Indo/US Collaborative Research Grants

National Science Foundation of US and Technology Innovation Hubs of India

Title: On-demand quality of transmission (QoT) aware Optical Phase Conjugator (OPC) deployment for coherent optical networks.
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US PI: Prof. Byrav Ramamurthy, Professor at University of Nebraska - Lincoln, USA.

Fiber optic communication systems form the backbone for mobile data and internet traffic. The demand for capacity directly translates to increased data-rate and bandwidth requirements in fiber optic communication links. This has been handled with coherent communication with advanced modulation which utilizes the phase of the optical carrier to encode digital data, in addition to amplitude and polarization. Coherent communication, however, requires heavy signal processing.

Optical signal processing techniques that aid in signal regeneration, low-noise amplification, equalization, and switching are attractive energy-efficient approaches that can complement digital signal processing. Specifically, optical phase conjugation (OPC) provides a method to auto-heal the dispersion induced impairments but needs to be implemented in the mid-span. This project aims at designing an "on-demand" quality of transmission (QoT) aware optical phase conjugator deployment based on the source and destination of the optical connections. Energy-efficient phase conjugator will be demonstrated by the Indian partner for data rates of 400 Gbps. Incorporation of the physical model of OPC into a network simulation tool, and use of machine learning algorithms will be carried out by the US partner. The OPC network allocation will be intelligently carried out and a complete physical and network layer solution with OPCs would be provided at the end of the project.
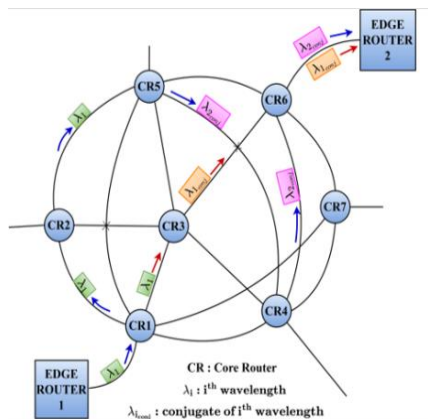
Concept behind on-demand OPC employed in optical network
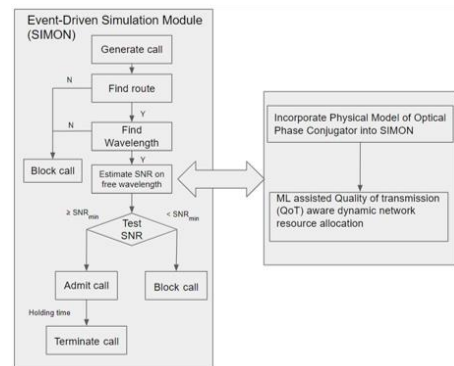
Schematic of Event-Driven simulation module (SIMON)