Optical Networking: A Foremost Solution for the Internet

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The Internet: A Brief Story

Optical Networks: Why and How

Challenges in Optical Networks

On-going Research

Internet Growing Fast ~40 years

Optical Networks using Fiber

Survivability

Multi-granular Switching: reduce ports/complexity

Internet Traffic Explosion

Optical too Fast for Electronic Devices

Optimal RWA: NP-Complete

How Routers Combine/Split Colors?

Ports Increase in Optical Routers

More Challenging Problems

Internet Reality

How Routers Combine/Split Colors?

One Fiber can carry >1000 colors

• One color (or wavelength) supports 100 Gbps traffic

Optical too Fast for Electronic Devices

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The speed of light is the fastest!

$\frac{1}{n} > \frac{1}{n_2}$

$0.5 \times 10^8$

$1 \times 10^8$

$2 \times 10^8$

$3 \times 10^8$

$10^9$

$10^10$

USA Population

USA Internet User

Internet Traffic Explosion

Number | Meaning behind
--- | ---
2 times | The Internet Traffic doubles every year
3 hours | Average time spent by teenagers on internet per day in USA
623,959 | New Internet Broadband subscribers per quarter in USA
110 million | The number of registered users of MySpace
2.7 billion | The number of searches performed on GOOGLE per month

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How Routers Combine/Split Colors?

4 ports at each OXC

Switch ports = 1 for each wavelength

Optical Cross-connect (OXC)

Challenges

High footprint, cost, control complexity, power consumption

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MicroElectroMechanical Systems (MEMS)

A mirror can quickly change the direction of light: router switches colors!

MEMS Mirror

A MEMS Mirror

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