

**Welcome to: ES011WS01**

DWDM Optical Networking **R/E**volution

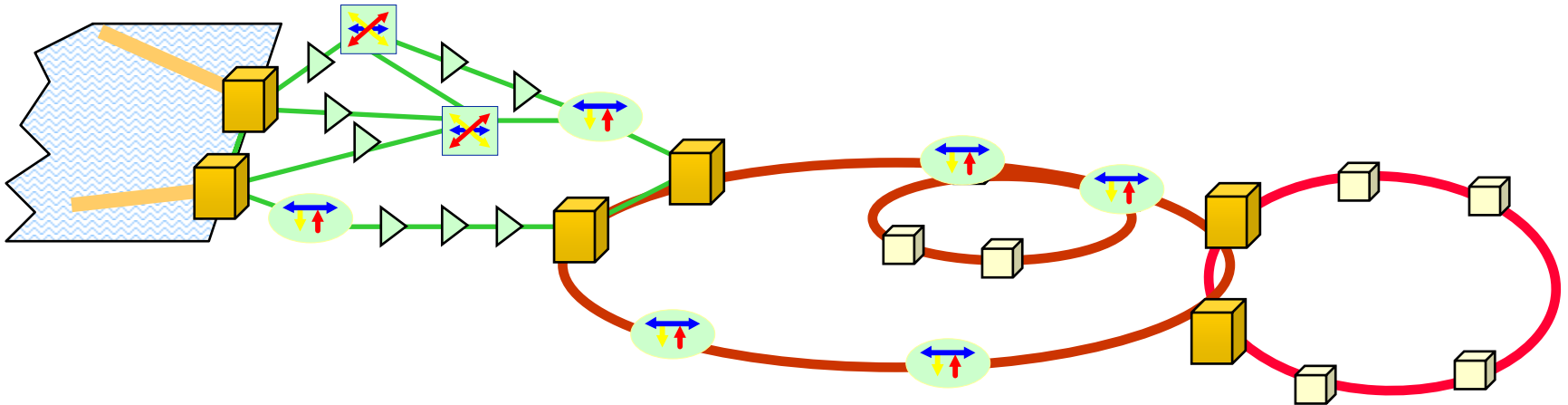
**The Magic of Photonics**

Module 4

Application Domains

# Module 4

## ON Application Domains



- Application Domains
  - Core Long-Haul
  - Metropolitan IOF Optical Networking
  - Metro Business Access

# ON Applications Domains

Application Domain	Typical Optical Connectivity/Traffic Connectivity
Core <ul style="list-style-type: none"><li>•Long-Haul</li><li>•Submarine</li></ul>	Mesh/Mesh
Metro <ul style="list-style-type: none"><li>•Inter-Office</li><li>•Business Access</li></ul>	Ring/Mesh
Private	Point-to-point

# Optical Networking Domains

**Long Haul Transport**

**Metro Optical Networking**  
covers regional/IOF transport and  
business access network applications

**Regional/IOF Transport**

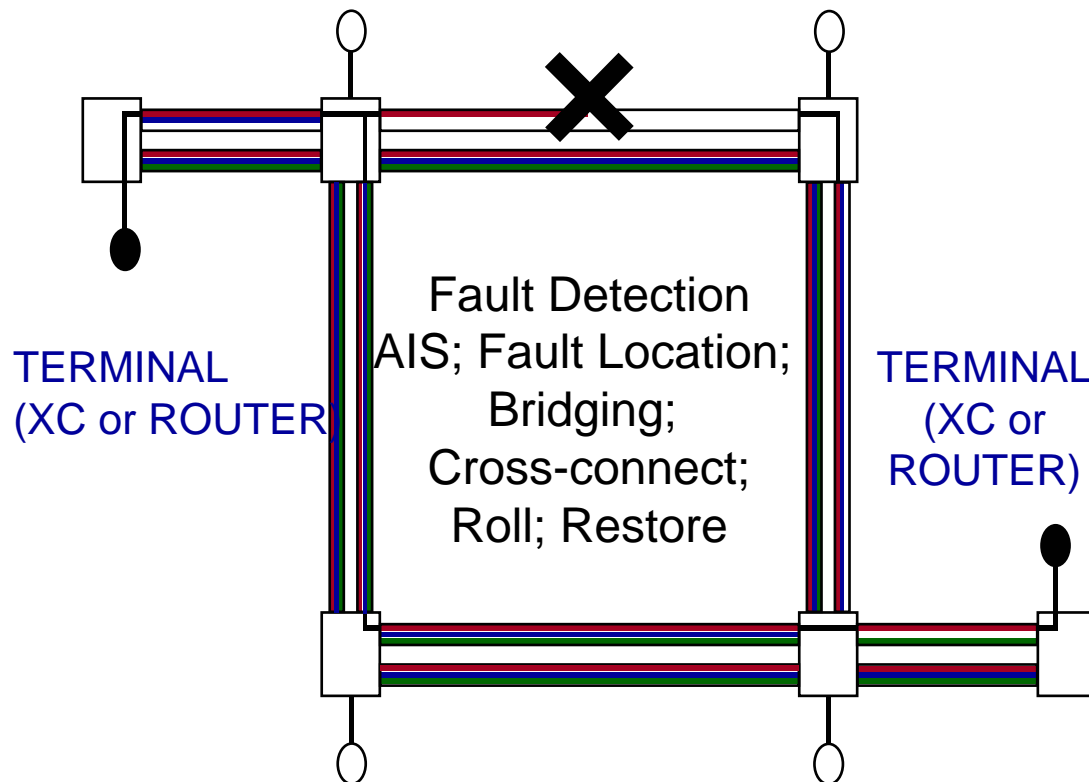
**Business Access**

	Long Haul	Metro IOF	Metro Access
Span	60 km	20 km	5-10 km
Reach	600 km	200 km	50-60 km



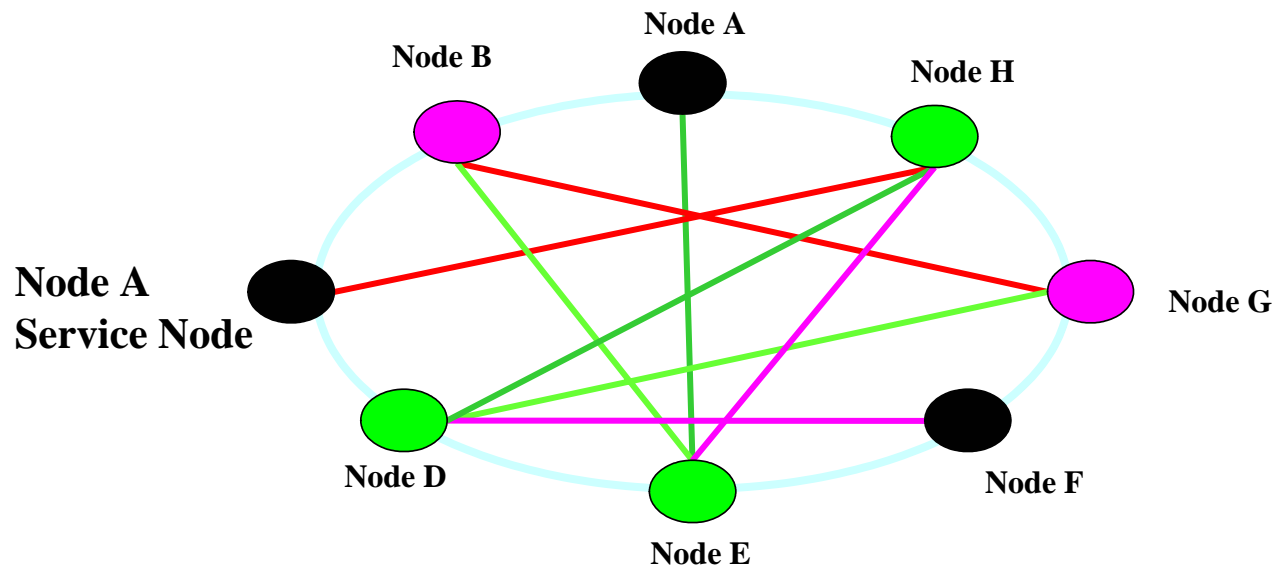
# Near-Term OXC Application Environment

## OXC used as a fast restoration vehicle



# Topology

## Optical Ring $\rightarrow$ Virtual Mesh



# Definition and Terminology: IOF-vs-Access

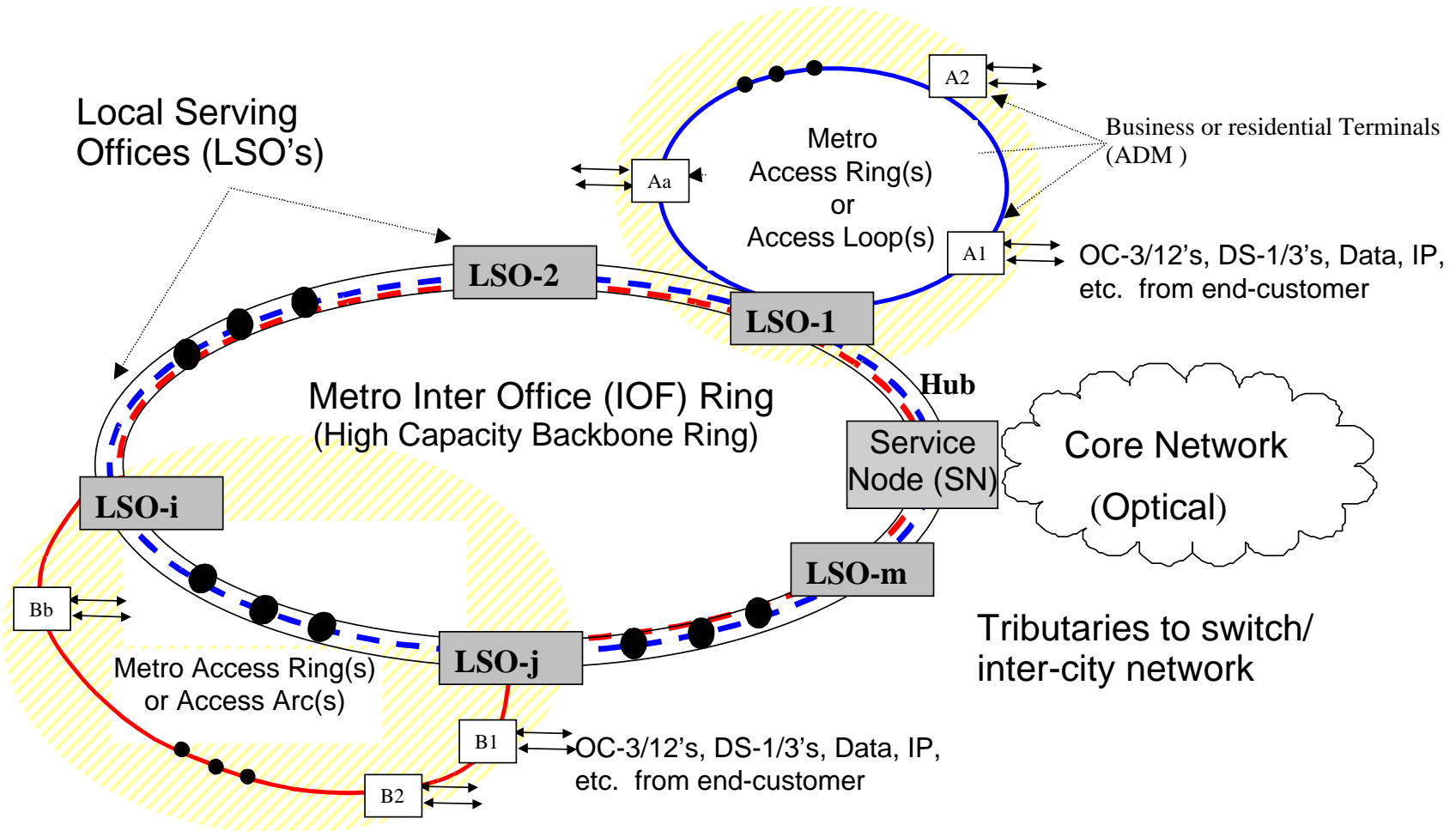
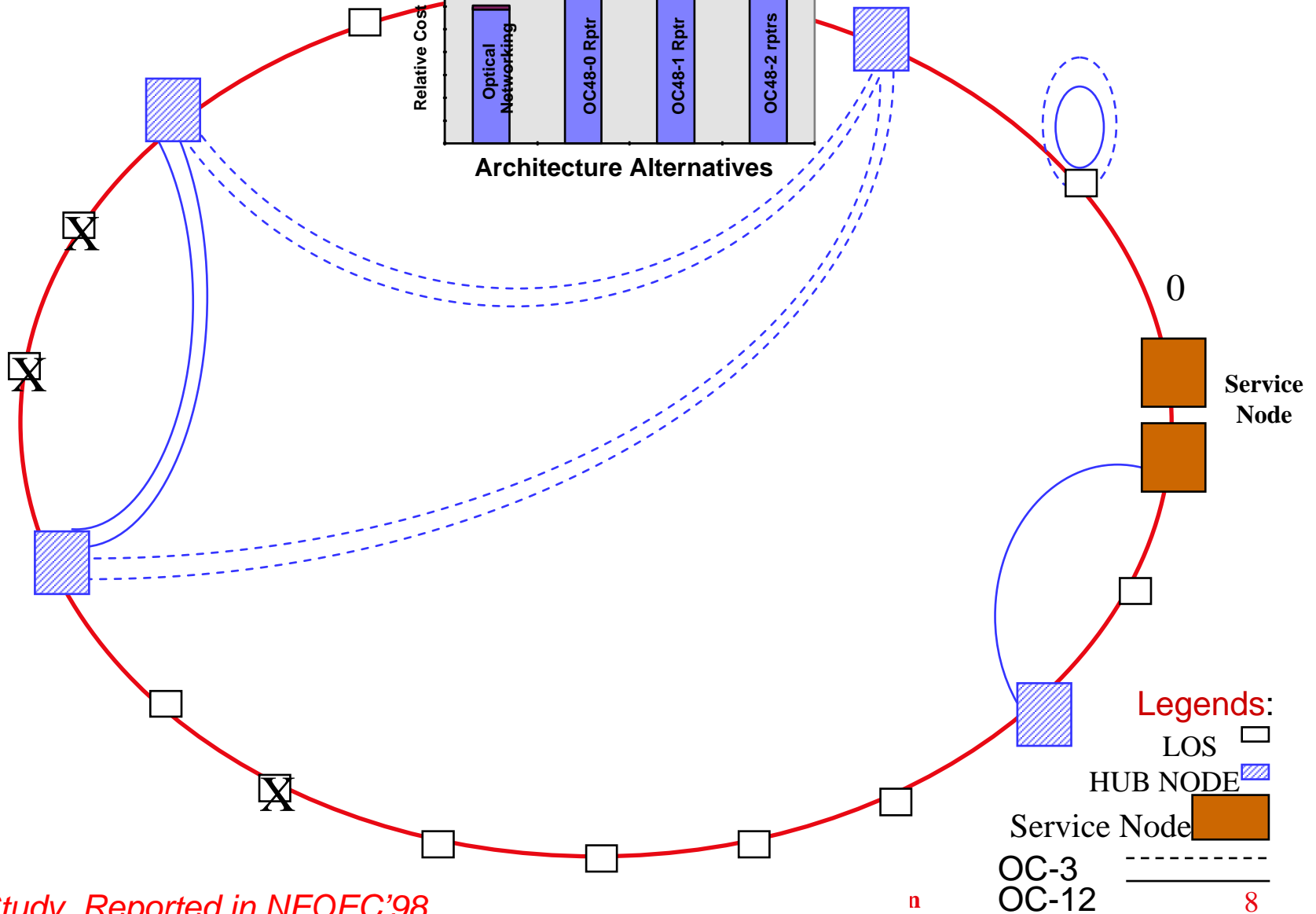
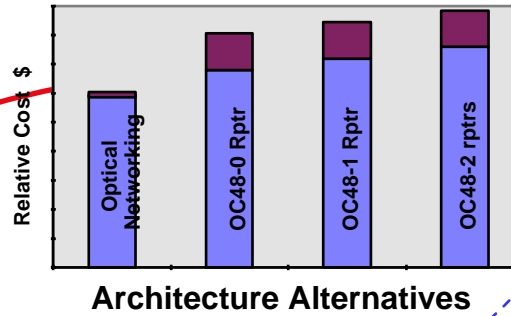


Figure 1 Metro Area Optical Network Topologies

# Metro Area Optical Networking -VS- Traditional SONET Architecture

## 1996 Study

Given Traffic Model





# Why Optical Metro and Access Networks at This time?

## Optical Networking Architecture Benefits

- Over 28% Equipment Cost saving over traditional (TDM) Architecture (**>>28% with FiberNode**)
- Fewer Fiber Lines Needed (e.g., 2 Rings -Vs- 5)
- Utilizing Embedded Fiber to Achieve Capacity Increase
- Transparency
- Seamless Upgrade from OC3 to OC12 to OC48 to Data networking
- Simplified Office Installation
- Simplified Timing Architecture
- Clear Channel Service Capability
- Fewer Components to Maintain

# What is next?

## On the the capacity limit and research directions

- Substantially unlimited capacity (Tera Hertz) in the future
  - Reduce spectral spacing
  - Optical spread spectrum transmission
  - Optical Time Division Multiplexing (OTDM)
  - Optical Code Division Multiplexing (OCDM)
  - Chirped WDM-TDM
  - Other
- Bandwidth is **no longer the issue**
- Bandwidth Management is **the challenge**