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

Access networks – Optical line systems for local and
access networks

Wavelength division multiplexed passive optical networks (WDM PON): General requirements

Recommendation ITU-T G.9802.1

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Recommendation ITU-T G.9802.1

Wavelength division multiplexed passive optical networks (WDM PON): General requirements

Summary

Recommendation ITU-T G.9802.1 describes the general requirements for wavelength routed ODN based WDM PON. The general architecture and system level requirements, such as line rates, capacity in terms of channel count, optical line terminal (OLT) and optical network unit (ONU) modularity, and security are given. The symmetric nominal line rate combinations of 25 Gbit/s and 10 Gbit/s per wavelength channel are supported. The requirements for a range of relevant applications are described in terms of the needed interfaces, physical layer, operation, synchronization, resilience and protection options.

History

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Recommendation ITU-T G.9802.1

Wavelength division multiplexed passive optical networks (WDM PON): General requirements

1 Scope

This Recommendation, as part of the multi-wavelength passive optical network (MW-PON) [ITU-T G.9802] series Recommendation, describes the general requirements of wavelength division multiplexing (WDM) PON using wavelength routed optical distribution network (WR-ODN), i.e., based on a wavelength multiplexer in the optical distribution network (ODN).

It describes requirements of WR-ODN based WDM PON, including general system architecture, service requirements, physical layer requirements (e.g., reach, channel count options), system level requirements (e.g., line rates, coexistence), and operational requirements (e.g., guidelines for provisioning, monitoring, energy efficiency).

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.652] Recommendation ITU-T G.652 (2016), *Characteristics of a single-mode optical fibre and cable*.
- [ITU-T G.657] Recommendation ITU-T G.657 (2016), *Characteristics of a bending-loss insensitive single-mode optical fibre and cable*.
- [ITU-T G.986] Recommendation ITU-T G.986 (2010), *1 Gbit/s point-to-point Ethernet-based optical access system*.
- [ITU-T G.987] Recommendation ITU-T G.987 (2012), *10-Gigabit-capable passive optical network (XG-PON) systems: Definitions, abbreviations and acronyms*.
- [ITU-T G.988] Recommendation ITU-T G.988 (2017), *ONU management and control interface (OMCI) specification*.
- [ITU-T G.989] Recommendation ITU-T G.989 (2015), *40-Gigabit-capable passive optical networks (NG-PON2): Definitions, abbreviations and acronyms*.
- [ITU-T G.989.1] Recommendation ITU-T G.989.1 (2013), *40-Gigabit-capable passive optical networks (NG-PON2): General requirements*.
- [ITU-T G.989.2] Recommendation ITU-T G.989.2 (2019), *40-Gigabit-capable passive optical networks 2 (NG-PON2): Physical media dependent (PMD) layer specification*.
- [ITU-T G.989.3] Recommendation ITU-T G.989.3 (2021), *40-Gigabit-capable passive optical networks (NG-PON2): Transmission convergence layer specification*.

[ITU-T G.8261]	Recommendation ITU-T G.8261 (2019), <i>Timing and synchronization aspects in packet networks</i> .
[ITU-T G.8262]	Recommendation ITU-T G.8262 (2018), <i>Timing characteristics of a synchronous equipment slave clock</i> .
[ITU-T G.9802]	Recommendation ITU-T G.9802 (2015), <i>Multiple-wavelength passive optical networks (MW-PONs)</i> .
[ITU-T G.9806]	Recommendation ITU-T G.9806 (2020), <i>Higher speed bidirectional, single fibre, point-to-point optical access system (HS-PtP)</i> .
[ITU-T G.9807.1 Amd. 1]	Recommendation ITU-T G.9807.1 Amd. 1 (2017), <i>10-Gigabit-capable symmetric passive optical network (XGS-PON)</i> .
[BBF TR-156]	Broadband Forum Technical Report BBF TR-156 (2017), <i>Using GPON Access in the context of TR-101</i> .
[IEC 60825-2]	International Standard IEC 60825-2 (2004), <i>Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)</i> .
[IEEE 802.3]	IEEE Standards Association IEEE 802.3 (2008), <i>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</i> .
[IEEE 1588]	IEEE Standards Association IEEE 1588 (2019), <i>IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems</i> .
[IEEE 1588v2]	IEEE Standards Association IEEE 1588v2 (2021), <i>Precision Timing Protocol (PTP)</i> .

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined in [ITU-T G.987]:

3.1.1 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.

3.1.2 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 optical access network (OAN) service node interface (SNI).

3.1.3 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 user network interface (UNI).

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