QAMELEON AT A GLANCE

Project Title

Sliceable Multi-QAM SDN-powered Transponders and ROADMs Enabling Elastic Optical Networks

Contract Number

780354

Programme

H2020 ICT 2016-2017 – Photonics KET

Duration

01/01/2018 – 31/12/2021 (48 Months)

Budget

Overall Cost: 7.999.558,75 €
EU Contribution: 7.999.558,75 €

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- Institute of Communications and Computer Systems - National Technical University of Athens (GR)
- Finisar Germany GMBH (DE)
- Fraunhofer-Gesellschaft Zur Förderung der Angewandten Forschung E.V (DE)
- Interuniversitair Micro-Electronica Centrum (BE)
- Finisar Sweden AB (SE)
- Smart Photonics BV (NL)
- Technische Universiteit Eindhoven (NL)
- Vario Optics AG (CH)
- Danmarks Tekniske Universitet (DK)
- III-V Lab (FR)
- Nokia Bell Labs France (FR)
- VPI Photonics GmbH (DE)
- Aristotelio Panepistimio Thessalonikis (GR)
- Nextworks (IT)
- Telecom Italia SPA (IT)
- Optocap Ltd (UK)

Further Information

https://ict-qameleon.eu

QAMeLeon

The Challenge

Telecom operators struggle to keep pace with the soaring, increasingly volatile traffic traversing their networks. New video services are setting busy-hour internet on a steep growth curve reaching 36% compound annual growth rate (CAGR), vastly outpacing average traffic that rides on a hefty 25% CAGR. This skyrocketing demand has driven equipment manufacturers into a speed race: 200G shipments are now ramping up, and the first 600G products are expected to showcase in 2019, scaling symbol rates to 64 Gbaud. And while component and system vendors are well underway with the development of their 64 Gbaud portfolio, the enabling technologies to shift to the next gear of 128 Gbaud are urgently being sought.

Meanwhile, telcos grapple with reduced profitability and suppressed margins, as end users demand higher bandwidth and better Quality-of-Service at the same price. Consent among telcos and system vendors is that gradual cost reduction and capacity increases are not enough to exit this suffocating model; new concepts are needed to make networks more efficient and dynamic. The benefits of elastic networking are well-established by now whereas software-defined networking (SDN) is gaining traction, towards point-and-click provisioning of resources and delivery of new services. Although these concepts laid the foundations of programmable optical networks, there is still a long way to go towards fully automated and efficient networking.

Vision

Within this highly demanding environment, QAMeleon aims to deliver a new generation of faster, cheaper, and greener photonic devices with reduced footprint towards scaling core and metro networks to the next decade that will enable:

- SDN-enabled generation and reception of reconfigurable optical data-flows having increased spectral efficiency at ultra-high-speed rates up to 128 Gbaud with state-of-the-art modulation format techniques
- the development of scalable Colorless Directionless Contentionless and Gridless Reconfigurable Optical Add Drop Multiplexing (ROADM) node architectures supporting spectrum sliceability and on-demand switching reconfigurability.

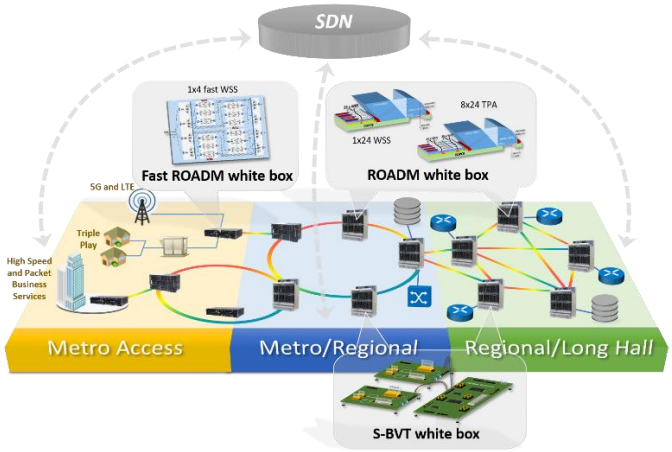

Figure 1: QAMeleon Concept and Vision

Project Objectives

Empowered by its ambitious vision (fig. 1), at the transponder side, QAMeleon will develop transceiver components enabling the switch to 128 Gbaud and bringing significant savings in footprint (>13×), energy/bit (10.4×) and cost/bit (>4.3×). More specifically, QAMeleon will develop:

- 75 GHz bandwidth InP electro-optical dual polarization IQ modulators
- >100 GHz InP HBT power electronic ICs
- 128 GSa/s high-resolution SiGe electronic ICs
- monolithic InP low-linewidth (<100 kHz) and high-power laser diodes

Targeting on the dramatically reducing the: overall power dissipation, footprint and cost/port of current-generation of switching modules at the ROADM side, QAMeleon will propose and develop an alternative compact and totally scalable optical switching platform for Wavelength Selective Switches (WSS) incorporating multiple InP PICs onto a low-loss electro-optical circuit board (EOPCB) platform. More specifically QAMeleon will develop:

- integrated flex-grid 1×4 WSS with nanosecond-scale switching time scalable to large channel counts (i.e. full C-band)
- a hybridly integrated large-scale and flex-grid 1×24 WSS and an 8x24 transponder aggregators (TPAs) enabled by compact Liquid Crystal on Silicon (LCoS) panels and miniaturized micro-optic subassemblies.

Taking a leap further, QAMeleon will integrate all its developed photonic components into functional subsystems and will validate them in scalable lab and field-trial demonstrators. More specifically, QAMeleon will deliver:

- a sliceable bandwidth-variable transponder (S-BVT) “white-box” operating a 3Tb/s speeds
- the entire DSP algorithm platform for generating, transmitting and detecting 128 Gbaud signals with novel modulation formats
- a flexible ROADM “white-box” for metro-access, empowered by the fast 1x4 WSS module
- two flexible and high port-count ROADM “white-boxes” for metro/long haul networks incorporating the 1x24 WSS and 8x24 TPA switching engines, respectively
- the entire overarching SDN framework for controlling the developed S-BVT and ROADM “white boxes”.

Technology Exploitation

QAMeleon is developing an end-to-end solution for next generation optical networking ranging from novel transceiver and ROADM modules to a flexible DSP and SDN toolkit as technology enabling framework for handling and switching ultra-high rate traffic flows. QAMelon's industry-driven consortium expands along the entire value chain and aims to foster the project's carefully selected set of innovations into tangible market outcomes. Driven by user needs, the project aims to bridge innovative research in optical networking with near-market exploitation, achieving transformational impact in energy consumption and cost/bit that will allow metro and core networks to continue to scale. QAMeleon's objectives address a vigorous multi-billion Euro market and the industrial partners of the consortium hold considerable market shares across the value chain. To this end, QAMeleon aims to industrialize the foreground knowledge that will be generated within the project and establish viable exploitation paths in order to reinforce the European industrial competitiveness. The envisioned industrialization lines are associated with:

- Photonic Components and devices
- Electronic components and devices
- >1 Tb/s SDN-enabled transceiver line-cards and white-boxes for next generation optical metro/core networks
- SDN-enabled sliceable optical switches and WSS components for ROADM nodes
- Photonic component and system modelling simulation platforms
- DSP algorithm suites for generating, transmitting and evaluating high-speed optical signals with novel and spectrally efficient modulation technique