Horizon 2020
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Research Success Story

CONNECTING THE INTERNET THROUGH PHOTONICS

By 2019, the 18 billion devices connected to the internet will transfer 1.4 zettabytes of data globally per day. However, since current server-board technology has already reached its limit, a new type must be developed that offers high bandwidth at lower cost and requires less physical space and electricity. In order to help achieve this goal, the Horizon 2020 "ICT-STREAMS" consortium aims to develop a radically new optical technology.

Over the past decade, the world's data centres have become gigantic. The footprint of the largest is over 600 000 m² – the equivalent of 90 soccer fields. Together, these data centres consume about 3% of global electricity, a figure some analysts expect to treble within 10 years. But there are technological problems inherent in the circuit boards currently used, says Dr Felix Betschon, CEO and Scientific Director of vario-optics AG in Switzerland. And technological problems are there to be solved.

Faster, cheaper, greener

vario-optics is a member of ICT-STREAMS, a 3-year research project that aims to use photonics technology to revolutionise data transfer. The transceivers and routers developed by the consortium will increase server-board density by over 400% and throughput by 1600%, reducing energy consumption 10-fold. "vario-optics's part is to develop optical waveguides (structures that guide the optical waves) for energy-efficient optical on-board communication at high bandwidth," Betschon explains.

"vario-optics is one of the only companies in the world able to produce the required polymer waveguides"

"Our task is to create a circuit board in which processors communicate simultaneously with each other through optical signals within a server at unprecedentedly high data rates."

Strategy

Polymer waveguides on this new kind of circuit board will provide a simple interface to silicon photonic communication chips. "Polymer waveguides provide a cheaper, more efficient interface to silicon photonics components than conventional glass fibres," explains Betschon. "vario-optics is one of the only companies in the world able to produce the required polymer waveguides. But coupling light from silicon waveguides of 0.4 µm to polymer waveguides of 5 µm will still be a challenge. Small waveguides are about 1/16th of a hair's width, so you need a profoundly precise, disciplined technology to make them." The team of vario-optics seems to see such puzzles as a stimulus. "We will have to further improve the infrastructure used to manufacture waveguides. Also, because they are difficult to observe, we will have to develop new tools for quality inspection. But this project is in line with our company's technological strategy."

About ICT-STREAMS

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Dr Felix Betschon
CEO, vario-optics AG

CONTENT SUMMARY

The 9-member ICT-STREAMS consortium aims to develop the necessary silicon photonics transceiver and routing technologies to achieve a new and power-efficient, wavelength-division-multiplexing-based, tera-bits per second, optical on-board interconnection paradigm. It will enable multiple high bandwidth, point-to-point direct links at board level and represents a step forward to the realization of exascale computing systems.

FACTS AND FIGURES

Project Name
ICT-STREAMS (Silicon Photonics Transceiver and Routing Technologies for High-End Multi-Socket Server Blades with Tb/s Throughput Interconnect Interfaces)

Research Area
Photonics Key Enabling Technologies

Organisations
Aristotle University of Thessaloniki (Coordinator) and 8 partners

Start Date – End Date
01.02.2016 – 31.01.2019

Duration
3 years

Project Cost
€4.1 million

Project Funding
€4.1 million

Programme
Horizon 2020 Industrial Leadership: Leadership in Enabling and Industrial Technologies (LEIT) - Information and Communication Technologies (ICT)

More Information
www.ict-streams.eu

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