



# STRAUSS: Orchestration of heterogeneous optical networks for Ethernet transport

## At A Glance: STRAUSS

*Scalable and efficient Orchestration of Ethernet services Using Software-defined and flexible optical networks*



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**Partners (JP):** Osaka University, KDDI R&D Labs, Fujitsu.

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*The STRAUSS project aims to define a highly efficient and global (multi-domain) optical infrastructure for Ethernet transport, covering heterogeneous transport and network control plane technologies, enabling an Ethernet ecosystem.*

## Main Objectives

STRAUSS will design, implement and evaluate, via large-scale demonstrations, an advanced optical Ethernet transport architecture. The proposed architecture leverages on software defined networking principles, on optical network virtualization as well as on flexible optical circuit and packet switching technologies beyond 100 Gb/s. In particular, the STRAUSS project objectives involve the design and development of the following technologies:

- Cost/energy efficient and extremely fast-performing switching nodes based on variable-capacity and fixed-length optical packet switching technology for access and aggregation networks.
- Flexi-grid DWDM optical circuit switching nodes and transmission systems for long haul transport, such as highly integrated and scalable software defined optical transceivers supporting bandwidth variable multi-flows for flexible Ethernet transmission.
- Technologies for dynamic and on-demand partitioning of the optical infrastructure, offering virtual optical Ethernet transport networks.
- Control plane architectures based on either legacy (e.g. GMPLS) and new (e.g. OpenFlow based) protocols for the control and management of virtual slices.
- A service and network orchestration layer for the interworking and coordination of heterogeneous control planes and transport technologies to offer end-to-end Ethernet transport services.

These objectives will be fulfilled by demonstrations on testbeds in EU & Japan, using and extending the available testbeds, infrastructures and know-how developed by the consortium partners.

**STRAUSS addresses the requirements of future optical infrastructures to support Ethernet transport beyond 100 Gbps and end-to-end network service provisioning**

## Technical Approach

STRAUSS proposes a future network architecture based on software defined optical Ethernet transport, composed of four layers:

- A flexi-grid optical path-packet transport network infrastructure. The underlying physical infrastructure covers different/heterogeneous technologies based on: i) optical packet switching technology to provide scalable and cost/energy-efficient traffic grooming at sub-wavelength granularity, ii) optical spectrum switching technology to provide flexible spectrum management capabilities, and iii) software-defined and sliceable (multi-flow) bandwidth-variable transponders (BVT) supporting multiple data flows with different modulation formats and bit rates.

- A transport network virtualization layer which, based on the abstracted infrastructure information, virtualizes the heterogeneous data plane resources. The physical infrastructure is partitioned and/or aggregated into virtual resources, and virtual resources from different domains are selected to compose end-to-end virtual transport infrastructures.

- A control plane for the virtualized infrastructure, employing GMPLS and/or network control based on OpenFlow, providing automated connection provisioning and recovery services.

- A Service and network orchestration layer, on top, using SDN-based service and network orchestrator(s), responsible for the interworking of different control plane paradigms in order to provide end-to-end Ethernet services.

STRAUSS work methodology is based on four technical Work Packages (WPs) addressing the proposed architecture:

- WP2 – Flexible Optical Infrastructure Solutions for Ethernet Transport.
- WP3 – Network Virtualization, Control Plane and Service Orchestration.
- WP4 – Integration and Demonstration.
- WP5 – Dissemination, Standardization and Exploitation of Results.

In addition to the technical activities, WP1 Coordination is the responsible to organize and implement from both EU and Japan sides decision-making, internal and external

communication, administrative and technical control of the whole project, etc. It will set the basis for EU-Japan coordination of the technical activities of WP2-5 and the close interaction of partners from both sides.

## Key Issues

- To investigate cost/energy-efficient solutions for transmission

and data plane aspects such as the design and development of sliceable transponders, flexible nodes and the integrated interface between fixed-length, variable-capacity OPS and flexible OCS switching nodes.

- To identify the requirements, use cases and architectural and functional design of the transport network virtualization.

- To investigate the OpenFlow protocol extensions and the SDN orchestrator for cross-layer (OPS and flexi-grid OCS) and cross-technology (GMPLS and OpenFlow-controlled) network infrastructures.

- The integration, experimental validation and demonstration of the implemented systems through both standalone EU and Japan testbeds and intercontinental EU-Japan experimental platform.

## Expected Impact

Outcomes of STRAUSS will be experimentally validated by means of demonstrations on large scale testbeds in EU & Japan. STRAUSS will provide technological roadmaps, technical approaches and deployment strategies aiming at shortening innovation and exploitation cycles in the area of future optical Ethernet transport networks for both academia and industry in EU and Japan. STRAUSS will contribute to Standardization bodies and publish scientific results in high-impact international journals and major conferences.

