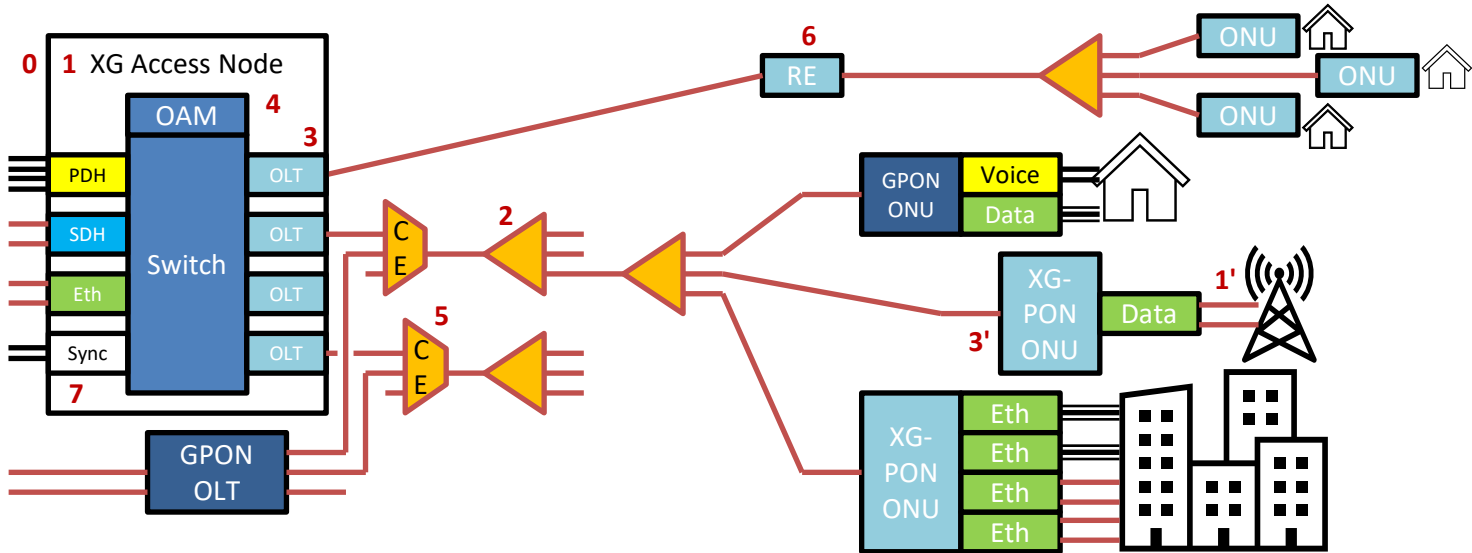


# G.987 10-Gigabit Passive Optical Networks

- G-PON compatibility via a wavelength plan, blocking filters, and loss budget for coexistence on a common ODN
- Support for single-sided and mid-span reach extension, with reach up to 60 km
- Full-service support with symmetric rate – including voice, TDM, Ethernet (up to Gigabit rates), xDSL, wireless backhaul
- Powerful OAM&P capabilities providing a feature rich service management system
- Advanced security features including authentication, rogue detection, and information privacy
- Power saving features on top of the already considerable low power nature of fibre access



## 0. ITU-T G.987 – 10-Gigabit-capable passive optical network (XG-PON) systems: Definitions and abbreviations

Establishes the common terms and acronyms used in the series, as well as delineating the various optical access topologies.

### 1. ITU-T G.987.1 – 10-Gigabit-capable passive optical networks (XG-PON): General requirements

Provides examples of services, User Network Interfaces (UNI) and Service Node Interfaces (SNI) that are required by network operators. In addition, it shows the principal deployment configuration. Wherever possible, this Recommendation maintains characteristics from the ITU-T G.984.x series Recommendations. The most important requirement is the backward compatibility with existing Optical Distribution Networks (ODN) that comply with these Recommendations.

#### 1'. ONU applications and services

The XG-PON system is intended to be a full-service access network. A key part of that is the extreme diversity of optical network units (ONU) types and form factors. In addition to all the applications described for G-PON, the higher capacity of XG-PON opens new possibilities. Examples of these are serving 4G cell sites and various enterprises. Existing G-PON ONUs can remain in service alongside the XG-PON ONUs, allowing for easier system upgrades.

### 2. ITU-T G.987.2 – 10-Gigabit-capable passive optical networks (XG-PON): Physical media dependent (PMD) layer specification

Provides the physical layer requirements and optical specifications for the PMD layer. This

Recommendation covers systems with nominal line rates of 9953.28 Mbit/s in the downstream direction and 2488.32 Mbit/s in the upstream direction, as well as other rates. The PMD is designed to operate bidirectionally over a single strand of single mode optical fibre (G.652). The downstream wavelength band is 1575 to 1580 nm, and the upstream wavelength band is 1260 to 1280 nm (with options). This wavelength plan allows coexistence with G-PON.

### 3. ITU-T G.987.3 – 10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) layer specification

Provides the frame format and media access control method, which are largely based upon the G-PON system with some field size adjustments. It describes the ranging and activation processes, dynamic bandwidth allocation (DBA), and the physical layer management (PLOAM) functionality that supports them. Security and authentication are also described.

#### 3'. ONU behaviour

The approach taken in G.987.3 is to describe in detail the behaviour of the ONU, leaving the detailed behaviour of the optical line terminal (OLT) to the implementer. The approach makes it possible to test for ONU conformance to the specifications. This makes the interoperability of different vendor's ONUs on a single PON possible. There are conformance and interoperability testing programs organized by the Broadband Forum (BBF).

### 4. ITU-T G.988 – ONU management and control interface (OMCI) specification

Defines the managed entities of a protocol-

independent Management Information Base (MIB) that models the exchange of information between the OLT and the ONU, not only for XG-PON, but all PON systems. The MIB describes the wide range of UNIs that an ONU may support. It covers the ONT management and control channel, protocol, and messages.

### 5. ITU-T G.9805 – Coexistence of Passive Optical Network Systems

Describes the methods and parameters for PON coexistence, where two or more PON systems share a common ODN.

### 6. ITU-T G.987.4 – 10-Gigabit-capable passive optical networks (XG-PON): Reach extension

Outlines the architecture and interface parameters for XG-PON systems with extended reach using a physical layer reach extension device, including regenerators or optical amplifiers. The maximum physical reach is up to 60 km, with loss budgets in excess of 28.5 dB being achievable in both spans. This new capability will allow operators to provide optical access service to areas that were previously out of reach, and also explore new network designs for greater central office consolidation.

**7. Synchronization** and timing are supported as part of the XG-PON system. G.987.3 describes methods for transferring precision timing information over the PON system, avoiding the inherent TDMA timing asymmetry. This is increasingly important for various wireless applications.