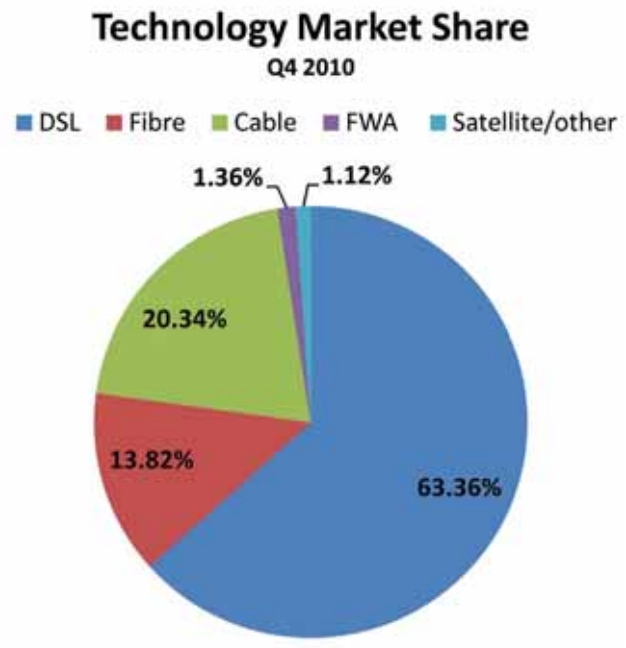
G-PON Advancements Fuelling a Record Year of Fibre Deployment

Robin Mersh, Broadband Forum Chief Executive Officer, talks to InterComms about how the Broadband Forum is supporting widespread adoption of G-PON, XG-PON1 and E-PON technologies

Passive Optical Networking has come today to be regarded as the vehicle for the delivery of better, faster broadband for both consumer and business use. PON technology is at the heart of broadband provision around the world as fibre deployments supplement DSL access technologies and bring the benefits of increased bandwidth and greater capacity for new services. Initially PON adoption was slowed by deployment costs as well as management and network integration questions. Today many of these issues have been resolved, through the work of bodies such as the Broadband Forum and FSAN (Full Service Access Networks), and fibre is now the fastest growing broadband access option in the world, with over 19% growth in the past twelve months.



Fibre eroding cable market share

Fibre and G-PON are often referred to as though they are synonymous. G-PON, however, is actually a type of point to multipoint, asymmetrical fibre architecture that can easily support up to 32 users off one fibre. The typical speed capabilities offered by the industry are 2.488 gigabits per second (Gbit/s) of downstream bandwidth, and 1.244 Gbit/s of upstream bandwidth. G-PON allows fibre to be brought closer to the user, and to increase the service opportunities and to utilize existing facilities wherever possible (i.e. keeping cost down) there are many hybrid G-PON/DSL deployment options serving customers around the world today.

The integration of fibre into traditional DSL-oriented networks and management platforms required a significant amount of work in creating specifications for conformance and interoperability. One of the organisations at the forefront of these efforts towards G-PON integration was the Broadband Forum, working with partners such as FSAN (Full Service Access Networks) and the ITU-T.

It was the ITU-T that developed the initial G-PON standard in 2003 and has since updated the specification many times to evolve the standard to meet new market requirements. The first major deployments of G-PON actually began four years ago, although regulatory concerns and interoperability issues still had to be faced at that time. It was at this point that the Broadband Forum began its important work towards enabling fibre architecture integration, interoperability and PON device management in broadband service providers' deployments, ensuring a wider adoption of G-PON through the industry. While standardization of G-PON systems is now complete, the Technical Reports (TRs) published by the Forum not only support the current phase of G-PON but are already paving the way for the easier and quicker adoption of next generation PON technologies.

A significant step forward was made with the birth of a strong collaboration between the Broadband Forum and FSAN in order to provide the stimulus for much of the exciting growth and introduction of higher bandwidth. A new Broadband Forum working group was created last year to focus specifically on Fibre Access ►

Networks. The FSAN IOP task Group now concentrates its efforts on the Physical and TC layers and the Broadband Forum has taken responsibility for the upper layers and the development of test suites for a G-PON conformance and interoperability program to serve the industry.

The first Broadband Forum Technical Report in this area was TR-156, which provided guidelines on how to integrate G-PON local loop into the IP access aggregation platform alongside DSL service. It enabled providers to take full advantage of GPON's capabilities, while insuring they can utilize the same access aggregation platform they have been using for DSL in order to deliver triple-play services effectively for residential and business customers, including Quality of Service, multicast, security and management support. This work has now been broadened to include support of the next generation technology, XG-PON1.

Since then the Broadband Forum has published a number of specifications needed to address better fibre integration into traditional networks as well as provisioning and remote management support of user PON access devices. As GPON is frequently paired with VDLS2 as a high speed hybrid solution, the Forum's work on establishing the industry's VDSL2 function and performance interoperability test suite has also been a key accelerator of the hybrid fibre deployments. The G-PON related body of work include:

- Ethernet Architecture for QoS & multicast (TR-101)
- G-PON Architectures (TR-156, TR-167)
- G-PON CPE management (TR-069, TR-142)
- G-PON CPE specification (WT-155)
- VDSL2 interoperability (TR-114, TR-115)
- Access Node Control Protocol (TR-147)

The Broadband Forum has also brought out an OMCI Implementer's Guide (G.Imp984.4) which defines exactly how the OMCI protocol must be used to manage TR-156 ONT/ONU.

Part of the role of the Broadband Forum's Fibre Access Network (FAN) working group involves the introduction of Interoperability and Conformance Testing for GPON equipment. There are two kinds of test plans being currently developed – conformance testing to check that a given device implements a given standard – and interoperability testing to verify that different devices developed by different vendors are able to work with each other. The specifications for these are at an advanced stage of development as Broadband Forum Working Texts (WT-247 – G-PON Conformance Test Plan and WT-255 – G-PON Interoperability Test Plan).

Even as these test plans are being finalised, the Forum has already staged a series of test and conformance events with FSAN – popularly known as Plugfests – which gives the industry the opportunity to test and fix their implementations and demonstrate the interoperability of their equipment. And whilst the new G-PON conformance test suite is now in final review, interoperability work on XG-PON1 is already starting, with first test events for the XG-PON1 PHY and TC layers already in the planning stages.

It is interoperability that is critical to the industry and everyone in it – as well as the users themselves. The main benefit for service providers is that true interoperability allows them to source their equipment from different suppliers safe in the knowledge that they can make sure their purchasing power remains competitive and also that they are not running the risk of single source dependency. At the user end of the chain, customers can move around the country confident that their equipment will remain easily supported wherever they choose to re-establish their broadband connection.

For vendors, interoperability is crucial; particularly to achieve mass deployment of G-PON and the investment levels they need to procure from service providers trying to keep pace with demand. Knowing their equipment has the interoperability "seal of approval" also opens up the potential for significant international growth and this situation will only expand as increased interoperability becomes the norm.

The next stage of development includes a simplification and convergence of devices. The desire of the market is to have the two consumer boxes become just one – to have the G-PON modem embedded into the routing gateway. The Broadband Forum has already published specifications for this device integration, which should help reduce both cost and the consumption of electric power. Management of these devices is supported by the TR-069 Customer WAN Management Protocol family of TRs.

As development continues on the next generation of G-PON – XG-PON1, the good news is that all the Broadband Forum's work in areas of G-PON such as network architecture and equipment support remains valid for XG-PON1. The Broadband Forum's conformance and interoperability programme developed in the context of G-PON will also apply to XG-PON1. This means that XG-PON1 equipment will be able to adhere to the established standards and program and therefore interoperability success for XG-PON1 will be a lot easier than it was for G-PON. The take-up of this next generation of equipment will therefore be much quicker and smoother for the market and the first commercial XG-PON1 products are expected as soon as end of this year.

One of the other next challenges for the Broadband Forum in this area will be to address some similar areas with E-PON – the IEEE-developed alternative technology which has been adopted largely across Asia. The first Broadband Forum specification addressing EPON (TR-200) "Using E-PON in the Context of TR-101" has just been delivered, with strong support and drive from our Asian service provider and manufacturing members.

Last year we saw the world's broadband connections pass the half a billion landmark. This in itself was a proud moment for the Broadband Forum whose focus over the last sixteen years has been to develop the full potential of broadband. The definition of broadband might have changed over the years, but the Forum's work evolved with that change and today's end-to-end architecture, management and interoperability efforts are as strong as ever. The G-PON standards based growth that we now enjoy sets the stage for the next phase of XG-PON1 deployments. All this work simply means we are helping the market reach the billion lines mark much faster and hopefully with much less pain – giving us the Connected Life we are all striving for.

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www.broadband-forum.org