Consortium

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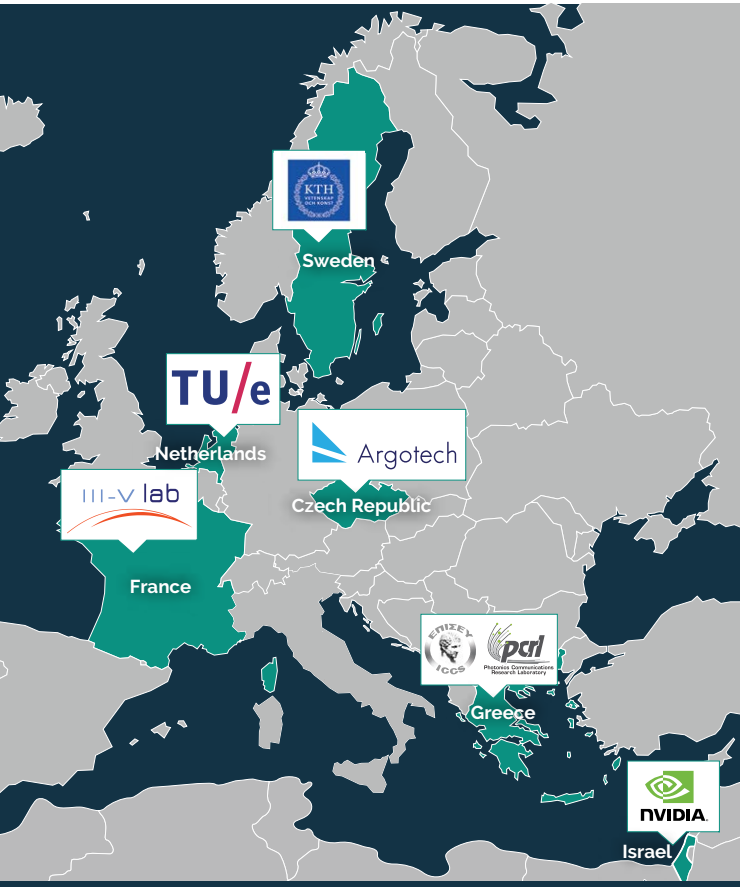

MEET THE TEAM

6 partners | 6 countries | 3 Universities | 2 Companies | 1 Research Institute

PHOTONICS PUBLIC PRIVATE PARTNERSHIP

Project Title:	Towards the neW era of 1.6 Tb/s System-InPackage transceivers for datacenter appLIcations exploiting wafer-scale co-inteGration of InP membranes and InP-HBT elecTronics
Project Website:	www.ict-twilight.eu
Project Coordinator:	Hercules Avramopoulos Institute of Communication and Computer Systems - National Technical University of Athens (GR)
Duration:	01/12/2019 – 30/11/2022 (48 Months)
Partners:	Institute of Communications and Computer Systems (GR) – Project Coordinator, Technische Universiteit Eindhoven (NL), III-V Lab (FR), Kungliga Tekniska Hoegskolan (SE), Argotech (CZ), Mellanox Technologies (IL)
Grant Agreement no:	781471
Funding:	ICT-05-2019 Application driven Photonics
EU Contribution:	5.080.621,25 €

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Towards the neW era of 1.6 Tb/s System-InPackage transceivers for datacenter appLIcations exploiting wafer-scale co-inteGration of InP membranes and InP-HBT elecTronics

PHOTONICS PUBLIC PRIVATE PARTNERSHIP

The Vision

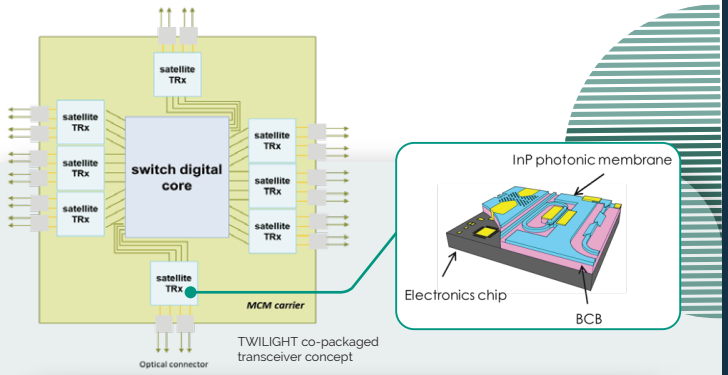
TWILIGHT will transform the datacenter environment by developing novel components and modules for 800 GbE and 1.6T co-packaged optical transceivers and optical space switches leveraging the combination of high speed InP membrane photonics and InP DHBT electronics technologies and novel co-integration and packaging schemes.

Objectives

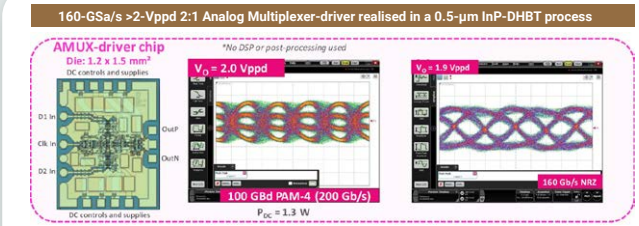
- **Objective 1: Development of high performance InP photonic components** on InP membranes enabling 112 Gbaud per lane transmission for intra- and inter- datacentre applications and ultra-fast large-scale integrated optical switches.
- **Objective 2: Development of high-speed InP-HBT electronics components** and ICs for interfacing with next generation 112G SERDES.
- **Objective 3: Development of system-on-chip photonic platform** based on the co-integration of actives and passives enabling complex functionalities.
- **Objective 4: Towards wafer-scale co-integration of InP photonics and InP-HBT electronics** for the development of optoelectronic engines with enhanced capabilities.
- **Objective 5: Intimate integration of optoelectronic engine with ASIC** for the development of system-in package (SiP) transceiver demonstrators for 1.6T intra- and inter- datacentre applications.
- **Objective 6: Development of a programmable compact ultra-fast 4×4 and 16×16 optical space switches** for low latency intra-datacentre connectivity.
- **Objective 7: Performance evaluation of the developed TWILIGHT demonstrators** under real network conditions and exploitation of project foreground.

Optical transceiver technologies

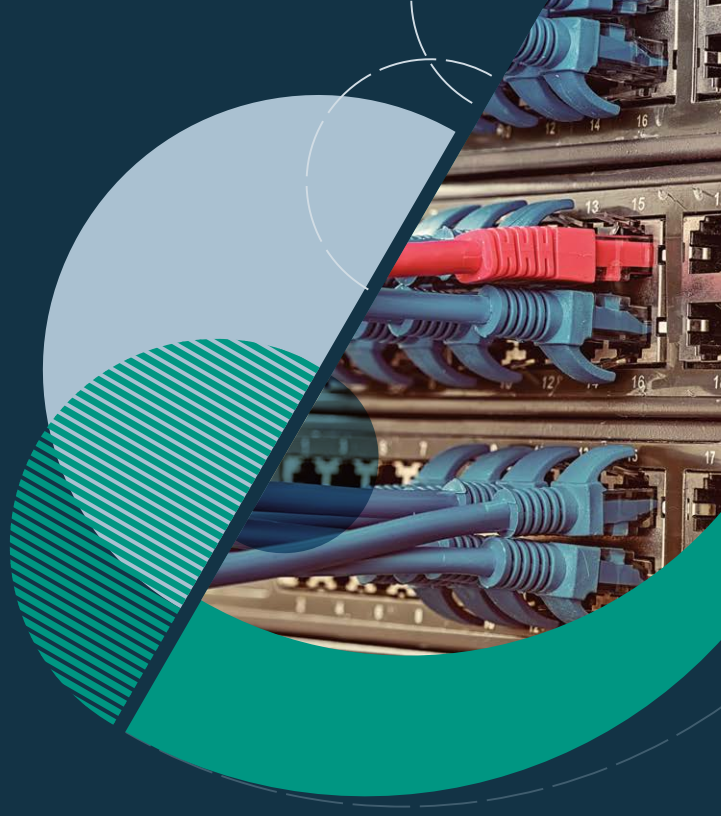
- **100-GHz electro-absorption modulated lasers (EMLs) and UTC photodiode arrays** on InP membrane photonic integration technology platform.
- **110-GHz InP-DHBT 2:1 analog multiplexer-driver** with gain peaking and linear amplification at the transmitter (Tx) side.
- **100 GHz InP-DHBT low-noise linear transimpedance amplifier (TIA)** and 1:2 analog demultiplexer at the receiver (Rx) side.
- **>400-GHz fT and >500-GHz fMAX 0.5-µm InP-DHBT process** with BVCE0>3.5 V for Tx and Rx InP-DHBT electronics integrated circuits
- **Close co-integration of photonics and electronics components (RF vias ~ 20-µm length)** via full wafers eliminating parasitic effects and allowing for ultra-high speed operation.
- **Multi-Chip-Module (MCM) transceiver architecture comprising satellite transceiver chiplets** placed close to the ASIC switch chip.



TWILIGHT co-packaged transceiver concept



R. Hersent et al.,"160-GSa/s-and-beyond 108-GHz-bandwidth over-2-Vppd output-swing 0.5-µm InP DHBT 2:1 AMUX-driver for next generation optical communications", IEEE MICROWAVE AND WIRELESS COMPONENTS LETTERS, VOL. 32, NO. 6, JUNE 2022, June 2022, doi: 10.1109/LMWC.2022.3161706.



Optical space switch technology

- **Nanosecond scale response exploiting ultra-fast energy efficient** and polarization insensitive InP membrane semiconductor optical amplifiers (SOAs).
- **Scalable to large number of I/O ports.**

Impact

TWILIGHT comprises industry-driven consortium and is committed to make large impact on next generation datacenter upgrades targeting 800 GbE and 1.6T standards and leveraging more than 70% power consumption savings and cost 0.89€/Gb/s.