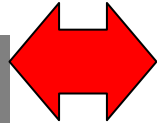# OKI's IP-Photonic traffic engineering network system
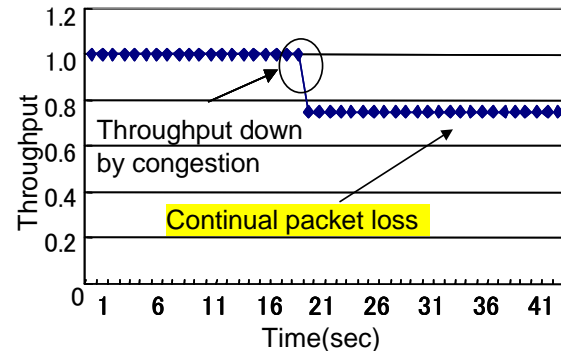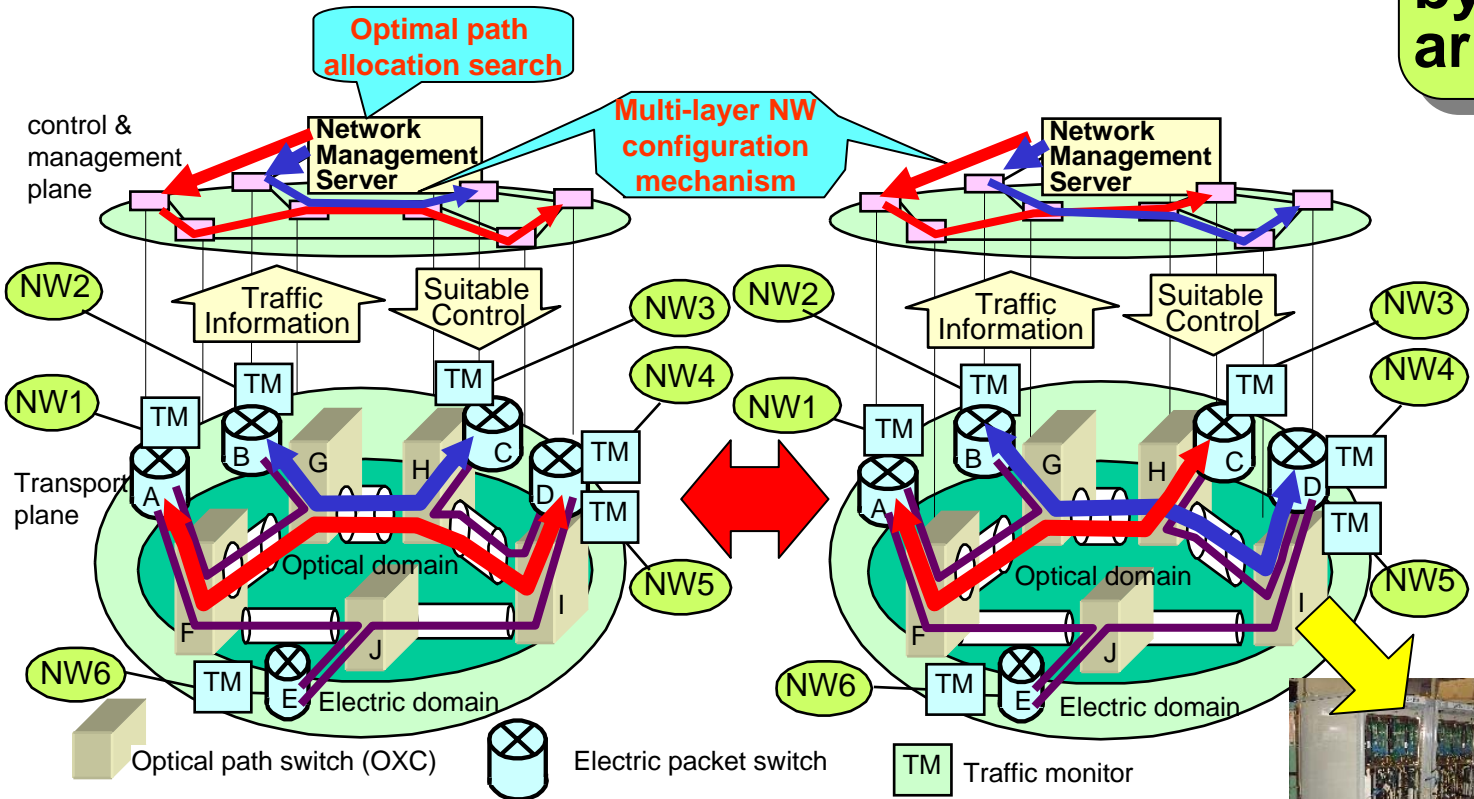
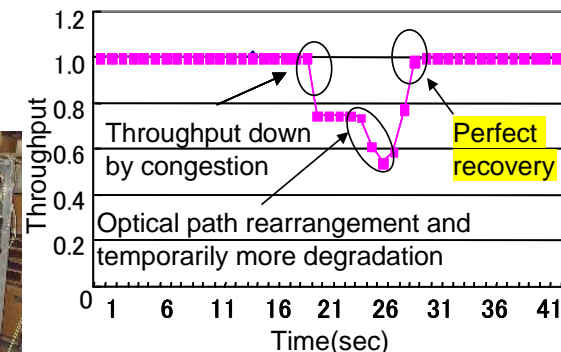**When the traffic between NW1&NW4, NW2&NW3 are heavy**

When the traffic between NW1&NW3, NW2&NW4 are heavy

Objectives
● **Maximization of network throughput by dynamic path re-arrangement**

Optimal path allocation search

Multi-layer NW configuration mechanism

control & management plane

Network Management Server

Network Management Server

NW2

NW3

NW2

NW3

Traffic Information

Suitable Control

Traffic Information

Suitable Control

NW1

NW4

NW4

NW1

TM

TM

TM

TM

TM

TM

TM

TM

TM

TM

B   G   H   C

B   G   H   C

Transport plane

A

D

A

D

Optical domain

Optical domain

F   I

F   I

J

J

NW5

NW5

NW6

TM

E   Electric domain

NW6

TM

E   Electric domain

Optical path switch (OXC)

Electric packet switch

TM Traffic monitor

Throughput down by congestion

Continual packet loss

Throughput vs Time(sec) — 1, 6, 11, 16, 21, 26, 31, 36, 41

(1) Conventional system

Throughput down by congestion

Perfect recovery

Optical path rearrangement and temporarily more degradation

Throughput vs Time(sec) — 1, 6, 11, 16, 21, 26, 31, 36, 41

(2) Proposed system

Experimental results

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Objectives of operation

- **Maximization of throughput**

How to?

- **Dynamic rearrangement of optical path and packet forwarding route**

Target

- **Tbit/s node using optical layer cut-through**

Expectation

- **Improvement of efficiency of resource utilization in IP optical multi-layer network**

- **Multi-service network, SLA, provisioning, etc….**

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GMPLS PSC packet loss-less route rearrangement for multi-layer network reconfiguration

Experimental platform
PC-AT x86 architecture
(Manufactured by other bender)
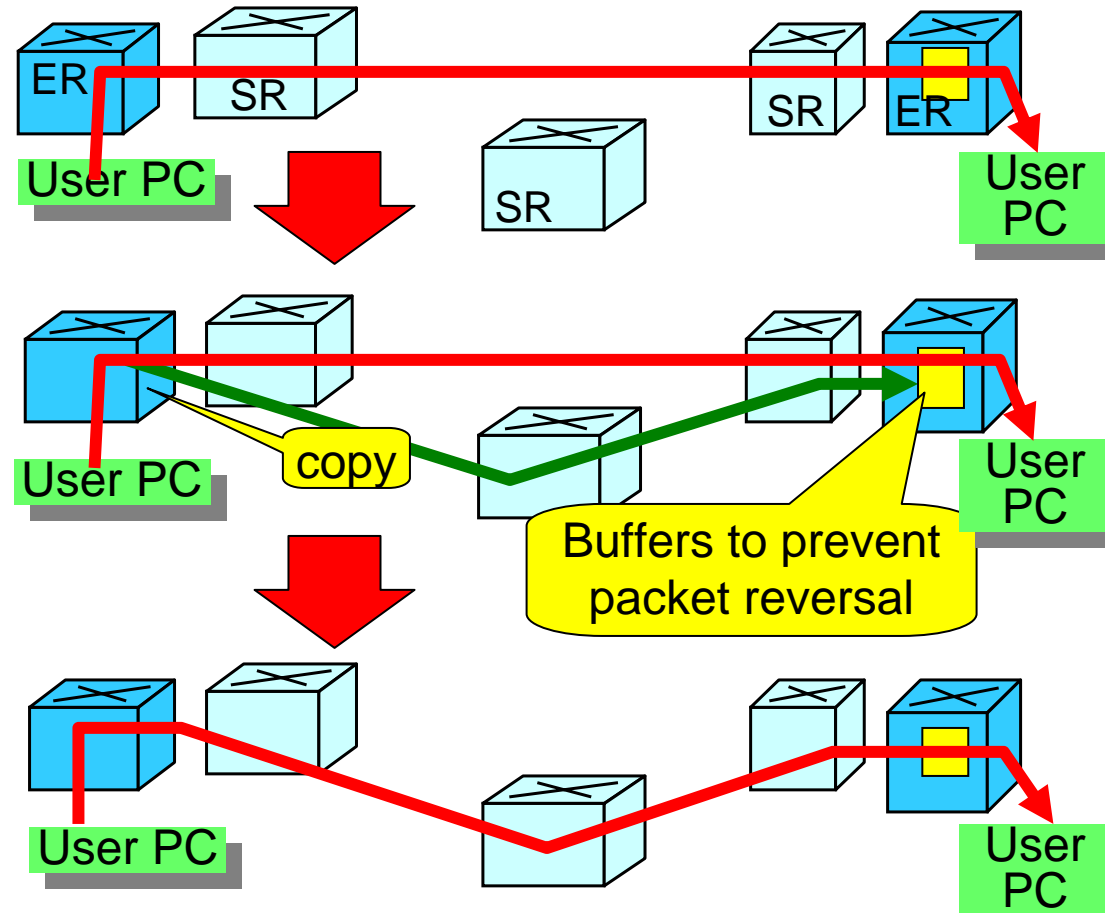**Base signaling protocol**
GMPLS RSVP-TE
Buffers to prevent packet reversal
100MByte
Mechanism of packet loss-less network re-configuration
1:New path allocation
2:Packet forwarding using both paths
3:Change the packet to be forwarded to the user at the egress ER
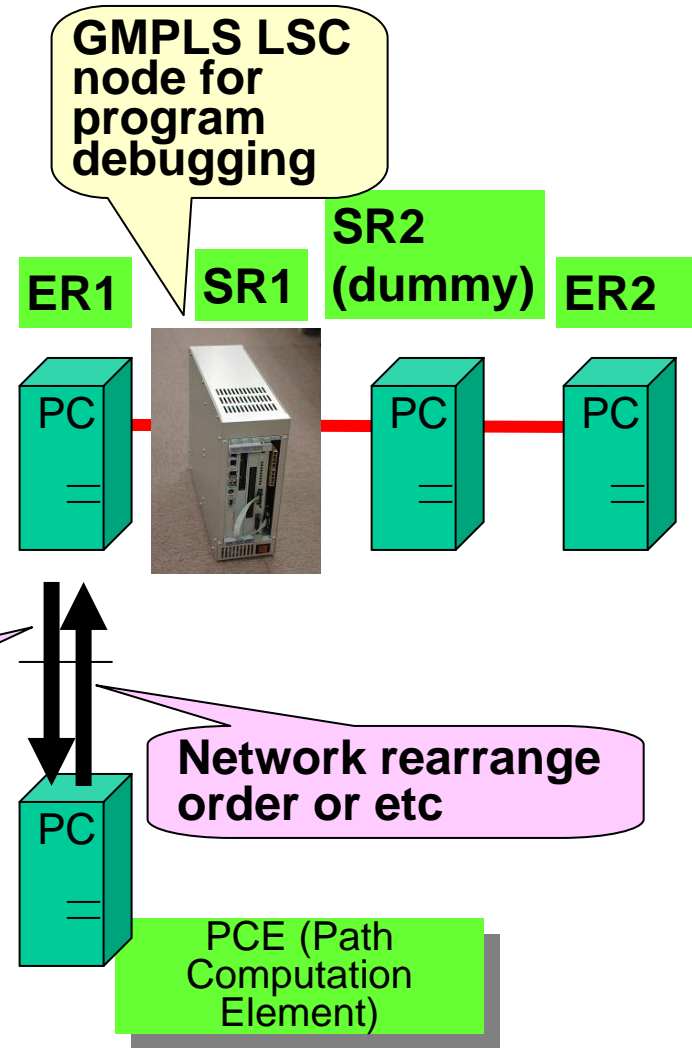**4:Tear down the old path**

ER   SR   SR   ER

User PC   SR   User PC

User PC   copy   User PC

Buffers to prevent packet reversal

User PC   User PC

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GMPLS LSC node and path computation element

Experimental platform	**PC-AT x86 architecture (Manufactured by other bender)**
Signaling protocol	**GMPLS RSVP-TE**
Path computation algorithm	**Genetic algorithm**
GMPLS LSC node type	**OOO type optical ADM**
Optical characteristics	**32 wavelengths 50GHz**

ER:Edge router
SR:Switch router

GMPLS LSC node for program debugging

ER1 SR1 SR2 (dummy) ER2

PC PC PC

Path request,
Traffic information, etc

Network rearrange order or etc

PC

PCE (Path Computation Element)

Configuration of demonstration