

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.8012/Y.1308

(02/2022)

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

Packet over Transport aspects – Ethernet over Transport
aspects

SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS,
NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Internet protocol aspects – Transport

Ethernet UNI and Ethernet NNI

Recommendation ITU-T G.8012/Y.1308

ITU-T G-SERIES RECOMMENDATIONS
TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS	G.200–G.299
INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES	G.300–G.399
GENERAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON RADIO-RELAY OR SATELLITE LINKS AND INTERCONNECTION WITH METALLIC LINES	G.400–G.449
COORDINATION OF RADIOTELEPHONY AND LINE TELEPHONY	G.450–G.499
TRANSMISSION MEDIA AND OPTICAL SYSTEMS CHARACTERISTICS	G.600–G.699
DIGITAL TERMINAL EQUIPMENTS	G.700–G.799
DIGITAL NETWORKS	G.800–G.899
DIGITAL SECTIONS AND DIGITAL LINE SYSTEM	G.900–G.999
MULTIMEDIA QUALITY OF SERVICE AND PERFORMANCE – GENERIC AND USER-RELATED ASPECTS	G.1000–G.1999
TRANSMISSION MEDIA CHARACTERISTICS	G.6000–G.6999
DATA OVER TRANSPORT – GENERIC ASPECTS	G.7000–G.7999
PACKET OVER TRANSPORT ASPECTS	G.8000–G.8999
Ethernet over Transport aspects	G.8000–G.8099
MPLS over Transport aspects	G.8100–G.8199
Synchronization, quality and availability targets	G.8200–G.8299
Mobile network transport aspects	G.8300–G.8399
Service Management	G.8600–G.8699
ACCESS NETWORKS	G.9000–G.9999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T G.8012/Y.1308

Ethernet UNI and Ethernet NNI

Summary

Recommendation ITU-T G.8012/Y.1308 specifies the Ethernet user-to-network interface (UNI) and the Ethernet network node interface (NNI). First, a set of physical Ethernet interfaces is defined for the Ethernet UNI and the Ethernet NNI. Further on, an Ethernet over transport interface is defined for the Ethernet NNI. The Ethernet over transport NNI uses the optical transport hierarchy (OTH) server layer network.

This edition of the Recommendation supersedes Recommendation ITU-T G.8012.1/Y.1308.1 (2012), and together with Recommendation ITU-T G.8021/Y.1341, supersedes Recommendation ITU-T G.8021.1/Y.1341.1 (2012).

This edition also removes items formerly considered for further study and incorporates terms formerly defined in Recommendations ITU-T G.8001/Y.1354 (04/2016) and ITU-T G.8101/Y.1355 (11/2016).

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T G.8012/Y.1308	2004-08-22	15	11.1002/1000/7362
1.1	ITU-T G.8012/Y.1308 (2004) Amd. 1	2006-05-07	15	11.1002/1000/8775
1.2	ITU-T G.8012/Y.1308 (2004) Amd. 2	2016-11-13	15	11.1002/1000/13094
2.0	ITU-T G.8012/Y.1308	2022-02-13	15	11.1002/1000/14931

Keywords

Ethernet NNI, Ethernet UNI.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents/software copyrights, 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 appropriate ITU-T databases available via the ITU-T website at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2022

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

	Page
1 Scope	1
2 References.....	1
3 Terms and definitions	2
3.1 Terms defined elsewhere	2
3.2 Terms defined in this Recommendation.....	2
4 Acronyms and abbreviations	2
5 Conventions	4
6 Ethernet transport network interface structure	4
6.1 Basic structure of Ethernet and EoT interfaces	4
6.2 Information structure for the Ethernet and EoT interfaces.....	5
7 Mapping and multiplexing principles	8
7.1 Mapping.....	9
7.2 Ethernet single level VID multiplexing.....	9
7.3 Ethernet two level VID multiplexing	9
8 Mapping of EC signals	10
Annex A – Ethernet over MPLS	12
A.1 MPLS link frame	12
A.2 Ethernet over MPLS	13
Bibliography.....	15

Recommendation ITU-T G.8012/Y.1308

Ethernet UNI and Ethernet NNI

1 Scope

This Recommendation specifies the Ethernet UNI and the Ethernet NNI, where the Ethernet UNI is formed by an Ethernet interface and the Ethernet NNI by an Ethernet interface or an Ethernet over transport interface. The Ethernet over transport NNI uses the OTH server layer network. The detailed requirements applicable to these interfaces are specified in a number of ITU-T Recommendations, and in IEEE Standards that are referenced.

This Recommendation defines the interfaces of the Ethernet transport network to be used within and between subnetworks of the Ethernet network, in terms of Ethernet transport hierarchy, formats for mapping and multiplexing client signals into Ethernet connections and formats for multiplexing Ethernet connection signals into Ethernet or non-Ethernet connection signals.

This Recommendation assumes but does not specify the Ethernet component and/or equipment models to support the Ethernet UNI and NNI. Those models are specified in [ITU-T G.8021]. This Recommendation limits the specification of the Ethernet UNI and NNI to Ethernet equipment types aligned with the bridge types specified in [IEEE 802.1Q] and supporting only the untagged, priority-tagged or tagged traffic units covered in [ITU-T G.8021].

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.

- [ITU-T G.709] Recommendation ITU-T G.709/Y.1331 (2020), *Interfaces for the optical transport network*.
- [ITU-T G.873.1] Recommendation ITU-T G.873.1 (2017), *Optical transport network: Linear protection*.
- [ITU-T G.873.2] Recommendation ITU-T G.873.2 (2015), *ODUk shared ring protection*.
- [ITU-T G.7041] Recommendation ITU-T G.7041/Y.1303 (2016), *Generic framing procedure*.
- [ITU-T G.8010] Recommendation ITU-T G.8010/Y.1306 (2004), *Architecture of Ethernet layer networks*.
- [ITU-T G.8011] Recommendation ITU-T G.8011/Y.1307 (2020), *Ethernet service characteristics*.
- [ITU-T G.8013] Recommendation ITU-T G.8013/Y.1731 (2015), *Operations, administration and maintenance (OAM) functions and mechanisms for Ethernet-based networks*.
- [ITU-T G.8031] Recommendation ITU-T G.8031/Y.1342 (2015), *Ethernet linear protection switching*.
- [ITU-T G.8032] Recommendation ITU-T G.8032/Y.1344 (2020), *Ethernet ring protection switching*.

[ITU-T G.8262]	Recommendation ITU-T G.8262/Y.1362 (2018), <i>Timing characteristics of a synchronous equipment slave clock</i> .
[ITU-T G.8264]	Recommendation ITU-T G.8264/Y.1364 (2017), <i>Distribution of timing information through packet networks</i> .
[ITU-T Y.1415]	Recommendation ITU-T Y.1415 (2005), <i>Ethernet-MPLS network interworking – User plane interworking</i> .
[IEEE 802]	IEEE Std 802-2014, <i>IEEE standard for local and metropolitan area networks: Overview and architecture</i> .
[IEEE 802.1AX]	IEEE Std 802.1AX-2020, <i>IEEE standard for local and metropolitan area networks – Link aggregation</i> .
[IEEE 802.1Q]	IEEE Std 802.1Q-2018, <i>IEEE standard for local and metropolitan area networks – Bridges and bridged networks</i> .
[IEEE 802.3]	IEEE Std 802.3-2018, <i>IEEE standard for Ethernet</i> .

3 Terms and definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 ETH_CI traffic unit: [ITU-T G.8010].

3.1.2 Ethernet services layer connection: [ITU-T G.8011].

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 customer Ethernet connection: An Ethernet connection of which the traffic units are encapsulated with an IEEE Std 802.1Q customer VLAN tag when they are transported through an Ethernet link¹. Outside an Ethernet link the traffic units are without such customer VLAN tag.

3.2.2 Ethernet connection²: Connectivity at the media independent layer of an Ethernet network.

3.2.3 link Ethernet connection: An Ethernet connection of which the traffic units are either not encapsulated (i.e., untagged) or encapsulated with an IEEE Std 802.1Q priority tag (i.e., priority-tagged).

3.2.4 service Ethernet connection: An Ethernet connection of which the traffic units are encapsulated with an IEEE Std 802.1Q service VLAN tag when they are transported through an Ethernet link. Outside an Ethernet link³ the traffic units are without such service VLAN tag.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

C-EC Customer Ethernet Connection

C-Tag Customer Tag

¹ The term 'Ethernet link' refers to the 'ETH link' topological component in [ITU-T G.8010].

² "Ethernet connection" as defined in this Recommendation is a superset of the "Ethernet services layer connection" defined in [ITU-T G.8011]. "EC" is a common abbreviation for both terms.

³ The term 'Ethernet link' refers to the 'ETH link' topological component in [ITU-T G.8010].