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DIGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Optical line
systems for local and access networks

40-Gigabit-capable passive optical networks (NG-PON2): Definitions, abbreviations and acronyms

Recommendation ITU-T G.989



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Recommendation ITU-T G.989

40-Gigabit-capable passive optical networks (NG-PON2): Definitions, abbreviations and acronyms

Summary

Recommendation ITU-T G.989 contains the common definitions, acronyms, abbreviations and conventions of the ITU-T G.989-series of Recommendations.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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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.

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Recommendation ITU-T G.989

40-Gigabit-capable passive optical networks (NG-PON2): Definitions, abbreviations and acronyms

1 Scope

This Recommendation contains the common definitions, acronyms, abbreviations and conventions of the ITU-T G.989-series of Recommendations.

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 J.185] Recommendation ITU-T J.185 (2012), *Transmission equipment for transferring multi-channel television signals over optical access networks by frequency modulation conversion*.
- [ITU-T J.186] Recommendation ITU-T J.186 (2008), *Transmission equipment for multi-channel television signals over optical access networks by sub-carrier multiplexing (SCM)*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

- 3.1.1 access network (AN)** [b-ITU-T G.902]: An implementation comprising those entities (such as cable plant, transmission facilities, etc.) which provide the required transport bearer capabilities for the provision of telecommunications services between a service node interface (SNI) and each of the associated user-network interfaces (UNIs).
- 3.1.2 Ethernet LAN service (E-LAN)** [b-MEF 6.1]: An Ethernet service type that is based on a Multipoint-to-Multipoint Ethernet virtual connection.
- 3.1.3 Ethernet line service (E-Line)** [b-MEF 6.1]: An Ethernet service type that is based on a Point-to-Point Ethernet virtual connection.
- 3.1.4 Ethernet tree service (E-Tree)** [b-MEF 6.1]: An Ethernet service type that is based on a Rooted-Multipoint Ethernet virtual connection.
- 3.1.5 Ethernet virtual connection (EVC)** [b-MEF 6.1]: An association of UNIs to which the exchange of service frames is limited.
- 3.1.6 jitter (timing jitter)** [b-ITU-T G.810]: The short-term variations of the significant instances of a digital signal from their ideal positions in time (where "short-term" implies that these variations are of a frequency greater than or equal to 10 Hz).

3.1.7 service node (SN) [b-ITU-T G.902]: A network element that provides access to various switched and/or permanent telecommunication services.

3.1.8 service node interface (SNI) [b-ITU-T G.902]: An interface which provides customer access to a service node.

3.1.9 user-network interface (UNI) [b-ITU-T I.112]: The interface between the terminal equipment and a network termination at which interface the access protocols apply.

3.1.10 1:1 VLAN [b-BBF TR-101]: A VLAN forwarding paradigm involving a one-to-one mapping between user port and VLAN. The uniqueness of the mapping is maintained in the Access Node and across the Aggregation Network.

3.1.11 N:1 VLAN [b-BBF TR-101]: A VLAN forwarding paradigm involving many-to-one mapping between user ports and VLAN. The user ports may be located in the same or different Access Nodes.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 Optical access architecture terms

3.2.1.1 channel group: A set of channel pairs carried over a common fibre.

3.2.1.2 channel pair: A set of one downstream wavelength channel and one upstream wavelength channel that provides connectivity between an OLT and one or more ONUs.

3.2.1.3 channel partition: Any of the operator-specified non-overlapping subsets of TWDM or PtP WDM channels in an NG-PON2 system.

3.2.1.4 channel partition index: An identity of an operator-specified TWDM or PtP WDM channel subset in an NG-PON2 system.

3.2.1.5 channel termination (CT): See OLT PtP WDM channel termination, OLT TWDM channel termination.

3.2.1.6 coexistence element: A bidirectional functional element used to connect PON systems defined in different Recommendation series to the same ODN.

3.2.1.7 domain: A collection of all NG-PON2 network elements under a common and unique operational administration.

3.2.1.8 gigabit-capable passive optical network (G-PON): A PON system supporting transmission rates in excess of 1.0 Gbit/s in at least one direction, and which implements the suite of protocols specified in the ITU-T G.984-series of Recommendations.

3.2.1.9 next generation PON (NG-PON): In the context of ITU-T standards development activity, a generic term referencing the PON system evolution beyond G-PON. The concept of NG-PON currently includes NG-PON1, where the ODN is maintained from B-PON and G-PON, and NG-PON2, where a redefinition of the ODN is allowed from that defined in B-PON and G-PON.

3.2.1.10 NG-PON1: A PON system with a nominal aggregate capacity of 10 Gbit/s in the downstream direction. The NG-PON1 system is represented by XG-PON.

3.2.1.11 NG-PON2: A PON system with a nominal aggregate capacity of 40 Gbit/s in the downstream direction and 10 Gbit/s in the upstream direction, and implementing the suite of protocols specified in the ITU-T G.989-series of Recommendations. An NG-PON2 system is composed of a set of TWDM channels and/or a set of PtP WDM channels.

3.2.1.12 OLT PtP WDM channel termination: A logical function that resides at the OLT network element and terminates a single PtP WDM channel in a PtP WDM system.

3.2.1.13 OLT TWDM channel termination: A logical function that resides at the OLT network element and that terminates a single TWDM channel in a TWDM system.

3.2.1.14 optical access network (OAN): A part of an access network whose network elements are interconnected by optical communication channels. Note that an OAN may or may not extend all the way to the UNI, so that the user-side interface of the OAN does not necessarily coincide with the UNIs of the AN.

3.2.1.15 optical distribution network (ODN): A point-to-multipoint optical fibre infrastructure. A simple ODN is entirely passive and is represented by a single-rooted point-to-multipoint tree of optical fibres with splitters, combiners, filters and possibly other passive optical components. A composite ODN consists of two or more passive segments interconnected by active devices, each of the segments being either an optical trunk line segment or an optical distribution segment. A passive optical distribution segment is a simple ODN itself. Two ODNs with distinct roots can share a common subtree.

3.2.1.16 optical distribution segment (ODS): A simple ODN, that is, a point-to-multipoint optical fibre infrastructure that is entirely passive and is represented by a single-rooted tree of optical fibres with splitters, combiners, filters and possibly other passive optical components.

3.2.1.17 optical line termination (OLT): A network element in an ODN-based optical access network that terminates the root of at least one ODN and provides an OAN SNI.

3.2.1.18 optical network terminal (ONT): An ONU supporting a single subscriber.

3.2.1.19 optical network unit (ONU): A network element in an ODN-based optical access network that terminates a leaf of the ODN and provides an OAN UNI.

3.2.1.20 optical trunk line (OTL): A passive point-to-point segment of a composite ODN.

3.2.1.21 parenting: A passive optical network protection configuration where ONUs are connected to two CTs hosted in different OLT chassis. Typically, the OLT chassis in dual parenting are geographically remote from each other.

3.2.1.22 passive optical network (PON) system: A combination of network elements in an ODN-based optical access network that includes an OLT and one or more ONUs and implements a particular coordinated suite of physical medium dependent layer, transmission convergence layer and management protocols.

3.2.1.23 PtP WDM channel: In an NG-PON2 system, PtP WDM channel refers to the pair of one downstream wavelength channel and one upstream wavelength channel providing point-to-point connectivity.

3.2.1.24 PtP WDM PON: A multiple wavelength PON system that enables point-to-point connectivity using a dedicated wavelength channel per ONU for the downstream direction and a dedicated wavelength channel per ONU for the upstream direction.

3.2.1.25 RF video overlay: A method for video transmission in the downstream direction in a wavelength band between 1550 nm and 1560 nm according to [ITU-T J.185] and [ITU-T J.186].

3.2.1.26 TWDM channel: In an NG-PON2 system, TWDM channel refers to the pair of one downstream wavelength channel and one upstream wavelength channel providing point-to-multipoint connectivity by using, respectively, time division multiplexing and multiple access mechanisms.

3.2.1.27 TWDM PON: A multiple wavelength PON system in which each wavelength channel may be shared among multiple ONUs by employing time division multiplexing and multiple access mechanisms.

3.2.1.28 wavelength channel: A unidirectional (downstream or upstream) optical communications channel characterized by a single unique central frequency or a set of unique central frequencies mapped to one WM tributary port.

3.2.1.29 wavelength multiplexer (WM): A bidirectional functional element used to multiplex / demultiplex between NG-PON2 wavelength channel pairs and channel groups.

3.2.1.30 10-gigabit-capable passive optical network (XG-PON): A PON system supporting nominal transmission rates on the order of 10 Gbit/s in at least one direction, and implementing the suite of protocols specified in the ITU-T G.987-series of Recommendations. XG-PON is the realization of NG-PON1.

3.2.1.31 XG-PON1: A variant of an XG-PON system that operates at a nominal line rate of 10 Gbit/s downstream and 2.5 Gbit/s upstream.

3.2.1.32 XG-PON2: A variant of an XG-PON system that operates at a nominal line rate of 10 Gbit/s downstream and upstream.

3.2.2 Optical parameters, optical power, losses and penalties¹

3.2.2.1 attenuation: See optical path loss.

3.2.2.2 channel spacing: The absolute difference between the nominal central frequencies of two adjacent wavelength channels in a given reference grid.

3.2.2.3 consecutive identical digit (CID) immunity: The longest continuous sequence of identical bits, that can be present in a digital signal without causing degradation so that the system specifications are no longer met.

3.2.2.4 differential fibre distance: The absolute difference between the fibre distances of any two given paths between the R/S and S/R-CG reference points in the same ODN.

3.2.2.5 differential optical path loss: The absolute difference between the optical losses, expressed in decibel units, of any two given paths between the R/S and S/R-CG reference points in the same ODN.

3.2.2.6 dispersion: A physical phenomenon comprising the dependence of the phase or group velocity of a light wave in the medium, on its propagation characteristics such as optical frequency (wavelength) or polarization mode.

3.2.2.7 dynamic range: An optical receiver characteristic that is equal to the ratio of the receiver overload to the receiver sensitivity.

3.2.2.8 extinction ratio (ER): With respect to a digital On-Off keying signal generated by an optical transmitter, the ratio of the average optical power level at the centre of the binary digit corresponding to the high intensity of light to the average optical power level at the centre of a binary digit corresponding to the low intensity of light.

¹ For the definition of the NG-PON2 architectural reference points mentioned within this clause, please see clause 5.2. For the relationship between optical power and loss parameters, see clause 5.3. For the definition of the burst-mode transmitter enabled/disabled periods and the associated transient times, see clause 5.13.