Terabit Optical Networks Challenge: Step Changes for Data Rates, Latency, and Energy Efficiency in Future Networks

Background:

The Terabit Optical Networks Challenge aims to support companies/organisations to develop new systems/components/subcomponents (across software and hardware) that support the next generation of optical fibre solutions, supporting a future 'terabit-scale' network. Prototypes/proof of concepts would support step-changes in data rates, latency, and energy efficiency. As the demand for faster and more reliable communication networks continues to grow, it is crucial to push the boundaries of optical technologies and pave the way for future generations of networks. This challenge seeks to mobilise industry leaders and experts to develop terabit optical networks that are commercially scalable and can be deployed in commercial networks and key transatlantic links by 2030.

Objectives:

- **Develop a terabit optical network:** The primary objective of this challenge is to develop constituent parts of a future terabit optical network that can demonstrate significant improvements in data rates, latency, and energy efficiency compared to existing optical networks. The network should be capable of reliably and efficiently handling terabit-scale data transmission.
- **Step-changes in performance:** The challenge requires participants to achieve substantial step-changes in data rates, latency, and energy efficiency. The proposed solutions should outperform current state-of-the-art optical technologies by a significant margin, driving the industry towards a new era of high-speed, low-latency, and energy-efficient optical networking.
- **Commercial scalability:** The challenge focuses on developing solutions that can be scaled up for commercial deployment. The proposed terabit optical networks should demonstrate their potential for integration into existing commercial networks, with the goal of realising commercial scalability by 2030.
- **Transatlantic links:** The challenge places a particular emphasis on solutions that can be deployed in key transatlantic links. These links are critical for global connectivity, and advancements made in this challenge should be able to have a direct impact in the future on improving the performance and capacity of transatlantic optical communication.

Scope and Deliverables:

- **Research and Development**: Participants are encouraged to explore novel technologies, architectures, and protocols that can enable terabit data rates, ultra-low latency, and improved energy efficiency in optical networks. The focus should be on developing practical and scalable solutions that can be implemented in real-world scenarios.
- **Proof of Concept Prototypes:** Participants must build and demonstrate a working proof of concept for their proposed elements of terabit optical network, or a full working proof of concept through consortia if able. The proof of concept should showcase the ability to achieve the desired step-changes in data rates, latency, and

energy efficiency using optical technologies.

- **Performance Metrics:** The proposed terabit optical solutions will be evaluated based on key performance metrics, including data transmission rates, latency measurements, and energy efficiency benchmarks. Participants should provide comprehensive data and analysis to support their claims.
- **Scalability Assessment:** Participants should assess the commercial scalability of their proposed solutions. This includes analysing the network's feasibility for integration into existing commercial networks, cost-effectiveness, and compatibility with emerging optical technologies.

Collaboration and Evaluation:

Collaboration: Participants are encouraged to collaborate with industry partners, research institutions, and relevant stakeholders to leverage collective expertise and resources. Collaboration should foster innovation and help accelerate the development of terabit optical networks.

Evaluation: The proposed terabit optical network solutions will be evaluated by a panel of experts based on the demonstrated step-changes in data rates, latency, and energy efficiency using optical technologies. The evaluation process will consider the viability, scalability, and potential impact of the solutions on the optical networking industry.