	http://www.atis.org/0240/sync.asp	Chair: Mr. Adam Wertheimer Telcordia Technologies 100 North Rd Chester, NJ 07930 Tel: (973) 829-2635 Fax: (973) 829-2622 E-mail: adam.wertheimer@telcordia.com	

Organization	Web Homepage	Contact	Status/Notes
OPTXS-OHI - Optical Hierarchical Interfaces Subcommittee	http://www.atis.org/0240/ohi.asp	Chair: Mr. Tobey Trygar 331 Newman Springs Rd Rm 2X306 Red Bank, NJ 07701 Phone: (732) 758-5399 Fax: (732) 578-4344 ttrygar@telcordia.com	
TIA - Telecommunications Industry Association	http://www.tiaonline.org	Chairman of the Board of Directors: Ed Kientz Benner-Nawman, Inc. 3450 Sabin Brown Rd. Wickenburg, AZ 85390 Tel: (800) 528-5502 Fax: (520) 684-7041	
TIA FO-4 Fiber Optics	http://www.tiaonline.org/standards/sfg/committee.cfm?comm=fo%2D4&name=Fiber%20Optics	Chair: Mr. Steve Swanson, Corning Incorporated Tel. +1 607-974-4252 E-mail: swansonse@corning.com	
TIA FO-4.1 Single Mode Systems		Chair: Mr. Allen H. Cherin, OFS Tel. +1 770-798-2619 Fax +1 770-798-4654 E-mail: cherin@ofsoptics.com	
TIA FO-4.5 Optically Amplified Devices, Subsystems and Systems		Chair: Mr. James Matthews III Corning Inc. 8 E. Denison Pkwy Corning, NY M831 USA Tel: +1 607 974 7608 Fax: +1 607 974 4941 Email: matthewsje@corning.com	

Organization	Web Homepage	Contact	Status/Notes
IEC - International Electrotechnical Commission	http://www.iec.ch/		
TC86: Fibre Optics	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=e&wwwprog=dirdet.p&progdb=db1&committee=TC&number=86	Chairman: Dr. Umberto ROSSI Sirti S.p.A. Via Stamira d'Ancona 9 IT - 20127 MILANO, MI ITALY Tel: +39 02 9588 2327 Fax: +39 02 9586 2327 Email: u.rossi@sirti.it	
TC 86/WG 1: Terminology and symbology	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1577	Convenor: Mr. Guy PERROT Nexans 16, rue de Monceau FR - 75008 PARIS FRANCE Tel: +33 01 56 69 85 03 Fax: +33 01 56 69 86 30 Email: guy.perrot@nexans.com	
TC 86/WG 4: Fibre optic test equipment calibration	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1579	Convenor: Dr. Marc BRETON Exfo E.O. Engineering Inc. 465 Godin Ave CA - VANIER QC G1M 3G7 CANADA Tel: +1 418 683 0913 Fax: +1 418 683 8073 Email: marc.breton@exfo.com	
Subcommittee 86A: Fibres And Cables	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirdet.p&committee=SC&number=86A	Chairman: Dr. Günter H. ZEIDLER Erikastrasse 3A DE - 82110 GERMERING GERMANY Tel: +49 89 841 24 68 Fax: +49 89 840 06 301 E-mail: gunter.zeidler@t-online.de	

Organization	Web Homepage	Contact	Status/Notes
SC 86A/WG 1: Fibres and associated measuring methods	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1418	Convenor: Mr. Gerard KUYT Draka Fibre Technology BV PO Box 1442 NL – Eindhoven 5602 BK Netherlands Tel: +31 40 2958 705 Fax: +31 40 2958 710 E-mail: g.kuyt@drakafibre.com	
SC 86A/WG 3: Cables	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1419	Convenor: Mr. Arthur J. WILLIS BICC Brand-Rex Ltd. Helsby GB - WARRINGTON WA6 0DJ UNITED KINGDOM Tel: +44 1928 728 268 Fax: +44 1928 728 317 E-mail: awillis@brand-rex.com	
Subcommittee 86B: Fibre Optic Interconnecting Devices And Passive Components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirdet.p&committee=SC&number=86B	Chairman: Mr. B.G. LEFEVRE AT & T Network Cable Systems Room 2B33 2000 NE Expressway US - NORCROSS, GA 30071 UNITED STATES OF AMERICA Tel: +1 770 448 4322 Fax: +1 770 798 2690 E-mail: blefevre@bellsouth.net	

Organization	Web Homepage	Contact	Status/Notes
SC 86B/WG 4: Standard tests and measurement methods for fibre optic interconnecting devices and passive components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1106	Convenor: Mr. Tom BOLHAAR Tyco Electronics BV PO Box 288 NL - 5201 AG DEN BOSCH NETHERLANDS Tel: +31 73 624 6453 Fax: +31 73 624 6917 E-mail: t.bolhaar@tycoelectronics.com	
SC 86B/WG 5: Reliability of fibre optic interconnecting devices and passive components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1107	Convenor: Mr. David MAACK JDS Uniphase 1985 Blue Hills Avenue US - WINDSOR, CONNECTICUT 06095 UNITED STATES OF AMERICA Tel: +1 860-731-4952 Fax: +1 860-731-4012 E-mail: david.maack@jdsu.com	
SC 86B/WG 6: Standards and specifications for fibre optic interconnecting devices and related components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1108	Convenor: Mr. Philip LONGHURST LEMO Fibre Optics R&D Riverside Business Centre Shoreham by Sea GB - WEST SUSSEX BN43 6RE UNITED KINGDOM Tel: +44 1273 466 927 Fax: +44 1273 466 921 E-mail: plonghurst@lemo.com	

Organization	Web Homepage	Contact	Status/Notes
SC 86B/WG 7: Standards and specifications for fibre optic passive components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1658	Convenor: Dr. Andre GIRARD EXFO E.O. Engineering Inc. 400 Godin Avenue CA - VANIER, QUEBEC G1M 2K2 CANADA Tel: +1 418 683 0211 Fax: +1 418 683 2170 Email: andre.girard@exfo.com	
Subcommittee 86C: Fibre Optic Systems And Active Devices	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirdet.p&committee=SC&number=86C	Chairman: Dr. Pietro M. DI VITA Telecom Italia Lab Via G. Reiss Romoli 274 IT - 10148 TORINO ITALY Tel: +39 011 228 5278 Fax: +39 011 228 5840 E-mail: p.divita@tin.it	
SC 86C/WG 1: Fibre optic communication systems and sub-systems	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=914	Convenor: Mr. Thomas A. Hanson Corning Inc. 1 Riverfront Plaza, MP-HQ-W2-03 US – CORNING, NY 14831 UNITED STATES OF AMERICA Tel: +1 607 974 4530 Fax: +1 607 974 4941 E-mail: hansonta@corning.com	
SC 86C/WG 3: Optical amplifiers	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1580	Convenor: Mr. Haruo OKAMURA Corning International 1-14-14, Akasaka, Minato-ku JP - TOKYO 107-0052 JAPAN Tel: +81 3 3586 1398 Fax: +81 3 3587 0906 E-mail: okamurah@corning.com	

Organization	Web Homepage	Contact	Status/Notes
SC 86C/WG 4: Fibre optic active components and devices	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1653	Convenor: Mr. Junichi YOSHIDA Chitose Inst. of Science & Technology 758-65, Bibi, Chitose-shi JP - HOKKAIDO 066-8655 JAPAN Tel: +81 123 27 6047 Fax: +81 123 27 6047 E-mail: yoshi@yoshiv0.spub.ac.jp	
SC 86C/WG 5: Dynamic modules	http://www.iec.ch/cgi-bin/procgi.pl/www/iecww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=2605	Convenor: Mr. Pin SU DiCon Fiberoptics 1689 Regatta Blvd. US - RICHMOND, CA 94804 UNITED STATES OF AMERICA Tel: +1 510 620 5315 Fax: +1 510 620 4100 Email: psu_std@yahoo.com	
IETF - Internet Engineering Task Force			
IETF Routing Area	http://www.ietf.org/html.charters/wg-dir.html#Routing Area	Area Director(s): Mr. Bill Fenner <fenner@research.att.com> Mr. Alex Zinin <zinin@psg.com>	
IETF Common Control and Measurement Plane (ccamp)	http://www.ietf.org/html.charters/ccamp-charter.html	Chair(s): Mr. Kireeti Kompella <kireeti@juniper.net> Mr. Adrian Farrel <adrian@olddog.co.uk>	

Organization	Web Homepage	Contact	Status/Notes
IETF Sub-IP Area	http://www.ietf.org/html.charters/wg-dir.html#Sub-IP_Area	Area Director(s): Mr. Bert Wijnen <bwijnen@lucent.com> Mr. Alex Zinin <zinin@psg.com>	
IETF IP over Optical (ipo)	http://www.ietf.org/html.charters/ipo-charter.html	Chair(s): Mr. James Luciani <james_luciani@mindspring.com> Mr. Daniel Awduche <awduche@movaz.com>	
IETF Transport Area	http://www.ietf.org/html.charters/wg-dir.html#Transport Area	Area Director(s): Ms. Allison Mankin <mankin@psg.com> Mr. Jon Peterson <jon.peterson@neustar.biz>	
Pseudo Wire Emulation Edge to Edge (pwe3)	http://www.ietf.org/html.charters/pwe3-charter.html	Chair(s): Mr. Stewart Bryant <stbryant@cisco.com> Mr. Danny McPherson <danny@tcb.net>	
IEEE - Institute of Electrical & Electronics Engineers		President: Michael Adler Email: president@ieee.org	
IEEE Standards Association	http://standards.ieee.org	Chair: Mr. Gerald Peterson E-mail: ghpeterson@ieee.org	
IEEE 802 LAN/MAN Standards Committee	http://www.ieee802.org/groups/802/index.html	Chair: Mr. Paul Nikolich E-mail: p.nikolich@ieee.org	
IEEE 802.3 CSMA/CD (ETHERNET) Working Group	http://www.ieee802.org/3/	Chair: Mr. Bob Grow E-mail: bob.grow@intel.com	

Organization	Web Homepage	Contact	Status/Notes
IEEE 802.3ah Ethernet in the First Mile Task Force	http://www.ieee802.org/3/efm/	Chair: Mr. Howard Frazier E-mail: millardo@dominetsystems.com	
IEEE 802.17 Resilient Packet Ring Working Group	http://www.ieee802.org/17/	Chair: Mr. Mike Takefman E-mail: tak@cisco.com	
Optical Internetworking Forum (OIF) Technical Committee	http://www.oiforum.com/	Steve Joiner Ignis Optics Phone: (408) 869-8442 Fax: E-mail: steve.joiner@ignisoptics.com	
OIF Architecture Working Group		Chair: Jim Jones Alcatel USA 3400 W. Plano Pkwy. M/S - PB6- OLXDV Plano, TX 75075 TEL. 972-519-2744 Jim.D.Jones1@usa.alcatel.com	
OIF Carrier Working Group		Chair: John Strand AT&T Optical Networks Research Dept. Tel: +1 732 420 9036 Fax: +1 732 345 3036 E-mail: jls@research.att.com Temporary Address: 267 Cory Hall U. of California Berkeley, Ca. 94720 Tel. +1 510 642-9719 jls@photonics.eecs.berkeley.edu	

Organization	Web Homepage	Contact	Status/Notes
OIF OAM&P Working Group		Chair: Dr. Douglas N. Zuckerman Senior Research Scientist Telcordia Technologies, Inc. 331 Newman Springs Road Red Bank, NJ 07701 Tel: +1 732 758 5108 Fax: +1 732 758 4372 Email: w2xd@research.telcordia.com	
OIF Physical & Link Layer (PLL) Working Group		Chair: Mike Lerer Avici Systems Tel: +1 978 964 2058 Fax: +1 978 964 2100 E-mail: mlerer@avici.com	
OIF Signaling Working Group		Chair: Bala Rajagopalan Tellium Tel: +1 732 923 4237 Fax: +1 732 923 9804 E-mail: BRaja@tellium.com	

Organization	Web Homepage	Contact	Status/Notes
ATM Forum	http://www.atmforum.com/	President: Marlis Humphrey Harris Corporation 1025 W. NASA Blvd. Melbourne Beach, FL 32951 USA Phone:+1.321.727.9374 FAX: +1.321.727.9644 Email:mhumph03@harris.com	
Metro Ethernet Forum (MEF) Technical Committee	http://www.metroethernetforum.org/	Technical Committee Chairs: Mr. Paul Bottorff Nortel Networks, Inc. 4655 Great America Parkway, SC100-04 Santa Clara, CA 95054 USA Phone:+1.408-495-3365 Email:pbottorf@nortelnetworks.com Mr. Bob Klessig Cisco Systems, Inc 170 West Tasman Dr. San Jose, CA 95134 USA Phone: +1.408-853-5194 e-mail: bklessig@cisco.com	

7. Overview of existing standards and activity

With the rapid progress on standards and implementation agreements on OTNT, it is often difficult to find a complete list of the relevant new and revised documents. It is also sometimes difficult to find a concise representation of related documents across the different organizations that produce them. This section attempts to satisfy both of those objectives by providing concise tables of the relevant documents.

7.1 New or Revised OTNT Standards or Implementation Agreements

Many documents, at different stages of completion, address the different aspect of the OTNT space. The table below lists the known drafts and completed documents under revision that fit into this area. The table does not list all established documents which might be under review for slight changes or addition of features.

Three major families of documents (and more) are represented by fields in the following table, SDH/SONET, OTN Transport Plane, and ASON Control Plane. All of the recommendations and standards of these three different families are included in tables in later sections of this document.

TABLE 7-1/OTNT: OTNT Related Standards and Industry Agreements

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.3/4)	M.2401 (M.24otn)	Error Performance Limits and Procedures for Bringing-Into-Service and Maintenance of multi-operator international paths and sections within Optical Transport Networks	12/2003
ITU-T (Q.4/4)	O.201	Q-factor test equipment to estimate the transmission performance of optical channels	07/2003
ITU-T (Q.8/13)	G.8201 (G.optperf)	Error performance parameters and objectives for multi-operator international paths within the Optical Transport Network (OTN)	09/2003
ITU-T (Q.10/13)	G.807/Y.1302	Requirements for Automatic Switched Transport Networks (ASTN)	07/2001
ITU-T (Q.2/15)	G.983.1	Broadband optical access systems based on Passive Optical Networks (PON)	10/1998
ITU-T (Q.2/15)	G.983.1 (corrig. 1)	Broadband optical access systems based on Passive Optical Networks (PON)	07/1999
ITU-T (Q.2/15)	G.983.1 (amend.1)	High speed optical access systems based on Passive Optical Network (PON) techniques	11/2001
ITU-T (Q.2/15)	G.Imp983.1	Implementor's Guide for G.983.1	10/2003
ITU-T (Q.2/15)	G.983.2	ONT management and control interface specification for ATM PON	06/2002

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.2/15)	G.983.2 (amend. 1)	ONT management and control interface specification for ATM PON	03/2003
ITU-T (Q.2/15)	G.Imp983.2	Implementor's Guide for G.983.2	01/2003
ITU-T (Q.2/15)	G.983.3	A broadband optical access system with increased service capability by wavelength allocation	03/2001
ITU-T (Q.2/15)	G.983.4 (ex G.983.dba)	A Broadband Optical Access System with increased service capability using Dynamic Bandwidth Assignment	11/2001
ITU-T (Q.2/15)	G.983.4 (Amend. 1)	New Annex A - Performance monitoring parameters	12/2003
ITU-T (Q.2/15)	G.983.5 (ex G.983.sur)	A Broadband Optical Access System with enhanced survivability	01/2002
ITU-T (Q.2/15)	G.983.6 (G.983.omci. sur)	ONT management and control interface specifications for B-PON system with protection features	06/2002
ITU-T (Q.2/15)	G.983.7 (G.983.omci. dba)	ONT management and control interface specification for dynamic bandwidth assignment (DBA) B-PON system	11/2001
ITU-T (Q.2/15)	G.983.8 (G.983.omci. ns)	B-PON OMCI support for IP, ISDN, Video, VLAN Tagging, VC Cross-Connections and other select functions	03/2003
ITU-T (Q.2/15)	G.983.omci.x dsl	B-PON OMCI for xDSL and 802.11 interfaces	2004 target
ITU-T (Q.2/15)	G.984.omci	Gigabit-capable Passive Optical Networks (GPON): ONT Management and Control Interface specification	2004 target
ITU-T (Q.2/15)	G.984.1 (G.gpon.gsr)	Gigabit-capable Passive Optical Networks (GPON): General characteristics	03/2003
ITU-T (Q.2/15)	G.984.2 (G.gpon.pmd)	Gigabit-capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) layer specification	03/2003
ITU-T (Q.2/15)	G.984.3 (G.gpon.tc)	Gigabit-capable Passive Optical Networks (GPON): Transmission Convergence layer specification	02/2003 pre-publ.
ITU-T (Q.2/15)	G.985 (G.ptp)	Point-to-Point optical access system	03/2003

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.2/15)	G.gpon.omci	Gigabit-capable Passive Optical Networks (GPON): ONT Management and Control interface specification	2003 target
ITU-T (Q.9/15)	G.783	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	02/2004 pre-publ.
ITU-T (Q.9/15)	G.798	Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks	01/2002
ITU-T (Q.9/15)	G.798 (Amend.1)	Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks	06/2002
ITU-T (Q.9/15)	G.808.1	Generic protection switching - Linear trail and subnetwork protection	12/2003 pre-publ.
ITU-T (Q.9/15)	G.841	Types and characteristics of SDH network protection architectures	10/1998
ITU-T (Q.9/15)	G.841 (Corrig. 1)	Types and characteristics of SDH network protection architectures	08/2002
ITU-T (Q.9/15)	G.842	Interworking of SDH network protection architectures	04/1997
ITU-T (Q.9/15)	G.873.1	Optical Transport network (OTN) - Linear Protection	03/2003
ITU-T (Q.9/15)	G.873.1 (Errata 1)	Optical Transport network (OTN) - Linear Protection	10/2003
ITU-T (Q.11/15)	G.707/Y.1322	Network node interface for the synchronous digital hierarchy (SDH)	12/2003 pre-publ.
ITU-T (Q.11/15)	G.709/Y.1331	Interfaces for the optical transport network (OTN)	03/2003
ITU-T (Q.11/15)	G.709/Y.1331 (addendum 1)	Interfaces for the optical transport network (OTN)	12/2003 pre-publ.
ITU-T (Q.11/15)	G.7041/Y.1303 (g.gfp)	Generic framing procedure (GFP)	12/2001
ITU-T (Q.11/15)	G.7041/Y.1303 (Amend. 1)	Generic framing procedure (GFP)	06/2002
ITU-T (Q.11/15)	G.7041/Y.1303 (Amend.2)	Generic framing procedure (GFP)	03/2003
ITU-T (Q.11/15)	G.7041/Y.1303 (Corrig. 1)	Generic framing procedure (GFP)	03/2003

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.11/15)	G.7041/Y.1303 (Err. 1)	Generic framing procedure (GFP)	07/2003
ITU-T (Q.11/15)	G.7042/Y.1305 (g.lcas)	Link capacity adjustment scheme (LCAS) for virtual concatenated signals	11/2001
ITU-T (Q.11/15)	G.7042/Y.1305 (Amend. 1)	Link capacity adjustment scheme (LCAS) for virtual concatenated signals	06/2002
ITU-T (Q.11/15)	G.7042/Y.1305 (Corrig. 1)	Link capacity adjustment scheme (LCAS) for virtual concatenated signals	03/2003
ITU-T (Q.12/15)	G.872	Architecture of optical transport networks	11/2001
ITU-T (Q.12/15)	G.872 (Amend. 1)	Architecture of optical transport networks	12/2003
ITU-T (Q.12/15)	G.8080/Y.1304 (g.ason)	Architecture for the Automatic Switched Optical Network	11/2001
ITU-T (Q.12/15)	G.8010/Y.1306 (g.ethna)	Ethernet Layer Network Architecture	02/2004 pre-publ.
ITU-T (Q.12/15)	G.8012/Y.1308(g.eota)	Ethernet over Transport Architecture	2004 target
ITU-T (Q.12/15)	G.esm	Ethernet over Transport - Ethernet Service Multiplexing	
ITU-T (Q.12/15)	G.8011.1/Y.1307.1 (g.ethsrv.1)	Ethernet over Transport - Ethernet Service Characteristics - Ethernet Private Line	2004 target
ITU-T (Q.12/15)	G.smc	Service Management Channel - private line	
ITU-T (Q.13/15)	G.813	Timing Characteristics of SDH Equipment Slave Clocks (SEC)	03/2003
ITU-T (Q.13/15)	G.8251 (g.otnjit)	The Control of Jitter and Wander within the Optical Transport Network (OTN)	11/2001
ITU-T (Q.13/15)	G.8251 (Amend. 1)	The Control of Jitter and Wander within the Optical Transport Network (OTN)	06/2002
ITU-T (Q.13/15)	G.8251 (corrig. 1)	The Control of Jitter and Wander within the Optical Transport Network (OTN)	06/2002
ITU-T (Q.14/15)	G.874	Management aspects of the optical transport network element	11/2001
ITU-T (Q.14/15)	G.874.1	Optical Transport Network (OTN) Protocol-Neutral Management Information Model For The Network Element View	01/2002

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.14/15)	G.875	Optical transport network (OTN) management information model for the network element view	
ITU-T (Q.14/15)	G.7710/Y.1701 (g.cemr)	Common equipment management function requirements	11/2001
ITU-T (Q.14/15)	G.7713/Y.1704 (g.dcm)	Distributed call and connection management (DCM)	12/2001
ITU-T (Q.14/15)	G.7713.1/Y.1704.1	Distributed Call and Connection Management – PNNI Implementation	03/2003
ITU-T (Q.14/15)	G.7713.2/Y.1704.2	Distributed Call and Connection Management – GMPLS RSVP-TE Implementation	03/2003
ITU-T (Q.14/15)	G.7713.3/Y.1704.3	Distributed Call and Connection Management – GMPLS CR-LDP Implementation	03/2003
ITU-T (Q.14/15)	G.7712/Y.1703 (g.dcn)	Architecture and specification of data communication network	03/2003
ITU-T (Q.14/15)	G.7714/Y.1705 (g.disc)	Generalized automatic discovery techniques	11/2001
ITU-T (Q.14/15)	G.7714.1/Y.1705.1	Protocol for automatic discovery in SDH and OTN networks	04/2003
ITU-T (Q.14/15)	G.7715/Y.1706 (g.rtg)	Architecture and requirements for routing in automatically switched optical networks	06/2002
ITU-T (Q.14/15)	G.7715.1/Y.1706.1	ASON routing architecture and requirements for link state protocols	02/2004
ITU-T (Q.14/15)	G.7716/Y.1707 (g.lcs)	[ASTN link connection status]	
ITU-T (Q.14/15)	G.7717/Y.1708(g.cac)	[common access control]	
ITU-T (Q.5/15)	G.650.1	Definitions and test methods for linear, deterministic attributes of single-mode fibre and cable	06/2002
ITU-T (Q.5/15)	G.650.2	Definitions and test methods for statistical and non-linear attributes of single-mode fibre and cable	06/2002
ITU-T (Q.5/15)	G.652	Characteristics of a single-mode optical fibre cable	03/2003
ITU-T (Q.5/15)	G.653	Characteristics of a dispersion-shifted single-mode optical fibre cable	12/2003

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.5/15)	G.654	Characteristics of a cut-off shifted single-mode optical fibre cable	06/2002
ITU-T (Q.5/15)	G.655	Characteristics of a non-zero dispersion shifted single-mode optical fibre cable	03/2003
ITU-T (Q.6/15)	G.691	Optical interfaces for single channel STM-64, STM-256 systems and other SDH systems with optical amplifiers	10/2000
ITU-T (Q.6/15)	G.692	Optical interfaces for multichannel systems with optical amplifiers	10/1998
ITU-T (Q.6/15)	G.692 (Corrig. 1)	Optical interfaces for multichannel systems with optical amplifiers – Corrigendum [referencing G.694.1 for frequency grid]	06/2002
ITU-T (Q.6/15)	G.693 (g.vsr)	Optical interfaces for intra-office systems	11/2001
ITU-T (Q.6/15)	G.694.1 (g.wdm.1)	Spectral grids for WDM applications: DWDM frequency grid	06/2002
ITU-T (Q.6/15)	G.694.2 (G.wdm.2)	Spectral grids for WDM applications: CWDM wavelength grid	06/2002
ITU-T (Q.6/15)	G.695 (G.capp)	Optical interfaces for Coarse Wavelength Division Multiplexing applications	02/2004
ITU-T (Q.6/15)	G.696.1 (G.IaDI)	Intra-Domain DWDM applications	2004 target
ITU-T (Q.6/15)	G.697 (G.optmon)	Optical monitoring for DWDM system	2004 target
ITU-T (Q.6/15)	G.957	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy	07/99
ITU-T (Q.6/15)	G.957 (Amend. 1)	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy	12/2003
ITU-T (Q.6/15)	G.959.1	Optical transport network physical layer interfaces	02/2001
ITU-T (Q.6/15)	G.Sup.39 (Sup.dsn)	Optical system design and engineering considerations	10/2003 pre-publ.
ITU-T (Q.7/15)	G.671	Transmission characteristics of optical components and subsystems	06/2002
IETF (ccamp)	RFC 3471	Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description	

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	RFC 3472	Generalized Multi-Protocol Label Switching (GMPLS) Signaling Constraint-based Routed Label Distribution Protocol (CR-LDP) Extensions	
IETF (ccamp)	RFC 3473)	Generalized Multi-Protocol Label Switching (GMPLS)Signaling Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Extensions	
IETF (ccamp)	RFC 3609	Tracing Requirements for Generic Tunnels	
IETF (ccamp)	draft-ietf-ccamp-gmpls-sonet-sdh-08.txt	Generalized Multiprotocol Label Switching Extensions for SONET and SDH Control	
IETF (ccamp)	draft-ietf-ccamp-gmpls-architecture-07.txt	Generalized Multi-Protocol Label Switching Architecture	
IETF (ccamp)	draft-ietf-ccamp-lmp-10.txt	Link Management Protocol (LMP)	
IETF (ccamp)	draft-ietf-ccamp-gmpls-routing-09.txt	Routing Extensions in Support of Generalized Multi-Protocol Label Switching	
IETF (ccamp)	draft-ietf-ccamp-ospf-gmpls-extensions-12.txt	OSPF Extensions in Support of Generalized Multi-Protocol Label Switching	
IETF (ccamp)	draft-ietf-ccamp-lmp-mib-08.txt	Link Management Protocol Management Information Base	
IETF (ccamp)	draft-ietf-ccamp-lmp-wdm-03.txt	Link Management Protocol (LMP) for Dense Wavelength Division Multiplexing (DWDM) Optical Line Systems	
IETF (ccamp)	draft-ietf-ccamp-sdhsonet-control-02.txt	Framework for GMPLS-based Control of SDH/SONET Networks	

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	draft-ietf-ccamp-gmpls-g709-07.txt	Generalized MPLS Signalling Extensions for G.709 Optical Transport Networks Control	
IETF (ccamp)	draft-ietf-ccamp-gmpls-tc-mib-04.txt	Definitions of Textual Conventions for Generalized Multi-Protocol Label Switching (GMPLS) Management	
IETF (ccamp)	draft-ietf-ccamp-gmpls-lsr-mib-04.txt	Generalized Multiprotocol Label Switching (GMPLS) Label Switch Router Management Information Base	
IETF (ccamp)	draft-ietf-ccamp-gmpls-recovery-terminology-04.txt	Recovery (Protection and Restoration) Terminology for Generalized Multi-Protocol Label Switching (GMPLS)	
IETF (ccamp)	draft-ietf-ccamp-lmp-test-sonet-sdh-04.txt	SONET/SDH Encoding for Link Management Protocol (LMP) Test messages	
IETF (ccamp)	draft-ietf-ccamp-gmpls-overlay-03.txt	GMPLS RSVP Support for the Overlay Model	
IETF (ccamp)	draft-ietf-ccamp-gmpls-recovery-analysis-03.txt	Analysis of Generalized Multi-Protocol Label Switching (GMPLS)-based Recovery Mechanisms (including Protection and Restoration)	
IETF (ccamp)	draft-ietf-ccamp-gmpls-recovery-functional-02.txt	Generalized MPLS Recovery Functional Specification	

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	draft-ietf-ccamp-gmpls-ason-reqts-06.txt	Requirements for Generalized MPLS (GMPLS) Signaling Usage and Extensions for Automatically Switched Optical Network (ASON)	
IETF (ccamp)	draft-ietf-ccamp-rsvp-te-exclude-route-01.txt	Exclude Routes - Extension to RSVP-TE	
IETF (ccamp)	draft-ietf-ccamp-gmpls-rsvp-te-ason-01.txt	Generalized MPLS (GMPLS) RSVP-TE Signalling in support of Automatically Switched Optical Network (ASON)	
IETF (ccamp)	draft-ietf-ccamp-crankback-01.txt	Crankback Signaling Extensions for MPLS Signaling	
IETF (ccamp)	draft-ietf-ccamp-gmpls-egress-control-01.txt	GMPLS Signaling Procedure For Egress Control	
IETF (ccamp)	draft-ietf-ccamp-gmpls-alarm-spec-00.txt	GMPLS - Communication of Alarm Information	
IETF (ccamp)	draft-ietf-ccamp-gmpls-recovery-e2e-signaling-00.txt	RSVP-TE Extensions in support of End-to-End GMPLS-based Recovery	
IETF (ccamp)	draft-ietf-ccamp-tunproto-00.txt	Generic Tunnel Tracing Protocol (GTTP) Specification	
IETF (ipo)	Draft-ietf-ipo-impairments-05.txt	Impairments And Other Constraints On Optical Layer Routing	ipo working group concluded

Organisation (Subgroup responsible)	**Number**	**Title**	**Public. Date**
IETF (ipo)	Draft-ietf-ipo-framework-05.txt	IP over Optical Networks: A Framework	ipo working group concluded
IEEE 802.3	IEEE Std. 802.3-2002	Published IEEE P802.3 Working Group standards	
IEEE 802.3	IEEE Std. 802.3ae-2002	Published IEEE P802.3 Working Group standards	
IEEE 802.3ah	Draft	The 802.3ah Task Force Draft	
IEEE 802.17	Draft	The 802.17 Working Group Draft	
OIF	OIF-TL-01.1	Implementation Agreement for Common Software Protocol, Control Syntax, and Physical (Electrical and Mechanical) Interfaces for Tunable Laser Modules.	Now available
OIF	OIF-TLMSA-01.0	Multi-Source Agreement for CW Tunable Lasers.	Now available
OIF	OIF-UNI-01.0	User Network Interface (UNI) 1.0 Signaling Specification	Now available
OIF	OIF-CDR-01.0	Call Detail Records for OIF UNI 1.0 Billing	Now available
OIF	OIF-SEP-01.1	Security Extension for UNI and NNI	Now available
OIF	OIF-E-NNI-Sig-01.0	Intra-Carrier E-NNI Signaling Specification	Now available
OIF	OIF-SMI-01.0	Security Management Interfaces to Network Elements	Now available
OIF	OIF-VSR4-01.0	Very Short Reach (VSR) OC-192 Interface for Parallel Optics	Now available
OIF	OIF-VSR4-02.0	Serial OC-192 1310nm Very Short Reach (VSR) Interfaces	Now available
OIF	OIF-VSR4-03.1	Very Short Reach (VSR) OC-192 Four Fiber Interface Based on Parallel Optics	Now available
OIF	OIF-VSR4-04.0	Serial Shortwave Very Short Reach (VSR) OC-192 Interface for Multimode Fiber	Now available
OIF	OIF-VSR4-05.0	Very Short Reach (VSR) OC-192 Interface Using 1310 Wavelength and 4 and 11 dB Link Budgets	Now available

Organisation (Subgroup responsible)	Number	Title	Public. Date
OIF	OIF-VSR5-01.0	Very Short Reach Interface Level 5 (VSR-5): SONET/SDH OC-768 Interface for Very Short Reach (VSR) Applications	Now available

7.2 SDH & SONET Related Recommendations and Standards

The following table lists all the known documents specifically related to SDH and SONET.

TABLE 7-2/OTNT: SDH & SONET Recommendations & Industry Standards

	ITU-T Published or Draft (Revised) Recommendation	Published or Draft (Revised) ETS or EN	Published or Draft (Revised) ATIS/ANSI T1
Internet Document Source	http://www.itu.int/publications/itut.htm	http://www.etsi.org/getastandard/home.htm	http://www.atis.org/atis/docstore/index.asp
Physical Interfaces	G.703 (10/98) G.957 (06/99), Amd1(12/03) G.692 (10/98) K.41 (05/98) G.691 (04/00)	ETS 300 166 ETS 300 232, ETS 300 232(A1) ETS 300 166 (09/99)	T1.102-1993 (R1999) T1.105.06-2002 T1.416-1999 T1.416.01-1999 T1.416.02-1999 T1.416.03-1999
Network Architecture	G.805 (11/95), (03/00) G.803 (06/97), (03/00) I.322 (02/99)	ETR 114	T1.105.04-1995 (R2001)
Structures & Mappings	G.704 (10/98) G.707 (12/03) G.7041 (12/01), Amd1(06/02), Amd2(03/03), Corr1(03/03), Err1(07/03) G.7042 (11/01), Amd1(06/02), Corr1(03/03) G.708 (10/98) G.832 (10/98)	ETS 300 167 (08/93), (09/99) ETS 300 147 Ed.3 ETS 300 337 Ed.2	T1.105-2001 T1.105.02-2001
Equipment Functional Characteristics	G.664 (06/99) G.781 (06/99) G.783 (10/00), Corr1(03/01), Amd1(06/02), Corr2(03/03) G.958 (01/94) G.705 (04/00) G.806 (04/0)	EN 300 417-x-y (x=1-7,9 y=1-2) ETS 300 635 ETS 300 785 RE/TM-1042-x-1 (x=1-5) MI/TM-4048 (9712)	-
Laser Safety	G.664 (06/99)	-	-
Transmission Protection	G.841 (10/98), Corr1 (08/02) G.842 (04/97) G.808.1 (2003) M.2102 (03/00)	ETS 300 746 ETS 300 417-1-1 ETS 300 417-3-1 ETS 300 417-4-1 TS 101 009 TS 101 010 RE/TM-1042	T1.105.01-2001

	ITU-T Published or Draft (Revised) Recommendation	**Published or Draft (Revised) ETS or EN**	**Published or Draft (Revised) ATIS/ANSI T1**
		TR/TM-03070	
Equipment Protection	M.3100 Amendment	-	-
Restoration	-	DTR/TM-3076	-
Equipment Management	G.784 (06/99)	EN 301 167 EN 300 417-7-1 DE/TM-2210-3	-
Management Communications Interfaces	-		T1.105.04-1995 (R2001)
Information Model	G.773 (03/93) G.774 (09/92), Corr.1(11/96), (04/00) G.774.01 (11/94), Corr1(11/96), (04/00) G.774.02 (11/94), Corr1(11/96), (04/00) G.774.03 (11/94), Corr1(11/96), (04/00) G.774.04 (07/95), Corr1(11/96), (04/00) G.774.05 (07/95), Corr1(11/96), (04/00) G.774.06 (04/00) G.774.07 (11/96), (04/00) G.774.08 (04/00) G.774.09 (04/00) G.774.10 (04/00)	ETS 300 304 Ed.2 ETS 300 484 ETS 300 413 ETS 300 411 ETS 300 493 prEN 301 155	T1.119-1994 (R2001) T1.119.01-1995 (R2001) T1.119.02-1998 T1.245-1997 (R2003)
Network Management	G.831 (08/96), (03/97) T.50 (09/92) G.85x.y (11/96)	ETS 300 810	T1.204-1997
Error Performance [network level view]	G.826 (02/99) G.827 (02/00) G.827.1 (11/00) G.828 (02/00) G.829 (02/00) M.2101 (02/00) M.2101.1 (04/97) M.2102 (02/00) M.2110 (04/97) M.2120 (04/97), (02/00) M.2130 (02/00) M.2140 (02/00)	EN 301 167	T1.105.05-1994 T1.514-2001
Error Performance [equipment level view]	G.783 (02/04) G.784 (06/99)	EN 300 417-x-1 RE/TM-1042	-
Jitter & Wander Performance	G.813 (08/96) G.822 (1988) G.823 (03/93), (03/00) G.824 (03/93), (03/00) G.825 (03/93), (02/99)	EN 300 462-5-1 EN 302 084 (01/99) DEN/TM-1079 (05/98)	T1.105.03-1994 T1.105.03a-1995 T1.105.03b-1997

	ITU-T Published or Draft (Revised) Recommendation	Published or Draft (Revised) ETS or EN	Published or Draft (Revised) ATIS/ANSI T1
	G.783 (10/00), corr. O.171 (04/97) O.172 (03/99), (06/98)		
Components & Subsystems	-	-	-
Leased Lines	M.13sdh (02/00)	EN 301 164 EN 301 165	-
Synchronisation [Clocks & Network Architecture]	G.803 (06/97), (02/99) G.810 (08/96) G.811 (09/97) G.812 (06/98) G.813 (03/03)	EN 300 462-1 EN 300 462-2 EN 300 462-3 EN 300 462-4 EN 300 462-5 EN 300 462-6 EN 300 417-6-1 DEG/TM-01080 (03/99)	T1.101-1999 T1.105.09-1996 (R2002)
Test signals	O.150 O.181	-	-
Environment	-	ETS 300 019-1-0 ETS 300 019-1-1 ETS 300 019-1-2 ETS 300 019-1-3 ETS 300 019-1-3 A1 ETS 300 019-2-0 ETS 300 019-2-1 ETS 300 019-2-2 ETS 300 019-2-3 ETS 300 019-2-3 A1	-
Digital Video	-	ETS 300 814 TR 101 200	-
Power & Grounding	-	ETS 300 132-2 ETS 300 132-2 C1 ETS 300 253	-
Physical Design	-	ETS 300 119-1 ETS 300 119-3 ETS 300 119-4	-
EMC	-	ETS 300 386-1 EN 300 386-2 ETS 300 753	-

7.3 ITU-T Recommendations on the OTN Transport Plane

The following table lists all of the known ITU-T Recommendations specifically related to the OTN Transport Plane. Many also apply to other types of optical networks.

TABLE 7-3/OTNT: ITU-T Recommendations on the OTN Transport Plane

Topic	Title	Publ.*

Topic	Title	Publ.*
Definitions	**G.870** Definitions and Terminology for Optical Transport Networks (OTN)	2004
Framework for Recommendations	**G.871/Y.1301** Framework for Optical Transport Network Recommendations	10/00
Architectural Aspects	**G.872** Architecture of Optical Transport Networks	11/01
	G.872 Amend. 1 Architecture of Optical Transport Networks	12/03
	G.872 Living List	
Control Plane	ASTN/ASON recommendations are moved to specific ASTN/ASON standards page.	
Structures & Mapping	**G.709/Y.1331** Network node interface for the optical transport network (OTN)	03/03
	G.709/Y.1331 Addendum 1	12/03
	G.709 Living List	
	G.975 Forward Error Correction	10/00
Functional Characteristics	**G.681** Functional characteristics of interoffice long-haul line systems using optical amplifiers, including optical multiplexing	10/96
	G.798 Characteristics of optical transport network (OTN) equipment functional blocks	01/02
	G.798 Amendment 1	06/02
	G.798 Living List	
	G.806 Characteristics of transport equipment - Description Methodology and Generic Functionality	10/00
	G.7710/Y.1701 Common Equipment Management Requirements	11/01
Protection Switching		
	G.808.1 (G.gps) Generic protection switching - Linear trail and subnetwork protection	12/03
	G.873.1 Optical Transport network (OTN) - Linear Protection	03/03
	G.873.1 Errata 1 Optical Transport network (OTN) - Linear Protection	10/03
Management Aspects	**G.874** Management aspects of the optical transport network element	11/01
	G.874.1 Optical Transport Network (OTN) Protocol-Neutral Management Information Model For The Network Element View	01/02
	G.875 Optical Transport Network (OTN) management information model for the network element view	
Data Communication Network (DCN)	**G.7712/Y.1703** Architecture and specification of data communication network	03/03
	G.dcn living list	
Error Performance	**G.8201 (G.optperf)** Error performance parameters and objectives for multi-operator international paths within the Optical Transport Network (OTN)	09/03
	G.optperf living list	
	M.2401 (M.24otn) Error Performance Limits and Procedures for Bringing-Into-Service and Maintenance of multi-operator international paths and sections within Optical Transport Networks	12/03
Jitter & Wander Performance	**G.8251(G.otnjit)** The control of jitter and wander within the optical transport network (OTN)	11/01
	G.8251 Amendment 1 The control of jitter and wander within the optical transport network (OTN)	06/02

Topic	Title	Publ.*
	G.8251 Corrigendum 1 The control of jitter and wander within the optical transport network (OTN)	06/02
Physical-Layer Aspects	**G.664** General Automatic Power Shut-Down Procedures for Optical Transport Systems	06/99
	G.691 Optical Interfaces for single-channel SDH systems with Optical Amplifiers, and STM-64 and STM-256 systems	10/00
	G.692 Optical Interfaces for Multichannel Systems with Optical Amplifiers	10/98
	G.693 Optical interfaces for intra-office systems	11/01
	G.694.1 Spectral grids for WDM applications: DWDM frequency grid	06/02
	G.694.2 Spectral grids for WDM applications: CWDM wavelength grid	06/02
	G.695 Optical interfaces for Coarse Wavelength Division Multiplexing applications	2003
	G.696.1(G.IaDI) Intra-Domain DWDM applications	2004
	G.697(G.optmon) Optical monitoring for DWDM system	2004
	G.959.1 Optical Transport Networking Physical Layer Interfaces	02/01
	Sup.39 (Sup.dsn) Optical System Design and Engineering Considerations	2003
Fibres	**G.651** Characteristics of a 50/125 um multipmode graded index optical fibre cable	02/98
	G.652 Characteristics of a single-mode optical fibre cable	03/03
	G.653 Characteristics of a dispersion-shifted single mode optical fibre cable	12/03
	G.654 Characteristics of a cut-off shifted single-mode fibre cable	06/02
	G.655 Characteristics of a non-zero dispersion shifted single-mode optical fibre cable	03/03
Components & Sub-systems	**G.661** Definition and test methods for the relevant generic parameters of optical amplifier devices and subsystems	10/98
	G.662 Generic characteristics of optical fibre amplifier devices and subsystems	10/98
	G.663 Application related aspects of optical fibre amplifier devices and sub-systems	04/00
	G.671 Transmission characteristics of passive optical components	06/02

*Note: Dates with year only are expected publication dates. Those with month and date are actual pre-published document availability dates or final publication dates.

7.4 Standards on the ASTN/ASON Control Plane

The following table lists all of the known ITU-T Recommendations specifically related to the ASTN/ASON Control Plane.

[Editor's Note: add IETF and OIF documents to table?]

TABLE 7-4/OTNT: Standards on the ASTN/ASON Control Plane

Topic	Title	Publ.*
Definitions	**G.8081/Y.1353** Definitions and Terminology for Automatically Switched Optical Networks (ASON)	2004
Requirements	**G.807/Y.1302** Requirements for the Automatic Switched Transport Network (ASTN)	07/01

Topic	Title	Publ.*
Architecture	**G.8080/Y.1304** Architecture for the Automatic Switched Optical Network (ASON)	11/01
	G.ason living list	
Protocol Neutral Specifications for key signalling elements	**G.7713/Y.1704** Generalised Distributed Connection Management	12/01
	G.7713.1/Y.1704 Distributed Call and Connection Management – PNNI Implementation	03/03
	G.7713.2/Y.1704 Distributed Call and Connection Management – GMPLS RSVP-TE Implementation	03/03
	G.7713.3/Y.1704 Distributed Call and Connection Management – GMPLS CR-LDP Implementation	03/03
	G.7714/Y.1705 Generalised automatic discovery techniques	10/01
	G.7714.1/Y.1705.1 Protocol for automatic discovery in SDH and OTN networks	04/03
	G.7715/Y.1706 Architecture and requirements for routing in automatically switched optical networks	06/02
	G.7715.1/Y.1706.1 ASON routing architecture and requirements for link state protocols	02/04
	G.7716/Y.1707 [ASTN link connection status]	
	G.7717/Y.1708 [Connection Admission Control]	
Specific Protocols to realise the signalling elements	. .	
Data Communication Network (DCN)	**G. 7712/Y.1703** Data Communication Network	01/03
	G.dcn living list	

*Note: Dates with year only are expected publication dates. Those with month and date are actual pre-published document availability dates or final publication dates.

7.4 Standards on the Ethernet Frames and MPLS over Transport

[Editor's Note: Generate new tables]

8. Overview of existing holes/overlaps/conflicts

Considering the number and diversity of different organizations working on standardising aspects of OTNT, it is inevitable that some areas will be missed. For the same reasons, some aspects will be addressed in multiple groups, resulting in possible conflicts based on different applications, priorities, or technical expertise. These items need to be identified and addressed as appropriate. The following table lists those that have been identified, the recommended action, and the status of that action.

TABLE 8-1/OTNT: Known OTNT Standardization Holes/Overlaps/Conflicts

No.	Issue	Action	Status

1.	NNI requirements documents being developed in the IETF ccamp and ipo working groups in parallel with the ITU-T work on G.807/Y.1302, G.8080, and many other drafts.	Formal communications, Cross-pollination by company representatives	Ongoing collaboration by company representatives, IETF Design Team working to align routing requirements
2.	Parallel work by ITU-T on permanent virtual circuit based on NNI with work at IETF work on both switch service based on optical UNI and permanent virtual connections based on optical NNI		Ongoing collaboration by company representatives
3.	10GbE WAN PHY may not interoperate with interfaces developed using STM-64 specifications	Adaptation in draft revision of G.707	CLOSED
4.	IEEE 802.3 Ethernet in the First Mile Study Group addressing work that should utilise Q.2/15 work on physical layer portions of Passive Optical Networks	Communication Statement sent to IEEE 802.3, Q.2/15 selected liaison to help coordinate work	Under study in Q.2 & 4/15
5	Metropolitan optical networks being developed independent of established standard interfaces, assuming they are stand-alone networks	Metro optical networks description included in OTNT SWP	CLOSED
6	IaDI standardization has different concepts among the different questions. What is necessary? Is the difference in opinion simply based on different interpretations of the IaDI definition?	Work proposals and discussion in Q.16/15 on IaDI standardization	Under study in Q.16/15
7	OTN Routing and how to deal with physical impairments on logical routing decisions	Proposals reviewed in Q.14/15	Under study in Q.14/15, G.7715.1 may address
8	Optical Supervisory Channel (OSC) has slightly different definitions and views of standardization among the different questions. What is necessary?	Proposals considered by Q.12/15 and Q.16/15	Inactive
9	Ethernet (GbE, 10GbE) is supported as a client of the OTN, but is additional standardization required specific to Ethernet?	Liaisons to and from the MEF, continuing work by Q.9, 11, & 12/15 on Transport of Ethernet Frames	CLOSED
10	OTN and ASON Framework Recommendations have been proposed in discussions. G.871 is valid (but out of date) as a framework for OTN. The new Optical Transport Networks & Technology Standardization/Work Plan will provide frequently updated information. Are framework recommendations necessary?	Options considered in Q.19/15	Inactive
11	Optical transport network terminology is inconsistent across the industry and in some cases even across the ITU-T. What about using G.871 as the holder for normative definitions for OTN?	SDH, OTN, and ASON terminology Recommendations developed for consent	CLOSED
12	Characterisation of optical monitoring parameters, which would be required for all-optical networking, remain undefined. Which parameters should be used at an all-optical measurement point, how should they be measured, and how should they be used?	G.697(G.optmon) completed by Q.16/15	Under study in Q.16/15 and Q.3/4
13	Multiple ITU-T SG15 questions have discussed the standardization of OTN GCC contents. Is coordination between the questions required?	NO, each group standardize the application within its scope	CLOSED

14	Optical control plane protocols to support ASON are currently being discussed, revised, or defined in several organizations, including ITU-T SG15, the IETF, the OIF, and the ATM Forum.	Formal communications, Cross-pollination by company representatives and liaisons	Ongoing collaboration by representatives and liaisons, IETF Design Team working to align routing requirements
15	GFP being considered for multiple applications not fully addressed by the current standardized version. Enhancements for different applications either need to be included in G.7041 or they will likely be captured in other application specific documents, resulting in multiple "versions" of GFP.	Q.2/15 used unique encapsulation for PON applications	CLOSED

Annex A - Terminology Mapping

The terminology used by different organizations working on similar or overlapping technical areas of standardization has complicated attempts to co-ordinate work between different groups. The same terms are often used, with different meanings by multiple organizations. Readers are warned to verify the definitions before assuming a common understanding of the terms. Specific appendices have been included in ITU-T Recommendations G.7713.x to assist the reader in mapping signalling protocol terminology used in those document to the similar terms used in other well know references.

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