FTTH Councils Global Alliance

Definition of Terms

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Powered by FTTH Councils Global Alliance - FCGA

Digital Council | FiberConnect Council MENA | Fiber Broadband Association | Fiber Broadband LATAM CHAPTER | Fiber Network Council APAC | FTTH Council Europe

ABOUT THE FCGA

The FTTH Council Global Alliance (FCGA) is the platform for cooperation of the six regional FTTH Councils active in North America, Latin America, Middle East and north Africa, Africa, Europe and Asia-Pacific. All FTTH Councils share a common goal: the acceleration of Fiber to the home adoption. They all act as powerful and independent organizations in their respective geographies. This regional focus gives the FTTH Councils a special strength to adapt their activities to the particular market situation in their area.

The FCGA ensures that those regional efforts are combined with the power of global cooperation. Within the FCGA, the FTTH Councils exchange studies, information and latest market developments.

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INTRODUCTION

The mission of the Fiber to the Home Global Councils (FGCA) includes the communication to stakeholders in our respective regions of the extent of usage of FTTH throughout the world and forecasting the growth of FTTH.

This task has been made difficult by the proliferation of terms and acronyms while no doubt useful to individual organizations for their specific purposes, lack precise definitions.

This is of particular concern when different research organizations choose their own definitions when conducting research. As a consequence it becomes impossible to compare the research on FTTH between different regions, or between different studies of the same region.

This document defines the terms used by all the FTTH Councils (North America, LATAM, Europe, the Middle East and North Africa, Asia-Pacific, and sub-Saharan Africa).

It is common in the industry to refer to systems that bring optical fiber close to the subscriber premises as FTTx. FTTx is a generic term where optical fiber replaces copper in the access network. This document explicitly defines FTTH and FTTB in which the fiber terminates at the subscriber's home or building.

This document specifically aims to reduce the terms used to a subset that are well defined, adequate and useful.

However, to be successful, the terms defined in this document must be used frequently and consistently. Thus, all Council members and other stakeholders such as operators, analysts, journalists, and government and regulatory staff are encouraged to use these terms as the well-defined vocabulary that underpin the more general expressions.

With regards to market research, however, in order to compare the research conducted by different organizations in the same or different regions, it is essential that these terms are used and not interchanged with other. The FTTH Councils will assure that the definitions of this document will be used for their market research.

THE TERMS

Supporting definitions:

"**Premises**" are homes or place of business. In a multi-dwelling unit[1] each apartment is therefore counted as one premises.

"**Subscriber**" is the premises that are connected to a network and uses at least one service on this connection under a commercial contract.

"**Homes Passed**" is the number of premises which an Operator has capability to connect to an FTTH/FTTB network in a service area, but the premises may or may not be connected to the network. Typically new service activation will require the installation and/or connection of a drop cable from the homes passed point (e.g. fiber-pedestal, manhole, chamber, utility-pole) to the premises, and the installation of subscriber premises equipment at the premises. This definition excludes premises that cannot be connected without further installation of substantial fiber plant such as feeder and distribution cables (fiber) to reach the property on which a potential new subscriber is located.

"**Homes Connected**" is the number of premises which are connected to a FTTH network and are already subscribers or can be turned into a subscriber without further installation work.

"**Penetration Rate**" equals "Homes Connected" divided by the number of premises in a service area.[2]

"**Connect Rate**" equals "Homes Connected" divided by "Homes Passed".

"**Take Rate**" equals "Subscribers" divided by "Homes Passed".[3] Expressed as a percentage, it can also be based on each type of service, i.e., take rates for data, video, voice, or triple/quadruple services.

Fiber-to-the-Home[4] (FTTH)
"Fiber to the Home" is defined as an access network architecture in which the final connection to the subscriber's premises is optical fiber. The fiber optic communications path is terminated on or inside the premises for the purpose of carrying communication services (voice, video, data) to a single subscriber. In order to be classified as FTTH, the access fiber must cross the subscriber's premises boundary and terminate: (a) inside the subscriber premises; (b) on an external wall of the subscriber's premises; or (c) no more than 2m from an external wall of the subscriber's premises. FTTH excludes architectures where the optical fiber terminates before reaching the premises and where the access path continues to the subscriber over a physical medium other than optical fiber, i.e., coax.

Fiber-to-the-Building (FTTB)[5]
"Fiber to the Building" is defined as a topological reference to a network that supports multiple subscribers in a single structure, i.e., a business or a building. Multiple dwelling unit (MDU) defines residential use and multiple tenant unit (MTU) defines business units. In order to classify as FTTB, the fiber must at least: (a) enter the building; (b) terminate on an external wall of the building; (c) terminate no more than 2m

[1] multi-tenant unit in some countries

[2] In the FTTH Global Ranking, the service area is defined as the country / economy

[3] It is expressed as a percentage. "Take rates" can be based on each type of service, for example, data take rates, video take rates, and voice take rates, or triple/quadruple services take rates

[4] Important note: This document uses the American English spelling "fiber". The FTTH Council Europe uses the British English spelling "fibre" in their communication. This is seen to be the same.

[5] FTTB construction is a transitional form commonly used as a means to deliver services to existing buildings in conjunction with associated FTTH construction (for example for new buildings). By introducing fiber cables from the fiber termination point to the premises FTTB can be subsequently converted to full FTTH. Such a conversion is desirable as FTTH provides better capacity and longevity than FTTB.

from an external wall of the building; (d) enter at least one building within a cluster of buildings on the same property; (e) terminate on an external wall of one building within a cluster of buildings on the same property; or (f) terminate no more than 2m from an external wall of one building within a cluster of buildings on the same property.

SOME MORE TERMS

Network Topology
The configuration of the cable plant that connects the operator's premises and the subscriber's premises, i.e., point-to-point, point-to-multipoint, or ring topology.

Point-to-multipoint (P2MP)
A star topology with optical splitters for PON systems in which an OLT is optically linked to multiple ONTs through entirely passive means. It provides branching optical signal paths from a communication node to more than one premises such that a portion of the optical paths are shared by traffic to and from multiple premises.

Point-to-point (P2P, PtP, Pt-Pt)
A topology in which all fiber links are from one transmitter to one receiver. Branching can be done at an intermediate point via an active device located anywhere on the network, including the CO or a curb-side enclosure. It provides an uninterrupted optical fiber path from the communication switching equipment point to a single location at the premises. For FTTx systems, it is typically used in active Ethernet.

	Technology			
Topology		Ethernet	T(W)DM PON	WDM-PON (wavelength per customer)
	Point-to-Point	Ethernet P2P	PON P2P	N.A.
	Point-to-Multipoint	Active Ethernet	PON P2MP	WDM PON

WDM-PON
A passive optical network with utilization of wavelength division multiplexing on a physical layer - assigning different wavelengths for separate ONU units. Specified by the ITU T G.989 document, two variations of WDM-PON ARE: point-to-point (P2P) and time and wavelength division multiplexing (TWDM).

RELATIONSHIP BETWEEN TOPOLOGIES AND TECHNOLOGIES

It is possible for a network to be built such that a common fiber plant can include a mix of different topologies or be re-configured over time to support different topologies, to allow for mixed user categories, to allow access diversity for reliability, and for future flexibility and network longevity.

Feeder Network
The fiber cables network deployed from the OLT in the central office to the first splitter in the field in a PON architecture.

Optical distribution network (ODN)
The fibers, splitters, couplers, etc., in a passive optical network that provide the optical transmission means from the OLT to the users, and vice versa.

Drop Cable
The fiber cable that connects the subscriber to the curb box and into the network.

Access Protocol
Access Protocols are the methods of communication used by the equipment located at the communication nodes and at the subscribers' premises (or buildings) to ensure reliable and effective transmission and reception of information over the optical paths. These protocols are defined in detail by the standards organizations that have created them, and are recognized and implemented by manufacturers around the world.

The Access Protocols in use today for FTTH Networks and the optical portion of FTTB Networks are:

"Ethernet" defined
A data communications protocol for premises and local access networks (IEEE 802.3). Ethernet features variable length packets that allow data to be sent with less overhead.

"EPON"
Based on IEEE 802.3ah protocol for Ethernet, EPON is a network data transport using a variable length packet structure up to 1,518 bytes at data rates up to 1,000 Mb/s over single-mode fiber. The EPON format uses up to 1:32 optical splitters and can use either one fiber bidirectionally (BX) or two fibers (LX) in low medium or high-power configurations.

"10GEPON" defined in IEEE802.3av is an upgrade of EPON to carry 10Gbps downstream and 1 or 10Gbps upstream

"B-PON" defined as
The first FTTx standard issued as ITU-T G.983, the B-PON standard was designed for the bidirectional transmission of ATM cells over G.652 single-mode fiber at a distance of 20 kilometers using wavelength independent splitters with split rates of up to 1:32. Originally defined by the FSAN S652 document.

"G-PON" defined as
Standardized in ITU-T G.984, G-PON handles data rates up to 2.5 Gb/s and split ratios up to 1:64. The standard features the GPON encapsulation method (GEM), which allows for the transmission of Ethernet packets and ATM cells.

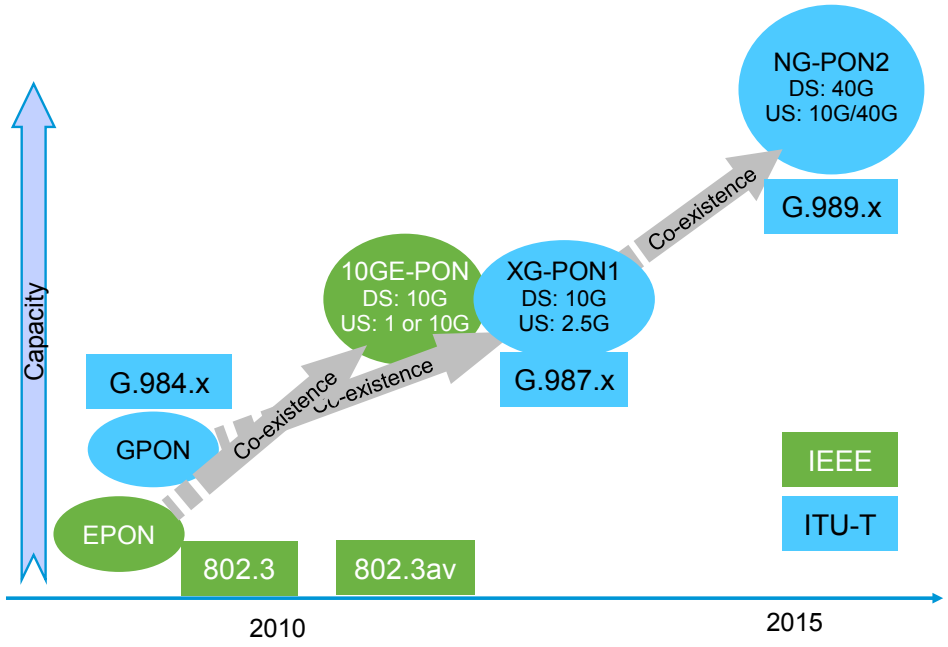
"XG-PON1" defined as
10 Gigabit passive optical networks covered under the ITU-T G.987 for telecommunicationbased optical networks.

Next generation PON (NG-PON)
Defined by FSAN as NG1 and released by the ITU as the G.987 10 Gigabit PON standard and G.9807.1 XGS-PON (symmetrical transmission).

Next generation PON2 (NG-PON2)
A 40-Gigabit passive optical network that uses time and wavelength division multiplexing (TWDM). Released as ITUT G.989.

"OTHER" access protocols such as proprietary or pre-standard access protocols may be noted for the

purpose of completeness in research.



Evolution of PON technologies

NETWORK USAGE

FTTH/FTTB networks may be dedicated to the services of a single retail or wholesale service provider, or made available to many retail service providers, who may connect to the network at the packet, wavelength or physical layer.

"Exclusive Access" refers to the situation where a single retail service provider (who may or may not be the network operator) has exclusive use of the FTTH network. Such a service provider is called "vertically integrated"

Open access
When multiple retail service providers may share use of infrastructure or network and compete to offer their services to end users.

Open access (duct)
The situation where multiple retail or wholesale service providers may use the infrastructure covering a substantial region by drawing or blowing their fiber cables through shared ducts and compete to offer their services.

Open access (packet)
The situation where multiple retail service providers may use the FTTH network on an equable base by connecting at a packet layer interface and competing to offer their services to end users.

Open access flexibility point
The concentration point, possibly located at a building or cabinet, where multiple retail or service providers may connect via their feeder cables and access Layer 1 feeder fiber connectivity to each household.

"Open Access (Layer2)"[6] refers to the situation where multiple retail service providers may use the FTTH

[6] In many cases this is also called "Bitstream Open Access"

network on an equable base by connecting at a layer 2 Ethernet interface from OLT or an aggregation point and compete to offer their services to end users

"Open Access (Layer3)"[7] refers to the situation where multiple retail service providers may use the FTTH network on an equable base by connecting at a layer 3 IP or MPLS layer interface from OLT or an aggregation point and compete to offer their services to end users

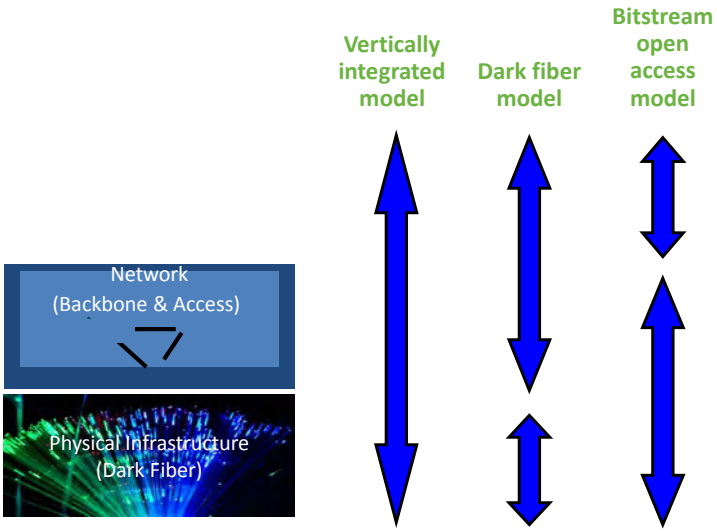
"Open Access (Wavelength)"[8] refers to the situation where multiple retail or wholesale service providers may use the FTTH network on an equable base by connecting at a wavelength layer interface and compete to offer their services.

"Open Access (Fiber)" refers to the situation where multiple retail or wholesale service providers may use the infrastructure by connecting at a physical layer (dark fiber[9]) interface and compete to offer their services.

"Open Access (Duct)" refers to the situation where multiple retail or wholesale service providers may share the use of infrastructure by drawing or blowing their fiber cables through the shared ducts, and compete to offer their services.

"Open Access Flexibility point" refers to the concentration point where multiple retail or service providers may connect via their feeder cables and access layer 1 feeder fiber connectivity to each household. This concentration or flexibility point may be located at the building or cabinet or ODF

Open access on multiple layers can be implemented in the same network, e.g., on a dark fiber level, and on a bitstream level. This is then called **"Multilayer Open Access"**.



Open Access Business Models

[7] In many cases this is also called "Bitstream Open Access"

[8] Open Access on a wavelength level was originally planned for WDM-PONs (which have never received sufficient market traction), but it will become relevant in the context of NG-PON2

[9] Dark Fiber is a strand of fiber which is made available to a provider, without active termination points, on an exclusive basis

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