

NORTEL NETWORKS

Submarine Network Landing Transmission Technology Evolution

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Agenda

- **Optimizing Global Networks**
 - Traditional submarine network design
 - Optimized global networks
- **Network Evolution**
 - Evolution of terrestrial networks
 - Intelligent Optical Connectivity
 - Network Element evolution
 - Submarine links in tomorrow's global network

Models for Submarine Networks deploy't

Consortium Model

Consortium Based Network

APCN-2, Southern Cross, Asia-America, TAT-14

Business Objectives

Competitive, compatible SDH services
Carriers' Carrier Model

Service Application requirements

Discrete network operation
SDH integrity

Global Carrier Model

Carriers with Global Networks Coverage

Global Crossing, L3, FLAG, TGN,

Business Objectives

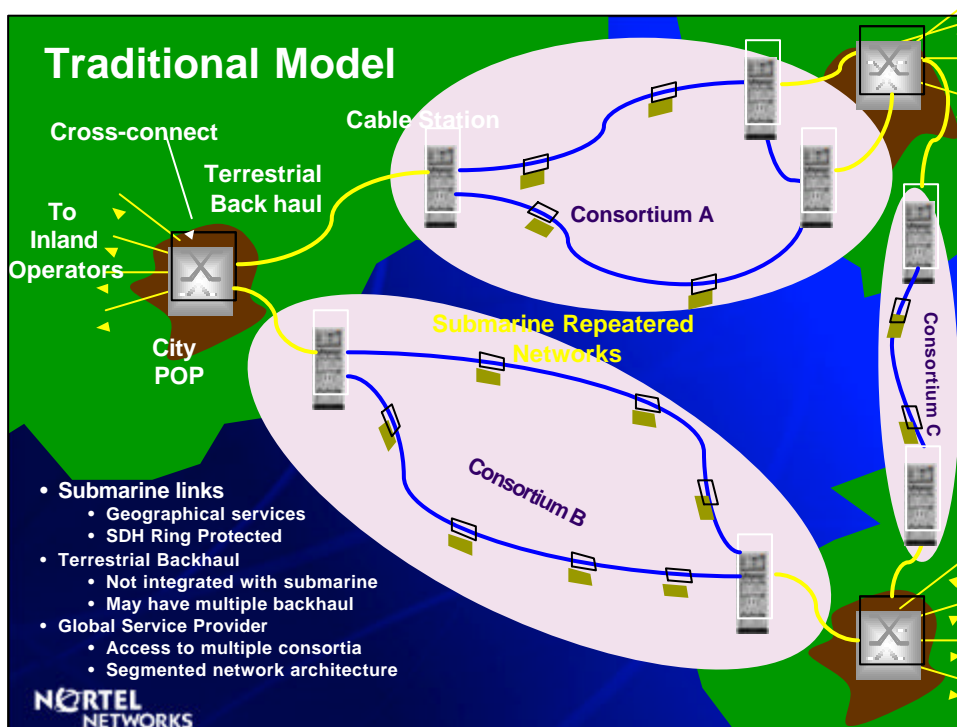
Low Cost Bandwidth Management
Carriers' Carrier & Global Model

Service Application requirements

Sub-rate services access & grooming and ? management
Integration of Terrestrial network with Global network

Key Feature Requirements for both Models

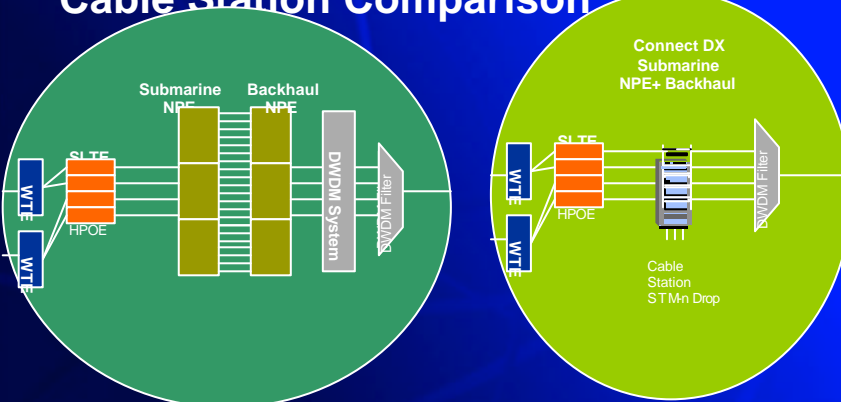
- End to end dynamic connectivity and Optical Layer Management
 - Oceanic switching via ring or mesh topologies
- Protocols Gateway (e.g. SDH-SONET standards conversion, etc.)
 - Part-time access on protection channels
 - Class of Services offering



Traditional Cable Station Configurations

- **Protection Structure**
 - NPE provides submarine ring protection
- **Services offered**
 - tribs selected at cable station may limit service offering (e.g. 4 x STM-1 ? STM-4c)
 - all tribs configured to provide service velocity
 - back-to-back tribs reliability (cables, circuit packs, systems)
 - need to backhaul regular and part-time traffic
- **Bandwidth management**
 - limited to submarine ring
 - constrictive to offering concatenated services (unless the cable station becomes the POP)
- **High floor space and power requirements**

Cable Station Comparison



System Attributes

- back-to-back tribs
- many cables, systems
- limited bandwidth management
- concatenated services limited

System Attributes

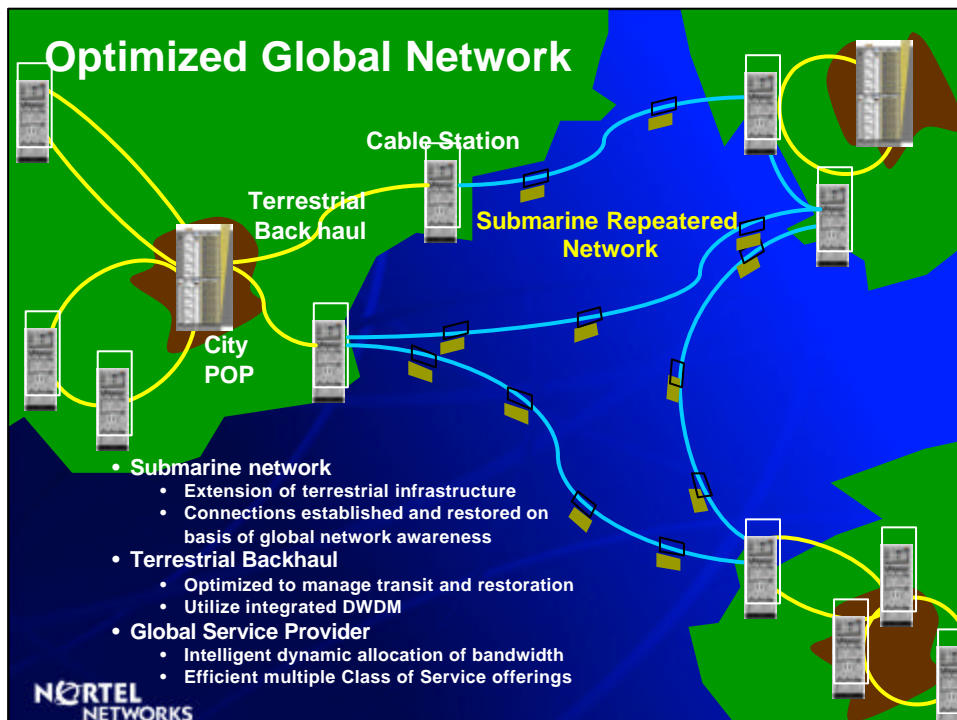
- integrated DWDM
- backplane interconnect
- full bandwidth management
- full concatenated services
- Up to 40% equipment savings

Backhaul Optimization

- Significant equipment savings over traditional equipment configuration
- End-to-end Bandwidth management
- Enhanced services (concatenated, extra traffic)
- Scalability
- Reliability improvement with integrated solution

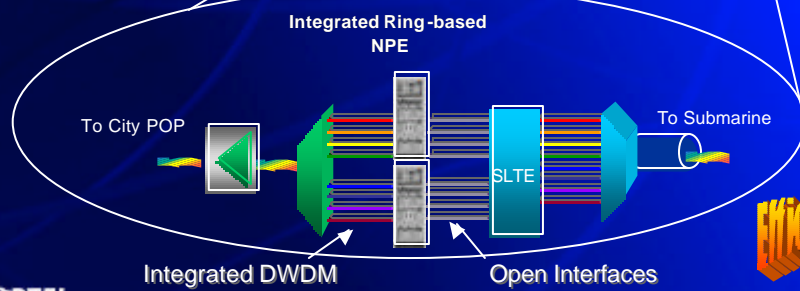
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Cable Station Optimization

- **Integrated Submarine NPE / Backhaul**
 - Integrated trans-oceanic and terrestrial ring-based restoration
 - 155 Mb/s to 10Gb/s services
 - 100s of Gb/s total capacity
- **Dense packaging**
 - Up to 40% savings over « back-to-back » configuration
 - Integrated DWDM optics on backhaul
 - Power & footprint efficiency
 - Migration to mesh-based network

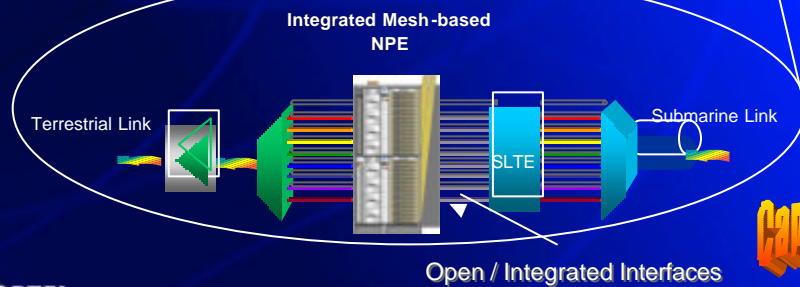


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Global Network Evolution

- **Open Transport Platform**
 - Grooming, transit and restoration applications
 - 10Gb/s, 40 Gb/s, 80 Gb/s line rates capable
 - Terabit total capacity
- **Dense packaging**
 - Up to 2.56 Tb/s per single bay
 - Integrated optics towards DWDM backhaul
 - Power & footprint efficiency
 - Migration to all-optical network



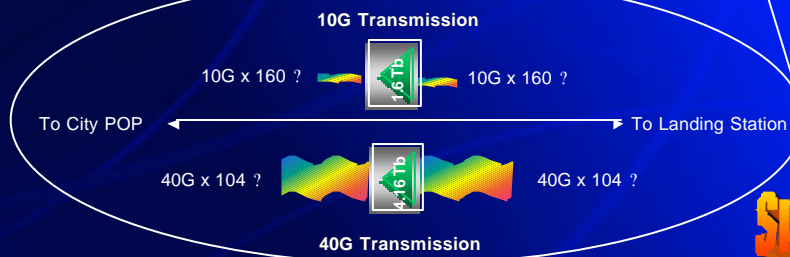
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DWDM Terrestrial Backhaul Optimization

DWDM Amplifiers

- ? Fully scalable amplifier platform to accommodate Terabit Submarine traffic
- ? Deployed on one fiber pair at a time to optimize fiber plant utilization
- ? Up to 1000km reach on any fiber types without O-E-O
- ? Lowest cost per gigabit-km on land
- ? 10Gb/s, 40 Gb/s, 80 Gb/s line rates capable

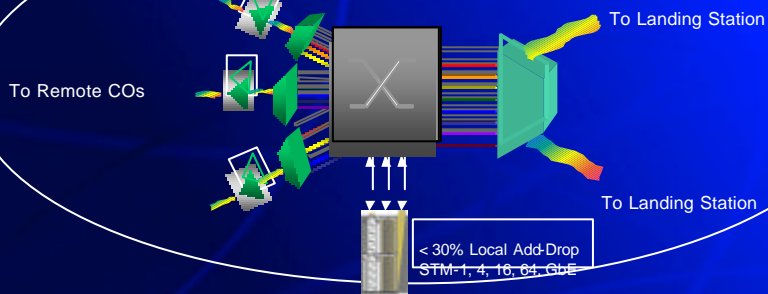


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All-optical Network Evolution

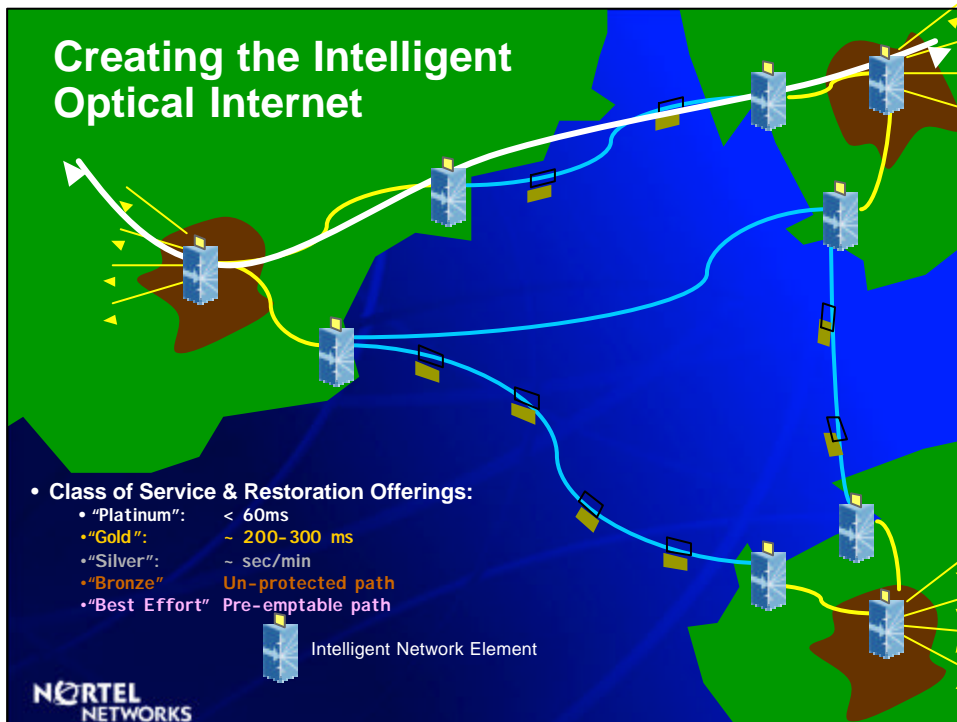
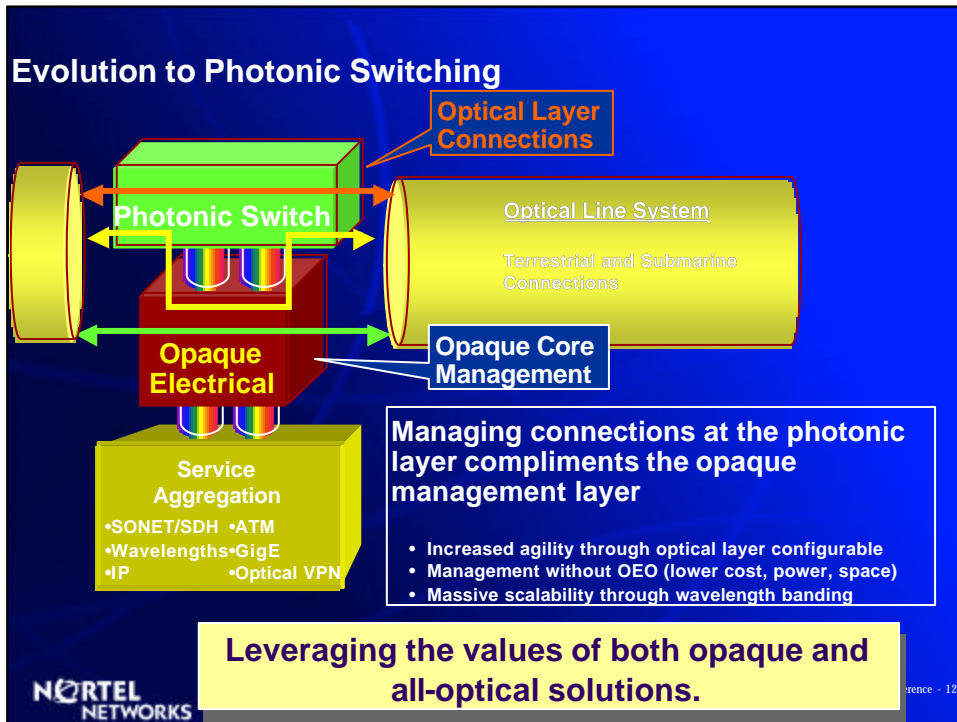
Optical Cross-Connect



- Petabit scaling
- Fully non-blocking optically managed ?'s
- Coarse Mgmt at City POP; Fine mgmt at remoteCos
- NPE Function provided by Optical Cross-Connect

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Intelligent Optical Connectivity Evolution

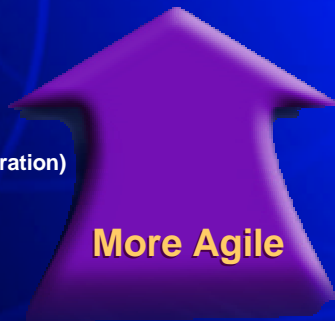
Evolving from Static Connectivity to an Intelligent Optical Infrastructure and Service Layer

Steering
(Service Driven, Optimized)

Switched
(Signaled, Routed, Mesh Restoration)

Provisioning
(Semi-Auto)

Patching
(Manual)



More Agile

Target

Emerging

Today

How Do You Manage Multi-Terabit Line Capacity?

- Agile, Multi-Terabit Optical Connection Managers
- Dynamic Optical Connection Control

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Summary

The following drivers :

- Optimizing efficiency, flexibility, speed and capacity
- Better economics
- Requirement for dynamic network control to handle multi terabit capacity and new levels of SLAs
- Emerging end user requirements for evolving global networks

is creating a need to more closely integrate all aspects of the global network including the submarine segments.

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