NQMSfiber – The Fibre Monitoring Solution
NQMSfiber – What Does It Do?

- Solution Main Functions
  - Continuous 24/7 fibre quality monitoring
  - Scheduled OTDR proactive maintenance testing
  - Remote trouble-shooting
- The Package…

EXFO – Global Leader in Test and Measurement

- Secure
- Scaleable
- Reports

- GIS
- 250km
- Extended Mode

- Fast Scan
- 10 Sec per port

- Award Winning
- Optics
- Auto
- Provisioning

- Easy Remote
- Access

- Local Support –
Some Customers & Markets

- CEZ GROUP
- VimpelCom
- Telefonica
- BESTEL
- Hydro Québec
- atracom
- atracon
- Durban
- Qatar Petroleum
- Cablevision
- Antar
- Móvil
- Cable & Wireless
- E.ON
- vtesse NETWORKS
- USA Based Space Agency
A Scaleable Cost Effective Solution in all scenarios..

- Single fibre monitoring between two sites
- 80% of all cable faults can be found by monitoring a single fibre within.
A Scaleable Cost Effective Solution in all scenarios..

- Or multiple sites countrywide
- Distributed OTDRs embedded across your network
Powerful Alerting Functions

ConnectMaster Server

NQMSfiber EMS
Oracle DB

- 100+ RTUs managed on single EMS. (300+ also configurable)

Centralised:
- Reporting
- Alarm Management
- Administration

field.engineer@home.com
• Modular, powerful and scalable

• Up to 4 OTH can be deployed per single THC

• We use our own OTDRs and a market leading optical switch. We do not use a competitor switch

No need for mouse, monitor & keyboard

DHCP front LAN port

Output ports FC-APC SC-APC

Rack-mount brackets

OTH status and OTDR laser

USB and F

Fr

FR405
RTU-720 Software

Notif. agent

User access
WEB Browser GUI

Email-Alerting
html-XML-short

Alerting / TOD
Short-messaging

WEB server
Alerting system

NQMSfiber RTU controller

Trace Compare
OTDR analysis

RTU-720

SOAP
XML

http
SOAP

smtp

GSM/GPRS
Short-messaging

User access

Email-Alerting

Alerting / TOD

SOAP
-XML

http

smtp

GSM/GPRS
Passive or Dark Fibre Monitoring

- No additional hardware is required
- Typ. Wavelengths - 1550nm or 1625nm
Monitoring Scenarios

Active or In-Service Monitoring - Out of Band

- Typ. Out of band monitoring
- 1625nm or 1650nm
- 1310nm available too, but …

Loss budget must be considered – FWDM = 0.6dB (typ) 1.2dB max
Both Active (In-Service) and Passive (Dark) Fibre Monitoring

- All testing will be in a ‘round robin’ sequence
- Priority can be given to specific ports if required
Monitoring Scenarios

**Active or In-Service Monitoring – In-Band**

- No need for FWDM; reduces Ins. Loss
- CWDM dedicated wavelength needed
## Unique Next Generation Testing

### Four Test Methods
- Monitoring
- Proactive Maintenance
- Test On Demand
- Ad-Hoc Test

### Monitored Values
- Injection Level
- Events
- Loss Total/Cumulative
- Sections
- Peak Levels

### Table: Monitored Values

<table>
<thead>
<tr>
<th>Event</th>
<th>Number</th>
<th>Type</th>
<th>Position (km)</th>
<th>Length (km)</th>
<th>Curve Level (dB)</th>
<th>Loss (dB)</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Std. Dev.</th>
<th>Targ. Thresh.</th>
<th>Applied. Thresh.</th>
<th>Attenuation (dB)</th>
<th>Reflection (dB)</th>
<th>Reflective Peak (dB)</th>
<th>Cumulative Loss (dB)</th>
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<td>-</td>
<td>-</td>
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</table>
• Saves reference data of internal loss from the OTDR to each port on the optical switch.
• ‘Go/No Go’ thresholds.
• Acts as a ‘self-test’ if there is an alarm condition near the RTU location.
• Award winning optics ensure optimal performance in event detection. From 36dB to 50dB at different wavelengths, with single, dual, and tri-band configurations with up to 250,000 data points.
• Detect events at the far end of the monitored link with the same sensitivity as the near end.
• EXFO’s OTDRs can easily detect and differentiate two closely spaced events such as two optical reflective connections in a site.
• Dual Wavelengths in One Module
  – ‘Active ready’ solution.
  – Proactive fault detection; macrobends
Learning Phase ensures optimised thresholds are applied across the whole monitored link by considering:

- SNR of the events and sections that are at the far end of the link
- Short-term varying environmental conditions, such as daily temperature variations, mechanical vibrations in interconnecting sites, etc.,

<table>
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<th>Curve Level (dB)</th>
<th>30.150</th>
<th>30.150</th>
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<td>0.1</td>
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<td>10.125</td>
<td>10.125</td>
<td>14.128</td>
</tr>
</tbody>
</table>
• 10 RTU System
  – 10 x 16 ports = 160 routes
  – 2 minutes per reference trace
  – 160 x 2 mins = 320 mins

• 60 RTUs = 6 x 320 mins
  – 1920 mins or 32 hours

• That also means that the system is not monitoring or testing for 32 hours!

• If more than 1 reference is required then this figure can be multiplied per extra reference required.

• So what? NQMSfiber will save you real time in both operational time, and maximising monitoring/testing time.
Learning Phase - So What?

• When monitoring long links, it is expected that the traces will be more noisy at the far end due to attenuation.
• If you applied a ‘tight’ threshold for event detection then you could expect false alarms.
• Learning Phase ensures that the best thresholds are applied for each event across the link.

<table>
<thead>
<tr>
<th>Targ. Thresh.</th>
<th>0.1</th>
<th>0.1</th>
<th>0.1</th>
<th>0.1</th>
<th>0.1</th>
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<tbody>
<tr>
<td>Applied. Thresh.</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.12</td>
<td>0.20</td>
<td>0.1</td>
<td>0.1</td>
<td>0.4</td>
</tr>
</tbody>
</table>
• Other vendors will use less averaging to reduce their testing time.
• When they have an alarm the RTU will instigate a confirmation test using the same parameters as the original reference trace.
• Now the test passes and the RTU moves to the next fibre.
• This doubles the exposure time for fibres on that RTU! Imagine if the same threshold was applied to all the connected fibres…
  – Inefficient monitoring
  – Would delay alarming for a real problem…increasing MTTR unnecessarily.
Extended Range Mode – For all Modules

- Unique Next Gen Testing – Extended Range Mode

RBS range
Ext. range

UPC termination
+ 25%!
Unique Next Gen Testing – Sectional Loss

Monitor with security in mind

Sectional loss degradation

Automated Reporting Functions

Flexible alarming & alerting

Min, Max & Probable Position

Loss & Type
• Cable template test
  – Allows for every splice point in a fiber or a entire cable to be measured over time
  – User settable tolerance on “matching” events in building the reference
  – One reference for acquiring event loss at every detected locations

OTDR traces of fibers in the same cable
Next Generation Testing - Cable Template Trends

<table>
<thead>
<tr>
<th>A1</th>
<th>B1</th>
<th>C1</th>
<th>D1</th>
<th>E1</th>
<th>F1</th>
<th>G1</th>
<th>H1</th>
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<td>THC700-K5EVDXDKK - OTH: 402900 - OTA port: 001</td>
<td>test #25 Campaign at 1550.0 nm</td>
<td>1.5707</td>
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<td>0.573549</td>
<td>0.962543</td>
<td>0.859241</td>
<td>0.848684</td>
</tr>
</tbody>
</table>

- Raw data in .csv file.
- Stored on RTU and updates itself as new data comes in.
• After formatting in EXCEL – for each splices into a fiber
• After formatting in EXCEL – for one splice enclosure
• Reduces hardware requirement = Saving money
• Used in cases where cables are at, or nearly at, full utilisation.
Topology and Network Status

- Current status can be viewed through WEB GUI
- RTU Comms
- Routes

Only authorised users can access a particular region.

Regions management
Key Benefit of Investing in NQMSfiber from EXFO

- Determine within minutes if a flood of SDH alarms occurred due to a fibre break, or a Network Element failed

- Automatically displays faults on a network map

- Informs:
  - The operator which customers may be affected
  - Could inform actual customers’ customer

- Correct repair crew dispatched directly to point of failure

- Ability to integrated with ConnectMaster, OSPInSight, or other 3rd party applications provide Network Documentation System (NDS) for entire network (Physical, Logical Inventory System plus more)
<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Auto Provisioning   | Automation in provisioning new RTUs and fibres                                                                                                                                                           | - Requires less experienced staff to provision new monitoring routes  
- Less prone to setup errors  
- Faster                                                                                                                                 |
| Learning function   | System learns about the network and dynamically adjust fault detection thresholds for best compromise between high sensitivity and occurrence of false alarms                                                       | - Allows for one single reference trace and faster monitoring                                                                                                                                             |
| 10 sec test per port| Ability to test each fiber at 10sec per port and create fault – alarm as soon as first event occur- no need for second pass to confirm presence of a fault.                                                 | - Combines fast monitoring with fast alerting (other solutions need a 2nd pass to confirm fault which reduces both port scan rate and alerting time)         |
## Feature Advantage Benefit (FAB) Analysis (cont)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1dB fault detection threshold</td>
<td>Create events for intermittent problems. Log these events without creating alarms is possible.</td>
<td>- Detect splice degradations early before they affect the network</td>
</tr>
<tr>
<td>50dB version</td>
<td>Ultra Long Haul Fiber Coverage</td>
<td>- 250km monitoring (extended Mode)</td>
</tr>
<tr>
<td>1650nm OTDR model (42dB)</td>
<td>For CWDM link monitoring (removed from 1611nm TX)</td>
<td>- Ability to migrate from WDM to CWDM without any changes to your system</td>
</tr>
<tr>
<td>Section Loss &amp; Cumulative loss monitoring</td>
<td>Section loss and cumulative loss monitoring (distributed) in addition to event (localized) loss monitoring – no new event detected</td>
<td>- Detect and report any increase in fiber attenuation due to premature aging of cable sheath or distributed strain/stress on cables</td>
</tr>
<tr>
<td>Feature</td>
<td>Advantage</td>
<td>Benefits</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Flexible alarm &amp; alerting definition</td>
<td>Allow for managers to define what an alarm condition is and the severity, based on fault information or other related information</td>
<td>- Agile and adaptable network maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Decide per alarm type, when or in which situation a user should be notified</td>
</tr>
<tr>
<td>Up to 1024 test port per RTU</td>
<td>Maximize use of the equipment in a multi-user, multi-tasking test environment</td>
<td>- Reduce cost per tested fiber</td>
</tr>
<tr>
<td>Complete &amp; integrated GIS NMS</td>
<td>Provide a living environment for engineering, planning, operation and maintenance</td>
<td>- Fault-on-map on updated network</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ability to go down to fiber documentation level</td>
</tr>
<tr>
<td>Scaleable Solution</td>
<td>Start with single Fiber Guardian and expand the system as required. Can add an EMS whenever; Fiber Guardian RTUs become standard RTU with a quick change in the software configuration.</td>
<td>- Flexible solution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Low initial costs to cover high risk cables, then rollout as budget allows. One EMS can support 100 plus RTUs. 300+ RTUs also configurable</td>
</tr>
</tbody>
</table>
Additional Features

Functions:
- Result browser through filters
- Printing and exports
- User profiles management
- Functional groups access right
- Database maintenance
- Automated report generation
Alternative LAN Connectivity

• With sites where there is no LAN provisioned, we can deploy a fibre modem solution (internal/external).
  • Easy to deploy; established technology
  • If there is an impact to the cable, no alerts could be sent to the EMS for it to send out an alarm.
  • Alerts could be sent via SMS, or local field engineer could connect to RTU to check status
Secondary Server Solution with no data loss
- Hot standby - Oracle License implications
- Cold backup - RAID configured, scheduled backups.
Summary

• Auto Discovery & Auto Provisioning:
  – Fast deployment, no OTDR expertise required.
• The only true stand-alone RTU available.
  – No connection to a server or other PC required.
• Scaleable Solution:
  – Add an EMS and single Fiber Guardians easily become system.
• Able to easily integrate GIS/NMS solutions:
  – SNMP or XML.
• Superior Alarm Management c/w Trouble Ticketing.
• Innovative Advanced Testing:
  – Learning Phase, Peak Monitoring, Sectional Loss, In-Service Monitoring, Fast-Scan
• A true Next Generation Monitoring Solution to future proof your investment
Questions?

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