**Proposal for the creation of an Optical Circuit Switching (OCS) Subproject**

In the framework of the Networking Project in the Open Compute Project

Leading members: iPronics, Lumentum

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**Charter and Mission Statement**

1. Overview of the OCS Subproject

The rapid evolution of data-intensive applications, such as artificial intelligence (AI), machine learning, and high-performance computing, demands innovative networking solutions that deliver high bandwidth, low latency, and energy efficiency. Optical Circuit Switching (OCS) is the perfect candidate to meet these needs within data centers and AI clusters. To accelerate its adoption and ensure seamless integration into modern network architectures, we propose the creation of an OCS Subproject within the OCP Networking Project.

This subproject will be dedicated to developing guiding principles, open standards, and a fully open network technology stack for OCS. Led by iPronics and Lumentum, the OCS Subproject aims to empower users and manufacturers by fostering collaboration, interoperability, and innovation in optical networking.

2. Mission Statement

The mission of the OCS Subproject is to standardize and advance Optical Circuit Switching as an open, scalable, and efficient solution for next-generation networking. By creating open specifications, integrating OCS with Software-Defined Networking (SDN), and promoting interoperability, we aim to unlock the full potential of OCS for data centers, AI clusters, and beyond—aligned with the OCP vision of openness, scalability, efficiency, and community-driven innovation.

3. Scope
   The OCS Subproject aligns with the core tenets of the Open Compute Project:
   - Openness: Deliver fully open specifications and software for OCS hardware and control systems.

- Scalability: Enable OCS to support the growing demands of data centers and AI workloads.
- Efficiency: Optimize network performance and energy usage through standardized OCS solutions.
- Interoperability: Ensure seamless integration with existing SDN frameworks and network technologies.

What Is in Scope?

1. Open Specifications for OCS Hardware and Software: Define standardized interfaces and control mechanisms.

2. SDN Integration for OCS: Develop a common integration layer and data models for OCS-SDN communication.

3. Telemetry and Monitoring for OCS: Establish protocols and requirements for real-time network visibility.

4. Data Center and AI Cluster Optimization: Demonstrate OCS applications for high-performance environments.

5. Open-Source Software Development: Contribute tools, agents, and models to the open-source community.

6. Interoperability and Standardization: Collaborate with standards bodies to ensure broad compatibility.

7. Proof-of-Concept Demonstration: Showcase network-level use cases for OCS-SDN integration.

What Is Not in Scope?

1. Proprietary Vendor-Specific Solutions: Focus remains on open, vendor-agnostic standards.

2. Long-Haul Telecom Applications: Primary focus is on data center and AI cluster.

3. Physical Layer Components (Beyond Interfaces): Emphasis is on control and integration, not component design.

4. Objectives

The OCS Subproject is structured around five key objective areas

1. Standardization and Specification Development

Objective 1.1: Develop open specifications for 2 levels of interface focusing on specification, data model, and API

- OCS Hardware Interface: e.g. Define a C/C++ data model and API, similar to the OCP Switch Abstraction Interface (SAI), to standardize hardware-level interactions.
- OCS Control and Management Interface: e.g. define a Protobuf-based data model aligned with OpenConfig standards and a gRPC API supporting gNMI/gNOI for control and management.

Objective 1.2: Create open software specifications for OCS control and management, ensuring accessibility and adaptability (e.g utilizing Protobuf-based data model that aligns with OpenConfig standard along with gRPC API (gNMI/gNOI))

Objective 1.3: Define standardized data models for OCS-SDN integration to enable consistent communication and control with an end goal of adapting to thestructure similar to the OCP Switch Abstraction Interface to help standardize interaction at the Hardware Level via API call

2. Open Source Implementation (SDN Integration, Control, and Telemetry)

2.1 Connection Handling

- Objective 2.1.1: Develop a production-worthy implementation from the OCS control and management interface to the OCS hardware interface (e.g including reusable software agents, built on or integrated into an open-source Network Operating System (NOS) environment like SONiC, going beyond a reference implementation or connection library)..

- Objective 2.1.2: Define standardized interfaces for OCS-SDN communication, ensuring plug-and-play compatibility.

- Objective 2.1.3: Identify and document end-user requirements for OCS-SDN integration based on real-world use cases.

2.2 Telemetry and Monitoring

- Objective 2.2.1: Define standardized telemetry data models for OCS to enable consistent monitoring.

- Objective 2.2.2: Specify telemetry protocols for OCS monitoring, leveraging existing OCP standards where applicable.

- Objective 2.2.3: Identify main telemetry requirements for OCS in data centers and AI clusters, focusing on performance and scalability.

3. Data Center and AI Cluster Optimization

- Objective 3.1: Develop use cases and best practices for OCS deployment in data centers and AI clusters, highlighting efficiency gains.  Select and define specific use cases for OCS deployment in Data Centers (at least 1 use case but no more than 2 use cases to build the Test Bed) and AI Clusters (at least 1 use case but no more than 2 use cases to build the Test Bed). Specify end-to-end test workflows/scenarios as user acceptance tests for these use cases to validate functionality and performance.

- Objective 3.2: Create a “Test Bed” Best Practices Document to guide OCS implementation and evaluation.  Define a generic Test Bed diagram/Topology with Hardware and Software requirements, including a software reference platform that implements the OCS hardware interface for developers and continuous integration (CI). Specify acceptable end-to-end user test cases that include test case workflows/scenarios supported by the SW reference platform. Ensure hardware testbeds, including topology and resource requirements, are well-defined to enable proof-of-concept (PoC) deployments.

- Objective 3.3: Demonstrate network-level applications of OCS-SDN integration through proof-of-concept deployments. Identify participants who will work on the SDN controller to interface/control/provision the OCS HW, determine where the LAB POC should be built & tested, and finally define the project schedule and milestones. Ensure hardware testbeds and software reference platforms are leveraged to support robust PoC implementations.

4. Open-Source Development and Collaboration

- Objective 4.1: Contribute to open-source projects relevant to OCS and SDN, enhancing community resources.

- Objective 4.2: Create and maintain a repository for OCS data models, software agents, and documentation.

- Objective 4.3: Promote interoperability and collaboration with relevant standards bodies (e.g.,OpenConfig, Linux Foundation, IETF) to align OCS efforts globally.

5. Community Engagement and Impact

- Objective 5.1: Establish a collaborative forum for OCS stakeholders to share insights and drive adoption.

- Objective 5.2: Publish regular progress reports and white papers to showcase subproject milestones and benefits.

- Objective 5.3: Drive adoption of OCS standards by engaging OCP members and the broader industry through workshops and demonstrations.

**Collaboration Model**

- Open Participation: Invite contributions from OCP members, industry partners, and academia.

- Regular Meetings: Host bi-weekly working group sessions to align objectives and deliverables.

- Transparent Governance: Establish a lightweight steering committee to oversee milestones and approvals.

**Value Proposition**

The OCS Subproject will deliver significant value to the OCP community and the networking industry:

- Accelerated Innovation: Open standards will lower barriers to OCS adoption, enabling faster development cycles.

- Cost Efficiency: Standardized interfaces and open-source tools will reduce dependency on proprietary solutions.

- Scalability for AI Era: OCS will empower data centers and AI clusters to handle exponential traffic growth.

- Ecosystem Growth: Collaboration with standards bodies and open-source communities will amplify OCP's influence in optical networking.

**Next Steps**

1. Approval: Submit this proposal to the OCP Networking Project leadership for review and endorsement.

2. Kickoff: Schedule an inaugural meeting with iPronics and Lumentum to finalize the workplan.

3. Engagement: Announce the subproject to the OCP community and invite participation.

4. Milestones: Target initial deliverables (e.g., hardware interface list, SDN integration layer) within 6-9 months.