Photonics21 Press Release

Researchers use photonics to develop low-emission 1.6 Tb/s internet

European scientists are using photonics to develop a low emission, 1.6 terabits-per-second speed internet that will reduce power consumption by 50% per Gb/s

The Horizon 2020 funded consortium TERIPHIC is developing new optical transceiver modules used in internet datacentres that will reduce power consumption by 50% per Gb/s and in turn see lower carbon emissions.

Using light to exchange terabits - or thousands of gigabits per second - the TERIPHIC group expect their new transceivers to solve problems faster and reduce queue times.

Shortening processing intervals for High-Performance Computing, Edge Computing, and machine learning, the new ultra-high-capacity, low power consumption pluggable modules are capable of both 800 Gb/s and 1.6 Tb/s.

Speeds of 1.6Tb/s are the equivalent of downloading **267** HD Netflix movies in one second.

Aiming to surpass current 'gold' standards of 400GB per second, TERIPHIC (or "TERabit optical transceivers based on InP EML arrays and a Polymer Host platform for optical InterConnects,") expect their modules to cost €0.3 per Gigabits per second.

The three year, €5.6 million TERIPHIC project will operate until December 2021 and has received a grant of €4.7 million from the European Commission via the Photonics PPP.

Photonic Integration

Panos Groumas from the TERIPHIC project coordination team, said: "Photonics is essential for the future of datacentres. TERIPHIC intends to develop low-cost terabit optical transceivers through the automation of current photonic integration concepts and processes in commercial assembly machines."

"While 400G is impressive, and was demonstrated in 2018, High-Performance Computing, Edge Computing, machine learning, end-user experiences will not run on existing speeds of 400 Gb/s."

"We are developing mass production compatible 800 Gb/s pluggable modules with 8 lanes and 1.6 Tb/s mid-board modules with 16 lanes having at least 2 km reach," Groumas said.

"When the Gb/s power consumption is reduced, data centres will consume less power, and given that they are powered by power plants relying on various fuel sources including coal, we will see a significant reduction in carbon emissions."

Project Leader, Professor Hercules Avramopoulos said: "TERIPHIC will bring together EML arrays in the O-band, PD arrays and a polymer chip that will act as the host platform for the integration of the arrays and the wavelength mux-demux of the lanes."

"The integration will rely on butt-end-coupling steps, which will be automated via the development of module-specific alignment and attachment processes on commercial equipment.

"The new transceiver design introduced by TERIPHIC will allow significant cost savings, due to assembly automation of both the transmitter and receiver optical subassembly (TOSA/ROSA) parts, and also at the packaging level, resulting in a cost of around €0.3 per Gb/s for the transceiver modules," Avramopoulos said.

"TERIPHIC is an industrially driven project with specific and well-defined technical objectives. The technology that will be developed and delivered by the project is feasible due to the unique expertise that each one of the consortium partners brings to TERIPHIC.

"ICCS and Telecom Italia are responsible for providing the system specs, and together with Mellanox are responsible for the testing of the devices in both lab and real settings.

"Fraunhofer-HHI provides the photonic platform, the active components and is responsible for the hybrid integration of the latter with the photonic platform using ficonTEC machines. FiconTEC provides custom equipment for the automated assembly processes while III-V lab provides the high-speed electronic driver chips. Finally, Mellanox Technologies will take up the packaging of the transceivers," said Avramopoulos.

The project is coordinated by the **Photonics Communications Research Laboratory (PCRL)** of the Institute of Communication and Computer Systems (**ICCS**) at NTU Athens, Greece.

The consortium comprises five additional partners from four European countries: **Heinrich-Hertz Institute** of Fraunhofer Gesellschaft Zur Foerderung der Angewandten Forschung e.v, ficonTEC Service GmbH (Germany); **III-V Lab** (France); **Mellanox Technologies** Ltd. Mlnx (Israel); **Telecom Italia** Spa (Italy).

About Photonics21

Photonics21 is the European Technology Platform (ETP) for photonics, a technology encompassing all of the products and processes around the emission, manipulation and detection of light.

Photonics is integral to a wide range of industries that include the medical, healthcare, transport, manufacturing, and telecommunications sectors.

In September 2009 the European Commission defined photonics as one of five European Key Enabling Technologies (KET's). Shortly after, the European Research & Innovation Program "Horizon 2020" invited Photonics21 to become a "Public-Private Partnership" (PPP).

Photonics21 was set up in December 2005 to bring the community of photonics researchers and industries together. The "Photonics 21 Association", a legal entity under Belgium law, became the private contract partner in November 2013 in a Public-Private Partnership (PPP) in conjunction with the EU Commission.

According to a 2018 European Commission and European Investment Bank report, 'Financing the Digital Transformation', "Photonics is one of these essential key enabling building blocks for the digital transformation of Europe, which will be based on deep technologies."

Today Photonics21 represents more than 3000 personal members from across Europe and abroad. Our members are experts in the photonics industry, research organisations and universities who work collectively to develop a joint photonics strategy for future research and innovation in Europe.

With the global photonics market growing from €350 Billion in 2011 to €447 Billion in 2015 and a long-term growth rate twice that of global GDP, Photonics remains a strong industry.

The European photonics industry, estimated to be worth about €90 billion (2019), has considerable global leadership positions in Production Technology, Machine Visions, Digital Infrastructure, Optical Components and Medical Technology and a proven track record in an Innovation spending quota of 14% of sales.

With positive growth forecast, current industry and societal trends like digital transformation, resource efficiency, CO_2 reduction and real-time quality control for zero failure production will drive the photonics industry further.

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