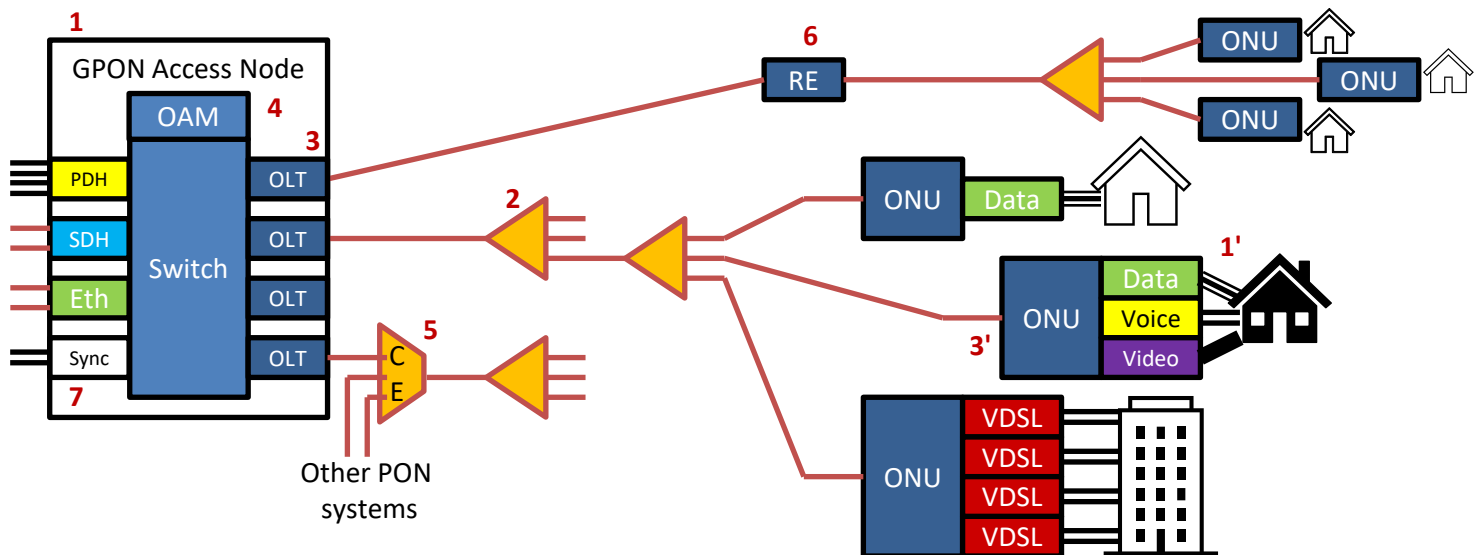


G.984 Gigabit Passive Optical Networks

- Full-service support – including voice, TDM, Ethernet (10/100/1000 BaseT), xDSL, leased lines, wireless extension and more
- Logical reach of up to 60 km. Basic physical reach 20 km, and reach extension provides 60 km physical reach
- Support for bit-rate options, the most important being 2.5 Gbit/s downstream and 1.25 Gbit/s upstream
- Strong Operation, Administration, Maintenance and Provisioning (OAM&P) capabilities for end-to-end service management
- Security at the protocol level for downstream traffic due to the broadcast nature of PON



1. ITU-T G.984.1 – Gigabit-capable passive optical networks (G-PON): General characteristics

Provides examples of services, user network interfaces (UNIs) and service node interfaces (SNIs) 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.982 and ITU-T G.983.x series Recommendations in order to promote backward compatibility with existing optical distribution networks (ODNs) that comply with these Recommendations.

1'. ONU applications and services

The G-PON system is intended to be a full-service access network. A key part of that is the extreme diversity of optical network unit (ONU) types and form factors. The simplest ONU would have a single data UNI. More elaborate ONUs can have multiple UNIs for the range of services consumed by a single user. A wide range of UNIs are possible, ranging from the simplest voice UNI to Ethernet, wireless data (802.11) and video (Coaxial networking) UNIs. Even more complex ONUs can have many interfaces to serve apartment buildings and businesses. It is also possible to serve wireless access networks (FTTwireless) and FTDrop-point networks (not shown).

2. ITU-T G.984.2 – Gigabit-capable passive optical networks (G-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 2488.32 Mbit/s in the downstream direction and 1244.16 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 (ITU-T G.652). The downstream wavelength is 1480 to 1500 nm, and the upstream wavelength is 1300 to 1320 nm (plus other options). The ODN is composed of fibres, passive splitters and connectors.

3. ITU-T G.984.3 – Gigabit-capable passive optical networks (G-PON): Transmission convergence layer specification

Provides the frame format and media access control method, including the means and policies of dynamic bandwidth allocation (DBA). It describes the ranging and activation processes, and the physical layer management (PLOAM) functionality that supports them. Security and authentication are also described.

3'. ITU-T ONU behaviour

The approach taken in ITU-T G.984.3 is to describe in detail the behaviour of the ONU, leaving the detailed behaviour of the 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 programmes 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 optical line termination (OLT) and the ONU, not only for G-PON, but all PON systems standardized

after G-PON. 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.984.5 – Gigabit-capable passive optical networks (G-PON): Enhancement band

Defines wavelength ranges reserved for additional service signals to be overlaid via wavelength-division multiplexing (WDM) in future PONs for maximizing the value of ODNs. The details of both the coexistence element (CE) and the blocking filter at the ONU are described. As new PON systems are standardized, this standard is updated to account for them.

6. ITU-T G.984.6 – Gigabit-capable passive optical networks (G-PON): Reach extension

Outlines the architecture and interface parameters for G-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 27.5 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 have long been supported as part of the G-PON system. More recent amendments to G.984.3 and G.988 have included methods for transferring precision timing information over the PON system, avoiding the inherent TDMA timing asymmetry.