# LIGHTNESS: Low latency and high throughput dynamic network infrastructures for high performance datacentre interconnects

## Description

The main objective of the LIGHTNESS project was the design, implementation and experimental evaluation of high performance data centre interconnects through the introduction of innovative photonic switching and transmission inside data centres. Harnessing the power of optics enabled data centres to effectively cope with the unprecedented demand growth to be faced in the near future, driven by the increasing popularity of computing and storage server-side applications in the society. Indeed, the deployment of optical transmission systems leveraging Dense Wavelength Division Multiplexing (DWDM) allows the transmission of more than a hundred of wavelength channels operating at 10, 40, 100 Gb/s and beyond. This effectively resulted in “unlimited” bandwidth capacities of multiple Terabit/s per fibre link, which can be efficiently utilized through next-generation all-optical switching paradigms like Optical Circuit Switching (OCS) or Optical Packet Switching (OPS).

In this context, the LIGHTNESS project joined efforts towards the demonstration of a high-performance all-optical hybrid data plane for data centre networks, combining both OCS and OPS equipment to implement transport services tailored to the specific applications’ throughput and latency requirements. To this goal, an OPS node suitable for intra- data centre connectivity services were developed and prototyped during the project, together with an enhanced Top of the Rack (TOR) switch seamlessly connecting servers in each rack to the hybrid OCS/OPS inter-cluster network. As an additional achievement of LIGHTNESS, the OCS/OPS inter-cluster network will be empowered with a control plane entity able to dynamically provision both OCS and OPS transport services in response of either the data centre management plane or the enhanced ToR switch. Such a control plane was also be developed and prototyped for integration in the final LIGHTNESS demo throughout the project. The LIGHTNESS project, in partnership with broad expertise in all data centre, optical data plane and optical control plane worlds, brought innovation to the realization of data centre networking solutions meeting the real needs in such environments.

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