

HOTARU

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.

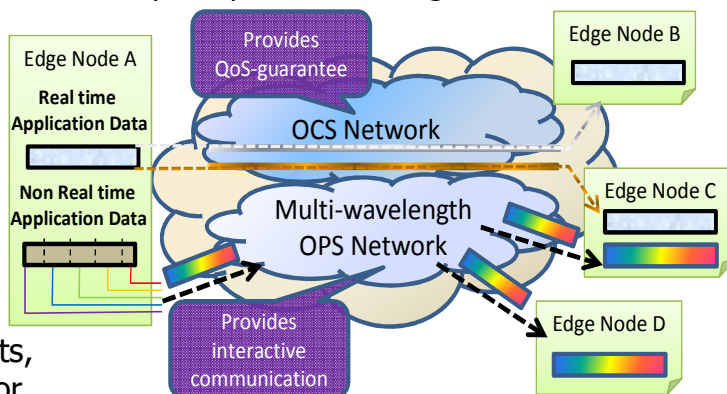


Fig.1 HOTARU Network Image

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 edge node via signaling protocol in advance.

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

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

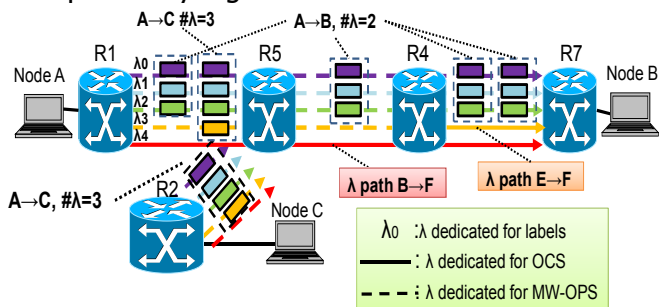


Fig.2 Lambda Utilization of the HOTARU Network

- **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.

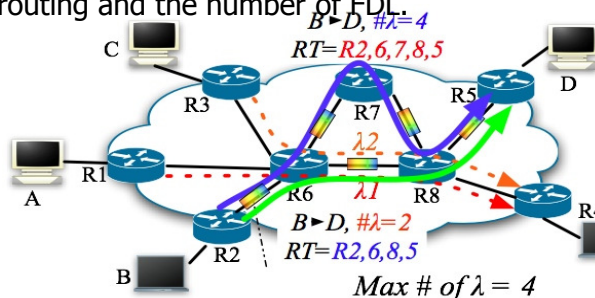


Fig.3 Service Differentiation in HOTARU networks

- ★ **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.

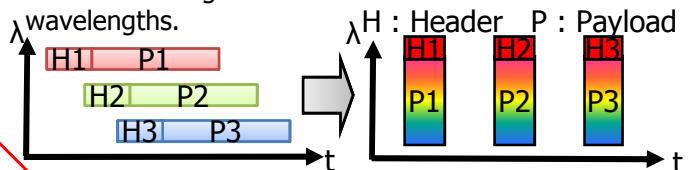


Fig.4 Difference of format between typical optical packet and multi-wavelength optical packet.

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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.

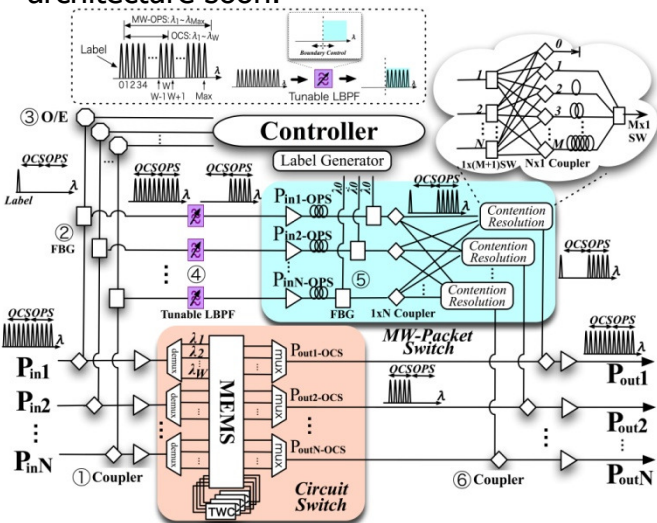


Fig.5 A Diagram of HOTARU Switching Node

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 OCS and MW-OPS in a 400 (10λx40) Gbps test-bed. This switching node equips a wavelength- and bandwidth-tunable filter for flexibly changing wavelength allocation for OCS and MW-OPS.

The result showed that error-free transmission is possible in this switching node.

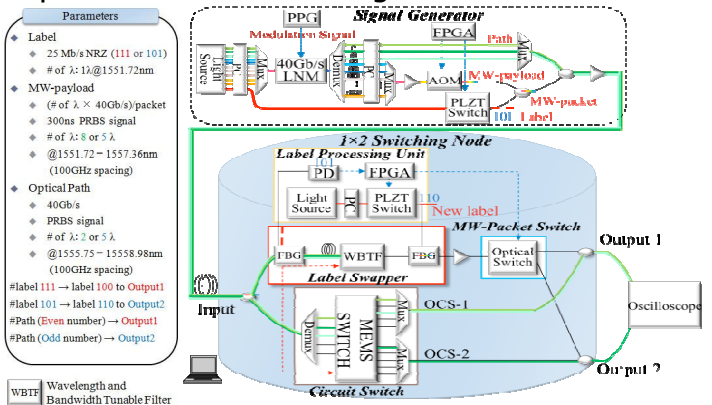


Fig.6 1x2 Switching Node Implementation

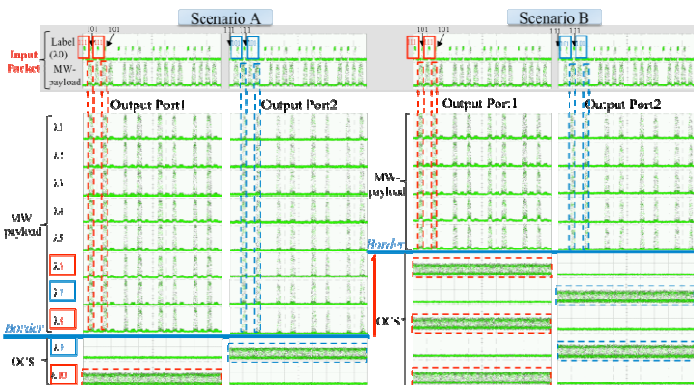


Fig.8 Waveform Results

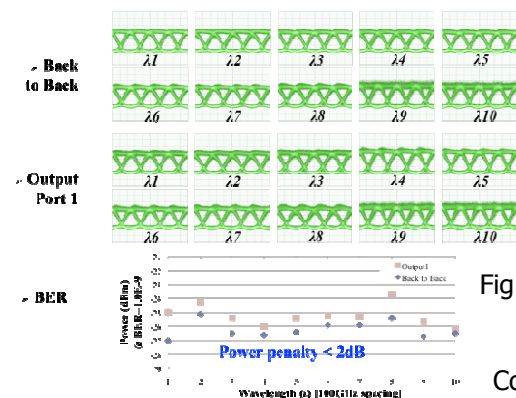


Fig.9 Eye-diagram and BER

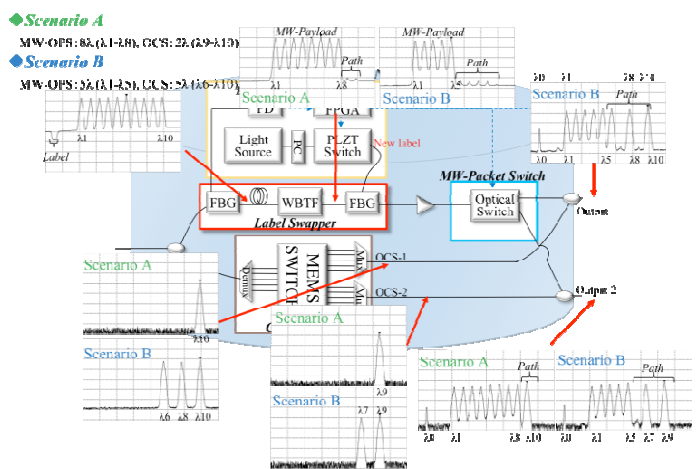


Fig.7 Spectrum Results