Improving the flow of the fibre optic freeway

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Engineers have optimised the carrying capacity of fibre optic cable, providing a way to boost the performance of networks like the NBN. Credit: ThinkStock

Monash University researchers have played a pivotal role in the invention of an energy-efficient method of increasing the data capacity of optical networks to the point where all of the world's internet traffic could travel on a single fiber.

The breakthrough uses commercial components manufactured in Australia to optimize the efficiency of the existing optical fibre networks that connect towns and cities. It could dramatically boost the overall performance of networks like the National Broadband Network (NBN) while reducing costs.

Professor Arthur Lowery and Dr Liang Du of the Monash Department of Electrical and Computer Systems Engineering collaborated with Jochen Schroeder, Joel Carpenter and Ben Eggleton at the University of Sydney, through the Centre of Excellence for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS).

Their findings were presented at the world's largest optical communications conference, Optical Fiber Communications (OFC), in California late last week. So significant was the breakthrough that OFC accepted the submission after the deadline for presentations had closed.

The CUDOS researchers re-programmed a network component (known as a Wavelength Selective Switch) to work with data encoding technology that makes more efficient use of the available data channels.

They transmitted a signal of 10 terabits per second more than 850 km. As a comparison, ADSL 2+ speeds are commonly around six megabits per second.

Professor Lowery said using the switch, the signals could squeeze into gaps in the data traffic that flows around the large optical-ring networks between cities.

"Importantly, new traffic can be squeezed into the fibre at any location and added to any 'lane' of the fiber freeway even between existing lanes. Our approach is so flexible, network operators could adjust capacity to respond to increased demand, for example from people following big sport events like the Olympics," Professor Lowery said.

The technology would maximize existing infrastructure, allowing it to cope with the rising demand for Internet, which is expected to increase 1000-fold over the next decade.

"Rather than laying hundreds of new parallel optical fibers to boost network capacity, we can make more efficient use of the existing network by tweaking the way data is transmitted over long distances," Professor Lowery said.

"The NBN is effectively building a data road to every single house in Australia. We've found a way to make the data highways between cities and countries, far more efficient, with minimal extra investment."

Dr Du said the demonstrated method packs the data channels very close together, effectively allowing more lanes on the same super-highway.

"Previously, data was transmitted with gaps between the channels – this translates to wasted carrying capacity," Dr Du said.

"Because we are have made use of equipment that is already on the market, this technology could be translated to the consumer quite quickly."

Provided by Monash University