

ITU-T

TELECOMMUNICATION
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OF ITU

G.7716/Y.1707

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**SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS**

Data over Transport – Generic aspects – Transport
network control aspects

**SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS**

Internet protocol aspects – Operation, administration and
maintenance

Architecture of control plane operations

Recommendation ITU-T G.7716/Y.1707

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TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

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Recommendation ITU-T G.7716/Y.1707

Architecture of control plane operations

Summary

Recommendation ITU-T G.7716/Y.1707 addresses the architecture of control plane operations. Guidance for service providers on the automatically switch optical network (ASON) network plan, performing typical operations in the network, and sequencing the ITU-T G.7718.1 operations, are described in this Recommendation. This Recommendation also provides guidance to control plane function and protocol designers on the sort of operations control plane protocols and implementations that they need to be able to support.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.7716/Y.1707	2010-01-13	15

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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Recommendation ITU-T G.7716/Y.1707

Architecture of control plane operations

1 Scope

This Recommendation provides guidance for the service providers on:

- how to plan an automatically switched optical network (ASON) network;
- the actions necessary to perform typical operations in the network;
- how to sequence the ITU-T G.7718.1 operations.

This Recommendation also provides guidance to control plane function and protocol designers on the sort of operations control plane protocols and implementations that they need to be able to support.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

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|------------------|--|
| [ITU-T G.798] | Recommendation ITU-T G.798 (2006), <i>Characteristics of optical transport network hierarchy equipment functional blocks</i> . |
| [ITU-T G.872] | Recommendation ITU-T G.872 (2001), <i>Architecture of optical transport networks</i> . |
| [ITU-T G.7710] | Recommendation ITU-T G.7710 /Y.1701 (2007), <i>Common equipment management function requirements</i> . |
| [ITU-T G.7712] | Recommendation ITU-T G.7712/Y.1703 (2008), <i>Architecture and specification of data communication network</i> . |
| [ITU-T G.7713] | Recommendation ITU-T G.7713/Y.1704 (2009), <i>Distributed call and connection management (DCM)</i> . |
| [ITU-T G.7713.1] | Recommendation ITU-T G.7713.1/Y.1704.1 (2003), <i>Distributed Call and Connection Management (DCM) based on PNNI</i> . |
| [ITU-T G.7713.2] | Recommendation ITU-T G.7713.2/Y.1704.2 (2003), <i>Distributed Call and Connection Management: Signalling mechanism using GMPLS RSVP-TE</i> . |
| [ITU-T G.7713.3] | Recommendation ITU-T G.7713.3/Y.1704.3 (2003), <i>Distributed Call and Connection Management: Signalling mechanism using GMPLS CR-LDP</i> . |
| [ITU-T G.7714] | Recommendation ITU-T G.7714/Y.1705 (2005), <i>Generalized automatic discovery for transport entities</i> . |
| [ITU-T G.7714.1] | Recommendation ITU-T G.7714.1/Y.1705.1 (2003), <i>Protocol for automatic discovery in SDH and OTN networks</i> . |

[ITU-T G.7715]	Recommendation ITU-T G.7715/Y.1706 (2002), <i>Architecture and requirements for routing in the automatically switched optical networks</i> .
[ITU-T G.7715.1]	Recommendation ITU-T G.7715.1/Y.1706.1 (2004), <i>ASON routing architecture and requirements for link state protocols</i> .
[ITU-T G.7715.2]	Recommendation ITU-T G.7715.2/Y.1706.2 (2007), <i>ASON routing architecture and requirements for remote route query</i> .
[ITU-T G.7718]	Recommendation ITU-T G.7718/Y.1709 (2005), <i>Framework for ASON management</i> .
[ITU-T G.7718.1]	Recommendation ITU-T G.7718.1/Y.1709.1 (2006), <i>Protocol-neutral management information model for the control plane view</i> .
[ITU-T G.8080]	Recommendation ITU-T G.8080/Y.1304 (2006), <i>Architecture for the automatically switched optical network (ASON)</i> .
[ITU-T G.8081]	Recommendation ITU-T G.8081/Y.1353 (2008), <i>Terms and definitions for Automatically Switched Optical Networks (ASON)</i> .

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 platform (ITU-T X.638): An implementation of an identified platform specification.

3.1.2 platform specification (ITU-T X.638): The functional specification of a formal programmatic interface and a set of supporting local services for an identified stack specification.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 commissioning: The act of specifying parameters necessary to create a control plane instance. These parameters are fundamental to the continued operation of the control plane instance and cannot be changed without significant impact to the control plane instance. Therefore, Commissioning is only done during the initialization phase of the control plane lifecycle. Note that commissioning is focused on the commissioning on the control plane component and not the data/transport plane resource.

3.2.2 provisioning: The act of specifying the parameters necessary when assigning/deassigning network resources to/from the control plane or to invoke/remove services provided by a control plane instance. These parameters are specific to a resource or service request, causing changes to these parameters to only impact a specific resource or service request. Therefore, provisioning is allowed in the initialization and operations phases of the control plane lifecycle.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AN	Abstract Node
ASON	Automatically Switched Optical Network
BN	Boundary Node
CC	Connection Controller

CD	Control Domain
CP	Control Plane
DA	Discovery Agent
DCN	Data Communication Network
E-NNI	External Network-Network Interface
FCAPS	Fault management, Configuration management, Accounting management, Performance management, Security management
ID	Identifier
I-NNI	Internal Network-Network Interface
LRM	Link Resource Manager
NCC	Network Call Controller
NE	Network Equipment
OSPF-TE	Open Shortest Path First – Traffic Engineering
PC	Protocol Controller
RA	Routing Area
RC	Routing Controller
RSVP-TE	Resource Reservation Protocol – Traffic Engineering
SCN	Signalling Communication Network
SN	Subnetwork
SNP	Subnetwork Point
SNPP	Subnetwork Point Pool
TAP	Termination and Adaptation Performer
TMN	Telecommunication Management Network
TRI	Transport Resource Identifier
UNI	User Network Interface
VPN	Virtual Private Network

5 Conventions

None.

6 Overview of control plane deployment

The design of a transport network requires network planning as well as traffic planning. The process of network planning determines the network design given a traffic forecast. Network planning processes could apply to only parts of a network, e.g., subnetworks. The process of traffic planning determines the way that traffic predicted in the traffic forecast will be routed using existing network resources. The process of capacity install is based on the service request from the customer, and activates the network resource for the assigned traffic.

These two processes are constantly attempting to provide the highest quality service at the least cost to the operator. They separately exist as they operate in two different time scales – the process of building new network resources (i.e., fibre routes, central offices, NE deployment) to deal with new

traffic predicted in a network forecast takes months to years while the process of establishing trunks using existing resources may take only minutes to weeks.

Traffic forecasts are periodically developed based on trends, advance information from customers and macro-economic factors. Since these inputs are dynamic, the forecast is also dynamic.

Figure 6-1 shows the three processes in transport network design and operation phases. The result of the traffic planning process is the input to the network planning process, and the network resource is activated by the capacity install process.

Before the network planning process starts, the operator should collect the traffic demands. These demands may come at different times. It is impossible to start the network planning process when each demand comes. So the demands are grouped, and the network planning process is periodically executed.

Initial state: Network has 0 capacity and 0 planned demands

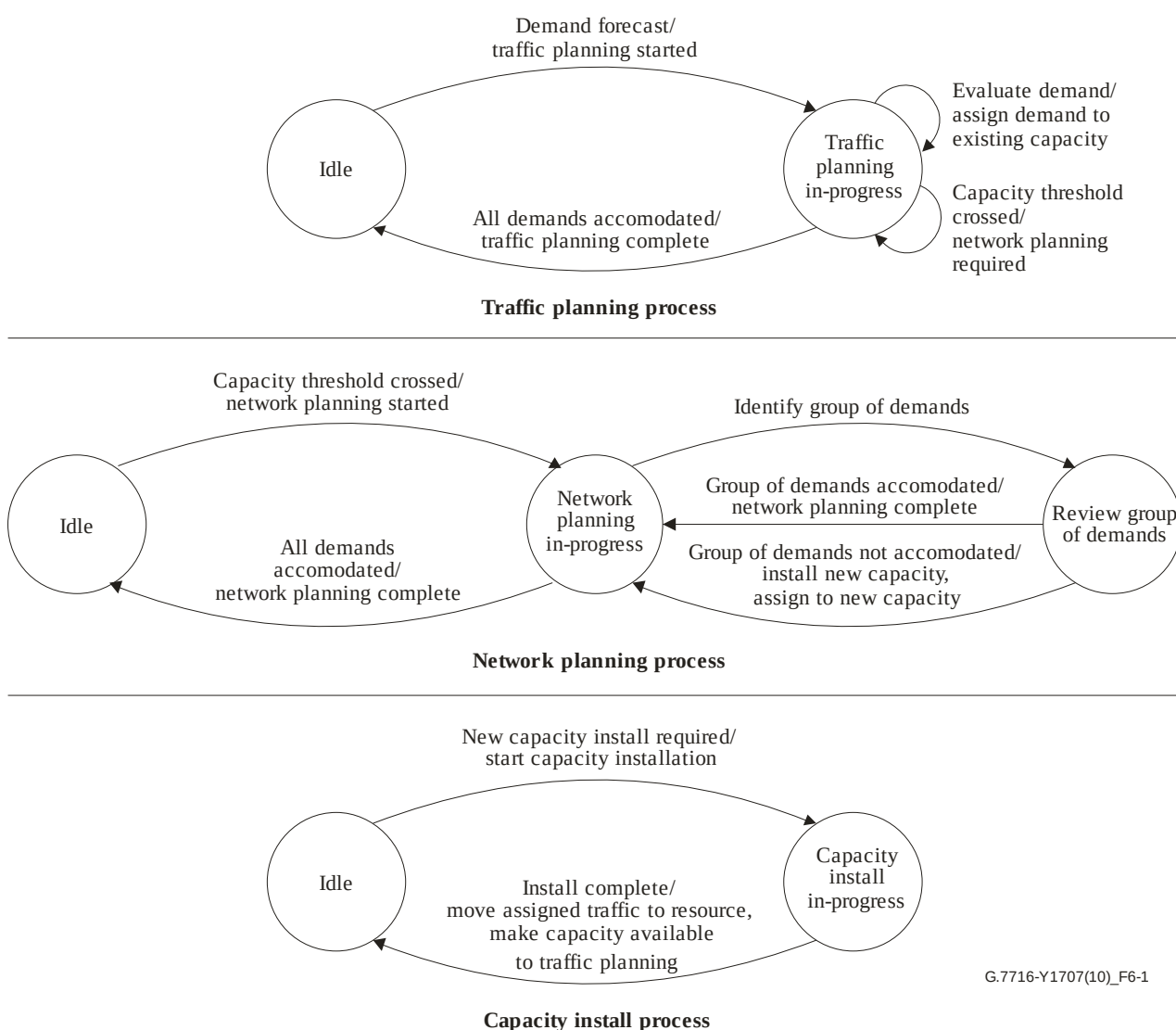


Figure 6-1 – Three processes in transport network design and operation phases

7 Automatically switched optical network plan

7.1 Transport network plan

As a part of the network engineering process, a transport network plan is developed and refined. This plan specifies the fundamental information needed to set up and operate an ASON. The information in the transport network plan can be divided into two categories: ASON Infrastructure and data plane topology. The necessary information for these two categories is shown in Table 7-1.

Table 7-1 – Network structure plan information

ASON infrastructure	Data plane topology
• protocol selection • control plane functional component distribution • signalling network design • component adjacency design	• subnetwork/routing area definition (Note 1) • layer network relationships • subnetwork/routing area hierarchy • topology abstraction • addressing structure (Note 2)
NOTE 1 – Subnetworks and routing areas are functionally identical, with some subtle differences. Clause 6.2 of [ITU-T G.8080] describes these differences. NOTE 2 – These addresses are for the data plane and should not be confused with addresses in use in a signalling communication network (SCN).	

Due to the dynamic nature of traffic forecasts, the transport network plan needs to be flexible – it must accommodate changes in network engineering. These may be manifested in changes to the data plane topology as well as to the signalling network, component adjacencies and even functional component distributions.

7.2 Management plane infrastructure

The management plane infrastructure for systems containing ASON functions is specified in [ITU-T G.7718] and [ITU-T G.7718.1]. [ITU-T G.7718] contains the framework for ASON management, putting ASON management within the telecommunication management network (TMN) context and specifying how the TMN principles may be applied. Requirements for ASON management information are specified so that a management information model can be developed.

[ITU-T G.7718.1] provides a protocol-neutral management information model for managing the ASON control plane. It identifies the TMN managed entities required. These entities are relevant to information exchanged across standardized interfaces defined in the Recommendation ITU-T M.3010 TMN architecture. The protocol-neutral management information model should be used as the base for defining protocol-specific management information models. The specific mapping of the protocol-neutral entities into protocol-specific managed object classes is the subject of the protocol-specific modelling design.

This Recommendation uses the ITU-T G.7718.1 information model when describing operational procedures. How implementations provide the information model and any operations necessary to synchronize the internal operation of the model implementation are out of scope of this Recommendation.