Marker Drivers and Requirements for Encryption and QKD in Enterprise Connectivity Applications

Christian Illmer
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ADVA™ Optical Networking

ADVA Optical Networking

"ADVA is a ***leading global provider*** of xWDM ***optical networking solutions*** for rapid and cost effective provisioning of high-speed data, storage, voice and video services in the **Enterprise** world.."

- ADVA Optical Networking
- Founded 1994
- ~ USD 300 million revenue[1)]
- Public company (FSE: ADV)
- > 1,000 employees[1)]
- Diverse global customer base
  - > 10,000 enterprises
- Market leader in Enterprise Connectivity solutions

1) 2008

...let us show you how our solutions help you solving Enterprise Connectivity problems

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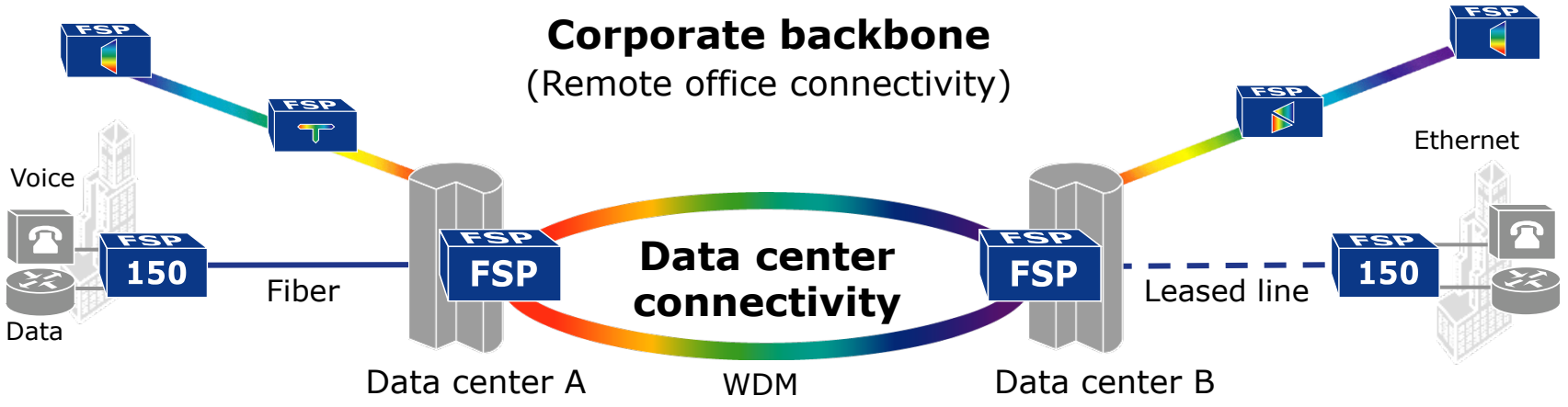
Enterprise Connectivity

Drivers behind Enterprise connectivity

- Data security requirements
  - Total loss of mission-critical data is a highly threatening prospect that can destroy or at least severely impact a company's future business.
- Cost of downtime
  - Revenue losses
  - Idle staff and
  - Damaged reputation
  - Can range from thousands of dollars per hour to millions
- Government regulations
  - Sarbanes-Oxley (US)
  - Health Information Portability and Administration Act (HIPAA; US)
  - Basel II Capital Accord framework (Europe)

Geographically dispersed storage concepts are vitally important

Private enterprise networks



Corporate backbones
Business Continuity
Disaster Recovery
Grid Computing
Mainframe and Open Systems
Legacy support (ESCON)

ALL APPLICATIONS

INNOVATIVE FEATURES

1/2/4/8/10G Fibre Channel
InfiniBand
Security
Optical line monitoring
300km repeaterless transmission

ISCL
IBM PPRC
IBM GDPS®
EMC SRDF
IBM SVC
SUN Solaris ready
HDS True Copy
HP Nonstop Server Cluster
Partnership w. all major SAN players

ALL QUALIFICATIONS

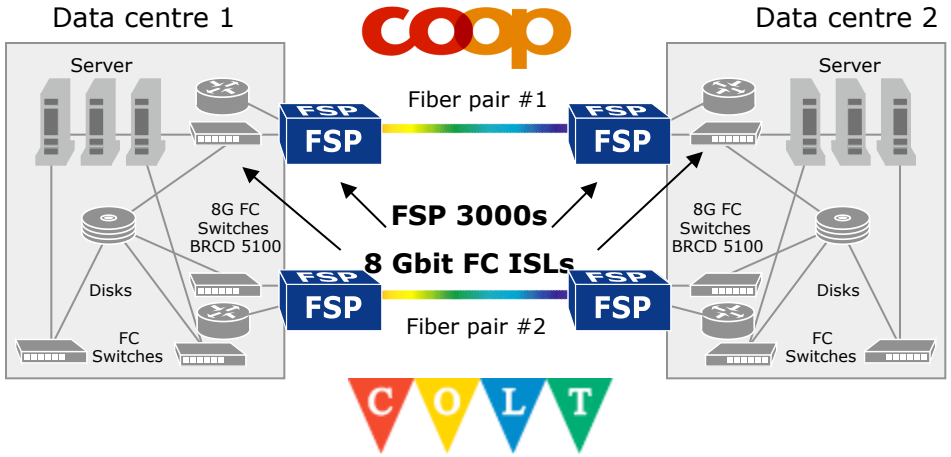
Market leading connectivity for the Fortune 1000

8G FC data centre coupling

Market vertical

RETAIL INDUSTRY

Data centre connectivity



First commercial solution for 8G FC

- Managed service via COLT
- Close cooperation with Brocade
- Extensive testing and PoC in ADVA labs

- Implementation
  - Q4/2008
- Applications
  - Data Backup (Tape)
  - Disk Mirroring
  - SAN and LAN interconnections
- Services
  - FC 4G and 8G
  - GbE and 10GbE
- Infrastructure
  - Pt-Pt 130 km
  - Full Hardware Protection
- Key performance
  - Usage of RAMAN
  - Only available 8G solution
  - FEC with 10TCC card
- Partner
  - COLT Telecom, CH

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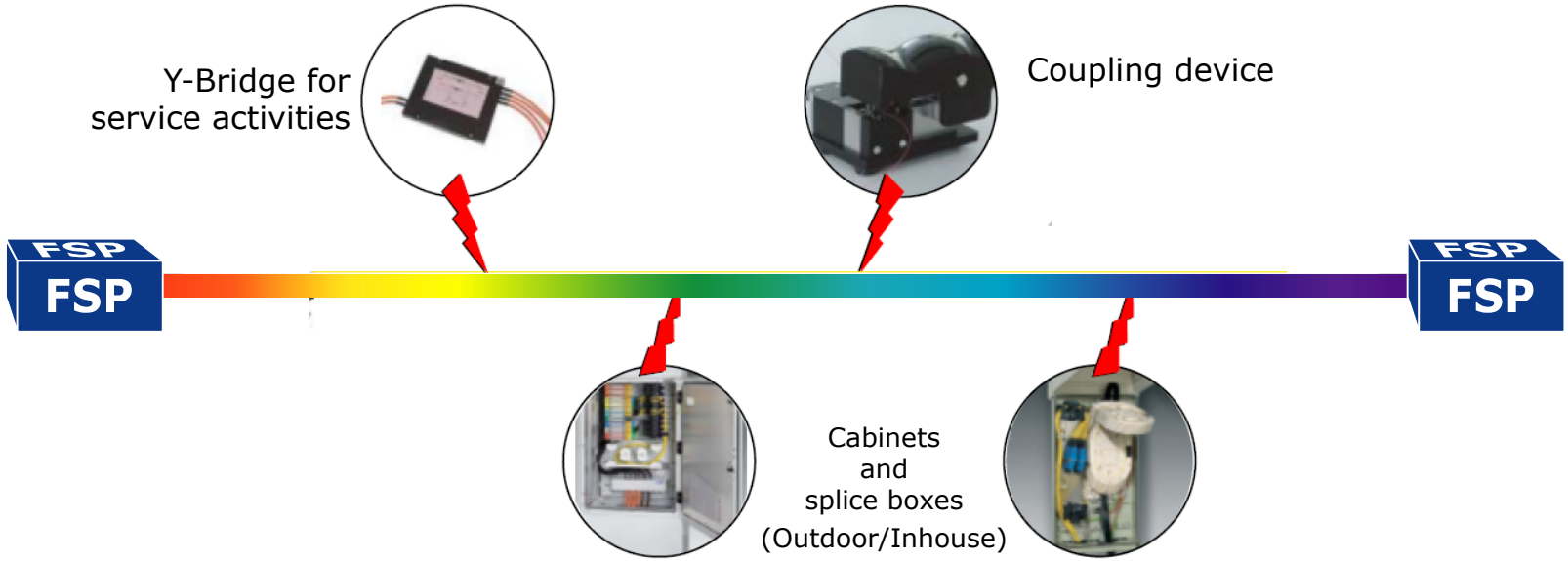
Transport security
Fiber tapping



- until recently tapping of fiber was considered as almost impossible
- DWDM and the type of data transmitted was considered as kind of encryption
- available encryption solutions did not scale beyond GbE and were very expensive

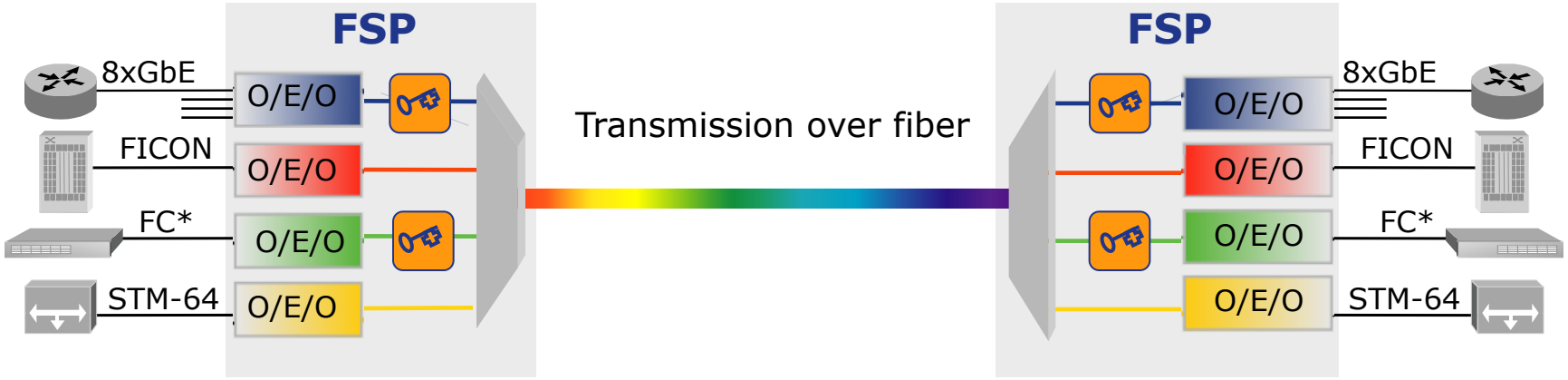
only recently has the threat become big and the price levels low enough to have enterprises thinking about encryption

Transport security
Solutions

- Owning dark fiber
  - Does not prevent from 3rd party intrusion
- Physical protection / Shielding of Fiber Path
  - Not economical
- Monitoring of optical performance (e.g. OLM module of the ADVA FSP)
  - Allows to detect tapping of fiber
  - No protection against reading of data
- In-flight encryption of transmitted data
  - Transmitted data is protected
  - Even reading of data does not provide meaningful content

Different levels of protection/encryption to accommodate different requirements

Transport security
WDM transmission with encryption

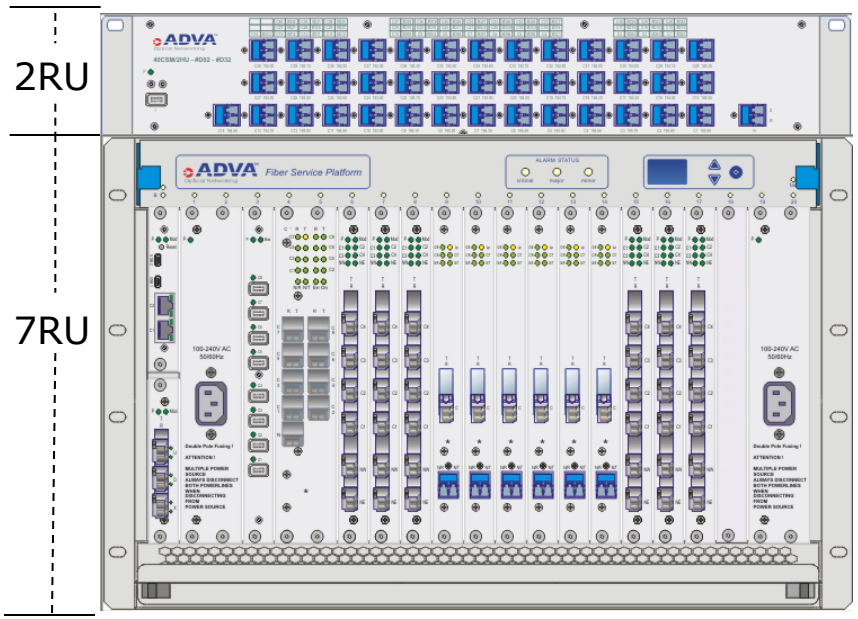


*1/2/4/10Gbit/s

Encryption module

Modular approach, can be added per channel on an as-needed basis

FSP300 - Product example



Max. power consumption

540 Watts

- 7RU shelf with one 2RU Mux/demux shelf
  - Up to 16 cards per shelf
  - Up to 10G and 40G aggregate data rate
  - Up to 80 wavelength per fiber
  - Optional optical amplification
- As shown:
  - 40-chn. Mux/DeMux
  - Network management card
  - One ESCON TDM
  - Six 4-port TDM card
    (GbE, 1G, 2G or 4G FC)
  - Six 10G Transponders
    (OC-192, 10G FC, 10GE, 4G/8G FC, IB SDR/DDR)

Transport security
Customer Requirements I

- Integrated solution
  - No additional boxes / box stacking
  - Integrated management
  - Look and feel of a WDM system
  - Support of all typical client interfaces (1/2/4/8/10G FC, 1/10G Ethernet, IB)
  - 40G and 100G ready

- No significant performance degradation
  - Must no decrease the amount of usable wavelength (80)
  - Must work with amplifiers (EDFA and RAMAN) up to 200km single span
  - Must not increase latency (<50µs)
  - Must run on existing fiber plant (standard fiber, standard patch panels and splices, no APC connector)

Primary focus is always efficient and low latency transport.
Encryption must fall into place and must be integrated

Transport security
Customer Requirements II

- As secure as commercially feasible
  - Biggest threat is still within the data center, not on the link
  - FIPS 140-2 Level 2 or 3 (certification not mandatory)
  - Use standard technology (AES 256, DH Key Exchange, shielding…)
  - Solution must be acceptable by the security officers but still manageable by operations
- As low as possible additional cost
  - Acceptable addtl. cost is 25% of system price (encryption and key exchange)
  - For a 10GG link this equals app. 10K € (list) per link

Enterprises are looking for simple and easy encryption solution, not necessarily for the best solution

Thank you

cillmer@advaoptical.com

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