

ITU-T

G.709.1/Y.1331.1

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

Digital terminal equipments – General

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

Internet protocol aspects – Transport

Flexible OTN short-reach interface

Recommendation ITU-T G.709.1/Y.1331.1

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

Recommendation ITU-T G.709.1/Y.1331.1

Flexible OTN short-reach interface

Summary

Recommendation ITU-T G.709.1/Y.1331.1 specifies functions associated with the $n \times 100$ Gbit/s FlexO Group interface application. The intent is to keep it separate from the main ITU-T G.709 text.

History

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B100G, FlexO, Flex OTN, IrDI, KP4 FEC, SR or short reach.

* 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/11.1002/1000/1830-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.

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Recommendation ITU-T G.709.1/Y.1331.1

Flexible OTN short-reach interface

1 Scope

This Recommendation specifies a flexible interoperable short-reach OTN interface, over which an OTUCn ($n \geq 1$) is transferred, using bonded interfaces. The FlexO interfaces are covered by application codes which are at the time of publication 4I1-9D1F, 4L1-9C1F, C4S1-9D1F and 4L1-9D1F in [ITU-T G.695] and [ITU-T G.959.1]. A FlexO group interface complements the existing functions specified in [ITU-T G.709], such as B100G OTUCn frame, ODUk/flex, with new functions such as physical interface bonding, group management and OTUCn (de)mapping. The intent of the FlexO Recommendation is to capture links to existing [ITU-T G.709]/[ITU-T G.798] functions and to provide specifications for new functions that are applicable to FlexO groups. In addition, some introduction material for the addressed application is included.

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.695] Recommendation ITU-T G.695 (2015), *Optical interfaces for coarse wavelength division multiplexing applications*.
- [ITU-T G.709] Recommendation ITU-T G.709/Y.1331 (2016), *Interfaces for the optical transport network*.
- [ITU-T G.798] Recommendation ITU-T G.798 (2012), *Characteristics of optical transport network hierarchy equipment functional blocks*.
- [ITU-T G.870] Recommendation ITU-T G.870/Y.1352 (2016), *Terms and definitions for optical transport networks (OTN)*.
- [ITU-T G.872] Recommendation ITU-T G.872 (2017), *Terms and definitions for optical transport networks*.
- [ITU-T G.959.1] Recommendation ITU-T G.959.1 (2016), *Optical transport network physical layer interfaces*.
- [ITU-T G.7041] Recommendation ITU-T G.7041/Y.1303 (2016), *Generic framing procedure (GFP)*.
- [ITU-T G.8260] Recommendation ITU-T G.8260 (2015), *Definitions and terminology for synchronization in packet networks*.
- [IEEE 802.3] IEEE Std. 802.3:2015, *IEEE Standard for Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements Part 3: Carrier Sense Multiple Access With Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*.
- [OIF FlexE IA] Optical Interworking Forum, OIF (2016), *FlexEthernet Implementation Agreement*.

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3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 Terms defined in [ITU-T G.870]

- completely standardized OTUCn (OTUCn)
- optical data unit (ODUCn)
- optical payload unit (OPUCn)
- optical transport network (OTN)

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 FlexO frame: Consists of frame alignment (markers), OH, FEC and payload area.

3.2.2 FlexO lane: Refers to an electrical/optical lane of a FlexO interface, used to carry OTUC transport signals.

3.2.3 FlexO interface: Refers to an individual interface that is part of a FlexO group. The acronym used for FlexO interface is FOICx.k. The term Cx signifies the FlexO interface rate. The term k refers to the number of lanes in the interface.

NOTE – The terms member and PHY are often used to refer to a FlexO interface.

3.2.4 FlexO group: Refers to the group of $m * \text{FlexO}$ interfaces.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AM	Alignment Marker
B100G	Beyond 100G
BMP	Bit-synchronous Mapping Procedure
CAUI	(Chip to) 100 Gb/s Attachment Unit Interface
CM	Common Marker
CRC	Cyclic Redundancy Check
FA	Frame Alignment
FAS	Frame Alignment Signal
FCC	FlexO Communications Channel
FEC	Forward Error Correction
FlexE	Flexible Ethernet
FlexO	Flexible Optical Transport Network
FOIC	FlexO Interface
GFP	Generic Framing Procedure
GID	Group Identification
IA	Implementation Agreement
LSB	Least Significant Bit

MAP	PHY Map field
MFAS	Multi-Frame Alignment Signal
MS	Multiplexed Section
MSB	Most Significant Bit
NNI	Network Node Interface
ODU	Optical Data Unit
OH	Overhead
OPU	Optical Payload Unit
OSMC	OTN synchronization messaging channel
OTL	Optical Transport Lane
OTLk.n	Group of n Optical Transport Lanes that carry one OTUk
OTLC.n	Group of n Optical Transport Lanes that carry one OTUC of an OTUCn
OTN	Optical Transport Network
OTU	Optical Transport Unit
PCS	Physical Coding Sublayer
PHY	Physical Layer
PID	Physical Identification
PTP	Precise Timing Protocol
RES	Reserved for future international standardization
RPF	Remote Physical Layer Fault
RS	Regeneration Section
RS	Reed-Solomon
SM	Section Monitoring
SSM	Source Sync Message
STAT	Status
UM	Unique Marker
UP	Unique Padding

5 Conventions

This Recommendation uses the following conventions defined in [ITU-T G.870]:

- k
- Cn
- m
- n
- r

Transmission order: The order of transmission of information in all the diagrams in this Recommendation is first from left to right and then from top to bottom. Within each byte the most