40G/100G
PACKET OPTICAL TRANSPORT NETWORK TEST ECOSYSTEM

EXFO CORPORATE HEADQUARTERS
400 Godin Avenue
Quebec City, Quebec G1M 2K2 CANADA
Tel.: +1 418 683-0211
Fax: +1 418 683-2170

EXFO America
3400 Waterview Parkway, Suite 100
Richardson, TX 75080 USA
Tel.: +1 972 761-9271
Fax: +1 972 761-9067

EXFO Asia
100 Beach Road, #22-01/03 Shaw Tower
SINGAPORE 189702
Tel.: +65 6333 8241
Fax: +65 6333 8242

EXFO China
36 North, 3rd Ring Road East, Dongcheng District
Room 1207, Tower C, Global Trade Center
Beijing 100013 P. R. CHINA
Tel.: +86 10 5825 7755
Fax: +86 10 5825 7722

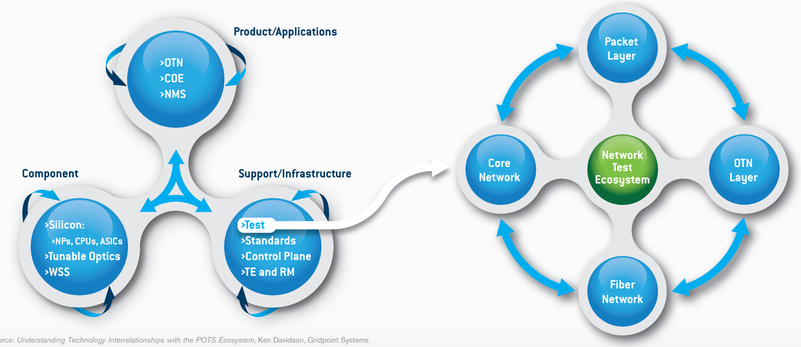
EXFO Europe
Omega Enterprise Park, Electron Way
Chandlers Ford, Hampshire S053 4SE ENGLAND
Tel.: +44 23 8024 6810
Fax: +44 23 8024 6801

EXFO NetHawk
Elektroniikkatie 2
FI-90590 Oulu FINLAND
Tel.: +358 (0)403 010 300
Fax: +358 (0)8 564 5203

EXFO Service Assurance
270 Billerica Road
Chelmsford, MA 01824 USA
Tel.: +1 978 367-5600
Fax: +1 978 367-5700

Core Networks

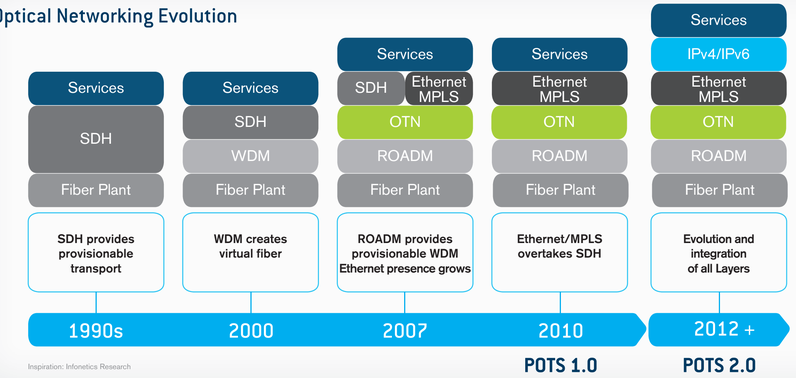
Paths of Influence within POTS Technology Ecosystem



Source: *Understanding Technology Interrelationships with the POTS Ecosystem*, Ken Davidson, Gridpoint Systems

Packet Layer

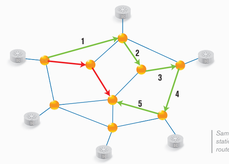
Optical Networking Evolution



Inspiration: Infonetics Research

Fiber Networks

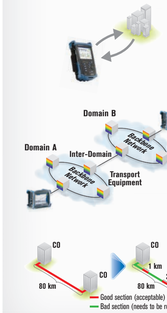
Short Links—Long Traveling Distances



Same transmitting station, two different route examples.

Green path example			
Network section	Length (km)	CD Value at 1550 nm (ps/nm)	PMD (ps)
1	53	890	6.49
2	37	632	0.39
3	29	484	8.93
4	45	765	5.21
5	42	726	0.88
Total	206	3497	12.24

Dispersion Approaches



Using a single-ended instrument–a CD and PMD test tool that can characterize a section between two sites without having instruments at both ends–means that many sections can be characterized in a few minutes instead of a few hours from a single location. As a result, an entire network can be characterized in 66% less time than any other traditional test methods. This greatly reduces truck rolls and OPEX, while increasing speed to deliver new services and reducing time-to-cash.

With data rates reaching 40 Gbit/s and beyond, fiber characterization is critical. When adding 40Gbit/s wavelengths to a DWDM route or ring, at that time, it will be nearly impossible to temporarily remove dozens of active wavelengths from service to characterize the optical fiber carrying them. It's important to fully characterize optical fiber links while it's possible: here ,in addition to being highly accurate, these future proof devices can be placed at several different positions, so a multitude of test points can be acquired, faster with high accuracy which together reduces test costs or the even greater cost of adding more fiber.

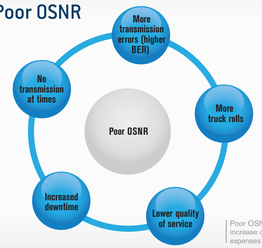
Distributed PMD analysis reduces CAPEX by revealing the worst segments on a high-PMD route. Replacing a few kilometers of fiber, instead of an entire route, puts it back in service for higher bit-rate services and substantially reduces CAPEX.

Importance of OSNR

If the measured OSNR is higher than the required OSNR for a given bit error rate, one can:
- Increase the bit rate
- Increase the number of channels (wavelengths)
- Increase the distance between amplifiers, thereby reducing CAPEX

An accurate measurement of OSNR helps exploit the maximum capacity of a link.

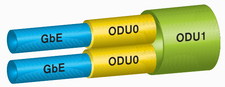
Impact of Poor OSNR



Poor OSNR can significantly increase operational expenses (OPEX).

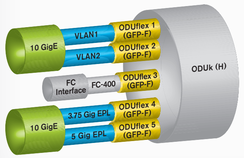
OTN Layer

OTN–ODU0



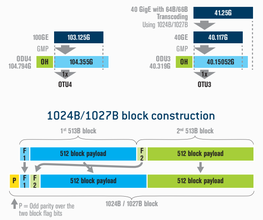
Size	• Newly defined OTN container in G.709 of 1.25 Gig • Virtual container that does not have a physical instance
Client	• Perfectly fits GigE , OC-3/STM-1 and OC-12/STM-4 services
Benefits	• Removes dependency on SONET/SDH for carrying GigE services • Provides OTN OAM capabilities

OTN–ODUflex

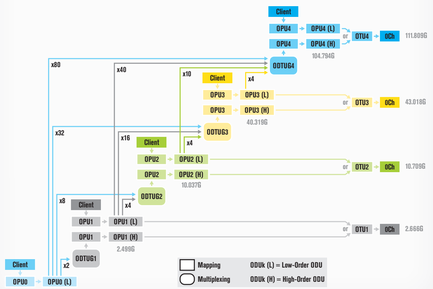


Definition	• ODUflex as defined in ITU-T G.709 allows traffic grooming • Addresses incremental bandwidth growth in steps of 1.25 Gbit/s
Benefits	• Fit existing OTN rates; x 32 = ODU3 and x 80 = ODU4 • Facilitates virtual channeling similar to VCAT • Enables bandwidth increase without allocating full ODU container • Supports OTN OAM and fault management

100/40 GigE Mapping into OTU4/OTU3



100/40 GigE Mapping into ODU Multiplexing



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