BROADBAND COMMUNICATIONS

THE NEED FOR SPEED

Even while most of us were still using dial-up modems, the EU recognised that citizens would only benefit from the internet revolution if a combination of research and strong policy could deliver broadband connections for everyone. Today research continues and speeds increase. What should we expect next?

Imagine going online, but having no video, no access to live TV, no instant messaging, iTunes, online maps or Skype. Just email (no large attachments) and web pages (with few pictures).

That was the web just a few years ago, yet already it seems like prehistory. There is no question of doubt that the development of broadband internet technologies and their deployment across Europe have been the primary stimulus of the internet revolution.

When Europe realised the great potential of the internet for Europe's economy and society, it also recognised that this enabling technology would rely on high-speed data connections. There would be little point in funding research on cutting-edge e-services if the basic infrastructure could not deliver these online innovations to citizens and business.

So the EU has ensured that its research programme always manages to include a comprehensive package of activities and calls to improve data transfer speeds. And over the past decade we have seen new technologies move from the lab and into the networks. From the painfully slow dial-up connections we have moved to the dominant ADSL broadband with speeds of up to 8 Mbit/s, or as high as 24 Mbit/s on ADSL2+ networks.

Some of the pioneering work in the development of broadband was funded through the European RACE programme which ran from 1987 to 1997. RACE projects were at the cutting edge of broadband technologies using the asynchronous transfer mode (ATM) for high-speed switching which forms the basis of today's ADSL networks.

These projects contributed 596 draft technical specifications to European and international standardisation bodies.

TAKING IT FURTHER

The idea of ADSL was conceived by Joe Leichleder, a researcher at Bellcore (now Telecordia Technologies) in 1987. He was originally developing this technology to transmit videos over phone lines. A small team of European researchers (funded by the EU) wanted to take it further.

They discovered that the technology is perfect for high-speed data communication like surfing the web. The French company Alcatel (now Alcatel-Lucent) patented ADSL and France Telecom tested the service in the main French cities between 1996 and 1999.

Since its introduction European companies have collaborated in EU projects to develop low-cost ADSL technologies and modems and make broadband affordable for domestic users and small businesses.

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Despite the success of ADSL using the legacy copper telephone network, Europe has also invested in optical and wireless broadband alternatives. Through the ACTS funding programme (successor to RACE) European researchers advanced the so-called multi-wavelength transmission method to increase the capacity of the internet's optical fibre backbone. At this time Europe also established its leadership in all-optical networking technologies.

The EU's vision of the internet as a tool for social inclusion and cohesion and a vehicle for better public services has also led to some big leaps in broadband networking. It was clear that the lack of broadband networks in non-urban or remote areas could lead to a 'digital divide' across the EU where citizens without broadband access could be seriously disadvantaged.

The i2010 policy was fundamental in setting the goal for full broadband access for all citizens by 2010. This in turn led to some exciting projects in FP6 that helped to make broadband commercially viable for low-density populations. The European roll out of the 3G mobile standard also opened the door to mobile broadband access.

Roughly a quarter of EU citizens now have fixed broadband connections and the majority of these are above 2 Mbit/s. There is clearly a long way to go before the goal of universal access is achieved, but citizens can be sure that even before today's broadband technology is taken up in earnest, European research is already working on the next jump in network capacity and speed. ■

PROJECTS IN FOCUS

The race is now in its third decade and still researchers are flat out trying to increase internet speeds. EU-funded research has made important contributions to the jump from dial-up networking to today's broadband connections. Can European research get us up to warp speed in time?

The Fashion project already gives us a glimpse of the new world of lightening fast internet. In technical demonstrations the project has set world-leading download speeds some 20 times faster than today's typical broadband. The project combined 16 high-speed 10 Gbp/s signals into one single signal/wavelength, and transmitted them error-free across a test network at an impressive 160 Gbp/s.

Taking a different approach, the Triumph project also achieved speeds of this order by developing state-of-the-art photonic switches.

Speed is one thing, but how do you ensure that everyone has broadband access? The Imosan project combined satellite and WiMAX wireless connectivity to give citizens in remote locations high-speed internet access and even interactivity with satellite TV.

Imosan took advantage of new European-led DVB-S2 standards. The team also developed components that could offer 'tripleplay' services — TV, internet and telephony. Finally, they developed optimisation software that would deliver the best possible service quality in bad weather or during high-demand periods.

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For isolated homes Imosan proposed a single community satellite receiver which could then deliver the content across a wider geographical area using WiMax. This service could cost as little as EUR 37 a month.

In 2008, the EU-funded UNIC project demonstrated how rural communities could have affordable broadband by combining a single satellite dish with a wireless WiMAX network. According to the project partners, this set-up is cost effective in villages of up to 1 000 residents.

Top speed data transmission and high bandwidth is also essential for the research community; broadband connections open up a whole new world of research capabilities.

The GÉANT project, also known as GN2, which received more than EUR 93 million under FP5, successfully built an open, accessible 'giant computer' in which powerful computer processing resources across Europe were networked together to provide researchers with supercomputing power.

With the infrastructure in place, the current GÉANT project (GN3) continues to explore innovative solutions to improve the network infrastructure. One way to speed up internet connectivity is to have end-to-end optical connections. The typical copper wire telephone connection is replaced with a fibre optic cable, a solution known as fibre-to-the-home (FTTH).

The problem with extending optical networks into every home is that the switching and routing components needed to distribute optical signals are expensive and it is not yet economical to mass produce them on the scale needed to wire up a city.

The Funfox project developed a laser signal transmitter and receiver, each integrated into an electronic chip. These two innovations hold the promise of cheap, mass produced chips for rolling out optical telecommunications networks on a big scale.