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Universities head towards unlimited bandwidth

The government institute BELNET currently provides high-speed Internet access for Belgian universities, colleges of higher education and research centres at a rate of 2.5 gigabits per second. By next year, that figure is set to quadruple to 10 gigabits per second. That will offer a capacity thousands of times higher than commercial broadband Internet in Belgium. BELNET's decision follows recent evolutions on the European front.

Belgian universities currently communicate with each other and with research institutions abroad through the BELNET network. From now on, these links will be forged through Géant2, the new European network for research and education. Géant2 has a standard capacity of 10 gigabits per second (Gbps). Its predecessor, Géant, was already the most advanced computer network in 2002, with more technological capabilities and a higher capacity than Internet2, its American counterpart.

Through Géant2, BELNET will now be able to offer universities almost unlimited bandwidth for international communication. BELNET expects that the increased capacity will result in greater instances and new forms of international, scientific collaboration. Currently at 2.5 Gbps, the current maximum capacity of BELNET's network. From next year this will quadruple when BELNET will offer the same capacity as Géant2.

"We expect that the lightning-fast connection speed will strike a chord with universities and research groups who need permanent, constant and exceptionally high bandwidth to do with as they wish," says Pierre Bruyère, director of BELNET. "Applications that simply don't exist because they were unthinkable with Géant, are now being made possible with Géant2. We are already approaching academics to brainstorm about new ways of establishing links with international co-researchers. That is why we are already announcing our capacity increase now. These kinds of new applications are not, after all, invented and implemented in a weekend."

Towards 10 Gbps per person?

Géant2 and BELNET go beyond simply providing 10 Gbps but will soon be able to simultaneously duplicate that capacity several times over. A Belgian university could therefore have a general connection of 10 Gbps, alongside additional connections of the same capacity for designated research groups. Even one individual researcher from the same university could, in principle, have access to a personal connection of 10 Gbps.

This virtually unlimited bandwidth is possible, at minimal extra cost, thanks to the so-called DWDM technology (Dense Wavelength Division Multiplexing). In a single existing fibre optic cable of Géant2, up to 50 different wavelengths (or light paths) can be activated, each with a capacity of 10 Gbps.

You could compare the new situation to a private freeway between two institutions. If a Belgian university wanted to connect, for example, to Heidelberg University in Germany, they will soon be

able to do so along a "freeway" reserved exclusively for them via BELNET, Géant2 and the German research network. Going even further than that, a direct link between two departments of these universities, such as the respective clinical biology laboratories, could be established in the same way. A freeway from door to door. No traffic jams and no intersections. Always the same, very high-speed connection. Several times the speed at which you used to drive before. You now know in advance, precisely when you will arrive.

DWDM connections (or light paths) are a breakthrough for applications that require co-operation but cannot tolerate variable data transmission. That is not the case, for example, with e-mail traffic, which can put up with delays. But think, for example, of a surgeon who operates on a patient via a remote-controlled robot. The robot must have a constant reaction speed, in real time. Other possible applications comprise, for example, video conferencing, distance learning, global observation, meteorological simulations, weather forecasting, research into the impact of nuclear disasters. Experimental collaborative performances could even be conducted with a virtual symphony orchestra, where the violin sections play in the USA and the horns in Europe.

"We are continuing to invest in highly advanced Internet infrastructure destined to lead to innovative scientific experiments, new applications and revolutions in the way we use the Internet," says Bruyère. "BELNET's key objective, after all, is to pioneer the way forward."

Géant2

One of the motivations behind the new Géant2 was the European CERN laboratory's high energy physics project in Geneva. As from next year, enormous amounts of data will be generated by a particle accelerator that will be processed by various research centres around Europe. Such a project demands a computer network with a virtually unlimited capacity.

Some 30 national research and education networks had already been connected to Géant for internal communication between clients of the respective networks. Since mid-October 2005, up until April this year, Géant's national research and education networks have been moving over to Géant2. BELNET is already connected to Géant2 and will function as a gateway for its clients.

Since September 2004, the national research and education networks have collectively contributed € 200 million a year to Géant2, and will continue to do so for a further 4 years. The European Commission has made the same commitment. BELNET currently contributes € 2 million a year to the Géant2 network, which is administered by DANTE (Delivery of Advanced Network Technology to Europe). TERENA (Trans-European Research and Education Networking Association), an organisation offering consultation to national research and education network employees, has also been involved in the development of Géant2. More information can be obtained from <http://www.geant2.net>.

Comparison: at 10 Gbps, a DVD containing 6 GB of uncompressed data can be downloaded in about 5 seconds. Through ADSL at, for example, 2 megabit per second, that would take more than 6 hours. Géant2 is therefore 5000 times faster. The difference is even greater, 40.000 times greater, for

uploading or sending data. It takes more than 2 days to send 6 GB by ADSL. Furthermore, download capacities are often restricted under commercial broadband Internet service providers, to a monthly data limit amounting to the capacity of just 1 DVD. BELNET clients, on the other hand, will be able to use their 10 Gbps capacity 24 hours a day, every day of the year.

About BELNET - "The knowledge network"

The government agency BELNET provides Internet access with a very high bandwidth to Belgian educational institutes, research centres and government services. More than 550,000 end-users use bandwidths of up to 2.5 gigabits per second; this is about a thousand times faster than the Internet access for consumers. References include all Belgian universities and most non-university higher education institutions, the computer network of the Federal Government services (FedMAN), all federal scientific institutes, the largest public research centres and various government administrations. BELNET provides high-quality Internet access with access control via the CERT (Computer Emergency Response Team) and a direct connection with world-wide research networks, including the American Internet2 and the European Géant. Internet pioneer BELNET was founded in 1993 at the Federal Research Policy's initiative. The network encourages research, training and scientific co-operation.

For more information, please go to <http://www.belnet.be> and <http://cert.belnet.be>

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BELNET expects that the increased capacity will result in greater instances and new forms of international, scientific collaboration. Currently at 2.5 Gbps, the current maximum capacity of BELNET's network. From next year this will quadruple when BELNET will offer the same capacity as Géant2. "We expect that the lightning-fast connection speed will strike a chord with universities and research groups who need permanent, constant and exceptionally high bandwidth to do with as they wish," says Pierre Bruyère, director of BELNET. "Applications that simply don't exist because they were unthinkable with Géant, are now being made possible with Géant2. We are already approaching academics to brainstorm about new ways of establishing links with international co-researchers. That is why we are already announcing our capacity increase now. These kinds of new applications are not, after all, invented and implemented in a weekend." Towards 10 Gbps per person? 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