

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.8312

(12/2020)

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

Packet over Transport aspects – Mobile network transport
aspects

Interfaces for metro transport networks

Recommendation ITU-T G.8312

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.8312

Interfaces for metro transport networks

Summary

Recommendation ITU-T G.8312 describes a transport technology for metro networks (MTNs), including transport of distributed radio access network (D-RAN) and centralized radio access network (C-RAN) traffic. This technology leverages existing and emerging pluggable Ethernet modules and reuses flex Ethernet (FlexE) implementation logic.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T G.8312	2020-12-22	15	11.1002/1000/14517

Keywords

Frame formats, MTN, multiplexing, OAM.

* 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 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 2021

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	Definitions	2
	3.1 Terms defined elsewhere	2
	3.2 Terms defined in this Recommendation.....	2
4	Abbreviations and acronyms	2
5	Conventions	4
6	Metro transport network interfaces.....	4
7	MTN section layer	5
	7.1 Frame format	5
	7.2 Rate adaptation	6
	7.3 Processing blocks with uncorrected forward error correction errors	6
8	MTN path layer.....	6
	8.1 MTNP layer forwarding	6
	8.2 MTNP OAM formats	7
	8.3 OAM insertion.....	9
	8.4 OAM extraction.....	10
9	MTN overhead description	11
	9.1 Trail trace identifiers	11
	9.2 MTNS overhead description.....	12
	9.3 MTNP overhead description.....	13
10	MTN maintenance signals	18
	10.1 MTNS maintenance signals.....	18
	10.2 MTNP maintenance signals.....	18
11	MTN client mappings	18
	11.1 Ethernet MAC based clients	18
	Appendix I – Background on error marking in MTN	20
	I.1 Error marking	20
	I.2 Error contamination due to 66B block forwarding.....	20

Recommendation ITU-T G.8312

Interfaces for metro transport networks

1 Scope

This Recommendation specifies the rates and formats for use in metro transport network (MTN) digital layer networks: the MTN path (MTNP) layer and the MTN section (MTNS) layer, which support the transport of distributed radio access network (D-RAN) and centralized radio access network (C-RAN) traffic. It includes the following elements:

- frame structures;
- functionality of the overhead;
- formats for mapping client signals (CSs).

The MTNP layer provides flexible connections that carry client data and path operations, administration, and maintenance (OAM) in 64 bit/66 bit (64B/66B) blocks that are conformant to the encoding rules in clause 82 of [IEEE 802.3]. OAM functions include connectivity verification (CV), performance monitoring, path status and delay measurement (DM). Overhead to support MTNP layer protection is also supported.

The MTNS layer operates over 50GBASE-R, 100GBASE-R, 200GBASE-R or 400GBASE-R server layers. The MTNS frame format is specified in a way that maximizes reuse of [OIF FLEXE IA] implementation logic, including support for bonding homogenous groups of 50GBASE-R, 100GBASE-R, 200GBASE-R, 400GBASE-R interfaces. The MTNS layer uses 64B/66B blocks that are conformant to the encoding rules in clause 82 of [IEEE 802.3], which allow the MTNS layer to be transported transparently over the lower layers of the Ethernet protocol stack.

Functions and process flows associated with the interfaces specified lie outside the scope of this Recommendation.

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.800] Recommendation ITU-T G.800 (2016), *Unified functional architecture of transport networks*.
- [ITU-T G.805] Recommendation ITU-T G.805 (2000), *Generic functional architecture of transport networks*.
- [ITU-T G.806] Recommendation ITU-T G.806 (2012), *Characteristics of transport equipment – Description methodology and generic functionality*.
- [ITU-T G.8310] Recommendation ITU-T G.8310 (2020), *Architecture of the metro transport network*.
- [ITU-T M.1400] Recommendation ITU-T M.1400 (2015), *Designations for interconnections among operators' network*.



- [ITU-T T.50] Recommendation ITU-T T.50 (1992), *International reference alphabet (IRA) (formerly international alphabet No. 5 or IA5) – Information technology – 7-bit coded character set for information interchange*.
- [ISO 3166-1] ISO 3166-1:2020, *Codes for the representation of names of countries and their subdivisions – Part 1: Country code*.
- [IEEE 802.3] IEEE 802.3-2018, *IEEE Standard for Ethernet*.
- [IEEE 802.3cd] IEEE 802.3cd (2018), *IEEE Standard for Ethernet – Amendment 3: Media access control parameters for 50 Gb/s and physical layers and management parameters for 50 Gb/s, 100 Gb/s, and 200 Gb/s operation*.
- [IEEE 1588] IEEE 1588-2008, *IEEE Standard for a precision clock synchronization protocol for networked measurement and control systems*.
- [OIF FLEXE IA] Optical Internetworking Forum, IA Flex Ethernet 2.1 (2019), *Implementation agreement*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

- 3.1.1 **100GBASE-R** [IEEE 802.3]
- 3.1.2 **200GBASE-R** [IEEE 802.3]
- 3.1.3 **400GBASE-R** [IEEE 802.3]
- 3.1.4 **50GBASE-R** [IEEE 802.3cd]
- 3.1.5 **FlexE client** [OIF FLEXE IA]
- 3.1.6 **FlexE instance** [OIF FLEXE IA]
- 3.1.7 **low power idle (LPI) mode** [IEEE 802.3]
- 3.1.8 **MAC frame** [IEEE 802.3]
- 3.1.9 **ordered set** [IEEE 802.3]
- 3.1.10 **path** [ITU-T G.806]
- 3.1.11 **physical coding sublayer (PCS)** [IEEE 802.3]
- 3.1.12 **physical layer entity (PHY)** [IEEE 802.3]
- 3.1.13 **section** [ITU-T G.806]

3.2 Terms defined in this Recommendation

This Recommendation defines the following term.

3.2.1 Flex Ethernet implementation agreement; FlexE: Agreement that provides a generic mechanism for supporting a variety of Ethernet MAC rates that may or may not correspond to any existing Ethernet PHY rate.

NOTE – Paraphrased from [OIF FLEXE IA].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

1DM one-way Delay Measurement

2DMM	two-way Delay Measurement
2DMR	two-way Delay Measurement Response
AIS	Alarm Indication Signal
APS	Automatic Protection Switching
BER	Bit Error Ratio
BIP	Bit-Interleaved Parity
C-RAN	Centralized Radio Access Network
CRC-16	Cyclic Redundancy Check-16
CS	Client Signal
CV	Connectivity Verification
DAPI	Destination Access Point Identifier
DM	Delay Measurement
D-RAN	Distributed Radio Access Network
EoM	End of Message
FEC	Forward Error Correction
FlexE	Flex Ethernet
G/PCC	Geographic/Political Country Code
ICC	ITU Carrier Code
LF	Local False
LPI	Low Power Idle
LSB	Least Significant Bit
MAC	Medium Access Control
MCC	Management Communication Channel
MSB	Most Significant Bit
MTN	Metro Transport Network
MTNP	MTN Path
MTNS	MTN Section
OAM	Operations, Administration, and Maintenance
OCI	Open Connection Indication
PCS	Physical Coding Sublayer
PHY	Physical layer entity
RDI	Remote Defect Indication
REI	Remote Error Indication
RF	Remote False
S	Start
SAPI	Source Access Point Identifier
SoM	Start of Message