Optical Transport Networks & Technologies Standardization Work Plan

Issue 9, June 2007

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/oth/T0901000001/en

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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 the ITU-T, e.g. SG 4, 11, 12, 13, 15 developing Recommendations related to optical transport. Moreover, other standards bodies, forums 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, WTSA-04 designated Study Group 15 as Lead Study Group on Optical Technology, with the mandate to:

- study the appropriate core Questions (Question 6, 7, 9, 11, 12, 13 and 14/15),
- 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 Telecommunications 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.

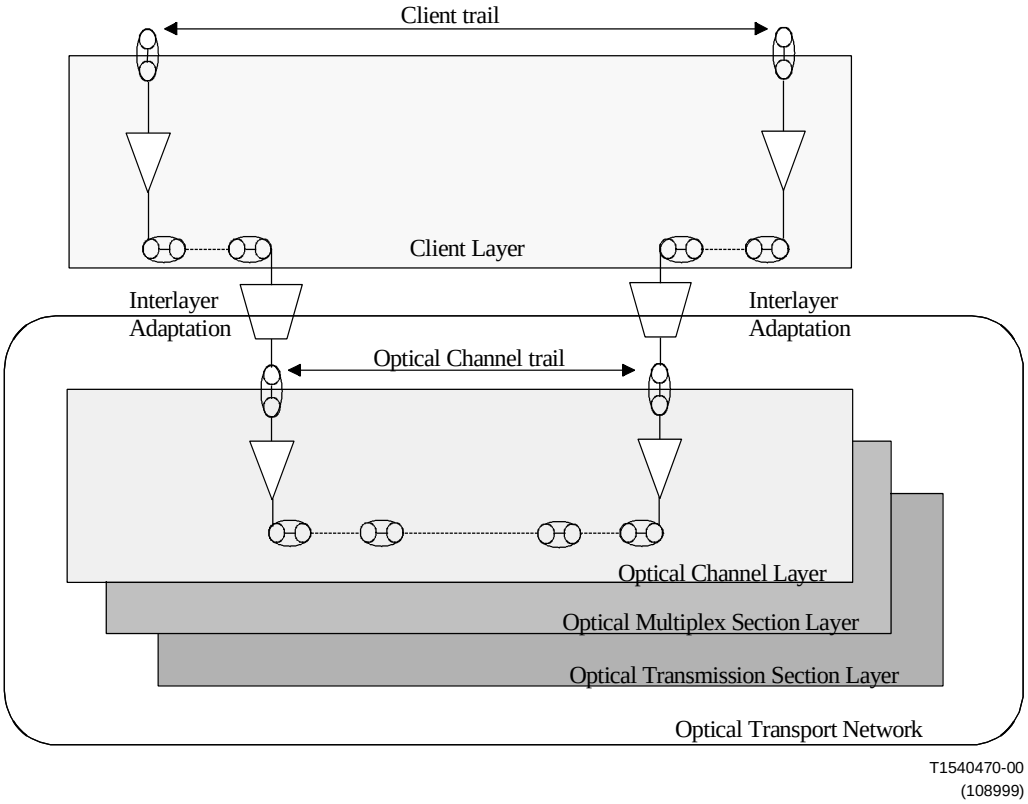

FIGURE 5-1/OTNT: Boundary Of An Optical Transport Network And Client-Server Relationship

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.

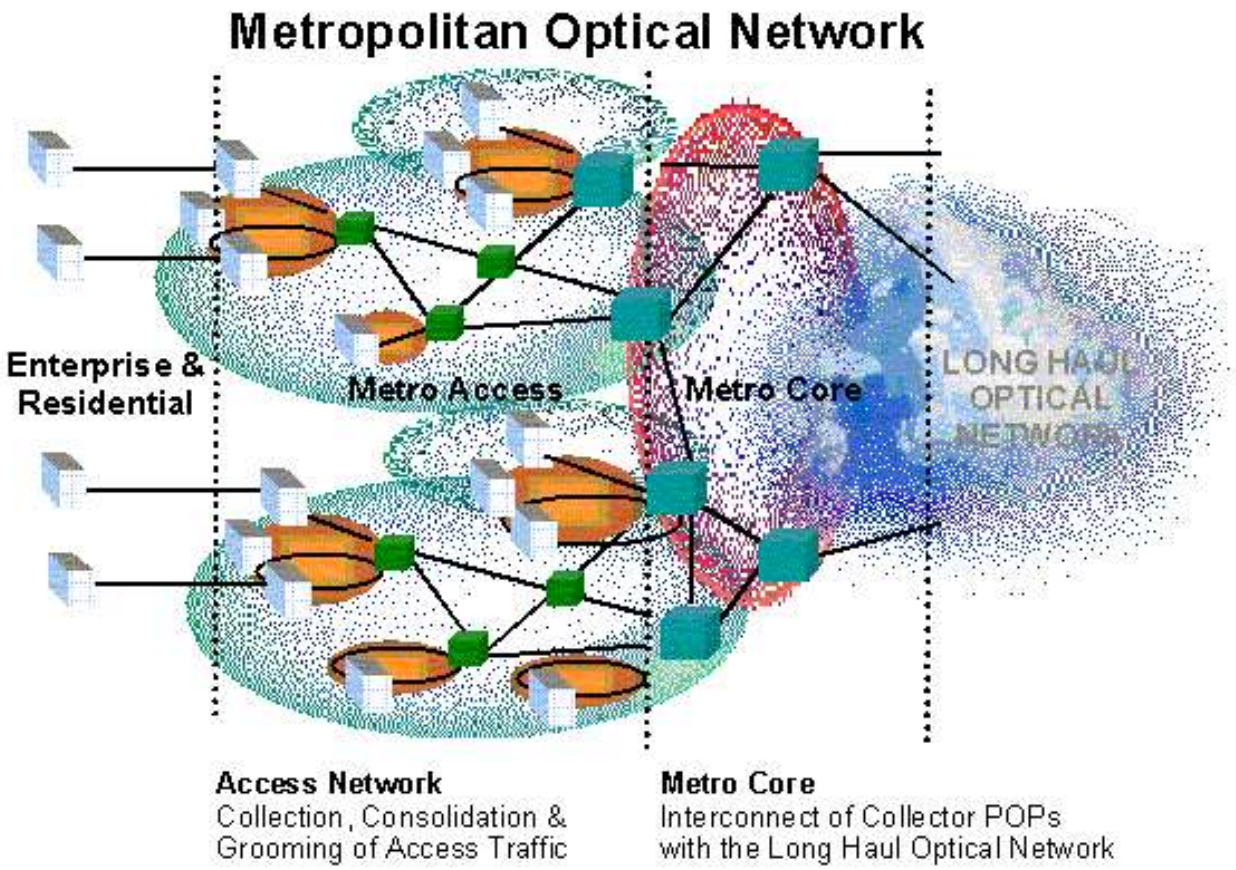

FIGURE 5-2/OTNT: Possible Relationship of MON and LHON

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.

5.5 Overview of the standardization of carrier class Ethernet

5.5.1 Evolution of "carrier-class" Ethernet

Ethernet became to be used widely in network operator's backbone or metro area network. Although Ethernet was originally designed to be used in LAN environment, it has been enhanced in several aspects so that it can be used in network operators' network. In addition, Ethernet can easily realize multipoint to multipoint connectivity, which would require n*(n-1)/2 connections if an existing point to point transport technology. Following subclauses explain enhancements which were done to Ethernet so far.

5.5.1.1 High bit rate and long reach interfaces

Up to 10Gbit/s, up to 40km Ethernet interfaces have been standardized by IEEE 802.3 WG. In addition to LAN-PHY (10GBASE-R), WAN-PHY (10GBASE-W) has been standardized. WAN-PHY can be connected to SDH/SONET interfaces.

5.5.1.2 Ethernet-based access networks

Ethernet capabilities as access networks have been enhanced by IEEE 802.3 WG (IEEE 802.3ah). This includes point-to-point and point-to-multipoint (PON) optical transmission methods as well as link level Ethernet OAM.

5.5.1.3 Enhancement of scalability

VLAN technology is widely used to provide customers with logically independent networks while sharing network resource physically. However, since 12bit VLAN ID must be a unique value throughout the network, the customer accommodation is limited to 4094 (2 values, 0 and 4095, are reserved for other purposes).

In order to expand this limitation, a method which uses two VLAN IDs in a frame has been standardized by IEEE 802.1ad (Provider Bridges) in October 2005. This method allows the network to provide up to 4094 Service VLANs, each of which can accommodate up to 4094 Customer VLANs.

5.5.2 Issues yet to be addressed

The following subclauses explain issues yet to be addressed. Some of them are under standardization.

5.5.2.1 Scalable Ethernet-based backbone

In order to realize further scalable network, IEEE 802.1ah (Backbone Provider Bridges) is standardizing a method which uses B-Tag, I-Tag and C-Tag. B-Tag and C-Tag include 12 bit VLAN ID. I-Tag includes 20bit Service ID (note: the size of the Service ID under study). One VLAN ID identifies a Customer VLAN. Service ID identifies a service in a provider network. Another VLAN ID identifies a Backbone VLAN. This allows the network to use 12bit VLAN ID space and 20 bit service ID space as well as its own MAC address space.

5.5.2.2 The number of MAC addresses to be learned by bridges

Bridges in a network automatically learn the source MAC addresses of incoming frames. When the number of stations is large, this learning process consumes a lot of resources of each bridge. In order to alleviate this burden, IEEE 802.1ah (Backbone Provider Bridges) is standardizing a method which encapsulates MAC addresses of user stations by backbone MAC addresses so that bridges inside the backbone network do not learn MAC addresses of user stations.

5.5.2.3 Network level OAM

In order to enable network operators to detect, localize and verify defects easily and efficiently, network level Ethernet OAM functions are being standardized by ITU-T SG13 (Q.5/13) and IEEE 802.1ag under a close cooperation. ITU-T Recommendation Y.1731 was approved in May 2006. IEEE 802.1ag is under the Sponsor Ballot. IEEE 802.1ag covers fault management functions only while Y.1731 covers both fault management and performance management.

5.5.2.4 Fast survivability technologies

In order to realize fast and simple protection switching in addition to Link Aggregation and Rapid Spanning Tree Protocol, a Recommendation on Ethernet protection switching mechanism (G.8031) was approved in June 2006. In addition, Q.9/15 is developing a Recommendation on Ethernet ring protection (G.8032). IEEE 802.1 is developing a standard on Shortest Path Bridging (IEEE 802.1aq) to optimize restoration capabilities.

5.5.2.5 QoS/traffic control/traffic conditioning

QoS, traffic control and traffic conditioning issues are being studied by ITU-T (SG12 and SG13), IEEE 802.3 and Metro Ethernet Forum. IEEE 802.1 created a new PAR on Provider Backbone Bridge Traffic Engineering (IEEE 802.1Qay) in April 2007.

5.5.2.6 Higher bit rates

IEEE 802.3 is developing a standard on 10Gbit/s Ethernet Passive Optical Network (10G EPON: IEEE 802.3av). In addition, Higher Speed Study Group in IEEE 802.3 is studying support of 100Gbit/s. They are also considering additional bit rates (e.g., 40Gbit/s). At the IEEE 802 plenary meeting in November 2006, the following objectives were approved:

1. Support full-duplex operation only
2. Preserve the 802.3/Ethernet frame format at the MAC Client service interface
3. Preserve minimum and maximum FrameSize of current 802.3 Std
4. Support a speed of 100 Gb/s at the MAC/PLS interface
5. Support at least 10km on SMF.

6. Support at least 100 meters on OM3 MMF.

5.5.3 Standardization activities on Ethernet

Standardization work on "carrier-class" Ethernet is conducted within ITU-T SG13, SG15, IEEE 802.1 WG, IEEE 802.3 WG, IETF and Metro Ethernet Forum. The table below summarizes current standardization activities on "carrier-class" Ethernet.

Table 5-1 Standardization on "carrier-class" Ethernet.

#	Standard body	Q/WG	Study items
1	ITU-T SG13	Q.5/13	Ethernet OAM mechanisms
2	ITU-T SG15	Q.3/15	Coordination on OTN including optical Ethernet
		Q.9/15	Ethernet protection/restoration and equipment functional architecture
		Q.11/15	Ethernet Service description and frame mapping (GFP)
		Q.12/15	Ethernet architecture
3	IEEE 802	P802.1	Higher layers above the MAC (including Network level Ethernet OAM mechanisms, Provider bridges, Provider backbone bridges)
		P802.3	Ethernet (including Ethernet in the First Mile (Completed in June 2004), 10G E-PON and Higher bit rate Ethernet)
4	IETF	CCAMP WG	common control plane and measurement plane solutions and GMPLS Ethernet Label Switching (GELS)
		L2VPN WG	VPLS (Virtual Private LAN Service)
		PWE3 WG	Point-to-point transport by Ethernet over MPLS (Ethernet wire)
5	Metro Ethernet Forum	Technical Committee	Service attributes including traffic and performance parameters, service definitions, Aggregation and E-NNI interfaces, management interfaces, performance monitoring, and test specifications.

5.5.4 Further details

Further details about standardization of Ethernet can be obtained the website of ITU-T SG13, SG15, IEEE 802.1, IEEE 802.3, IETF and Metro Ethernet Forum as below:

ITU-T SG13: http://www.itu.int/ITU-T/studygroups/com13/index.asp

ITU-T SG15: http://www.itu.int/ITU-T/studygroups/com15/index.asp

IEEE 802.1 WG: http://www.ieee802.org/1/

IEEE 802.3 WG: http://www.ieee802.org/3/

IETF: http://www.ietf.org/

Metro Ethernet Forum: http://www.metroethernetforum.org/

5.6 Standardization on MPLS/T-MPLS

In order to use MPLS technology in operators' network, standardization for enhancing MPLS is conducted by ITU-T SG13, SG15. In addition to “normal” MPLS, Transport MPLS (T-MPLS) is studied actively.

5.6.1 MPLS/T-MPLS OAM

MPLS OAM has been standardized by ITU-T SG13 (Q.5/13). Recommendations on OAM requirements (Y.1710), mechanisms (Y.1711), OAM under ATM-MPLS interworking (Y.1712) and misbranch detection (Y.1713) have been published. Additional MPLS OAM functions such as performance monitoring is being studied within Q.5/13. Q.5/13 consented Recommendations on T-MPLS OAM (G.8113 (ex. Y.17tor) on OAM requirement and G.8114 (ex. Y.17tom) on OAM mechanisms).

5.6.2 MPLS/T-MPLS protection switching

MPLS protection switching has been standardized by ITU-T SG15 (Q.9/15). Revised Recommendation on MPLS protection switching (Y.1720) was approved in December 2006. T-MPLS linear protection switching (G.8131) was approved in December 2006. T-MPLS ring protection switching (G.8132) is under development.

5.6.3 MPLS interworking

Interworking with MPLS networks has been studied by ITU-T SG13 (Q.7/13). Recommendations on ATM-MPLS interworking (cell mode: Y.1411, frame mode: Y.1412), TDM-MPLS interworking (Y.1413) and Voice services – MPLS interworking (Y.1414) have been published.

5.6.4 T-MPLS network architecture

G.8112, “Interfaces for the Transport MPLS (T-MPLS) hierarchy” was approved by ITU-T SG15 (Q.11/15) in October 2006. Transport MPLS (T-MPLS) network architecture (G.8110.1) was approved by ITU-T SG15 (Q.12/15) in November 2006.

5.6.5 T-MPLS equipment functional architecture

T-MPLS equipment functional architecture (G.8121) has been approved within ITU-T SG15 (Q.9/15).

5.6.6 Further details

Further details about standardization of MPLS can be obtained the website of ITU-T SG13 and SG15 as below:

ITU-T SG13: http://www.itu.int/ITU-T/studygroups/com13/index.asp

ITU-T SG15: http://www.itu.int/ITU-T/studygroups/com15/index.asp

5.7 Standardization on NGN related issues

5.7.1 Relationships between OTN standardization and NGN standardization

Standardization work on the Next Generation Network (NGN) is conducted by several groups within ITU-T, in particular, by SG13, SG11 and GSI (Global Standardization Initiative). The overview and the definition of the NGN is given by ITU-T Recommendation Y.2000[1]. Further details of the NGN are described by a set of related Recommendations. NGN-FG worked on several NGN related documents until November 2005. These documents were transferred to appropriate SGs based on the subjects. Also, GSI (Global Standardization Initiative) was established to facilitate collaboration among SGs.

One of the characteristics of the NGN is that it consists of a service stratum and a transport stratum (see Figure 5-3)[2]. Transport technologies such as OTN, ATM and SDH (developed by SG15) can be a means to realize a transport stratum. In addition to these, Ethernet and MPLS can also

construct the transport stratum based on the recent standardization work for enhancing these technologies toward "carrier-class" Ethernet and MPLS.

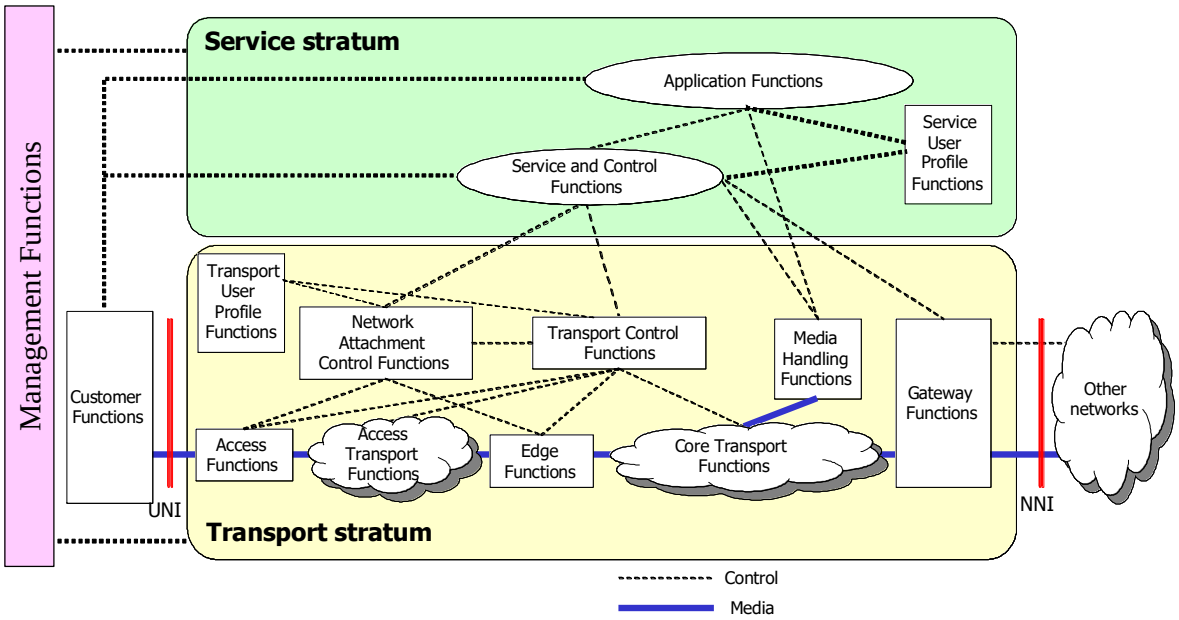

Figure 5-3 NGN architecture overview

This architecture enables service and transport technologies evolve independently keeping the interfaces between them consistent. However, close cooperation between these efforts is nevertheless important.

5.7.2 Standardization status for transport stratum

Various technologies such as PDH, SDH, ATM, OTN, Ethernet and MPLS/T-MPLS can provide capabilities for transport stratum. The following table summarizes the standardization status for each technology in terms of various aspects.

Table 5-3 – Standardization status on the various aspects of PDH, SDH, ATM, OTN, Ethernet, MPLS and T-MPLS

Topic	Generic	PDH	SDH	ATM	OTN	Ethernet	MPLS	T-MPLS
Architectural aspects	G.805, G.809		G.803, G.805	G.805 , I.326	G.872, G.8080	G.809, G.8010, IEEE 802.3, 802.1D, 802.1Q, 802.1ad, 802.1ah	G.8110, RFC 3031	G.8110.1
Structures and mapping		G.704, G.73x, G.74x, G.75x (note 1), G.804, G.7043, G.8040	G.707, G.832, G.7041, G.7042	I.361, I.362, I.363	G.709, G.7041, G.7042	G.7041, G.7042, IEEE 802.3as	RFC3032	G.8112
Equipment functional characteristics	G.806	G.706, G.73x, G.74x, G.75x (note 1)	G.783, G.784, G.806, G.813,	I.731, I.732	G.798, G.806	G.8021		G.8121
OAM and protection switching	G.808.1		G.707, G.783, G.841, G.842	I.610, I.630	G.873.1	Y.1730, Y.1731, IEEE 802.1ag, 802.3ah, G.8031, G.8032	Y.1710, Y.1711, Y.1712, Y.1713, Y.1720,	G.8131, G.8132, G.8113 (ex. Y.17tor), G.8114 (ex. Y.17tom)
Management aspects			G.774-x, G.784, G.831, G.7710, M.3100 am3	I.751	G.874, G.874.1 , G.875, G.7710, M.3100 am3	IEEE 802.aj	Y.1714	
Physical layer characteristics		G.703	G.664, G.691, G.692, G.693, G.703, G.957	G.703 , G.957 , I.432	G.664, G.693, G.959.1	IEEE 802.3, 802.3ae, 802.3ah		
Performance		G.821, G.822, G.826, G.823, G.824	G.826, G.827, G.828, G.829, G.783, G.825	I.356, I.357	G.8201, G.8251	Y.ethperf, IEEE 802.3ar	Y.1561	

Topic	Generic	PDH	SDH	ATM	OTN	Ethernet	MPLS	T-MPLS
Terminology			G.780		G.870, G.8081	G.8001		G.8101

Note 1: G.73x, G.74x, G.75x denote series of Recommendations of which numbers start with G.73, G.74 or G.75.

Note 2: Y-series Recommendation numbers are assigned to NGN related Recommendations in addition to their original Recommendation numbers.

5.7.3 Further details

Further details about NGN standardization can be obtained from SG13, SG11 and FG-NGN websites as below.

ITU-T SG13: http://www.itu.int/ITU-T/studygroups/com13/index.asp

ITU-T SG11: http://www.itu.int/ITU-T/studygroups/com11/index.asp

FG-NGN: http://www.itu.int/ITU-T/ngn/fgngn/index.html

6. OTNT Correspondence and Liaison Tracking

6.1 OTNT Related Contacts

The International Telecommunication Union - Telecommunications 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 the ITU-T and their URL for further information.

ITU-T SG4, SG12, SG13, SG15: http://www.itu.int

ATIS - Alliance for Telecommunications Standards: http://www.atis.org

TIA - Telecommunications Industry Association: http://www.tiaonline.org

IEC - International Electrotechnical Commission: http://www.iec.ch/

IETF - Internet Engineering Task Force: http://www.ietf.org

IEEE 802 LAN/MAN Standards Committee: http://www.ieee802.org/groups/802/index.html

Optical Internetworking Forum (OIF) Technical Committee: http://www.oiforum.com/

ATM Forum: http://www.atmforum.com/

Metro Ethernet Forum (MEF) Technical Committee: http://www.metroethernetforum.org/

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 7-1-1/OTNT: OTNT Related Standards and Industry Agreements (ITU-T Recommendations)

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.3/4)	M.2401	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.10/12)	G.8201	Error performance parameters and objectives for multi-operator international paths within the Optical Transport Network (OTN)	09/2003
ITU-T (Q.2/15)	G.983.1	Broadband optical access systems based on Passive Optical Networks (PON)	01/2005
ITU-T (Q.2/15)	G.983.1 (Amend.1)	PICS for OLT and ONU – published in English only	05/2005
ITU-T (Q.2/15)	G.983.2	ONT management and control interface specification for ATM PON	07/2005
ITU-T (Q.2/15)	G.Imp983.2	Implementer's Guide to G.983.2	02/2006
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.983.3 (Amend. 1)	A broadband optical access system with increased service capability by wavelength allocation	02/2002
ITU-T (Q.2/15)	G.983.3 (Amend. 2)	A broadband optical access system with increased service capability by wavelength allocation	07/2005
ITU-T (Q.2/15)	G.983.4	A Broadband Optical Access System with increased service capability using Dynamic Bandwidth Assignment	11/2001

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.2/15)	G.983.4 (Amend. 1)	New Annex A – Performance monitoring parameters	12/2003
ITU-T (Q.2/15)	G.983.4 (Corrig. 1)	New Annex A – Performance monitoring parameters	01/2005
ITU-T (Q.2/15)	G.983.5	A Broadband Optical Access System with enhanced survivability	01/2002
ITU-T (Q.2/15)	G.983.6	ONT management and control interface specifications for B-PON system with protection features	06/2002
ITU-T (Q.2/15)	G.983.7	ONT management and control interface specification for dynamic bandwidth assignment (DBA) B-PON system	11/2001
ITU-T (Q.2/15)	G.983.8	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.983.9	B-PON ONT management and control interface (OMCI) support for wireless Local Area Network interfaces	06/2004
ITU-T (Q.2/15)	G.983.10	B-PON ONT management and control interface (OMCI) support for Digital Subscriber Line interfaces	06/2004
ITU-T (Q.2/15)	G.984.1	Gigabit-capable Passive Optical Networks (GPON): General characteristics	03/2003
ITU-T (Q.2/15)	G.984.2	Gigabit-capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) layer specification	03/2003
ITU-T (Q.2/15)	G.984.3	Gigabit-capable Passive Optical Networks (GPON): Transmission Convergence layer specification	02/2004
ITU-T (Q.2/15)	G.984.3 (Amend. 1)	Gigabit-capable Passive Optical Networks (GPON): Transmission Convergence layer specification	07/2007
ITU-T (Q.2/15)	G.984.4	Gigabit-capable Passive Optical Networks (GPON): ONT Management and Control Interface specification	06/2004
ITU-T (Q.2/15)	G.984.4 (Amend. 1)	Gigabit-capable Passive Optical Networks (GPON): ONT Management and Control Interface specification	06/2005
ITU-T (Q.2/15)	G.985	100 Mbit/s point-to-point Ethernet based optical access system	03/2003
ITU-T (Q.2/15)	G.985 (Corrig. 1)	100 Mbit/s point-to-point Ethernet based optical access system	01/2005
ITU-T (Q.3/15)	G.780/Y.1351	Terms and definitions for synchronous digital hierarchy (SDH) networks	07/2004
ITU-T (Q.3/15)	G.780/Y.1351 (Amend. 1)	Terms and definitions for synchronous digital hierarchy (SDH) networks	06/2005
ITU-T (Q.3/15)	G.870/Y.1352	Terms and definitions for Optical Transport Networks (OTN)	06/2004
ITU-T (Q.3/15)	G.870/Y.1352 (Amend. 1)	Terms and definitions for Optical Transport Networks (OTN)	06/2005
ITU-T (Q.3/15)	G.8081/Y.1353	Terms and definitions for Automatically Switched Optical Networks (ASON)	06/2004

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.3/15)	G.8081/Y.1353 (Amend 1)	Terms and definitions for Automatically Switched Optical Networks (ASON)	06/2006
ITU-T (Q.3/15)	G.8001/Y.1354	Terms and definitions for Ethernet Frames Over Transport Networks	06/2006
ITU-T (Q.5/15)	G.650.1	Definitions and test methods for linear, deterministic attributes of single-mode fibre and cable	06/2004
ITU-T (Q.5/15)	G.650.2	Definitions and test methods for statistical and non-linear attributes of single-mode fibre and cable	01/2005
ITU-T (Q.5/15)	G.650.2 (Erratum 1)	Definitions and test methods for statistical and non-linear attributes of single-mode fibre and cable	10/2005
ITU-T (Q.5/15)	G.651	Characteristics of a 50/125 µm multimode graded index optical fibre cable	02/1998
ITU-T (Q.5/15)	G.652	Characteristics of a single-mode optical fibre cable	06/2005
ITU-T (Q.5/15)	G.653	Characteristics of a dispersion-shifted single-mode optical fibre cable	12/2003
ITU-T (Q.5/15)	G.654	Characteristics of a cut-off shifted single-mode optical fibre cable	06/2004
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.664	Optical safety procedures and requirements for optical transport systems	03/2003
ITU-T (Q.6/15)	G.664 (Amend. 1)	Optical safety procedures and requirements for optical transport systems	01/2005
ITU-T (Q.6/15)	G.691	Optical interfaces for single channel STM-64, STM-256 systems and other SDH systems with optical amplifiers	12/2003
ITU-T (Q.6/15)	G.691 (Amend. 1)	Optical interfaces for single channel STM-64, STM-256 systems and other SDH systems with optical amplifiers	01/2005
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	01/2000
ITU-T (Q.6/15)	G.692 (Corrig. 2)	Optical interfaces for multichannel systems with optical amplifiers	06/2002
ITU-T (Q.6/15)	G.692 (Amend. 1)	Optical interfaces for multichannel systems with optical amplifiers	01/2005
ITU-T (Q.6/15)	G.693	Optical interfaces for intra-office systems	01/2005
ITU-T (Q.6/15)	G.694.1	Spectral grids for WDM applications: DWDM frequency grid	06/2002
ITU-T (Q.6/15)	G.694.2	Spectral grids for WDM applications: CWDM wavelength grid	12/2003

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.6/15)	G.695	Optical interfaces for Coarse Wavelength Division Multiplexing applications	02/2004
ITU-T (Q.6/15)	G.695 (Erratum 1)	Optical interfaces for Coarse Wavelength Division Multiplexing applications	06/2005
ITU-T (Q.6/15)	G.696.1	Intra-Domain DWDM applications	07/2005
ITU-T (Q.6/15)	G.697	Optical monitoring for DWDM system	06/2004
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.957 (Amend. 2)	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy	01/2005
ITU-T (Q.6/15)	G.959.1	Optical transport network physical layer interfaces	12/2003
ITU-T (Q.6/15)	G.959.1 (Erratum 1)	Optical transport network physical layer interfaces	04/2004
ITU-T (Q.6/15)	Sub.39 (Sup.dsn)	Optical system design and engineering considerations	10/2003
ITU-T (Q.7/15)	G.671	Transmission characteristics of optical components and subsystems	01/2005
ITU-T (Q.9/15)	G.783	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	02/2004
ITU-T (Q.9/15)	G.783 (Corrig. 1)	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	06/2004
ITU-T (Q.9/15)	G.783 (Errata 1)	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	03/2005
ITU-T (Q.9/15)	G.783 (Amend. 1)	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	07/2005
ITU-T (Q.9/15)	G.798	Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks	06/2004
ITU-T (Q.9/15)	G.798 (Errata 1)	Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks	05/2005
ITU-T (Q.9/15)	G.Imp798	Implementer's Guide to G.798	05/2005
ITU-T (Q.9/15)	G.806	Characteristics of transport equipment – Description methodology and generic functionality	02/2004
ITU-T (Q.9/15)	G.806 (Amend. 1)	Characteristics of transport equipment – Description methodology and generic functionality	06/2004
ITU-T (Q.9/15)	G.806 (Corrig. 1)	Characteristics of transport equipment – Description methodology and generic functionality	08/2004
ITU-T (Q.9/15)	G.806 (Corrig. 2)	Characteristics of transport equipment – Description methodology and generic functionality	01/2005
ITU-T (Q.9/15)	G.808.1	Generic protection switching – Linear trail and subnetwork protection	12/2003
ITU-T (Q.9/15)	G.808.1 (Erratum 1)	Generic protection switching - Linear trail and subnetwork protection (applies to English version only)	03/2005

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.9/15)	G.808.1 (Amend. 1)	Generic protection switching - Linear trail and subnetwork protection	07/2005
ITU-T (Q.9/15)	G.Imp808.1	Implementer's Guide to G.808.1	05/2005
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 (Erratum 1)	Optical Transport network (OTN) - Linear Protection	10/2003
ITU-T (Q.9/15)	G.Imp873.1	Implementer's Guide to G.873.1	05/2005
ITU-T (Q.11/15)	G.707/Y.1322	Network node interface for the synchronous digital hierarchy (SDH)	12/2003
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
ITU-T (Q.11/15)	G.Imp709/Y.1331	Implementer's Guide	05/2005
ITU-T (Q.11/15)	G.7041/Y.1303	Generic framing procedure (GFP)	08/2005
ITU-T (Q.11/15)	G.7042/Y.1305	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.11/15)	G.7043/Y.1343	Virtual Concatenation of PDH Signals	07/2004
ITU-T (Q.11/15)	G.7043/Y.1343 (Amend. 1)	Virtual Concatenation of PDH Signals	01/2005
ITU-T (Q.11/15)	G.8011/Y.1307	Ethernet over Transport - Ethernet services framework	08/2004
ITU-T (Q.11/15)	G.8011/Y.1307 (Corrig. 1)	Corrigendum 1 to Recommendation G.8011/Y.1307	06/2005
ITU-T (Q.11/15)	G.8011/Y.1307 (Amend. 1)	Amendment 1 to Recommendation G.8011/Y.1307	08/2005
ITU-T (Q.11/15)	G.8011.1/Y.1307.1	Ethernet Private Line Service	08/2004
ITU-T (Q.11/15)	G.8011.1/Y.1307.1 (Corrig. 1)	Corrigendum 1 to Recommendation G.8011.1/Y.1307.1	06/2005
ITU-T (Q.11/15)	G.8011.2/Y.1307.2	Ethernet Virtual Private Line Service	09/2005
ITU-T (Q.11/15)	G.8012/Y.1308	Ethernet UNI and Ethernet NNI	08/2004
ITU-T (Q.11/15)	G.8112/Y.1371	Interfaces for the Transport MPLS (T-MPLS) Hierarchy (TMH)	2006

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.12/15)	G.807/Y.1302	Requirements for Automatic Switched Transport Networks (ASTN)	07/2001
ITU-T (Q.12/15)	G.Imp807/Y.1302	Implementer's Guide for G.807	05/2005
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.872 (Corrig. 1)	Architecture of optical transport networks	01/2005
ITU-T (Q.12/15)	G.Imp872	Implementer's Guide to G.872	05/2005
ITU-T (Q.12/15)	G.8080/Y.1304	Architecture for the Automatic Switched Optical Network	11/2001
ITU-T (Q.12/15)	G.8080/Y.1304 (Amend. 2)	Architecture for the Automatic Switched Optical Network (contains material originally issued as Amend. 1)	02/2005
ITU-T (Q.12/15)	G.Imp8080/ Y.1304	Implementer's Guide to G.8080/Y.1304	05/2005
ITU-T (Q.12/15)	G.8010/Y.1306	Ethernet Layer Network Architecture	02/2004
ITU-T (Q.12/15)	G.8010/Y.1306 (Amend 1)	Ethernet Layer Network Architecture	05/2006
ITU-T (Q.12/15)	G.8012/Y.1308	Ethernet UNI and Ethernet NNI	08/2004
ITU-T (Q.12/15)	G.8012/Y.1308 (Amend. 1)	Ethernet UNI and Ethernet NNI	05/2006
ITU-T (Q.12/15)	G.8110/Y.1370	MPLS Layer Network Architecture	01/2005
ITU-T (Q.12/15)	G.8112/Y.1371	Interfaces for the Transport MPLS (T-MPLS) hierarchy	10/2006
ITU-T (Q.9/15)	G.8121/Y.1381	Characteristics of Transport MPLS (T-MPLS) equipment functional blocks	03/2006
ITU-T (Q.12/15)	G.8601/Y.1391 (ex. G.asm)	Architecture for the Management of Transport Services	06/2006
ITU-T (Q.13/15)	G.813	Timing Characteristics of SDH Equipment Slave Clocks (SEC)	03/2003
ITU-T (Q.13/15)	G.813 (Corrig. 1)	Timing Characteristics of SDH Equipment Slave Clocks (SEC)	06/2005
ITU-T (Q.13/15)	G.8251	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.784	Synchronous digital hierarchy (SDH) management	07/1999
ITU-T (Q.14/15)	G.874	Management aspects of the optical transport network element	11/2001
ITU-T (Q.14/15)	G.Imp874	Implementer's Guide to G.874	05/2005

Organisation (Subgroup responsible)	**Number**	**Title**	**Public. Date**
ITU-T (Q.14/15)	G.874.1	Optical Transport Network (OTN) Protocol-Neutral Management Information Model For The Network Element View	01/2002
ITU-T (Q.14/15)	G.Imp874.1	Implementer's Guide to G.874.1	05/2005
ITU-T (Q.14/15)	G.875	Optical transport network (OTN) management information model for the network element view	(ed. Note: not yet published)
ITU-T (Q.14/15)	G.7710/Y.1701	Common equipment management function requirements	11/2001
ITU-T (Q.14/15)	G.7712/Y.1703	Architecture and specification of data communication network	03/2003
ITU-T (Q.14/15)	G.7713/Y.1704	Distributed call and connection management (DCM)	12/2001
ITU-T (Q.14/15)	G.7713/Y.1704 (Amend. 1)	Distributed call and connection management (DCM)	06/2004
ITU-T (Q.14/15)	G.Imp7713/ Y.1704	Implementer's Guide to G.7713/Y.1704	05/2005
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.Imp7713.1/ Y.1704.1	Implementer's Guide to G.7713.1/Y.1704.1	05/2005
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.Imp7713.2/ Y.1704.2	Implementer's Guide to G.7713.2/Y.1704.2	05/2005
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.Imp7713.3/ Y.1704.3	Implementer's Guide to G.7713.3/Y.1704.3	05/2005
ITU-T (Q.14/15)	G.7714/Y.1705	Generalized automatic discovery techniques	08/2005.
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.Imp7714.1/ Y.1705.1	Implementer's Guide to G.7714.1/Y.1705.1	05/2005
ITU-T (Q.14/15)	G.7715/Y.1706	Architecture and requirements for routing in automatically switched optical networks	06/2002
ITU-T (Q.14/15)	G.Imp7715/ Y.1706	Implementer's Guide to G.7715/Y.1706	05/2005
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.Imp7715.1/ Y.1706.1	Implementer's Guide to G.7715.1/Y.1706.1	05/2005

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.14/15)	G.7715.2/Y.1706.2	ASON routing architecture and requirements for remote route query	02/2007

Table 7-1-2 below lists IETF RFCs and Internet Drafts. It should be noted that all Internet-Drafts should be identified as "work in progress". This request is made, as standard, by the IETF in the following boilerplate text at the head of every Internet-Draft:

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

TABLE 7-1-2/OTNT: OTNT Related Standards and Industry Agreements (IETF RFCs and Internet Drafts)

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	RFC 3468,	The Multiprotocol Label Switching (MPLS) Working Group decision on MPLS signaling protocols	02/2003
IETF (ccamp)	RFC 3609	Tracing Requirements for Generic Tunnels	09/2003
IETF (ccamp)	RFC 3945	Generalized Multi-Protocol Label Switching Architecture	10/2004
IETF (ccamp)	RFC 4003	GMPLS Signaling Procedure For Egress Control – updates RFC 3473	02/2005
IETF (ccamp)	RFC 4139	Requirements for Generalized MPLS (GMPLS) Signaling Usage and Extensions for Automatically Switched Optical Network (ASON)	07/2005
IETF (ccamp)	RFC 4201	Link Bundling in MPLS Traffic Engineering (TE)	10/2005
IETF (ccamp)	RFC 4202	Routing Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS)	10/2005
IETF (ccamp)	RFC 4203	OSPF Extensions in Support of Generalized Multi-Protocol Label Switching – updates RFC 3630	10/2005
IETF (ccamp)	RFC 4204	Link Management Protocol (LMP)	10/2005
IETF (ccamp)	RFC 4207	Synchronous Optical Network (SONET)/Synchronous Digital Hierarchy (SDH) Encoding for Link Management Protocol (LMP) Test Messages	10/2005
IETF (ccamp)	RFC4208	Generalize Multiprotocol Label Switching(GMPLS) User-Network Interface (UNI): Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Support for the Overlay Model	10/2005
IETF (ccamp)	RFC4209	Link Management Protocol (LMP) for Dense Wavelength Division Multiplexing (DWDM) Optical Line Systems	10/2005
IETF (ccamp)	RFC4258	Requirements for Generalized Multi-Protocol Label Switching (GMPLS) Routing for the Automatically Switched Optical Network (ASON)	11/2005

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	RFC4257	Framework for Generalized Multi-Protocol Label Switching (GMPLS)-based Control of Synchronous Digital Hierarchy/Synchronous Optical Networking (SDH/SONET) Networks	12/2005
IETF (ccamp)	RFC4328	Generalized Multi-Protocol Label Switching (GMPLS) Signaling Extensions for G.709 Optical Transport Networks Control – updates RFC 3471	01/2006
IETF (ccamp)	RFC4394	A Transport Network View of the Link Management Protocol	02/2006
IETF (ccamp)	RFC4397	A Lexicography for the Interpretation of Generalized Multiprotocol Label Switching (GMPLS) Terminology within The Context of the ITU-T's Automatically Switched Optical Network (ASON) Architecture	02/2006
IETF (ccamp)	RFC4420	Encoding of Attributes for Multiprotocol Label Switching (MPLS) Label Switched Path (LSP) Establishment Using Resource ReserVation Protocol-Traffic Engineering (RSVP-TE)	02/2006
IETF (ccamp)	RFC4426	Generalized Multi-Protocol Label Switching (GMPLS) Recovery Functional Specification	03/2006
IETF (ccamp)	RFC4427	Recovery (Protection and Restoration) Terminology for Generalized Multi-Protocol Label Switching (GMPLS)	03/2006
IETF (ccamp)	RFC4428	Analysis of Generalized Multi-Protocol Label Switching (GMPLS)-based Recovery Mechanisms (including Protection and Restoration)	03/2006
IETF (ccamp)	RFC4558	Node ID based RSVP Hello: A Clarification Statement	06/2006
IETF (ccamp)	RFC4606	Generalized Multi-Protocol Label Switching (GMPLS) Extensions for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Control	08/2006
IETF (ccamp)	RFC4631	Link Management Protocol (LMP) Management Information Base (MIB) – updates RFC4327	09/2006
IETF (ccamp)	RFC4801	Definitions of Textual Conventions for Generalized Multiprotocol Label Switching (GMPLS) Management	02/2007
IETF (ccamp)	RFC4802	Generalized Multiprotocol Label Switching (GMPLS) Traffic Engineering Management Information Base	02/2007
IETF (ccamp)	RFC4803	Generalized Multiprotocol Label Switching (GMPLS) Label Switching Router (LSR) Management Information Base	02/2007
IETF (ccamp)	RFC4874	Exclude Routes – Extension to RSVP-TE	04/2007
IETF (ccamp)	draft-ietf-ccamp-crankback-06.txt	Crankback Signaling Extensions for MPLS and GMPLS RSVP-TE	
IETF (ccamp)	RFC4783	GMPLS – Communication of Alarm Information	12/2006

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	RFC4872	RSVP-TE Extensions in support of End-to-End Generalized Multi-Protocol Label Switching (GMPLS)-based Recovery	05/2007
IETF (ccamp)	RFC4873	GMPLS Based Segment Recovery	05/2007
IETF (ccamp)	RFC4726	A Framework for Inter-Domain MPLS Traffic Engineering	11/2006
IETF (ccamp)	RFC4736	Reoptimization of Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) loosely routed Label Switch Path (LSP)	11/2006
IETF (ccamp)	draft-ietf-ccamp-rsvp-restart-ext-08.txt	Extensions to GMPLS RSVP Graceful Restart	
IETF (ccamp)	draft-ietf-ccamp-inter-domain-pd-path-comp-05.txt	A Per-domain path computation method for establishing Inter-domain Traffic Engineering (TE) Label Switched Paths (LSPs)	
IETF (ccamp)	RFC4652	Evaluation of existing Routing Protocols against ASON routing requirements	10/2006
IETF (ccamp)	draft-ietf-ccamp-gmpls-addressing-07.txt	Use of Addresses in Generalized Multi-Protocol Label Switching (GMPLS) Networks	
IETF (ccamp)	draft-ietf-ccamp-automesh-04.txt	Routing extensions for discovery of Multiprotocol (MPLS) Label Switch Router (LSR) Traffic Engineering (TE) mesh membership	
IETF (ccamp)	draft-ietf-ccamp-te-node-cap-05.txt	Routing extensions for discovery of Traffic Engineering Node Capabilities	
IETF (ccamp)	draft-ietf-ccamp-gmpls-mln-reqs-03.txt	Requirements for GMPLS-based multi-region and multi-layer networks (MRN/MLN))	
IETF (ccamp)	draft-ietf-ccamp-gmpls-mln-eval-02.txt	Evaluation of existing GMPLS Protocols against Multi Layer and Multi Region Networks (MLN/MRN)	
IETF (ccamp)	draft-ietf-ccamp-inter-domain-rsvp-te-05.txt	Inter domain Multiprotocol Label Switching (MPLS) and Generalized MPLS (GMPLS) Traffic Engineering - RSVP-TE extensions	
IETF (ccamp)	draft-ietf-ccamp-lsp-stitching-05.txt	Label Switched Path Stitching with Generalized Multiprotocol Label Switching Traffic Engineering (GMPLS TE)	
IETF (ccamp)	draft-ietf-ccamp-gmpls-rsvp-te-call-04.txt	Generalized MPLS (GMPLS) RSVP-TE Signaling Extensions in support of Calls	
IETF (ccamp)	draft-ietf-ccamp-lsp-hierarchy-bis-01.txt	Procedures for Dynamically Signaled Hierarchical Label Switched Paths	
IETF (ccamp)	draft-ietf-ccamp-mpls-gmpls-interwork-fmwk-02.txt	Framework for MPLS-TE to GMPLS migration	

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	draft-ietf-ccamp-ethernet-traffic-parameters-01.txt	MEF Ethernet Traffic Parameters	
IETF (ccamp)	draft-ietf-ccamp-gmpls-ason-routing-ospf-03.txt	OSPFv2 Routing Protocols Extensions for ASON Routing	
IETF (ccamp)	draft-ietf-ccamp-mpls-graceful-shutdown-02.txt	Graceful Shutdown in GMPLS Traffic Engineering Networks	
IETF (ccamp)	draft-ietf-ccamp-gmpls-vcat-lcas-02.txt	Operating Virtual Concatenation (VCAT) and the Link Capacity Adjustment Scheme (LCAS) with Generalized Multi-Protocol Label Switching (GMPLS)	
IETF (ccamp)	draft-ietf-ccamp-gmpls-ted-mib-01.txt	Traffic Engineering Database Management Information Base in support of GMPLS	
IETF (ccamp)	draft-ietf-ccamp-pc-and-sc-reqs-00.txt	Requirements for the Conversion Between Permanent Connections and Switched Connections in a Generalized Multiprotocol Label Switching (GMPLS) Network	
IETF (ccamp)	draft-ietf-ccamp-mpls-gmpls-interwork-reqts-00.txt	Interworking Requirements to Support operation of MPLS-TE over GMPLS networks	
IETF (ccamp)	draft-ietf-ccamp-inter-domain-recovery-analysis-00.txt	Analysis of Inter-domain Label Switched Path (LSP) Recovery	
IETF (pce)	RFC 4655	A Path Computation Element (PCE) Based Architecture	08/2006
IETF (pce)	RFC 4657	Path Computation Element (PCE) Communication Protocol Generic Requirements	09/2006
IETF (pce)	RFC 4674	Requirements for Path Computation Element (PCE) Discovery	10/2006
IETF (pce)	draft-ietf-pce-pcep-07.txt	Path Computation Element (PCE) communication Protocol (PCEP)	
IETF (pce)	draft-ietf-pce-inter-layer-req-04.txt	PCC-PCE Communication Requirements for Inter-Layer Traffic Engineering	
IETF (pce)	draft-ietf-pce-pcecp-interarea-reqs-05.txt	PCE Communication Protocol (PCECP) Specific Requirements for Inter-Area Multi Protocol Label Switching (MPLS) and Generalized MPLS (GMPLS) Traffic Engineering	
IETF (pce)	draft-ietf-pce-inter-layer-frwk-03.txt	Framework for PCE-Based Inter-Layer MPLS and GMPLS Traffic Engineering	
IETF (pce)	draft-ietf-pce-policy-enabled-path-comp-01.txt	Policy-Enabled Path Computation Framework	
IETF (pce)	draft-ietf-pce-interas-pcecp-reqs-01.txt	Inter-AS Requirements for the Path Computation Element Communication Protocol (PCECP)	

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (pce)	draft-ietf-pce-brpc-04.txt	A Backward Recursive PCE-based Computation (BRPC) procedure to compute shortest inter-domain Traffic Engineering Label Switched Paths	
IETF (pce)	draft-ietf-pce-disco-proto-ospf-03.txt	OSPF protocol extensions for Path Computation Element (PCE) Discovery	
IETF (pce)	draft-ietf-pce-disco-proto-isis-03.txt	IS-IS protocol extensions for Path Computation Element (PCE) Discovery	
IETF (pce)	draft-ietf-pce-disc-mib-01.txt	Definitions of Managed Objects for Path Computation Element Discovery	
IETF (pce)	draft-ietf-pce-tc-mib-01.txt	Definitions of Textual Conventions for Path Computation Element	
IETF (pce)	draft-ietf-pce-pcep-xro-00.txt	Extensions to the Path Computation Element Communication Protocol (PCEP) for Route Exclusions	

TABLE 7-1-3/OTNT: OTNT Related Standards and Industry Agreements (IEEE 802 standards)

Organisation (Subgroup responsible)	Number	Title	Public. Date
IEEE 802.3	IEEE Std. 802.3-2005	Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications	12/2005
IEEE 802.17	IEEE Std. 802.17-2004	Resilient packet ring (RPR) access method and physical layer specifications	09/2004

TABLE 7-1-4/OTNT: OTNT Related Standards and Industry Agreements (OIF documents)

Organisation (Subgroup responsible)	Number	Title	Public. Date
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-ITLA-MSA-01.0	Integratable Tunable Laser Assembly Multi-Source Agreement.	Now available
OIF	OIF-ITLA-MSA-01.1	Integrable Tunable Laser Assembly Multi Source Agreement	Now available
OIF	OIF-UNI-01.0	User Network Interface (UNI) 1.0 Signaling Specification	Now available
OIF	OIF-UNI-01.0-R2-Common	User Network Interface (UNI) 1.0 Signaling Specification, Release 2: Common Part	Now available

Organisation (Subgroup responsible)	Number	Title	Public. Date
OIF	OIF-UNI-01.0-R2-RSVP	RSVP Extensions for User Network Interface (UNI) 1.0 Signaling, Release 2	Now available
OIF	OIF-CDR-01.0	Call Detail Records for OIF UNI 1.0 Billing	Now available
OIF	OIF-SEP-01.0	Security Extension for UNI and NNI	Now available
OIF	OIF-SEP-02.0	Addendum to the 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-SMI-02.0	Addendum to the Security for 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
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
OIF	OIF-ENNI-OSPF-01.0	External Network-Network Interface (E-NNI) OSPF-based Routing - 1.0 (Intra-Carrier) Implementation Agreement	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 (07/99), Amd1(12/03),	ETS 300 166 ETS 300 232, ETS 300 232(A1)	T1.102-1993 (R1999) T1.105.06-2002

	ITU-T Published or Draft (Revised) Recommendation	**Published or Draft (Revised) ETS or EN**	**Published or Draft (Revised) ATIS/ANSI T1**
	Amd2(01/05) G.692 (10/98), Cor.2(06/02), Amd1(01/05) K.41 (05/98) G.691 (04/00)	ETS 300 166 (09/99)	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 (08/05) 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 (03/03), Amd1(01/05)	-	-
Transmission Protection	G.841 (10/98), Corr1 (08/02) G.842 (04/97) G.808.1 (12/03), Err1(03/05), Amd1(07/05) 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 TR/TM-03070	T1.105.01-2001
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 (02/01) G.774.1 (02/01) G.774.2 (02/01) G.774.3 (02/01) G.774.4 (02/01) G.774.5 (02/01) G.774.6 (02/01) G.774.7 (02/01) G.774.8 (02/01) G.774.9 (02/01)	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 (R2004) T1.245-1997 (R2003)

	ITU-T Published or Draft (Revised) Recommendation	**Published or Draft (Revised) ETS or EN**	**Published or Draft (Revised) ATIS/ANSI T1**
	G.774.10 (02/01)		
Network Management	G.831 (03/00) T.50 (09/92) G.85x.y (11/96)	ETS 300 810	T1.204-1997 (R2003)
Error Performance [network level view]	G.826 (12/02) G.827 (09/03) G.828 (03/00), Corr1 (07/01) G.829 (12/02) M.2101 (06/03) M.2101.1 (04/97) M.2102 (02/00) M.2110 (07/02) M.2120 (07/02) M.2130 (02/00) M.2140 (02/00)	EN 301 167	T1.105.05-2002 T1.514-2001
Error Performance [equipment level view]	G.783 (02/04), Corr1 (06/04), Err1(03/05), Amd1(07/05) G.784 (07/99)	EN 300 417-x-1 RE/TM-1042	-
Jitter & Wander Performance	G.813 (03/03), Corr1 (06/05) G.822 (11/88) G.823 (03/00) G.824 (03/00) G.825 (03/00), Err1 (08/01) G.783 (02/04), Corr1 (06/04), Err1(03/05), Amd1(07/05)O.171 (04/97) O.172 (04/05)	EN 300 462-5-1 EN 302 084 (01/99) DEN/TM-1079 (05/98)	T1.105.03-2003
Components & Subsystems	-	-	-
Leased Lines	M.1301 (01/01)	EN 301 164 EN 301 165	-
Synchronisation [Clocks & Network Architecture]	G.803 (03/00) G.810 (08/96), Corr1 (11/01) G.811 (09/97) G.812 (06/04), Err1 (03/05) G.813 (03/03), Corr1 (06/05)	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 (05/96), Corr1 (05/02) O.181 (05/02)	-	-
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	-

	ITU-T Published or Draft (Revised) Recommendation	Published or Draft (Revised) ETS or EN	Published or Draft (Revised) ATIS/ANSI T1
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.*
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
	G.798 Characteristics of optical transport network (OTN) equipment functional blocks	06/04
	G.798 Erratum 1	05/05
	G.798 Living List	
	G.806 Characteristics of transport equipment - Description Methodology and Generic Functionality	02/04
	G.806 Amendment 1	06/04
	G.806 Corrigendum 1	08/04
	G.806 Corrigendum 2	01/05
	G.7710/Y.1701 Common Equipment Management Requirements	11/01

Topic	Title	Publ.*
Protection Switching		
	G.808.1 (G.gps) Generic protection switching - Linear trail and subnetwork protection	12/03
	G.808.1 Erratum 1	03/05
	G.808.1 Amendment 1	07/05
	G.873.1 Optical Transport network (OTN) - Linear Protection	03/03
	G.873.1 Erratum 1 Optical Transport network (OTN) - Linear Protection	10/03
	G.873.1 Erratum 1 Implementer's Guide	05/05
Management Aspects	**G.874** Management aspects of the optical transport network element	11/01
	G.874 Implementer's Guide	05/05
	G.874.1 Optical Transport Network (OTN) Protocol-Neutral Management Information Model For The Network Element View	01/02
	G.874.1 Implementer's Guide	05/05
	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** Error performance parameters and objectives for multi-operator international paths within the Optical Transport Network (OTN)	09/03
	G.optperf living list	
	M.2401 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** 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
	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	03/03
	G.691 Optical Interfaces for single-channel SDH systems with Optical Amplifiers, and STM-64 and STM-256 systems	12/03
	G.691 Amendment 1	01/05
	G.692 Optical Interfaces for Multichannel Systems with Optical Amplifiers	10/98
	G.692 Corrigendum 1	01/00
	G.692 Corrigendum 2	06/02
	G.692 Amendment 1	01/05
	G.693 Optical interfaces for intra-office systems	01/05
	G.694.1 Spectral grids for WDM applications: DWDM frequency grid	12/03
	G.694.2 Spectral grids for WDM applications: CWDM wavelength grid	06/02
	G.695 Optical interfaces for Coarse Wavelength Division Multiplexing applications	02/04

Topic	Title	Publ.*
	G.695 Erratum 1	06/05
	G.696.1 Intra-Domain DWDM applications	07/05
	G.697 Optical monitoring for DWDM system	06/04
	G.959.1 Optical Transport Networking Physical Layer Interfaces	12/03
	G.959.1 Erratum 1	04/04
	Sup.39 Optical System Design and Engineering Considerations	10/03
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	06/05
	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	06/04
	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	07/05
	G.663 Application related aspects of optical fibre amplifier devices and sub-systems	04/00
	G.663 Amendment 1	01/03
	G.671 Transmission characteristics of passive optical components	01/05

*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 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)	06/04
Requirements	**G.807/Y.1302** Requirements for the Automatic Switched Transport Network (ASTN)	07/01
Architecture	**G.8080/Y.1304** Architecture for the Automatic Switched Optical Network (ASON)	11/01
	G.8080/Y.1304 (2001) Amendment 2	02/05
	G.Imp8080 Implementer's Guide	05/05
	G.8080 living list	
Protocol Neutral Specifications for key signalling elements	**G.7713/Y.1704** Generalised Distributed Connection Management	12/01
	G.7713/Y.1704 Amendment 1	06/04
	G.7713/Y.1704 Implementer's Guide	05/05

Topic	Title	Publ.*
	G.7713.1/Y.1704 Distributed Call and Connection Management – PNNI Implementation	03/03
	G.7713.1/Y.1704 Implementer's Guide	05/05
	G.7713.2/Y.1704 Distributed Call and Connection Management – GMPLS RSVP-TE Implementation	03/03
	G.7713.2/Y.1704 Implementer's Guide	05/05
	G.7713.3/Y.1704 Distributed Call and Connection Management – GMPLS CR-LDP Implementation	03/03
	G.7713.3/Y.1704 Implementer's Guide	05/05
	G.7714/Y.1705 Generalised automatic discovery techniques	08/05
	G.7714.1/Y.1705.1 Protocol for automatic discovery in SDH and OTN networks	04/03
	G.7714.1 Implementer's Guide	05/05
	G.7715/Y.1706 Architecture and requirements for routing in automatically switched optical networks	06/02
	G.Imp7715 Implementer's Guide	05/05
	G.7715.1/Y.1706.1 ASON routing architecture and requirements for link state protocols	02/04
	G.Imp7715.1 Implementer's Guide	05/05
	G.7716/Y.1707 [ASTN link connection status]	
	G.7717/Y.1708 [Connection Admission Control]	
	G.7718/Y.1709 Framework for ASON Management	02/05
Specific Protocols to realise the signalling elements	. .	
Data Communication Network (DCN)	**G. 7712/Y.1703** Data Communication Network	03/03
	G.7712/Y.1703 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.

Figure 7-1 shows the mapping of existing protocol-specific documents between ITU-T Recommendations and ones that were received from other organizations.

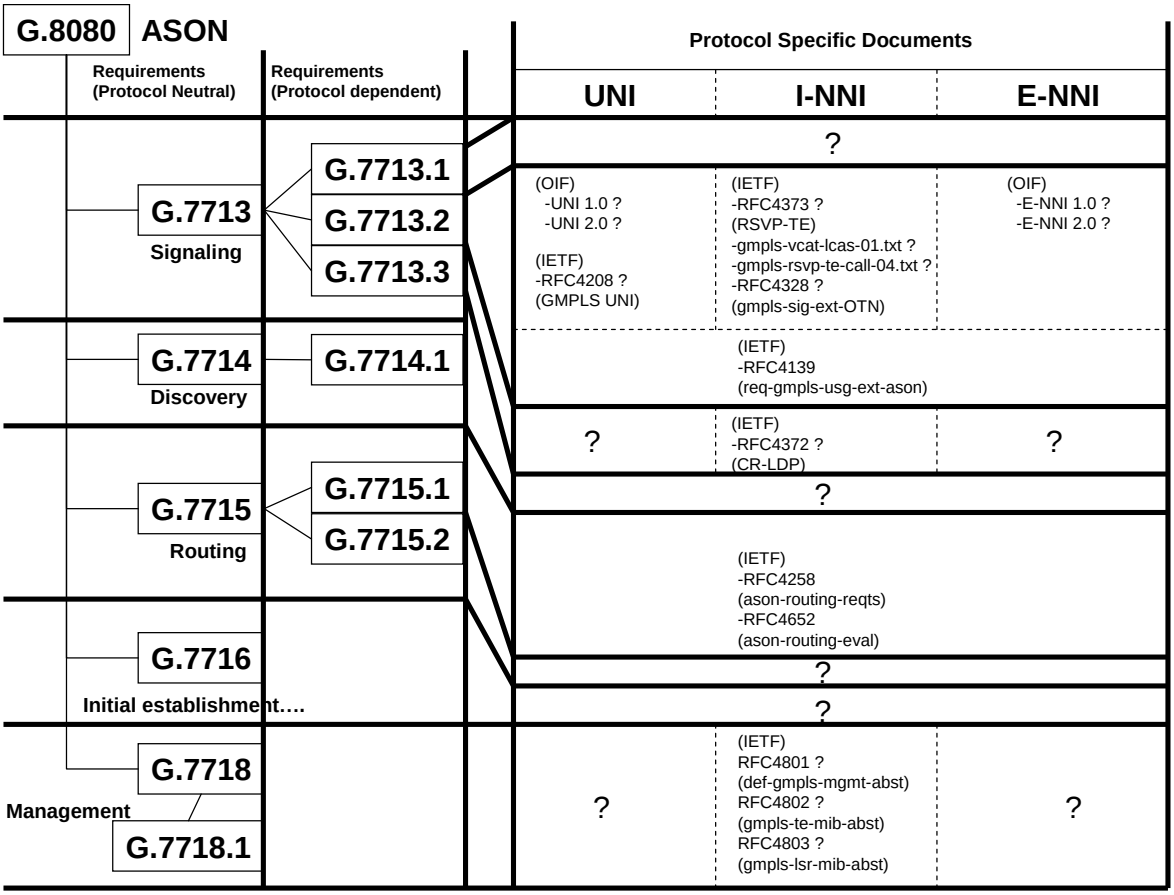

Figure 7-1: Estimated mapping of protocol-specific documents in IUT-T ASON Recommendations

7.5 Standards on the Ethernet Frames, MPLS and Transport MPLS

The following tables list ITU-T Recommendations specifically related to the Ethernet and MPLS/T-MPLS.

Table 7-5 Ethernet related Recommendations

Organisation (Subgroup responsible)	Number	Title	Public. Date
SG13(Q.7/13)	Y.1415	Ethernet-MPLS network interworking - User plane interworking	02/2004
SG13(Q.5/13)	Y.1730	Requirements for OAM functions in Ethernet-based networks and Ethernet services	01/2004
SG13(Q.5/13)	Y.1731	OAM functions and mechanisms for Ethernet based networks	05/2006
SG15(Q.3/15)	G.8001	Terms and definitions for Ethernet over transport	06/2006
SG15(Q.12/15)	G.8010/Y.1306	Architecture of Ethernet Layer Networks	02/2004
SG15(Q.11/15)	G.8011/Y.1307	Ethernet over Transport - Ethernet services framework	08/2004

Organisation (Subgroup responsible)	Number	Title	Public. Date
SG15(Q.11/15)	G.8011/Y.1307 (Corr. 1)	Corrigendum 1 to Recommendation G.8011/Y.1307	06/2005
SG15(Q.11/15)	G.8011/Y.1307 (Amend. 1)	Amendment 1 to Recommendation G.8011/Y.1307	08/2005
SG15(Q.11/15)	G.8011.1/Y.1307.1	Ethernet private line service	08/2004
SG15(Q.11/15)	G.8011.1/Y.1307.1 (Corr. 1)	Corrigendum 1 to Recommendation G.8011.1/Y.1307.1	06/2005
SG15(Q.11/15)	G.8011.2/Y.1307.2	Ethernet Virtual Private Line Service	09/2005
SG15(Q.11/15)	G.8011.3	Ethernet Virtual Private LAN Service	Working text
SG15(Q.11/15)	G.8011.4	Ethernet TREE Service	Working text
SG15(Q.11/15)	G.8012/Y.1308	Ethernet UNI and Ethernet NNI	08/2004
SG15(Q.9/15)	G.8021/Y.1341	Characteristics of Ethernet transport network equipment functional blocks	08/2004
SG15(Q.9/15)	G.8021/Y.1341 (Amend. 1)	Amendment 1 to Recommendation G.8021/Y.1341	06/2006
SG15(Q.9/15)	G.8031	Ethernet protection switching	06/2006
SG15(Q.9/15)	G.8032	Ethernet ring protection switching	Working text

Table 7-6 MPLS related Recommendations

Organisation (Subgroup responsible)	Number	Title	Public. Date
SG13(Q.2/13)	Y.1311.1	Network-based IP VPN over MPLS architecture	07/2001
SG12 (Q.17/12)	Y.1561	Performance and availability parameters for MPLS networks	05/2004
SG13(Q.7/13)	Y.1411	ATM-MPLS network interworking - Cell mode user plane interworking	02/2003
SG13(Q.7/13)	Y.1412	ATM-MPLS network interworking - Frame mode user plane interworking	11/2003
SG13(Q.7/13)	Y.1413	TDM-MPLS network interworking - User plane interworking	03/2004
SG13(Q.7/13)	Y.1413 (Corr. 1)	TDM-MPLS network interworking - User plane interworking	10/2005
SG13(Q.7/13)	Y.1414	Voice services - MPLS network interworking	07/2004
SG13(Q.7/13)	Y.1415	Ethernet-MPLS network interworking - User plane interworking	02/2005
SG13(Q.5/13)	Y.1710	Requirements for OAM functionality for MPLS networks	11/2002

Organisation (Subgroup responsible)	Number	Title	Public. Date
SG13(Q.5/13)	Y.1711	Operation & Maintenance mechanism for MPLS networks	02/2004
SG13(Q.5/13)	Y.1711 (Corr. 1)	Operation & Maintenance mechanism for MPLS networks	02/2005
SG13(Q.5/13)	Y.1711 (Amend. 1)	Operation & Maintenance mechanism for MPLS networks	10/2005
SG13(Q.5/13)	Y.1712	OAM functionality for ATM-MPLS interworking	01/2004
SG13(Q.5/13)	Y.1713	Misbranching detection for MPLS networks	03/2004
SG13(Q.5/13)	Y.1714	MPLS management and OAM framework	Under AAP
SG15(Q.9/15)	Y.1720	Protection switching for MPLS networks	09/2003
SG15(Q.9/15)	Y.1720 (Err.1)	Protection switching for MPLS networks	04/2004
SG15(Q.9/15)	Y.1720 (Corr. 1)	Protection switching for MPLS networks	07/2005
SG15(Q.9/15)	Y.1720 (Amend. 1)	Protection switching for MPLS networks	08/2005
SG15(Q.12/15)	G.8110/Y.1370	MPLS Layer Network Architecture	01/2005

Table 7-7 T-MPLS related Recommendations

Organisation (Subgroup responsible)	Number	Title	Public. Date
SG15(Q.3/15)	G.8101	Terms and Definitions for Transport MPLS	12/2006
SG15(Q.12/15)	G.8110.1/Y.1370.1	Architecture of Transport MPLS (T-MPLS) layer network	11/2006
SG15(Q.11/15)	G.8112/Y.1371	Interfaces for the Transport MPLS (T-MPLS) hierarchy	10/2006
SG13(Q.5/13)	Y.1372/G.8113 (Y.17tor)	Requirements for OAM function in T-MPLS based networks	Under AAP
SG13(Q.5/13)	Y.1373/G.8114 (Y.17tom)	Operation & maintenance mechanism for T-MPLS layer networks	Under AAP
SG15(Q.9/15)	G.8121/Y.1381	Characteristics of Transport MPLS (T-MPLS) equipment functional blocks	03/2006
SG15(Q.9/15)	G.8131	T-MPLS linear protection	02/2007
SG15(Q.9/15)	G.8132	T-MPLS ring protection	Working text

7.6 Standards on the NGN

The following table lists ITU-T Recommendations specifically related to the NGN.

Table 7-8 NGN related Recommendations

Organisation (Subgroup responsible)	Number	Title	Public. Date
SG13	Y.2001	General overview of NGN	12/2004
SG13	Y.2011	General principles and general reference model for next generation networks	10/2004
SG13	Y.2012	Functional requirements and architecture of the NGN	09/2006
SG13	Y.2021	IMS for Next Generation Networks	09/2006
SG13	Y.2031	PSTN/ISDN emulation architecture	09/2006
SG13	Y.2091	Terms and definitions for Next Generation Networks	03/2007
SG13	Y.2111	Resource and admission control functions in Next Generation Networks	09/2006
SG13	Y.2171	Admission control priority levels in Next Generation Networks	09/2006
SG13	Y.2261	PSTN/ISDN evolution to NGN	09/2006
SG13	Y.2271	Call server based PSTN/ISDN emulation	09/2006
SG11	Q.3900	Methods of testing and model network architecture for NGN technical means testing as applied to public telecommunication networks	09/2006

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 working group 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 soft switch service based on optical UNI and soft 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	Completed

No.	Issue	Action	Status
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	Completed (IEEE 802.3ah was completed in June 2004)
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	Completed
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?		Completed
7	OTN Routing and how to deal with physical impairments on logical routing decisions	Possible proposals should be considered in Q.6/15 & Q.14/15	Inactive
8	Optical Supervisory Channel (OSC) has slightly different definitions and views of standardization among the different questions. What is necessary?	Possible proposals should be considered by Q.12/15 and Q.6/15	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	Completed
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.3/15	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	Completed
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.6/15	Completed
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	Completed
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	Completed

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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