Whole proves to be mightier than the parts

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Networking the world of education and research. Photo: © Krishna Kumar - Dreamstime.com

European researchers have developed solutions to help weld a mishmash of different technologies, protocols and system architectures, making it easier to run research and education networks.

Nearly all countries have research and education networks, which are separate from commercial telecommunications networks. But most are based on a mishmash of different technologies, network protocols and architecture, a situation that makes end-to-end connectivity for high-bandwidth connections very difficult.

It was the National Research and Education Network (NREN) in the United States that eventually evolved into the Internet. Every country in Europe, and in most of the rest of the world, also has its own NREN-type network linking together universities, research institutions and

computing centres. The EU has also established a backbone network to link the various research networks to each other.

So far, so good. The setup all sounds simple and logical. But there is a fly in the ointment in the shape of interconnectivity. Or rather the difficulties lie in connecting the different networks to each other, and particularly to commercial networks, from which the research ones are completely separated in most cases.

For a start there are three different levels, or layers of networks to deal with. At the bottom are the individual campuses with the different departments and buildings linked by a university-wide network.

Each university-wide network is joined to the national network of the country where the institution is located. The national networks then link up to the top-level European-wide network.

Bringing together the networks

Researchers with the EU-funded MUPBED project, spent about three years until the end of 2007, researching and testing ways in which the disparate components of different networks could be seamlessly linked together for high-quality and quick communications with very high bandwidth requirements.

Project coordinator Dr Jan Spaeth says a unique aspect of the project was that for the first time it brought together research network operators with standard telecom network operators.

“Until MUPBED, the two communities had been quite separate, with the incumbents and big telcos on one side of the fence and the research network on the other,” he says. “But there had been a big potential to improve mutual exchange and collaboration, starting by finding a

common technical language."

And although the project was geared up to meet the requirements of the research networks, its findings have proven to be of equal importance to the commercial networks. The researchers expect the commercial networks will build on the work done by the project to launch a new range of advanced services.

"What we see in research networks we also see in commercial networks but on a much bigger scale," says Spaeth. "Research networks are often a bit ahead of commercial networks in terms of both requirements and evolution, and this proved to be the case here."

The starting point for the project was to find a simple and fast way for people at different universities in different countries to share information.

"Somebody at a university somewhere in Europe may have to go through several different technologies and network domains before connecting to a colleague at another European university, and the quality of connection will not allow them to exchange the information they need to when they need to," Spaeth says.

Cutting out the middleman

The solution to this was to find a way to cut down vertically through the layers using an automated control plane. When a user makes a request for a connection of a particular bandwidth for a specific purpose, an automatic connection is set up between the networks. The networks then communicate with each other and provide the correct solution before informing the parties at both ends, and the operators involved in between, what has happened over the links.

“We developed a network solution which allows multi-domain networking, and working with standards bodies tested it against emerging standards,” says Spaeth. “We were able to influence the standards bodies, who had not previously been aware of the research networks’ requirements and had no input from that source.”

The MUPBED research partners then set up a series of connected test beds across the European networks, deploying new equipment, such as optical connections, Ethernet switches and routers. They were able to prove their solutions were technically feasible using current state-of-the-art technology.

At the heart of the solution is the optimisation of network resources by only using capacity when it is required for a specific task, and then releasing it again.

The researchers tested the system by holding high-quality multiple-person videoconferencing of a far better standard than what is commercially available today, by transferring bulk data from one point on the network to another, and by sending uncompressed video for medical purposes.

In each case the applications set up the required links with all the bandwidth that was required, and then released the capacity back to the network when the task was completed.

These solutions are not yet fully commercially available. It is now up to the research networks, and later the commercial operators, to decide if and when to invest in the infrastructure to make it and other as yet unsought scenarios a reality.

What MUPBED has done is to demonstrate the technology is real and ready to use right now.

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Source: ICT Results