HOTARU

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

Supported by NiCT

OBJECTIVES

■ **Designing New Optical Network Architecture satisfying requirements for the next generation Internet.**

- High-speed / capacity of 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 online fighting games and remote conference require to satisfy various quality conditions such as maximum delay, minimum bandwidth or maximum jitter.

APPROACH

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

HOTARU provides both lambda path switching and optical packet switching.

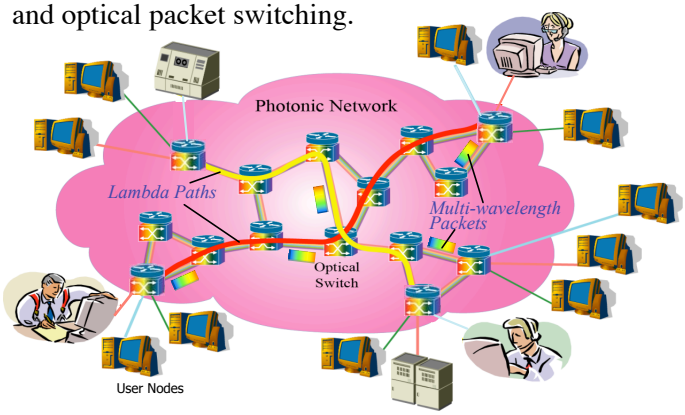

Fig.1 HOTARU Network Image

HOTARU FEATURES

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

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

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

Available wavelengths which are not dedicated as labmda paths are utilized for multi-wavelength optical packets. It can provide comparatively high bandwidth utilization.

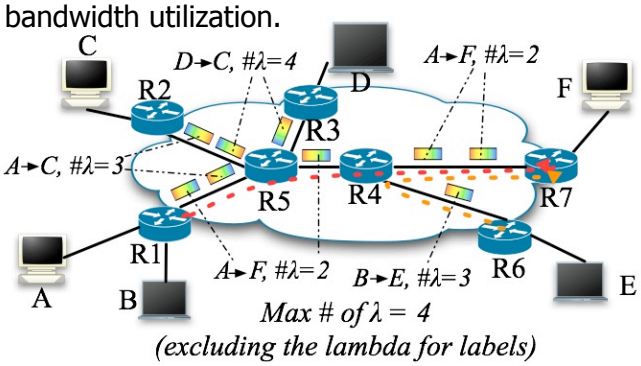

Fig.2 HOTARU Network Example

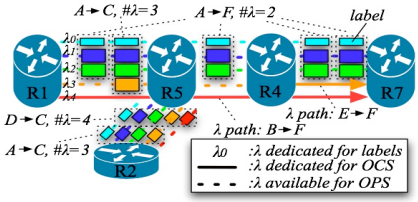

Fig.3 Lambda Utilization of the Example Network

■ **Service Differentiation**

HOTARU can provide service differentiation by using difference of some parameters such as total delay, path bandwidth, availability of deflection routing and the number of FDL.

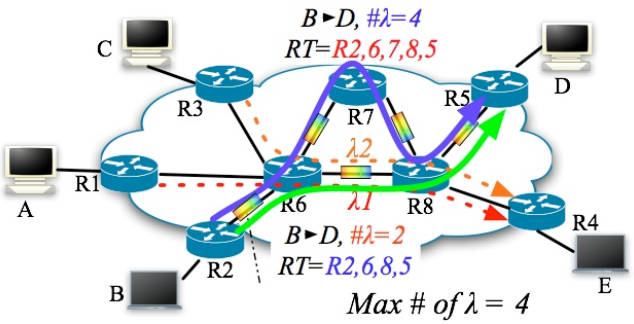

Fig.4 Service Differentiation in HOTARU networks

★*Multi-wavelength Optical Packet Switching*

One wavelength is dedicated for headers and other wavelengths are dedicated for payloads. A payload is fragmented into pieces of the number of wavelengths and each fragment is encoded into different wavelength.

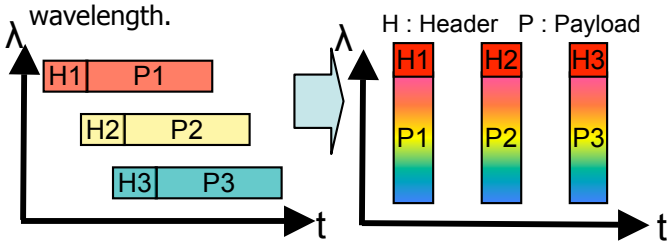

Fig.5 Difference of format between typical optical packet and multi-wavelength optical packet.

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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.

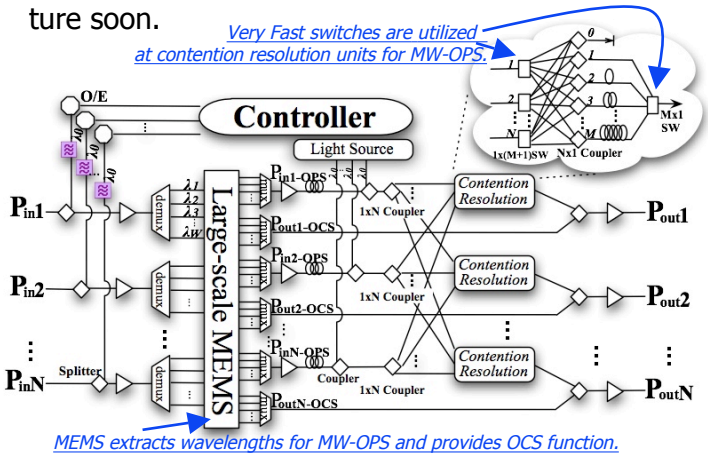


Fig.6 NxN HOTARU Core Node Architecture

Performance Evaluation

■ Network Performance Evaluation

HOTARU Core Node simulator has been implemented design has been done so far. Before evaluating HOTARU network performance, we evaluates contention resolution function of HOTARU Core Node by using real IP traffic.

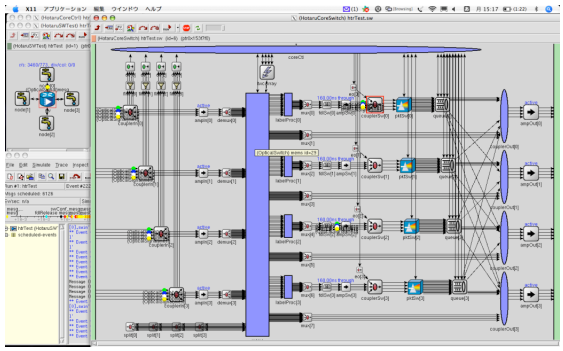


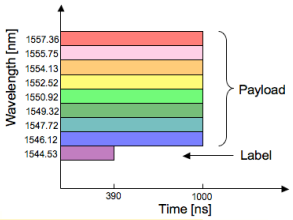
Fig.7 HOTARU Network Simulator

80G MW-OPS Experiment

■ 80G (10Gbps x 8 wavelengths) MW-OPS Experiment using a PLZT switch

Before implementing a prototype of HOTARU nodes, feasibility of MW-OPS which is one of the most important functions in HOTARU nodes must be examined. For the purpose, we had the experiment on 80Gbps (10G x 8 wavelengths) multi-wavelength OPS using a PLZT switch.

	Payload	Label
Bit rate	10Gbps NRZ	7.69Mbps NRZ
Number of wavelength	8	1
Data signal	2^7-1 PRBS	"111" or "100"
Date length	1000ns or 1500ns	390ns



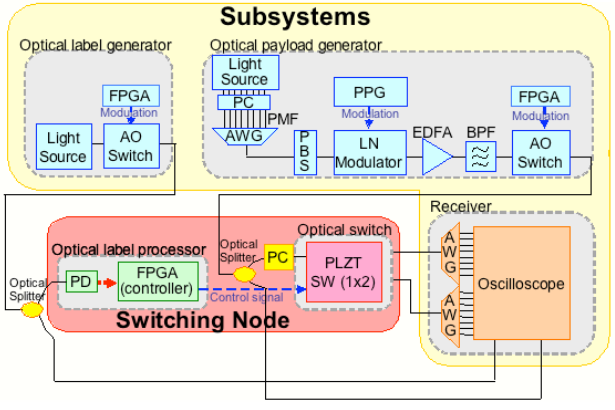
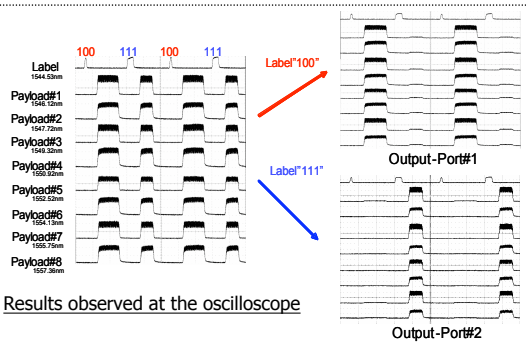
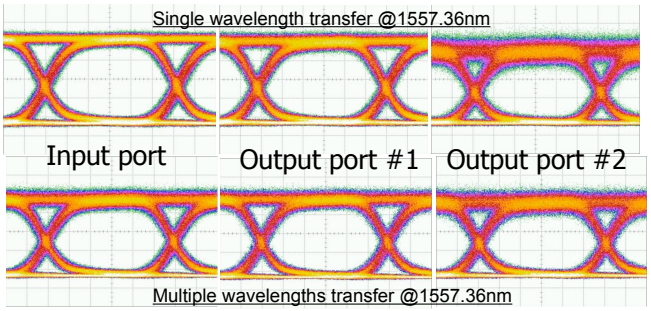


Fig.8 Experiment Setup



Results observed at the oscilloscope



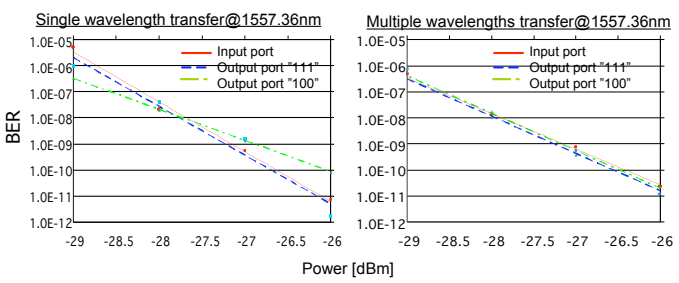


Fig.9 Experiment Results

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