

A Hybrid Optical neTwork ARchitectUre Concept
Combining Circuit and Multi-Wavelength Packet Switching

OBJECTIVES

■ **To Design New Optical Network Architecture** satisfying various requirements for the next generation Internet.

- High-capacity using optical transport

In the future Internet, more enormous traffic will be transmitted than that in the current Internet. In order to transmit such enormous traffic, optical transport technology will be exploited efficiently.

- QoS (Quality of Service) support

Various applications have emerged and some of them such as 8K digital cinema, online games require various quality constraints, such as maximum delay, minimum bandwidth or maximum jitter, to be satisfied.

APPROACH

■ **HOTARU: Hybrid Optical neTwork ARchitectUre** combining **Multi-Wavelength Optical Packet** and **Optical Circuit Switching**.

- HOTARU provides both lambda path switching and optical packet switching.

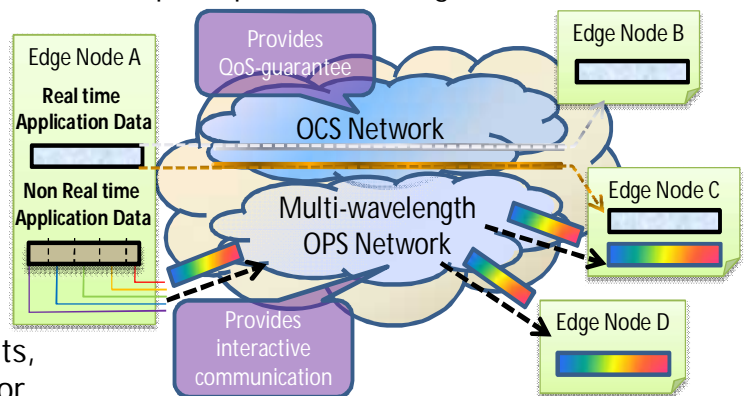


Fig1. HOTARU Network Image

HOTARU FEATURES

■ **OCS provides QoS-guaranteed transport.**

Wavelengths can be dedicated exclusively for particular traffic or aggregated traffic as lambda paths. Lambda path is established by an edge node via signaling protocol in advance.

■ **Multi-Wavelength OPS provides interactive communication and high bandwidth utilization.**

Available wavelengths which are not dedicated as lambda paths are utilized for Multi-Wavelength optical packets. It can provide comparatively high bandwidth utilization.

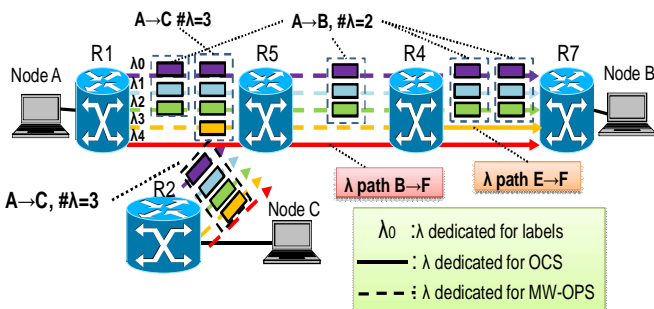


Fig2. Lambda Utilization of the HOTARU Network

■ **Service Differentiation(Class of Service)**

HOTARU can provide service differentiation by using different set of parameters such as total delay, # of available lambdas, availability of deflection routing and the number of FDL.

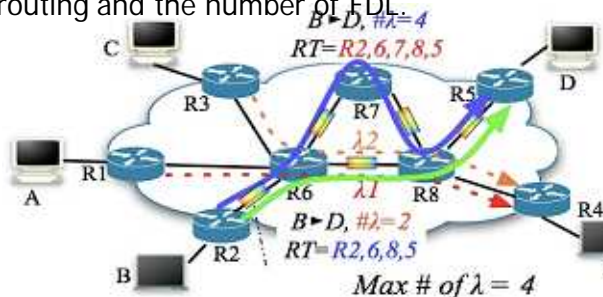


Fig3. Service Differentiation in HOTARU networks

Multi-Wavelength Optical Packet Switching

One wavelength is dedicated for headers and other wavelengths are dedicated for payloads. A payload is divided into fragments of the number of available wavelengths.

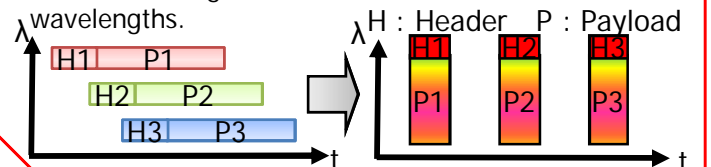


Fig4. Difference of format between typical optical packet and multi-wavelength optical packet.

HOTARU

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NODE DESIGN

NxN Core Node Design

Currently HOTARU Core Node design has been done. We will try to design Edge Node architecture soon.

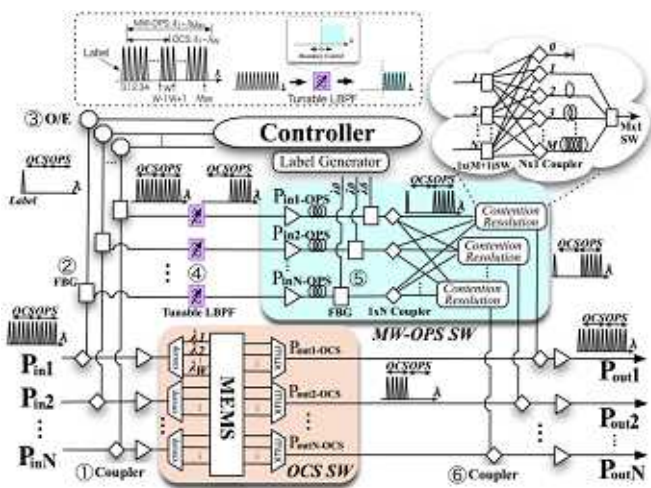


Fig5. A Diagram of HOTARU Switching Node

HOTARU Node Experiment

Implementation of Switching Node for Multi Paradigm Optical Networks

In this time, we designed and implemented a novel hybrid switching node for the optical network architecture combining both 40G OCS and 240G MW-OPS in order to provide QoS and high bandwidth utilization. The result showed that error-free transmission is possible in this switching node. We will exploit a tunable LBF and support dynamic control for MEMS and tunable LBFs.

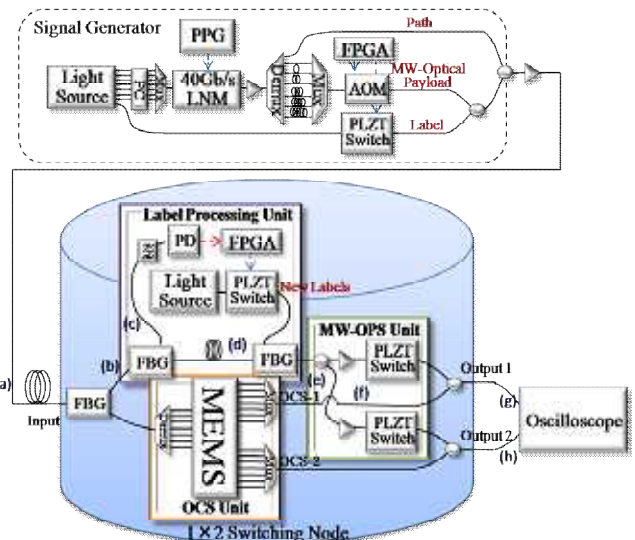


Fig6. Experimental Setup

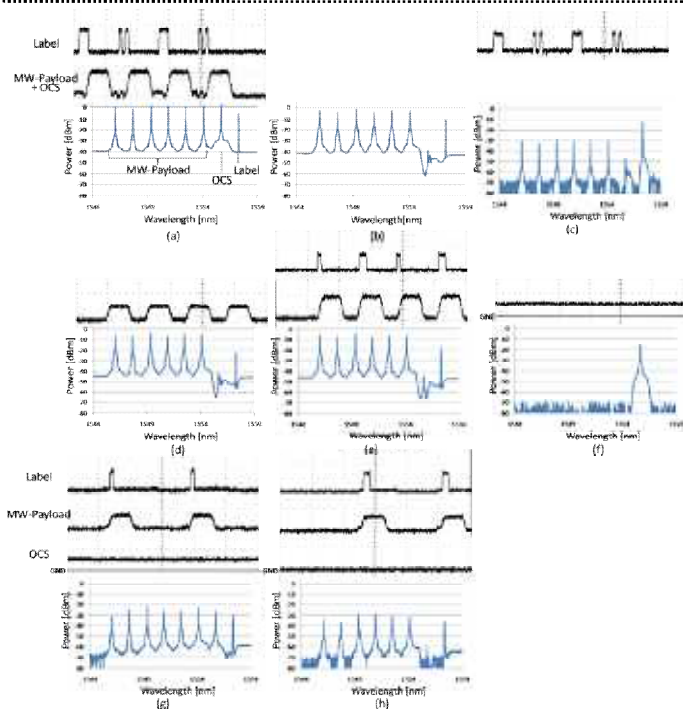


Fig7. Waveform and Spectrum Results

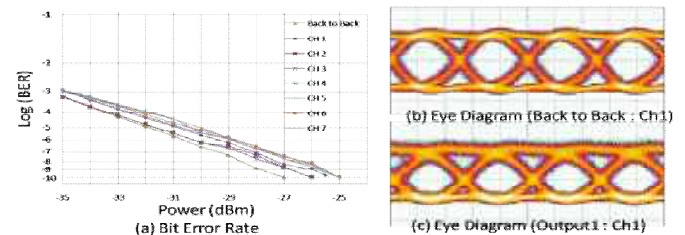


Fig8. Bit Error Rate and Eye Diagrams