4GBB
GOLD/G.fast

GOLD

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Partners:

ADTRAN GmbH, Germany

BT (British Telecom), UK

Deutsche Telekom AG, Germany

Ericsson AB (EAB), Sweden

Lund University, Sweden

Marvell Hispania S.L., Spain

Newcastle University, UK

Nokia Bell N.V., Belgium

Orange SA, France

SAGEMCOM, France

Sckipio Technologies, Israel

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www.celticplus.eu/project-gold

Gigabits Over the Legacy Drop

The GOLD project was the final project in a series of three developing the G.fast standard. G.fast is a fibre-backhauled broadband access standard using the last 20 to 450 meters of telephony wiring to deliver broadband to homes and businesses. Over short distances it delivers Gigabit rates. It extends fibre-optic networks delivering fibre speeds without the deploying fibre all the way to the homes, and can be seen as a DSL system extending the series of 1) voice band modems; 2) the ADSL family; 3) the VDSL family; and 4) now a G.fast family of broadband access systems. Thus, it is sometimes referred to as the 4th generation broadband systems.

Main focus

The first project in the trilogy G.fast series, 4GBB, explored the idea of large bandwidth signalling over copper drops for broadband access, extending previous DLS systems. The idea was found feasible opening up a new research domain. Following the surprisingly positive results, the project initiated the standardization of G.fast. The second project, HFCC, completed what turned out to become a G.fast family of standards, and created the first chipset and products. GOLD, the final project, matured the standard and the products, and prepared for mass deployment. The overall goal for GOLD and its predecessors was to ensure the competitiveness of European telecommunications industry and increase the bandwidth of the European broadband access networks to gigabit rates.

The first G.fast standard was approved in December 2014, earlier than expected, and the goals for the GOLD project has been to:

- Further develop and spread know-how around deployment practices in order to ensure that G.fast becomes a market success.

- Boost the usability of G.fast towards dense city areas by developing alternative backhauling options based on copper instead of fibre.

- Go beyond the first standard by initiating a second version of the standard with doubled bandwidth.

Approach

The projects were designed to be innovation platforms running in parallel with the standardization aiming at supporting standardization, product development and testing. The projects offered a friendly and cooperation-oriented environment where industry could explore areas needed to progress the standards work, coordinate work for increased efficiency, come to agreements about how to proceed, and prepare joint standardization contributions when appropriate. Academia supported the process with explorative research, by administrating a neutral innovation platform and by leading projects meeting in a role as mediator.

As the main goal of the project series was completing the G.fast family of standards, the creation of effective standardization contributions was a key performance indi-
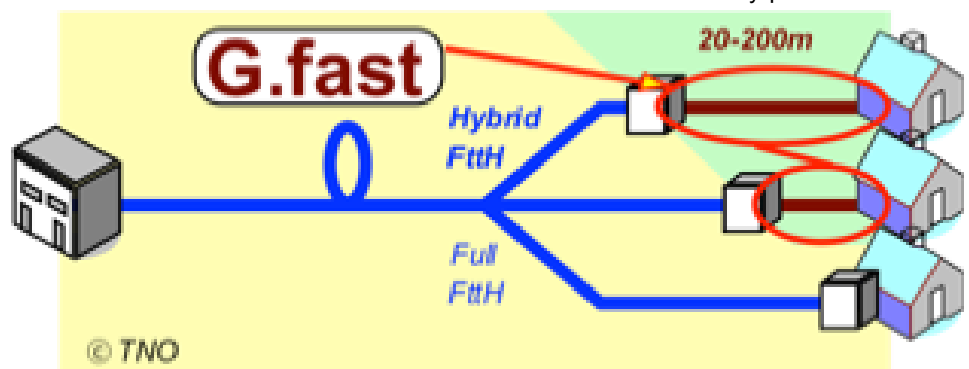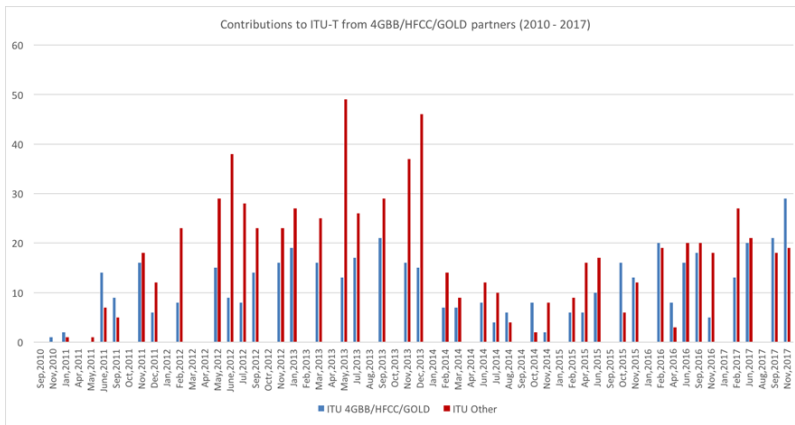

Figure 1: G.fast deployment

Figure 2: Contributions to Standardization Bodies (4GBB/HFCC/GOLD).

cator. The graph below show the number of standardization contributions made by the project partners to the various standardization bodies.

In addition to driving the standardization work, the project prepared carefully for the chip and system testing phase. Thanks to the vertical integration structure of the project, the testing could be done efficiently and over much shorter time than otherwise.

Achieved results

The Celtic-Plus platform was perfectly suited for the task creating a new standardized broadband system. As the direction of the standardization work changed, the project descriptions were continuously updated to match, ensuring that no effort was spend on topics no longer relevant. EU-projects could not have been used to achieve this as their flexibility is much more limited, often resulting in that European talent is spent completing tasks agreed in the past but since long obsolete.

As shown in the table below, the time from idea to product was about no less than five years faster for G.fast compared to the predecessor standards. This achievement is a result of the Celtic-Plus projects 4GBB, HFCC and GOLD and how these initiated and drove the standards, and how timely and effective testing was facilitated.

The project series delivered:

1. The G.fast family of standards,

2. a G.fast chip set,

3. a number of G.fast products,

including complete systems ready for installation,

4. new know-how about high-frequency signalling on copper that resulted in new broadband products in other areas than G.fast as well as in new radio systems,

5. knowledge and best practices about the deployment of G.fast,

6. and finally, in a number of fields trials and initial mass deployments.

Impact

The project series was initiated as a response to an impossible situation where public expectation and economic realities clashed. The European commission and many regulatory bodies pushed for a rapid deployment of optical fibre networks in order to deliver higher

	ADSL	VDSL	G.fast
Start of standard development	1992	1996	2011
First approved ITU standard	1999 (T1.413 approved in 1996)	2004	2014
Start of interop. tests	~2003	~2006	2015
Start mass deployment	~2000	~2009	2016/2017
Years to deployment	11 years	13 Years	5 Years

Figure 3: Time from standardization to product.

bitrates, in particular 100 Mb/s, to European homes. However, little public funding was provided to support this and the return of investment was far too low for private capital to fund such a venture. In particular, it was the last meters of fibre that was the most expensive per user, deploying individual fibres over lawns and in houses. The solution was then to come close to the homes with the fibres and use telephony copper only for the last few hundred meters, if the copper could deliver fibre speeds, gigabit rates. The project series realised this vision and created G.fast.

G.fast will enable a faster deployment of high bitrate broadband services in Europe, increasing the competitiveness of Europe, Europeans and European businesses, including of course the telecommunications industry. It also enables more effectively addressing a number of market segment and geographical areas. Access to broadband is an integral part of the European life style and democratic processes.