Optical Networking 2002
Challenges & Opportunities



Photonics
2002

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Lucent Technologies
Bell Labs Innovations

Forward-Looking Statement Disclosure

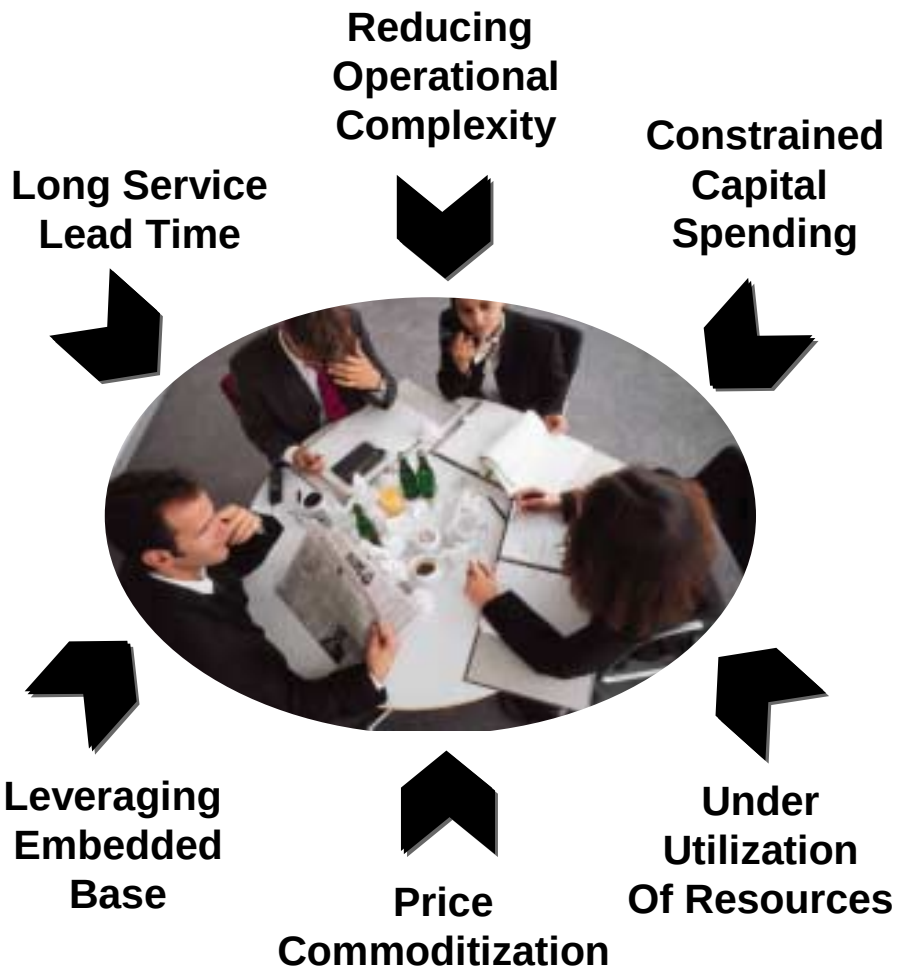
This presentation may include some forward-looking statements about our expectations for our future performance. Actual results could differ materially from those suggested by our comments today. Additional information about factors that could affect future results are addressed in our SEC filings, including our 10-K, 10-Q, and 8-Ks.

Agenda

- Industry Challenges and Trends
- Growth Opportunity
- Lucent Optical Portfolio
- Optical Networking Progress
- Conclusion

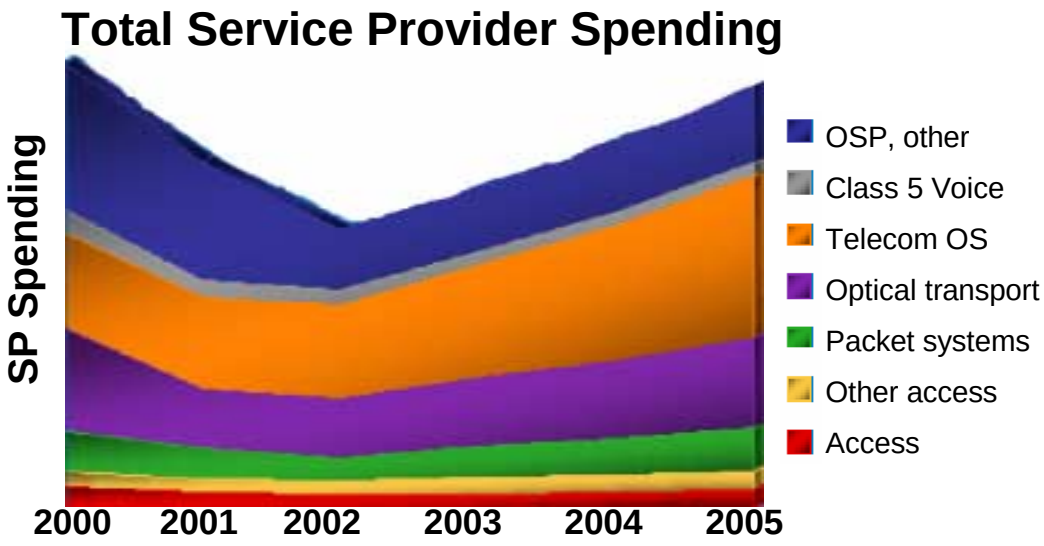


Industry Challenges



Service Provider trends:

- CAPEX Decline
- Shift Towards Spending to Cut Costs
- Move Towards Optimization, Deferring Expansion



Total capital spending of IXCs, EIXCs, CLECs and ILECs
Excludes: Wireless, ISPs MSOs

Source: RHK, Nov. 2001

Growth Opportunities

- Migration away from DCS and SONET/SDH ADMs towards OCS having STS-1 grooming capabilities
- Growth of system sales offering lower cost of transport through extended reach and increased interface rates
- Growth in Metro DWDM in support of Ethernet and Storage Networking applications
- Move towards simpler, streamlined operations that make better use of existing resources and speed service delivery



Lucent's New Optical Networking Portfolio

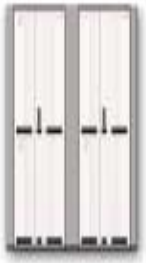
Designed to Address Real Service Provider Needs

LambdaUnite™ MSS



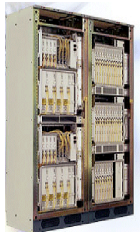
Bridging and uniting different traffic across core and metro networks

LambdaManager™ TMSS



Terabit capacity TDM systems to manage "sub wavelength" or electronic traffic

Metropolis® EON



Scales DWDM costs to Metro market realitie and supports ring DWDM

LambdaXtreme™ Transport



Low cost/Gb for long haul and ultra long haul 10G and 40G systems

Navis™ Optical Management Solutions

Metropolis® DMX / DMX*press*



Efficient TDM plus IP/Ethernet transport

WaveStar® AM 1 Plus



Small SDH ADM Access Applications

LambdaRouter™ AOS



The first commercially available high capacity all optical switch

WaveStar® ADM 16/1 and ADM 16/1 Compact



Integrates cross-connect and SDH ADM functions

WaveStar® TDM 10G

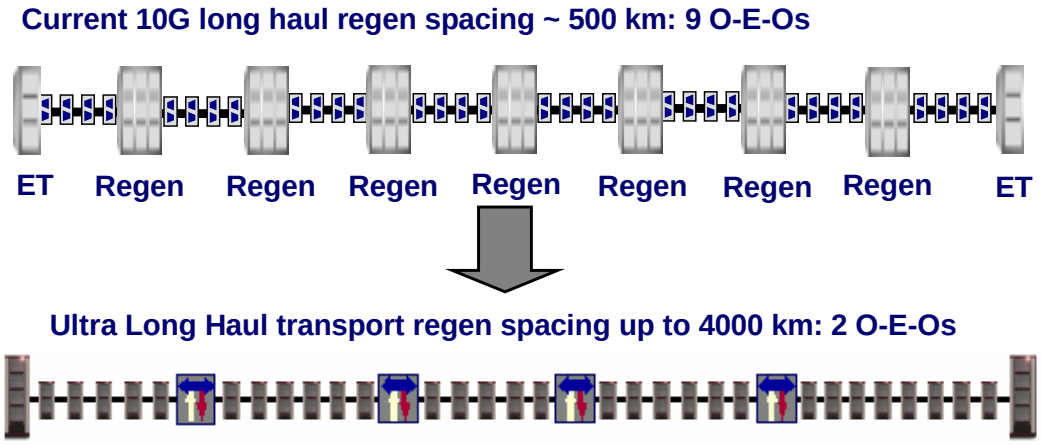


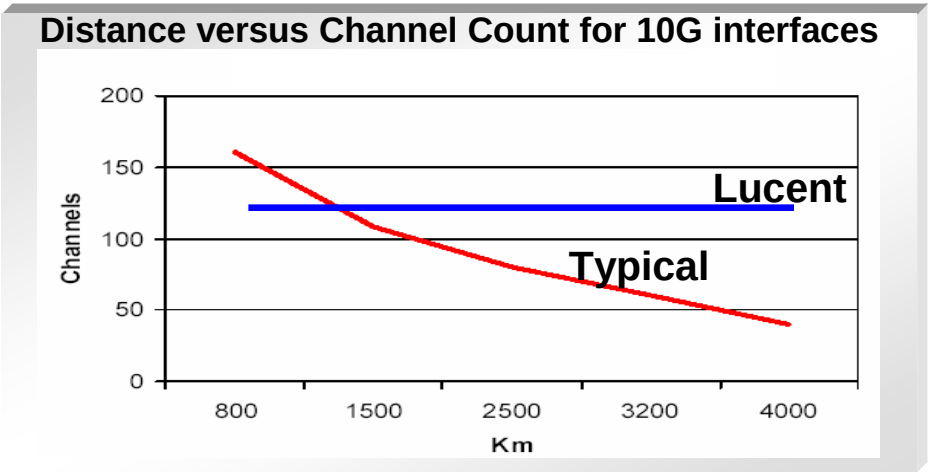
High capacity SDH multiplexer for STM 64 applications

Working to Reduce Capital Costs

Next generation optical transport – Lowering the cost per bit

- Reduction of equipment through longer system reach without sacrificing 10G channel count
- Support of high speed interfaces including 40G
- Multi-functional support (ULH, LH, UHC) and flexible OADM capability enables architecture flexibility and helps protect investment



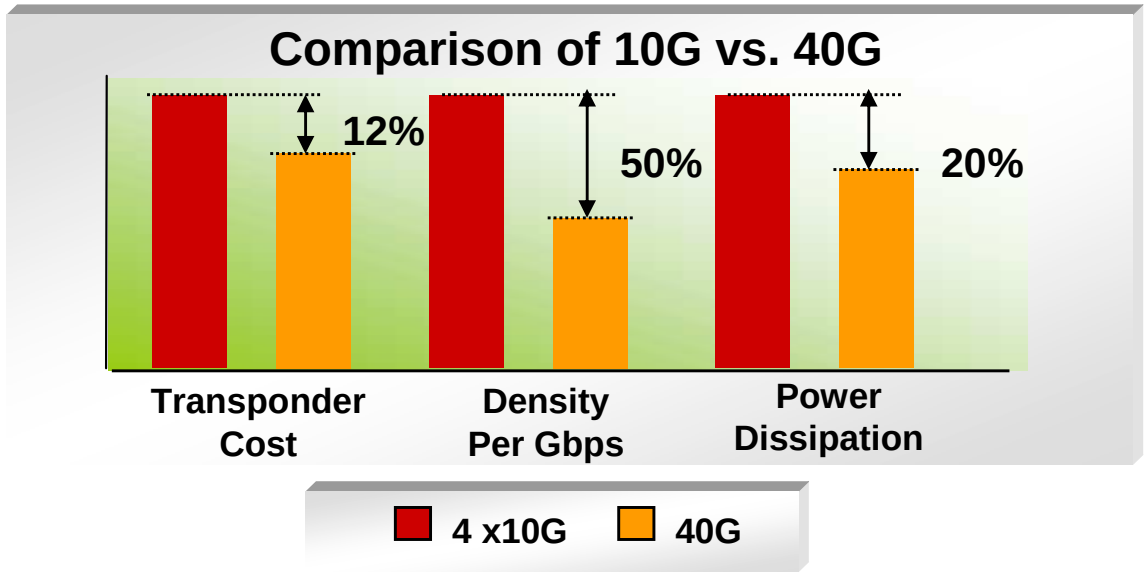


Source: RHK / Lucent
March 2002

Economics of 40G

A Further Reduction in the Cost of Transport

- 40G is less costly than 4 x 10G interfaces and simpler to manage
- 40G can offer better footprint and power dissipation than 10G
- 40G provides support for Long Haul & Ultra Long Haul
- 40G is a viable solution for today's networks



Potential Cost Savings

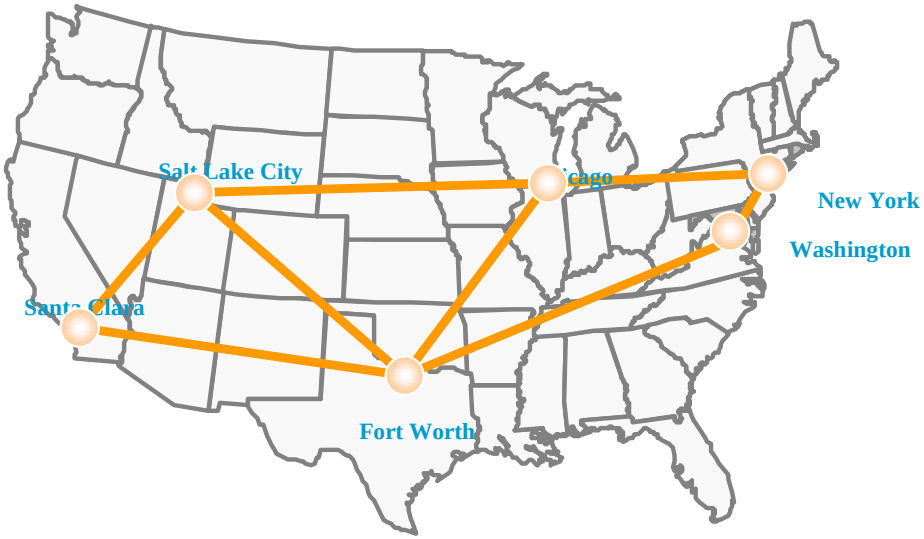
Helping to Simplify Operations

Network Intelligence

- Plug & Play capabilities to auto-discover & configure circuit packs
- Self-testing to isolate problems quickly and get them fixed before new service is turned up

Example: Potential savings from Dynamic Gain Control enables savings when adding or removing DWDM wavelengths:

- 1,000 km (10 spans) - 3 sites require manual gain adjustment
- Channel growth: 12 per year (each requiring 1 truck roll to each repeater & ET)
- Truck roll: Cost $1,000

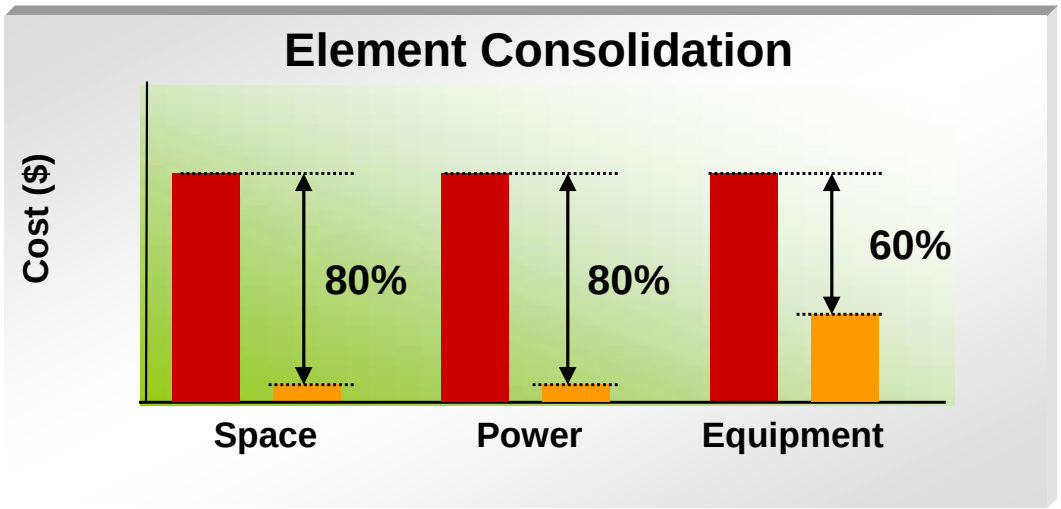


Total operational cost savings can be over $500,000 per year for a 20,000 mile network

Changing the Face of the Central Office

MultiService Platforms

- Central office network element consolidation through support of multiservice platforms
- Support of a multitude of interfaces electrical and optical (including 40G)
- Helping to reduce network costs through support of ring and mesh architectures and multi-vendor support



Potential Cost Savings

In a typical office, a carrier could save up to $1.5M in Capex, 15 bays of equipment, and space/power savings of $18K per month

Looking Ahead to Tomorrow's Services

All Optical Switching

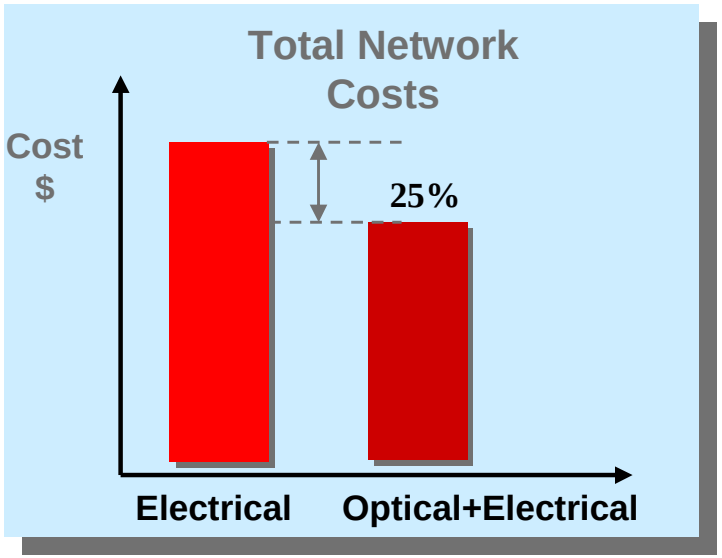
- Supports existing wavelength services and enables dynamic wavelength services
  - Enables switching of any bit rate or protocol
- Provides Service Level Agreement (SLA) responsive QoS options
- Reduction of optical/electrical conversions reduces network costs

Wide Range of SLA Options

Service Level Agreement

Protection Type	Service
Dedicated protection	**Platinum**
Shared mesh restoration	**Gold**
Unprotected	**Silver**
"Pre-emptible"	**Bronze**

Country-Wide Backbone Study (USA)



Potential Cost Savings

Lucent's Recent Optical Networking Progress

January 2002

- Telia (NAR)
- Deutsche Telekom (EMEA)
- Qwest (NAR)

February 2002

- Korean National Railroad and Seoul Metropolitan Government (A/P)
- Sichuan Telecom (A/P)

March 2002

- BT PLC (EMEA)
- Slovenske Telekom (EMEA)
- T Systems Telekom (EMEA)
- Deutsche Telekom (EMEA)
- Verizon (NAR) – in April

Publically Announced Optical Wins / Milestones

Optical Networking Portfolio

Navis™ Optical Management Solutions

MultiService Switches



WaveStar® BandWidth Manager



LambdaUnite™ MultiService Switch



LambdaManager™ Terabit MultiService Switch

All Optical Switch



LambdaRouter™ All Optical Switch

Digital Cross Connect



WaveStar® DACS 4/4/1

Long Haul / Ultra Long Haul



WaveStar® OLS 1.6T (400G/800G)



LambdaXtreme™ Transport

Metro Access



Metropolis® DMX Access Multiplexer



Metropolis® DMX*press* Access Multiplexer



WaveStar® TDM 2.5G (OC-48 2F)



WaveStar® AM 1 Plus

Metro Core



Metropolis® EON



WaveStar® TDM 10G (OC-192 2F)

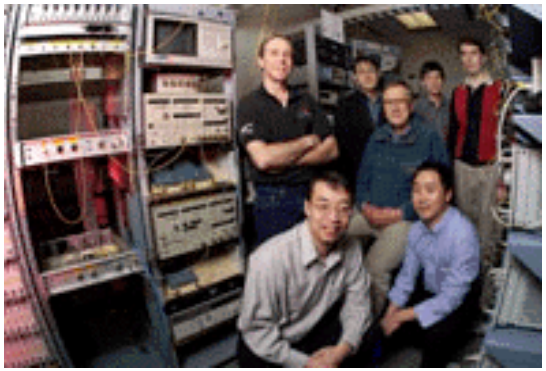


WaveStar® ADM 16/1 Compact



WaveStar® ADM 16/1

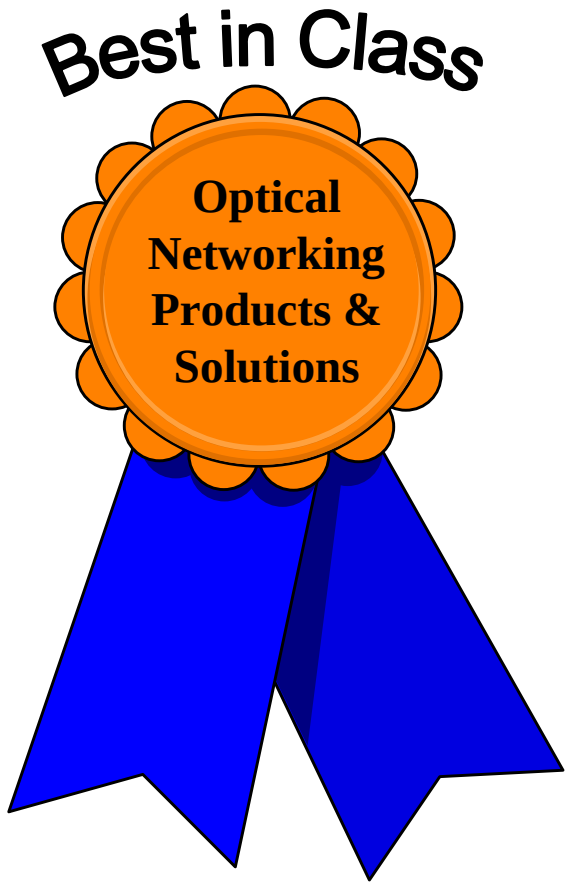
Bell Labs – Inventors of Optical Networking



- Vast experience in Optical Networking
- Delivering cutting edge innovations that benefit our product portfolio

Lucent – Bringing Optical Innovations to Market

- **Bell Labs researchers develop Raman amplification to reduce attenuation**
- **Bell Labs develops Soliton transmission reducing the need for regeneration**
- **Bell Labs develops Tunable Dispersion Compensation to reduce Chromatic Dispersion**
- **Bell Labs sets fiber optic transmission record (64 40G channels @ 4000km) using differential phase shift keying among other Bell Labs innovations**



Conclusion

Lucent is partnering with Service Providers to ensure that the right products are being delivered at the right time with a focus on streamlining:

- Network architectures - improved capital utilization
- Operations – reduced error prone manual processes
- Interworking – faster service delivery / investment protection
- Designs - consolidation and reduction of network elements
- Service delivery - flexibility and differentiation



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