FLEX-SCALE

Flexibly Scalable Energy Efficient Networking

INTRODUCTION TO FLEX-SCALE PROJECT

6G SNS Projects Worskshop, 6th March 2023

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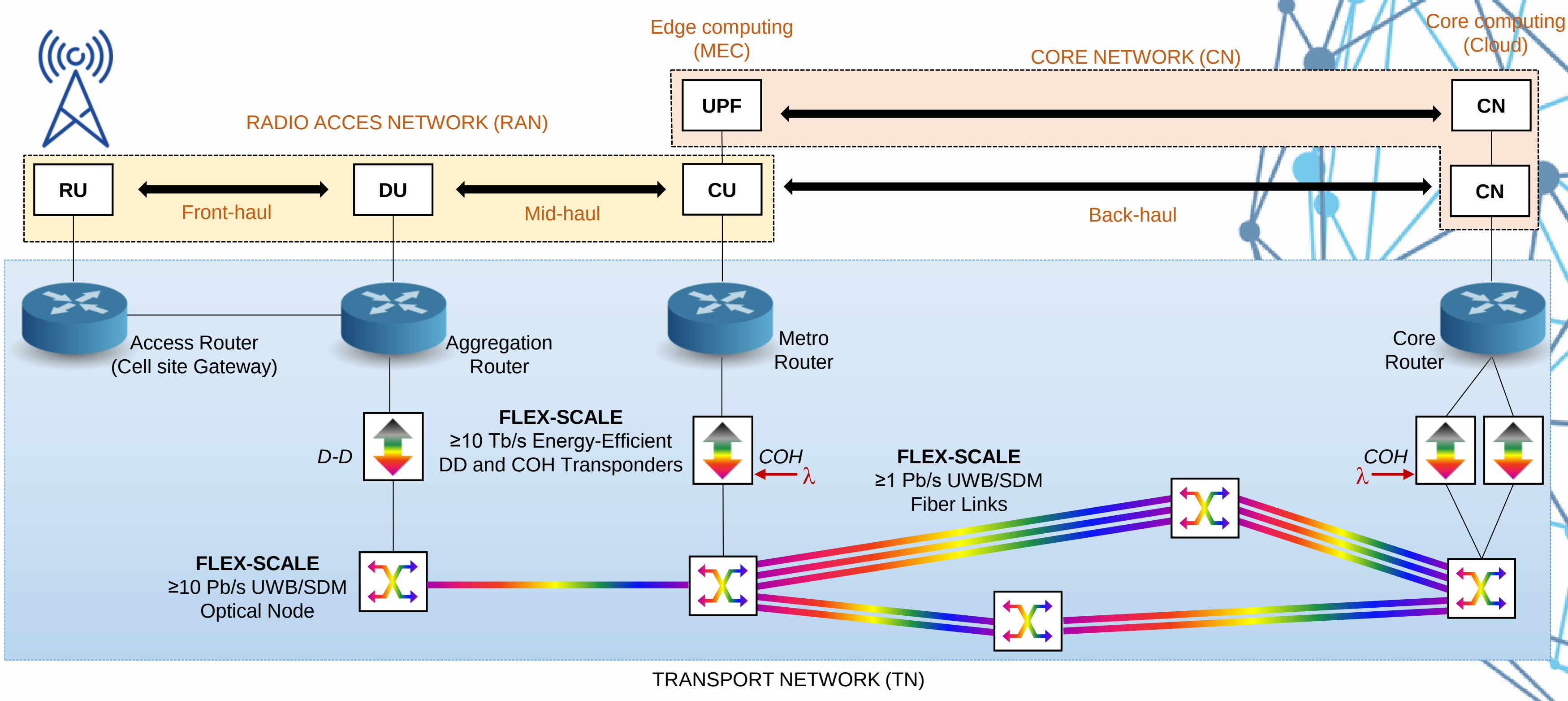
OVERVIEW

- Introduction to FLEX-SCALE project:
    - Overall Scope
    - Consortium Composition
    - Project Coordination Structure
    - Innovation Areas of FLEX-SCALE project
    - Management of Workplan
    - Project Objectives/KPIs

FLEX-SCALE SCOPE: END-TO-END 6G NETWORKING RELYING ON ADVANCED OPTICAL NETWORKING

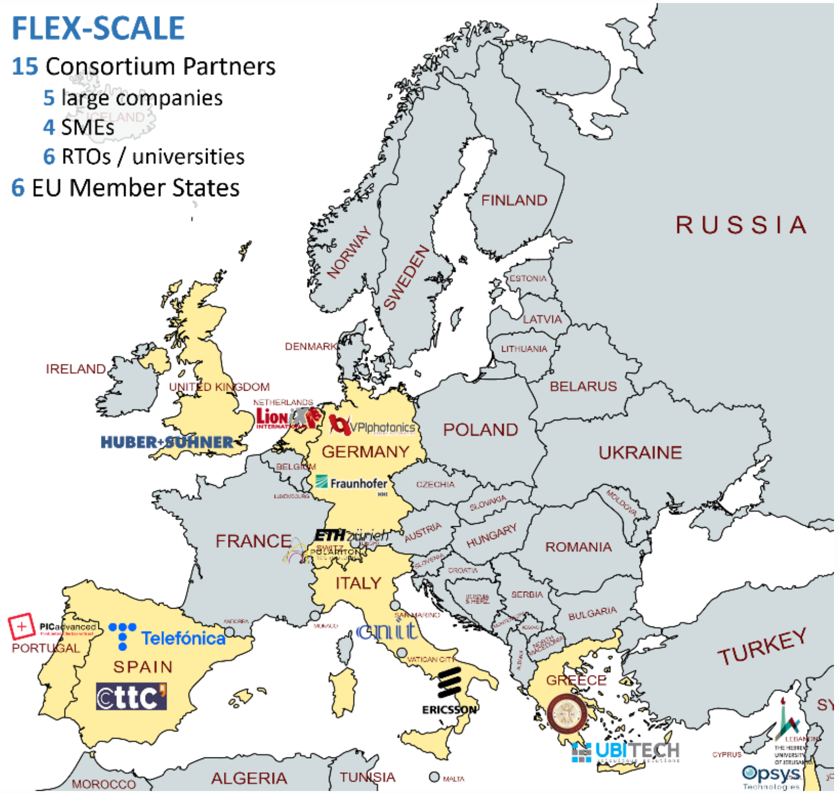
- FLEX-SCALE consortium develops innovations that will enable flexible capacity scaling of 6G x-haul networks, while ensuring security and reducing costs & energy consumption per packet-flows, by utilizing:
  - Optoelectronic interfaces of line-systems to scale to ≥10 Tb/s,
  - Network link capacities to scale ≥1 Pb/s by utilizing UWB/SDM multiplexing schemes
  - Optical switching node capacities to scale to ~tens Pb/s
  - Optical layer security solutions
  - SDN management of the packet-optical x-haul networks



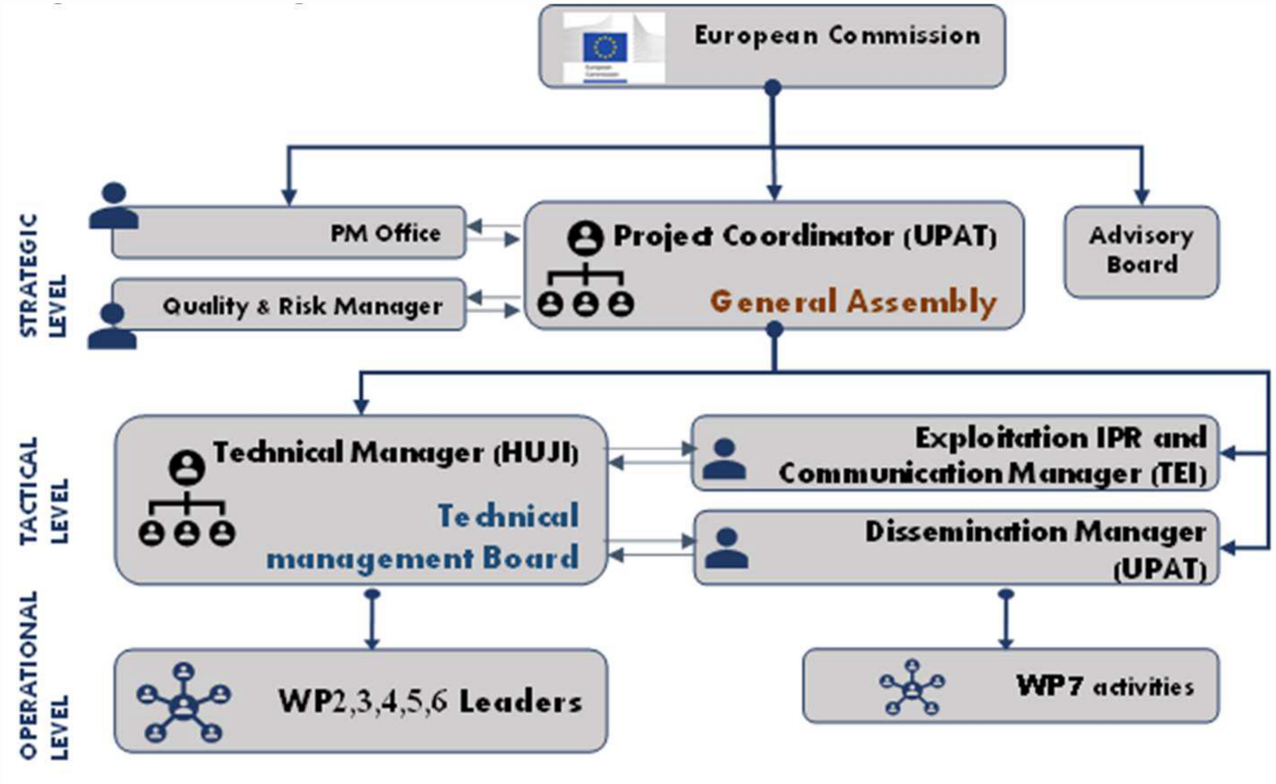
FLEX-SCALE PROJECT CONSORTIUM

Work programme	HORIZON-JTI-SNS-2022
Programme Topic	STREAM-B-01-03
Type of action	HORIZON-JU-RIA
Project acronym:	FLEX-SCALE
Contact person:	Prof. Ioannis Tomkos (UPAT)
List of participants:	

UNIVERSITY OF PATRAS
CONSORZIO NAZIONALE INTERUNIVERSITARIO PER LE TELECOMUNICAZIONI
CENTRE TECNOLOGIC DE TELECOMUNICACIONS DE CATALUNYA
HUBER+SUHNER POLATIS LIMITED
FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.
THE HEBREW UNIVERSITY OF JERUSALEM
LIONIX INTERNATIONAL BV
OPSYS SENSING TECHNOLOGIES LTD
PICADVANCED, SA
ERICSSON TELECOMUNICAZIONI SPA
TELEFONICA INVESTIGACION Y DESARROLLO SA
UBITECH
VPIPHOTONICS GMBH
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH
POLARITON TECHNOLOGIES AG



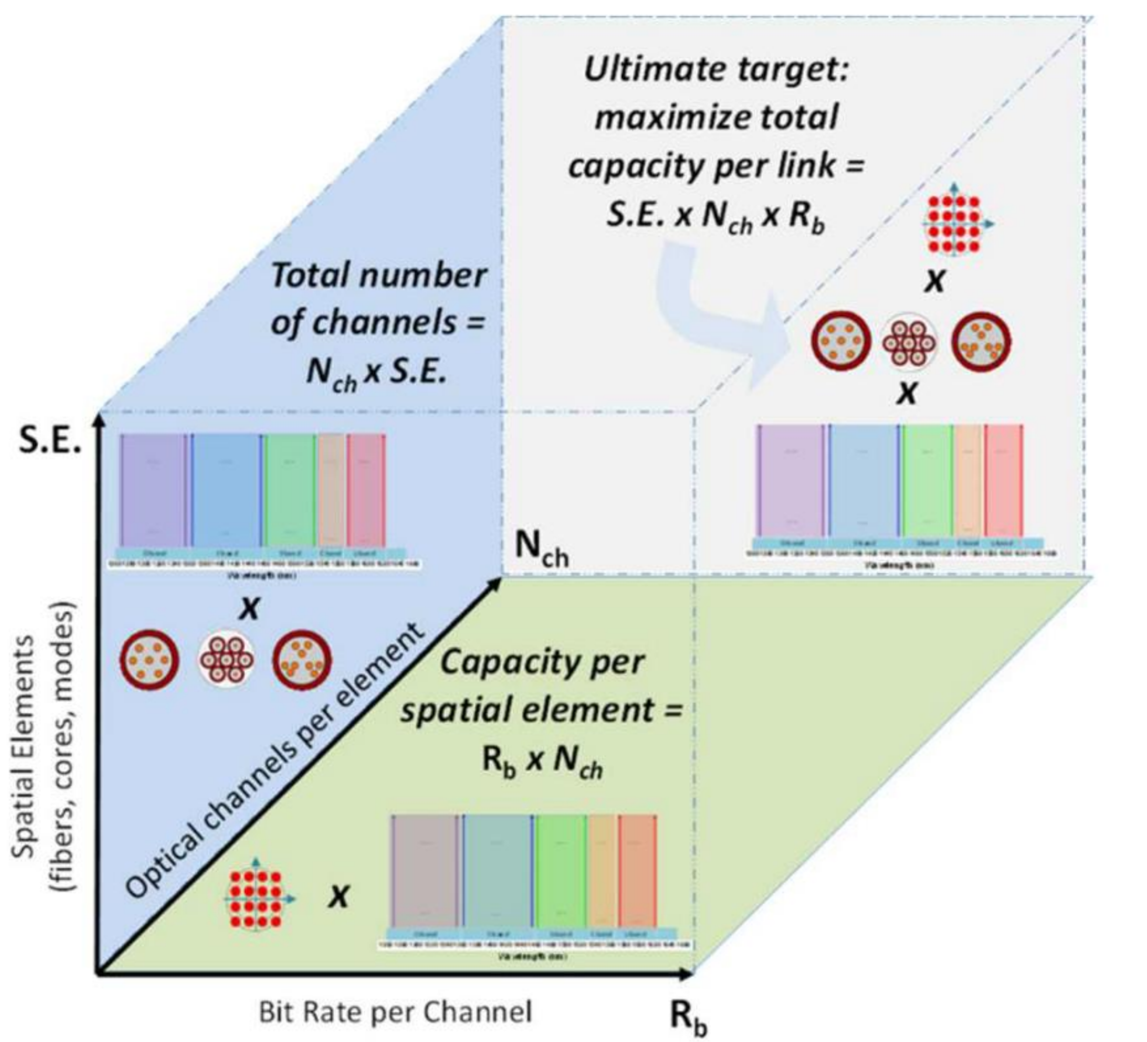
PROJECT COORDINATION STRUCTURE: BODIES AND ROLES



- The General Assembly (GA) managed by the Project Coordinator (PC), UPAT, and composed by one member of each beneficiary.
- The Technical Management Board (TMB) is managed by the Technical Manager (TM), HUJI, and is composed by the WP2,3,4,5,6 leaders, the Exploitation IPR and Standardization Manager (EISM), TEI, and the Dissemination Manager (DCM), UPAT.
- The Advisory Board (AB) is established by M06, with the scope to guide the project vision and activities
- Quality Manager (QM): CTTC

INNOVATION AREA-1: SCALING OPTICAL X-HAUL FOR 6G

- In future 6G networks, information should seamlessly flow across wireless access and optical x-haul networks, from end-users to datacentres, whether they are located nearby or anywhere around the globe.
- The required x-haul link capacities and switching nodes throughput are expected to exceed in a few years 1 Pbit/s and 10 Pbit/s, respectively.
- Novel UWB and SDM multiplexing approaches are promising approaches to scale not only the total system capacity, but also the optical network node throughput.
- FLEX SCALE utilizes novel transmission and switching related innovations relying on UWB/SDM to efficiently utilize all available capacity scaling approaches, while also contributing to significant reductions in the power consumption of the entire network.

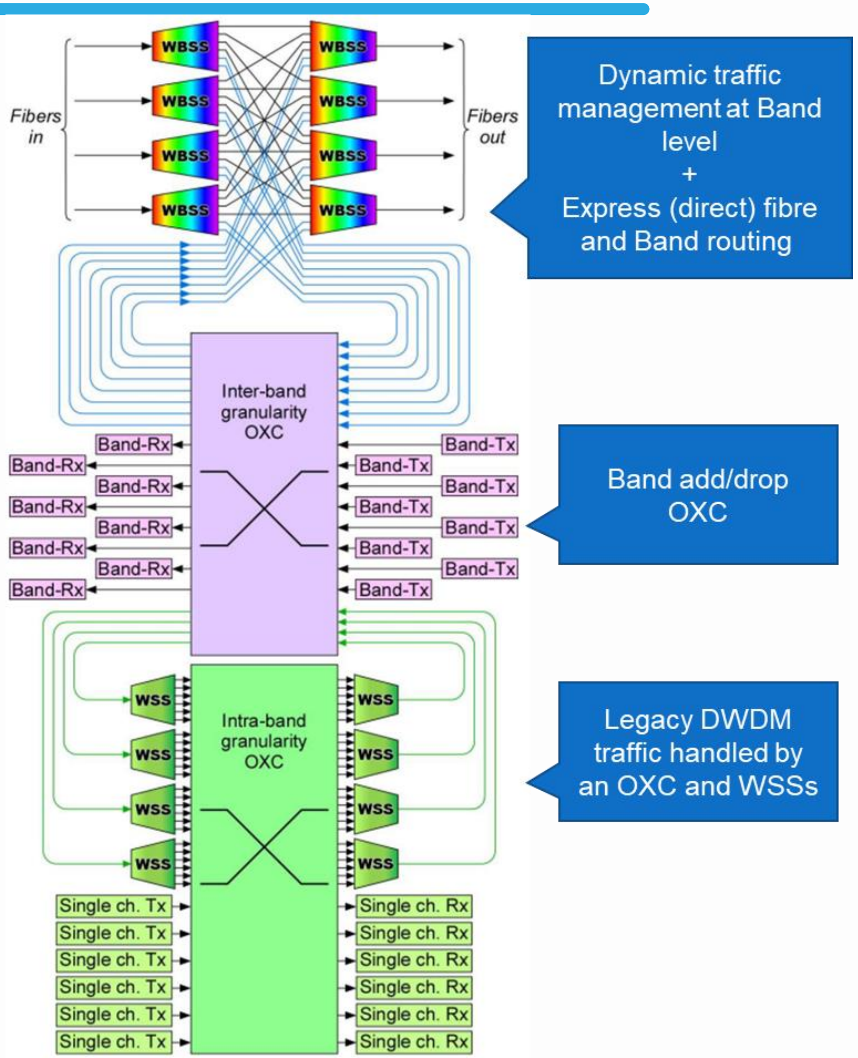


INNOVATION AREA-2: MULTI-GRANULAR OPTICAL NODE ARCHITECTURE AND WAVEBAND-SELECTIVE SWITCH

- The FLEX-SCALE Switching Node architecture is based on a novel Multi-Granular architecture (MG-ON) and a new switching subsystem that can realize reconfigurable WaveBand-Selective Switching (WBSS), in addition to Spatial and Spectral Lanes switching using enhanced Optical Xross Connects (OXCs) and conventional Wavelength Selective Switching (WSS)

- The WBSS is implemented as a compact programmable and rapidly reconfigurable PIC that is capable of dynamically processing the entire UWDM optical spectrum and as demanded dynamically carve portions of the spectrum into flexibly-defined, continuous, and flat spectral bands, which are subsequently switched to multiple output ports.

- The FLEX-SCALE MG-ON is a hierarchical network node that offers fast, route-and-select architecture at the band and fibre levels at the top tier, with a secondary route-and-select architecture implemented with todays per Band WSSs ensuring backwards compatibility with legacy transport schemes.



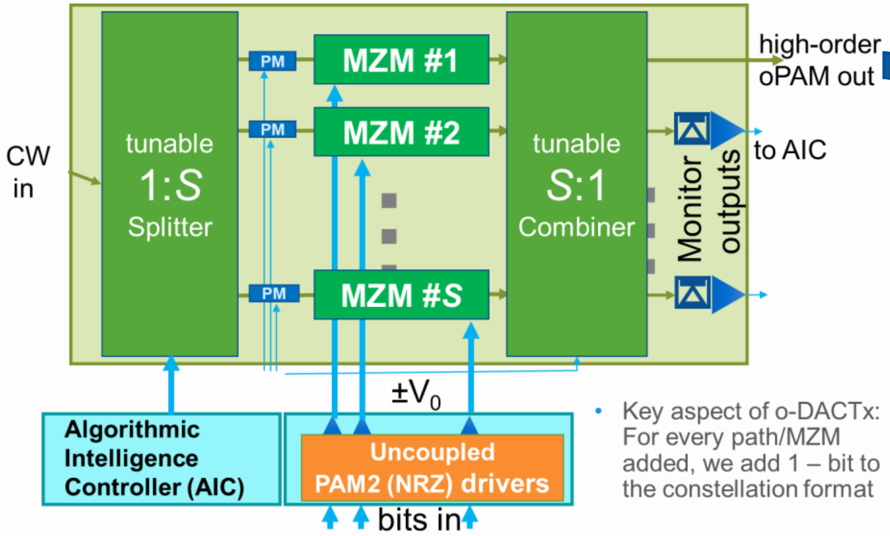
INNOVATION AREA-3: ULTRA-HIGH-SPEED, ENERGY-EFFICIENT, FLEXIBLY PROGRAMMABLE TRANSCEIVERS

- FLEX-SCALE introduces novel optical-DAC based transmitters (oDACs) that improve the trade-offs between performance, energy efficiency, complexity and cost reduction for optical transmitters (Tx's) through direct D/O conversion, essentially eliminating the bandwidth-limited and power-hungry electronic DACs.

- This transmitter architecture is implemented based on the concepts of Programmable Photonics ICs and can be easily reconfigured to operate with either coherent-detect or direct-detect systems

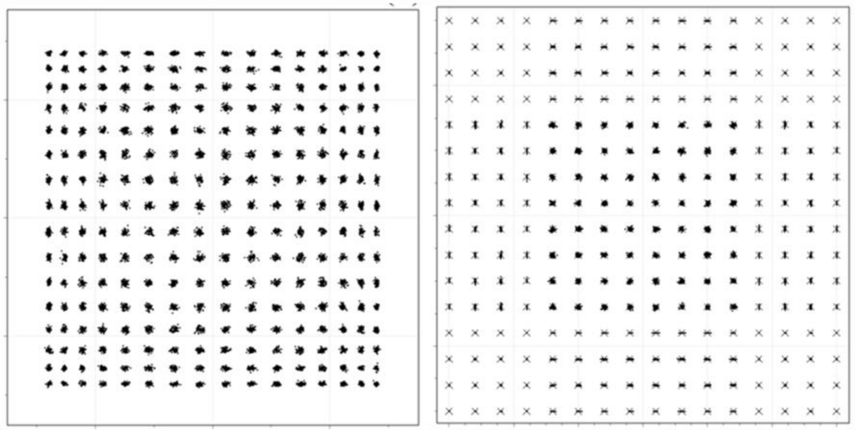
- It can realize (with today's commercially available electronics/photonics components) bit-rate scalability at multiples of what the conventional/alternative approaches can offer

- It achieves high energy-efficiency per bit, while the performance of the generated m-PAM or m-QAM signals exhibit enormous improvements in EVM



- Key aspect of o-DACTx: For every path/MZM added, we add 1 – bit to the constellation format

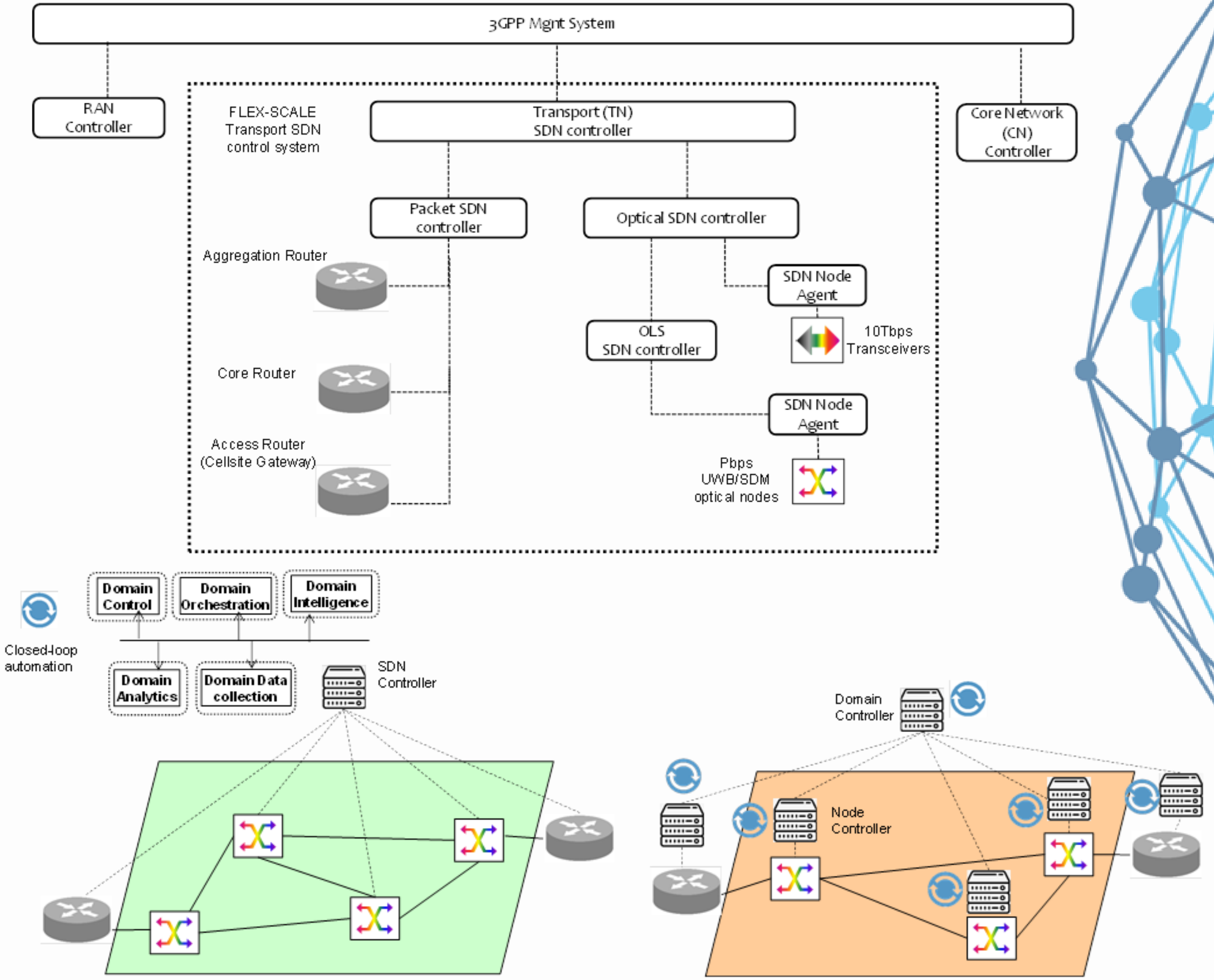
256-QAM constellations



Conventional Tx vs o-DAC based Tx

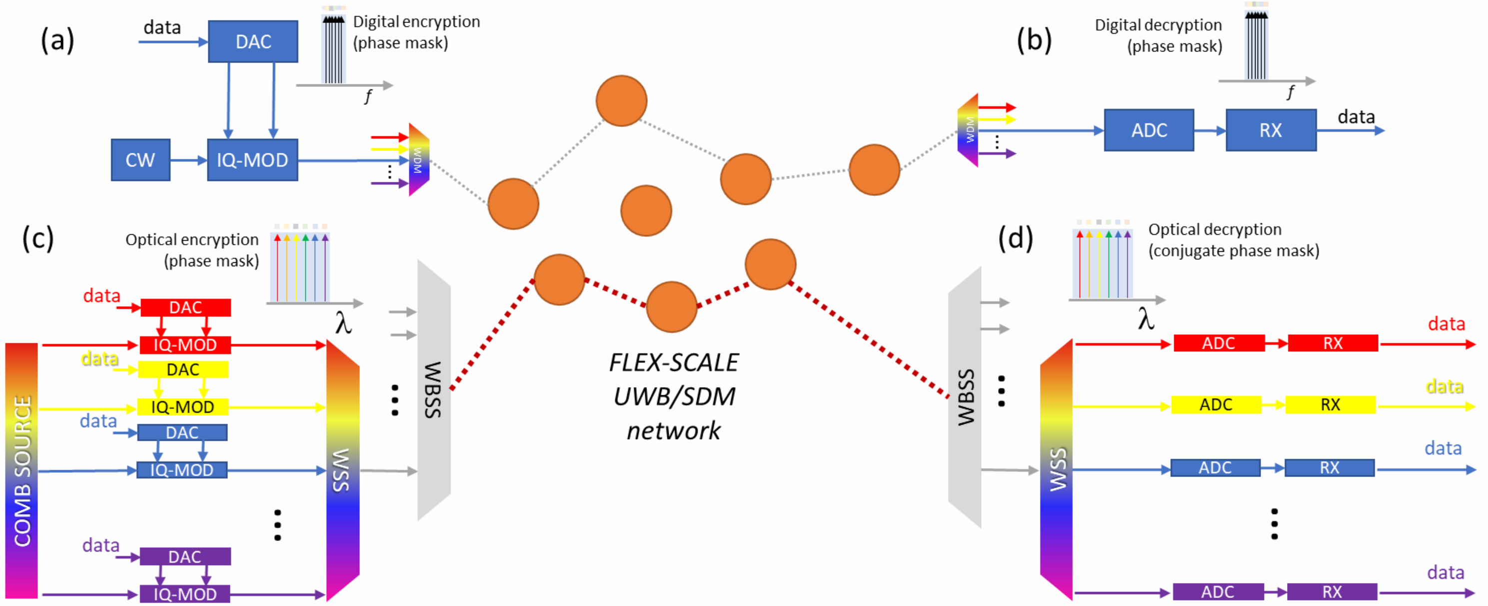
INNOVATION AREA-4: CONTROL, MONITORING AND STREAMING TELEMETRY FOR 6G TRANSPORT NETWORKS

- FLEX-SCALE develops an autonomous SDN control plane that acts as a network operating system
- It is based on a full-fledged closed-loop automation integration of disaggregated packet/optical networking.
- With the utilization of novel ML-enabled algorithms will ensure the optimization of joint management of packet flows and optical channels with the goal to reduce the energy consumption while maintaining a low blocking probability under dynamic traffic conditions.
- Configuration, monitoring, and streaming telemetry data models, as well as the associated protocols will be investigated for the key network devices such as the multi-Pb/s UWB/SDM optical node and the 10 Tb/s transceiver to become fully programmable and suitable monitoring and telemetry sources.



INNOVATION AREA-5: IMPLEMENTING PHYSICAL LAYER SECURITY USING OPTICAL STEGANOGRAPHIC SYSTEMS

- The gap between the data security requirements and the available security techniques calls for security approaches that are immune to traffic characteristics and provide stealthy data transmission. In addition, novel approaches to ensure network survivability needs to be developed.
- FLEX-SCALE develops optical steganographic systems that enable scalable and high key-change rates, and compatibility with today's flex-grid DWDM networks, based on off-the-shelf components.
- FLEX-SCALE also targets to develop optical performance monitoring (OPM) techniques agnostic to the modulation format, by reusing the coherent receivers at the network nodes, to provide proactive resiliency based on ML techniques to predict, detect/localize, and classify failures.



FLEX-SCALE OBJECTIVES & KPIS ASSOCIATED WITH THE INNOVATION AREAS TO BE IMPLEMENTED

- <u>Objective 1:</u> Establish front-haul and back-haul 6G network requirements and system specifications to satisfy the 6G application needs, and identification of components' capabilities, supported by modelling and simulation studies to optimize the management of traffic flows across the network.

Implementation: O.1 is implemented by WP2, Tasks T2.1-T2.4
<u>KPI O.1.1</u>: Publishing of network traffic models in support of 6G services (T2.1) <u>KPI O.1.2</u>: Evaluation of FLEX-SCALE capabilities considering traffic requirements (T2.3) <u>KPI O.1.3</u>: Model 6G network traffic, estimate latency and energy consumption when using MG-ON (T2.3-T2.4)

- <u>Objective 2:</u> Implementation and evaluation of a Multi-Granular (MG) optical network node implemented by WBSS modules at ingress/egress fibre ports (top tier), augmented by OXC and WSSs in support of (i) full fibre routing, (ii) full band routing and (iii) legacy wavelength routing.

Implementation: O.2 is implemented in WP3 (architecture T3.1, HW control T3.4, assembly and test T3.5) and being fed by the tasks in WP2, T5.1 and T5.2.
<u>KPI O.2.1</u>: Route and Select with WBSS at node's top tier for flexible band switching between ingress-egress fibres with total switching event times <10 ms (T3.1 and T3.3). <u>KPI O.2.2</u>: Hierarchical node simultaneously supporting full-fibre switching, flexible band switching and legacy traffic on other bands with transient strengths ≤1 dB and duration ≤10 μs (T3.1 and T3.5). <u>KPI O.2.3</u>: Integration of WBSS into common control plane and communication port of network node (T3.4-3.5) <u>KPI O.2.4</u>: Flexible node supporting multiple data rates per channel up to 1 Tb/s. (T3.1, T3.2 and T3.4)

FLEX-SCALE OBJECTIVES & KPIS ASSOCIATED WITH THE INNOVATION AREAS TO BE IMPLEMENTED

- Objective 3: Development of WaveBand Selective Switch (WBSS) on SiN PIC platform

Implementation: O.3 is implemented in WP3 (design+fab, packaging T3.2-T3.3) and fed by specs in WP2.
KPI O.3.1: WBSS adaptive spectral filtering block based on FIR lattice filter with ≥10 taps for independently routing flexibly-defined four bands with ≥23dB crosstalk suppression and < 5 dB insertion loss (T3.2) KPI O.3.2: WBSS crossbar switch block for independently routing four input channels to ≥19 output ports, with ≥20 dB port isolation and < 5 dB insertion loss (T3.2) KPI O.3.3: WBSS compactly implemented in PIC with driver electronics, drawing ≤3 W per switch/PIC (T3.3) KPI O.3.4: Enhancement of LioniX SiN commercial platform with polarization independent directional couplers and phase modulators, as well as publishing of filter design and simulation tools (T3.2)

- Objective 4: 10 Tb/s-capable all-optical energy-efficient optical interconnects

Implementation: O.4 is implemented in WP4 (T4.1-T4.5) and being fed by specifications from WP2.
KPI O.4.1: A photonic multiplexing option (oDAC) to leverage the plasmonics, delivering rate doubling and power efficiency tripling compared to equivalent electronic solutions (i.e., against an electronic DAC at same symbol rate). KPI O.4.2: Dual-polarization 1 Tb/s IQ data modulation with an electrical switching energy of <10 fJ/bit will be performed. The transmitter will offer fibre-to-fibre losses of <10 dB across the S-, C-, and L-bands. KPI O.4.3: Dual-polarization 1 Tb/s balanced photodetection in an optical hybrid will be performed. The detector will offer a responsivity of 0.5 A/W (50% external quantum efficiency) and operate across the S-, C-, and L-bands. KPI O.4.4: Scalability towards >10 Tb/s net data rate (considering FEC 20% overhead) in 12 parallel channels will be demonstrated by parallelizing transceivers.

FLEX-SCALE OBJECTIVES & KPIS ASSOCIATED WITH THE INNOVATION AREAS TO BE IMPLEMENTED

- Objective 5: Development of an energy-efficient plasmonic optoelectronic platform

Implementation: O.5 is implemented in WP4 and being fed by all its tasks.
KPI O.5.1: Monolithic plasmonic platform offering active components including modulators and detectors with 200 GHz opto-electrical bandwidth, dual-polarization functionality, and wideband low-loss silicon photonic passives (1 dB edge couplers, 1 dB polarization rotator and combiner). KPI O.5.2: Wideband 1 Tb/s plasmonic modulators and detectors in a joint monolithic platform. KPI O.5.3: Packaged monolithic plasmonic transceiver on silicon photonics for 10 Tb/s transmission. KPI O.5.4: Creation of a plasmonic device library and process design kit (PDK)

- Objective 6: Develop algorithms and implement sustainable transport network control to optimize traffic flows across network layers

Implementation: O.6 is implemented in WP2and WP5 and being fed by tasks T2.1, T2.2, T5.1 and T5.2
KPI O.6.1: Provisioning of traffic flows achieving 50% reduction of the energy consumption. KPI O.6.2: Provisioning of traffic flows in less than 15 second, considering packet and optical layers. KPI O.6.3: Two energy-efficiency algorithms and/or heuristics for multi-layer (packet/optical) networks. KPI O.6.4: Integration of the transport SDN control with the 3GPP management for holistic management.

- Objective 7: Integration of SDN controlled 10Tbps Transceivers & Pb/s UWB/SDM Nodes

Implementation: O.7 is implemented in WP5 and WP6 and being fed by tasks T5.1 and T6.1
KPI O.7.1: Provisioning of spectral and spatial optical channels at 10 Tb/s. KPI O.7.2: Provisioning of optical channels in less than 10 seconds. KPI O.7.3: Integration of the proposed optical SDN control plane with the prototypes of the 10Tb/s transceivers & Pb/s UWB/SDM Nodes. KPI O.7.4: Integration of the proposed optical SDN control plane with the sustainable transport (packet/optical) SDN control plane.

FLEX-SCALE OBJECTIVES & KPIS ASSOCIATED WITH THE INNOVATION AREAS TO BE IMPLEMENTED

- Objective 8: Demonstration of the SDM/UWB fast switching using the abilities of the WBSS and demonstration of oDAC solution through lab trials

Implementation: O.8 is implemented in WP6 and being fed by tasks T2.2, T2.3, T3.5, T4.5, 5.4

KPI O.8.1: MG-ON addressable bandwidth spanning S+C+L bands (1460 – 1625 nm = 165 nm = 21 THz)
KPI O.8.2: Per-band MG-node throughput (>80 Tb/s)
KPI O.8.3: Long term operation, while rapidly and continuously switching (≥1 week)
KPI O.8.4: Power consumption of WBSS normalized to traffic flow through it (<3W/(3·80 Tb/s)= 12.5 fJ/bit).
KPI O.8.5: Switching granularity of the MG-ON: 50 GHz (single wavelength channel switching), 5-8 THz (single waveband switching), 21 THz (complete fibre switching)

- Objective 9: Techno-economic studies of the FLEX-SCALE network, subsystems and device

Implementation: O.9 is implemented in WP2(T2.4) and being fed by tasks T2.2, actual powers from T3.5, T4.5

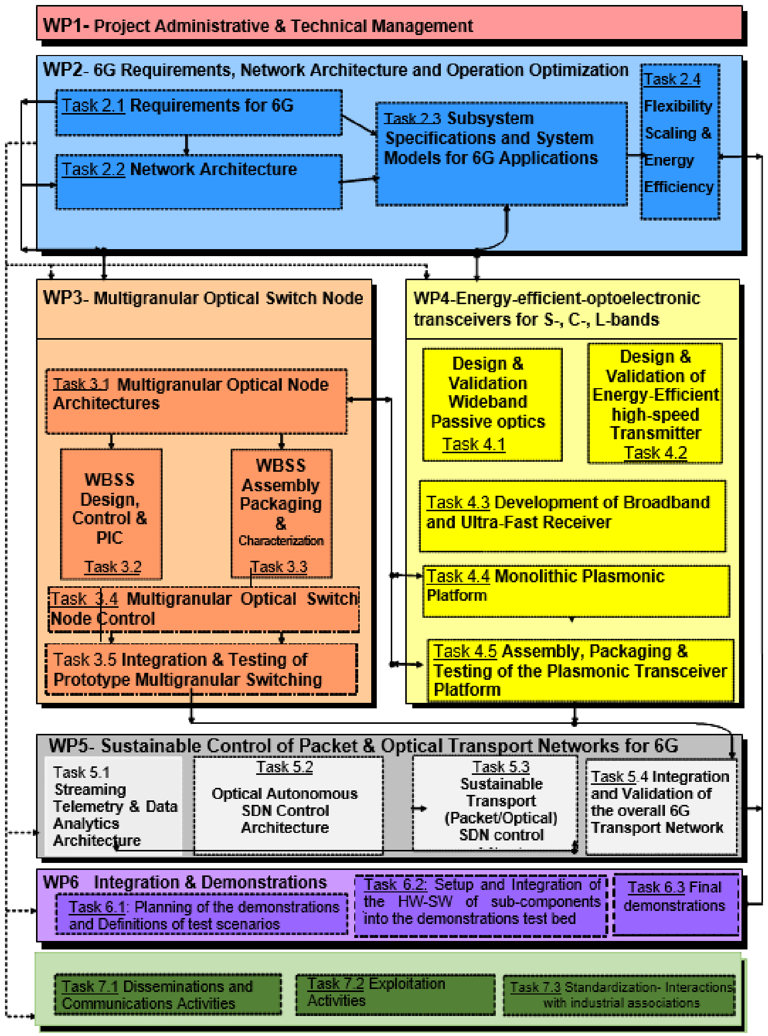
KPI O.9.1: Network scaling study in back-haul and long-haul transmission using collected data and validating network reconfiguration in 10 ms meets requirements.
KPI O.9.2: Energy and carbon footprint study of WBSS vs. WSS, demonstrating >50% reduction.
KPI O.9.3: Study of WBSS market to identifying price targets (e.g. 3000€) to overtake market.

- Objective 10: To maximise the impact and adoption of FLEX-SCALE results through wide dissemination, communication, standardisation and exploitation measure

Implementation: O.10 is implemented in WP7 and is fed by all tasks in WP2, WP3, WP4, WP5 & WP6.

KPI O.10.1: Achieve the Dissemination and Communication target values as specified in Section 2.2.

OVERALL MANAGEMENT OF WORKPLAN



WP1: PROJECT ADMINISTRATIVE & TECHNICAL MANAGEMENT

Objectives

O1.1 To coordinate all activities in the project and ensure that partners work together effectively.

O1.2 To ensure the project meets its contractual commitments (deliverables, quality, risk management, etc.).

O1.3 To report on project progress and ensure the effective use of resources for realising project activities.

O1.4 To plan and facilitate communication and interactions within the consortium and with EC.

O1.5 To set out the project's ethics requirements and effectively manage legal, ethics and gender matters.

O1.6 To determine how project data will be handled and to develop the DMP.

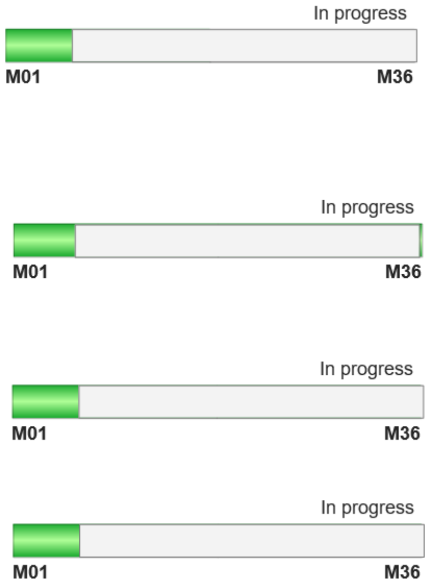
Tasks

T1.1 Coordination.

T1.2 Technical Management.

T1.3 Quality Control.

T1.4 Data Management and IPR Protection Activities.



Deliverables

D1.1 Periodic activity report (incl. legal, ethics, gender and risk management).
Leader: UPAT - Delivering Month: M18, M36.

D1.2 Data Management Plan
Leader: UBI - Delivering Month: M03.

D1.3 Project Management Handbook
Leader: UPAT-Delivering Month: M06, M18, M35.

D1.4 Project Quality Handbook
Leader: CTTC - Delivering Month: M06, M18, M35.

WP2: 6G REQUIREMENTS, NETWORK ARCHITECTURE AND OPERATION OPTIMIZATION

Objectives

O2.1 Network requirements for 6G infrastructure.

O2.2 Network architecture.

O2.3 Sub-systems specifications and systems' models.

O2.4 Capacity Scaling and Energy Efficiency.

Tasks

T2.1 Requirements for 6G — In progress — M01 – M04

T2.2 Network Architecture. — Pending — M04 – M18

T2.3 Sub-system specifications and system models for 6G applications. — Pending — M04 – M24

T2.4 Flexibility Scaling and Energy Efficiency. — Pending — M24 – M36

Deliverables

D2.1 6G network requirements
Leader: UPAT
Task Partners: TEI/ TID/ CTTC/UBI - Delivering Month: M04.

D2.2 Network architecture
Leader: TID
Task Partners: CNIT/CTTC /UPAT/H&S/UBI/HUJI - Delivering Month: M18.

D2.3 Specifications and model
Leader: CNIT
Task Partners: UPAT/VPI/POL/PICA/H&S/ETHZ/CTTC/ HUJI/LIX/OPSYS/TID - Delivering Month: M24.

D2.4 Flexibility Capacity Scaling and Energy Efficiency
Leader: UPAT
Task Partners: TEI/TID/CNIT/ LIX/HUJI - Delivering Month: M36.

WP3: MULTIGRANULAR OPTICAL SWITCH NODE

Objectives

O3.1 To study different designs for a WaveBand-Selective Switch (WBSS); a multigranular optical switch based on space, wavelength selective and fast, flexible waveband selective switching and comply to reliability requirements of the packaged modules with the PZT controls required for the applications.

O3.2 Modelling and development of simulation tools for switches and lattice band filters, supporting tuneable bands and flexible BW, and update and/or extension of the already existing LioniX specific PDK library within the VPI simulation tool. Develop several WBSS modules and control units that interface and support the envisioned system architecture from T2.2.

O3.3 To assemble, functionally test and characterise the performance of a semi-integrated, lab-based implementation of the multigranular switch before making it available for integration into the final demonstrator.

O3.4 To implement a suitable prototype switch node control "agent" (hardware) along with software protocol agents to realise all the necessary NBIs and southbound communications to the low-level hardware controlling the optical subsystems making up the multigranular switch.

Tasks

T3.1 Multigranular Optical Node Architectures. — In progress (M01–M04)

T3.2 WBSS design, control & PIC fabrication. — In progress (M01–M28)

T3.3 WBSS assembly packaging & characterisation. — In progress (M01–M34)

T3.4 Multigranular optical switch node control. — Pending (M12–M32)

T3.5 Integration and testing of prototype multigranular switch node. — Pending (M22–M34)

Deliverables

D3.1 Design of multigranular SDM/UWB optical switch node
Leader: HUJI Task Partners: VPI/LIX/H&S/UPAT/OPSYS - Delivering Month: 04.

D3.2 WBSS-PICs and control unit
Leader: LIX Task Partners: VPI/PICA/HUJI/OPSYS Delivering Months: 13, 28

D3.3 WBSS-characterized modules
Leader: PICA Task Partners: LIX/HUJI - Delivering Months: 19, 34.

D3.4 Multigranular optical switch node control
Leader: H&S Task Partners: CTTC/LIX/OPSYS Delivering Month: 22, 34.

D3.5 Integration and testing of prototype multigranular optical switch node
Leader: H&S Task Partners: HHI/LIX/PICA/HUJI - Delivering Month: 24, 34.

WP4: ENERGY-EFFICIENT OPTOELECTRONIC TRANSCEIVERS FOR S-, C-, L-BANDS

Objectives

O4.1 Multiband >10 Tb/s dual-polarisation coherent plasmonic transceiver.

O4.2 Dual-polarisation coherent 1 Tb/s plasmonic transmitter module for S-, C- and L-bands.

O4.3 Dual-polarisation coherent 1 Tb/s plasmonic receiver module for S-, C- and L-bands.

O4.4 Monolithic plasmonic platform and process design kit (PDK).

Tasks

T4.1 Design & Validation of wideband passive optics.
In progress — M01 to M12

T4.2 Design & validation of energy-efficient high-speed transmitter.
In progress — M01 to M24

T4.3 Development of broadband and ultra-fast receiver.
In progress — M01 to M24

T4.4 Monolithic plasmonic platform.
In progress — M01 to M30

T4.5 Assembly, packaging & testing of the plasmonic transceiver platform.
Pending — M13 to M33

Deliverables

D4.1 Definition of monolithic plasmonic platform specifications and process flow
Leader: POL Task Partners: ETHZ, PICA, Delivering Month: 6.

D4.2 Design and demonstration of passive optical components.
Leader: ETHZ Task Partners: POL Delivering Month: 12.

D4.3 Design and demonstration wide-band high-speed electro-optic modulator Leader: POL Task Partners: ETHZ, UPAT Delivering Month: 24.

D4.4 Design and demonstration of plasmonic photodiodes Leader: ETHZ Task Partners: Delivering Month: 24.

D4.5 Demonstration of monolithic plasmonic platform
Leader: POL Task Partners: ETHZ Delivering Month: 30.

D4.6 Demonstration of packaged transceiver module Leader: PICA Task Partners: ETHZ, POL - Delivering Month: 33.

WP5: SUSTAINABLE CONTROL OF PACKET & OPTICAL TRANSPORT NETWORKS FOR 6G

Objectives

O5.1 To design and validate novel control interfaces (i.e., YANG-based data models and protocols) for the configuration, monitoring and streaming telemetry of the UWB/SDM MG-ON developed in WP3, and the 10Tb/s Transceivers developed in WP4, to enable the full programmability of the proposed optical layer.

O5.2 To design and develop an optical SDN control and telemetry architecture to perform joint autonomous control of UWB WDM and SDM technologies for 10 Tb/s optical channels, and data collection and ML analysis to improve system reliability, leveraging the programmability by the optical transceiver and multi-granular nodes.

O5.3 To design and validate a northbound interface of the SDN control plane for interoperability with the overall multi-layer Transport SDN system providing control functions such as topology discovery, path computation, and connectivity service management of spectral/spatial optical channels ,10 Tbps data services.

O5.4 To design and develop a novel, sustainable transport (packet/optical) SDN control system for energy-efficient and large-scale management of traffic flows with dedicated quality of service (QoS) in the front-, mid-, and back-haul transport network segments for 6G services.

O5.5 To enable the integration of the traffic grooming and routing algorithms defined in WP2 to optimally bypass intermediate energy-hungry packet nodes by providing optical channels combining the optical spectral and spatial dimensions provided by the energy-efficient multi-granular optical node and transceivers developed in FLEX-SCALE.

O5.6 To define the northbound interface of the sustainable transport (packet/optical) SDN control system to enable full integration with the overall 6G management system for a holistic management of the radio access network (RAN), core network, and Transport network.

Tasks

Task	Status	Start	End
T5.1 Streaming telemetry and data analytics architecture.	In progress	M01	M30
T5.2 Optical autonomous SDN control architecture.	In progress	M01	M30
T5.3 Sustainable Transport (packet/optical) SDN control architecture.	In progress	M01	M30
T5.4 Integration and Validation of the overall 6GTransport SDN control.	Pending	M18	M36

Deliverables

D5.1 Preliminary design of sustainable transport SDN control enablers for 6G
Leader: CNIT
Task Partners:CTTC/H&S/UBI/ UPAT
Delivering Month: 9

D5.2 Final design and preliminary implementation of sustainable transport SDN control enablers for 6G
Leader: UBI
Task Partners:CTTC/CNIT /H&S/UBI
Delivering Month: 18.

D5.3 Integration and validation of the sustainable transport SDN control framework for 6G
Leader: CTTC
Task Partners: CNIT/ H&S/UBI/HHI -
Delivering Month: 36.

WP6: INTEGRATION AND DEMONSTRATION

Objectives

O6.1 To plan the demonstration activities and define the test scenarios of the MG-node, including the WBSS and the oDAC.

O6.2 To set-up the demonstration testbed and integrate the oDAC, the WBSS andthe transport SDN control architecture into the demonstration testbed.

O6.3 To demonstrate the capabilities of the WBSS and the oDAC with integrated SDN control.

O6.4 To demonstrate the capabilities of the complete UWB/SDM optical node with WBSS and oDAC-based transponders with respect to the KPIs.

Tasks

T6.1 Planning of the demonstrations and definitions of test scenarios.

Pending
M06 M12

T6.2 Setup and Integration of the SW & HW of sub-components into the demonstration test-bed.

Pending
M12 M30

T6.3 Final Demonstration.

Pending
M30 M36

Deliverables

D6.1 Demonstration plan & test scenarios
Leader: UBI Delivering Month: 12.

D6.2 Integration of first components in demonstration testbed
Leader: CNIT
Delivering Month: 30.

D6.3 Demonstration of final project results
Leader: HHI
Delivering Month: 36.

WP7: IMPACT MAXIMIZATION AND OUTREACH

Objectives

O7.1 Impact-driven dissemination, targeted to the exploitation of project results to the relevant industrial and academic communities.

O7.2 Exploitation of project results through in standards or industry product planning (product and technology roadmaps, prototypes, commercial products, etc.).

O7.3 Communication of the project outcomes to the widestpossible audience, including nontechnical audience.

Tasks

T7.1 Dissemination & communication activities.

In progress — M01 to M36

T7.2 Exploitation activities.

In progress — M01 to M36

T7.3 Standardization and interaction with industrial associations.

In progress — M01 to M36

Deliverables

D7.1 Website: Y1 [M01 M03]

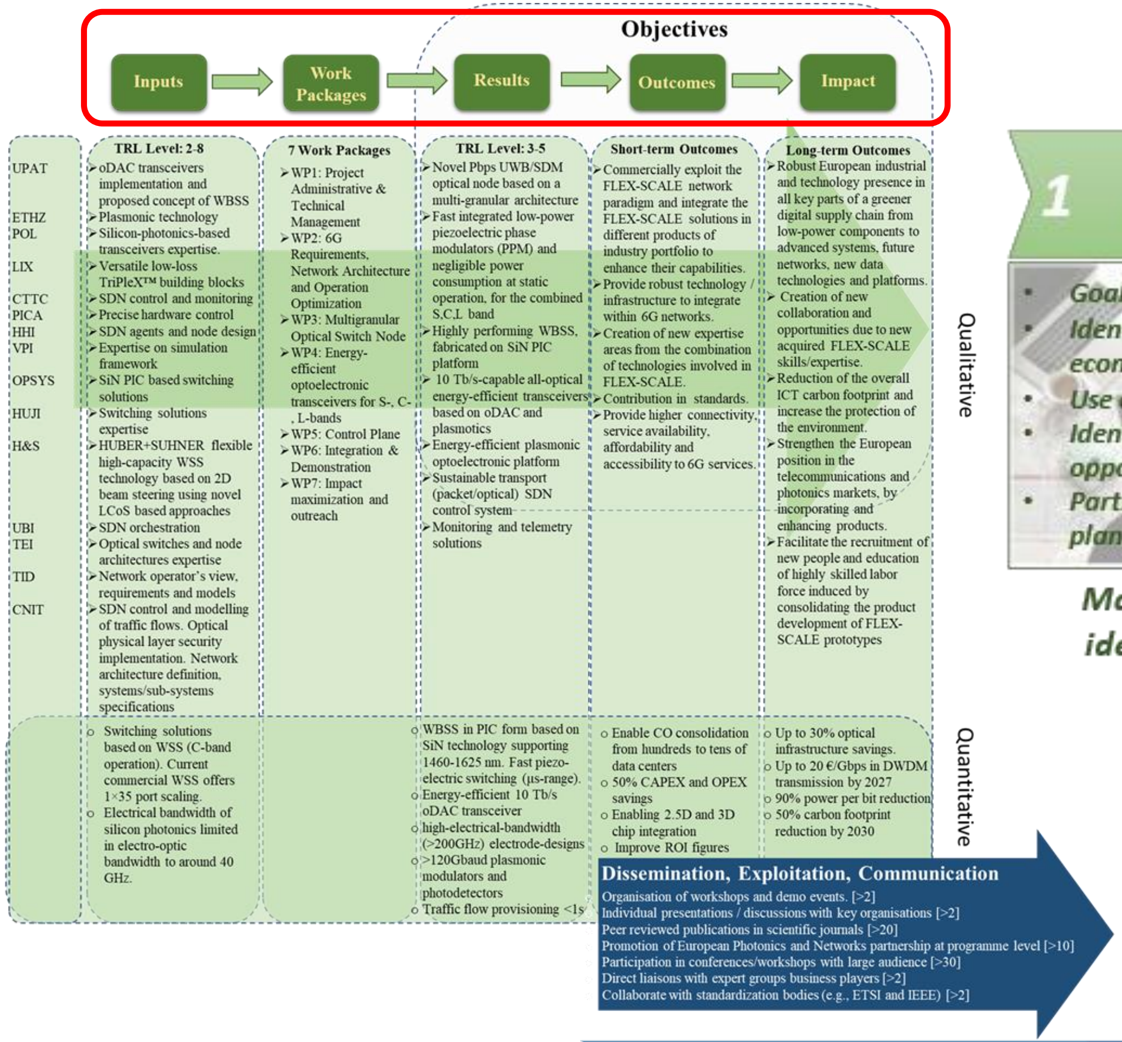
Leader: UPat
Task Partners: All - Delivering Month: M03.

D7.2 Annual Report: Y1 [M01 M12]
Leader: UPat
Task Partners: All -Delivering Month: M12.

D7.3 Annual Report: Y2 [M13 M24]
Leader: Telefonica
Task Partners: All -Delivering Month: M24.

D7.4 Annual Report: Y3 [M25 M36]
Leader: TEI
Task Partners: All - Delivering Month: M36.

ROADMAP FOR IMPLEMENTATION OF OUTCOMES & IMPACTS



- From TRL 2-3 to TRL 4-5

- Three (3) Key Expected Outcomes (related to WP KPIs)
- Five (5) Wider Impacts (related to WP KPIs)

THANK YOU ON BEHALF OF THE ENTIRE FLEX-SCALE CONSORTIUM!

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