

Case Study

Multi-service Resilient Fibre Networking via CWDM

Background

In the early 90's, Metrodata developed a bespoke network solution for deployment in the North Sea between three oil production platforms. The network required TDM Voice and Routed data traffic, plus Serial data from a critical power management system, to be combined and connected between the platforms via undersea fibres, prior to transmission to shore via both microwave and satellite links.

Incorporating the power management system data within the network allowed the operator to deploy one platform without the need for its own on-board power generation capability, with power being fed from the two nearby platforms. This resulted in both time and cost savings.

Due to the critical nature of the network, it had to be a highly resilient. Metrodata designed a custom media converter which could rate adapt between the power management system and a Nortel multiplexer used for the more conventional Voice and Data traffic.

In order to facilitate integration testing and reduce deployment lead-time, Metrodata was then commissioned to design a custom test solution, which enabled specific testing at various points within the network, which went live in 1994.

Network Evolution

After 15 years of continuous and satisfactory operation, Metrodata Network Solutions was approached regarding an update to this critical network. After assessment of various options Metrodata was commissioned to implement a complete replacement network based on resilient fibre rings, using Optical Multiplexing (Passive CWDM) technology.

The choice of a CWDM network, within which multiple traffic types would be multiplexed together across minimal fibre links, meant that the replacement network could be deployed on available spare fibre pairs between the platforms. The new architecture could be fully tested in-situ without de-commissioning the existing network, thus ensuring the absolute minimum of production down time. Another advantage of a CWDM approach was that network fibre resources could be shared whilst maintaining complete separation between the various applications.

As part of the contract, Metrodata's highly flexible Serial-to-Fibre (FIMO) conversion technology was deployed to interface the critical power management system. In fact, a design modification to an existing product was commissioned to introduce dual SFP fibre connection to the serial converter, allowing concurrent connection via CWDM 'coloured' transceivers to two separate passive fibre multiplexers at each node of the network. Similarly, Voice traffic between elements of the TDM PBX infrastructure used on the platforms was interfaced to the CWDM network using Metrodata's E1-to-Fibre converters (FC1200). Finally, a Gigabit Ethernet service was added to the network, again via SFP CWDM transceivers.

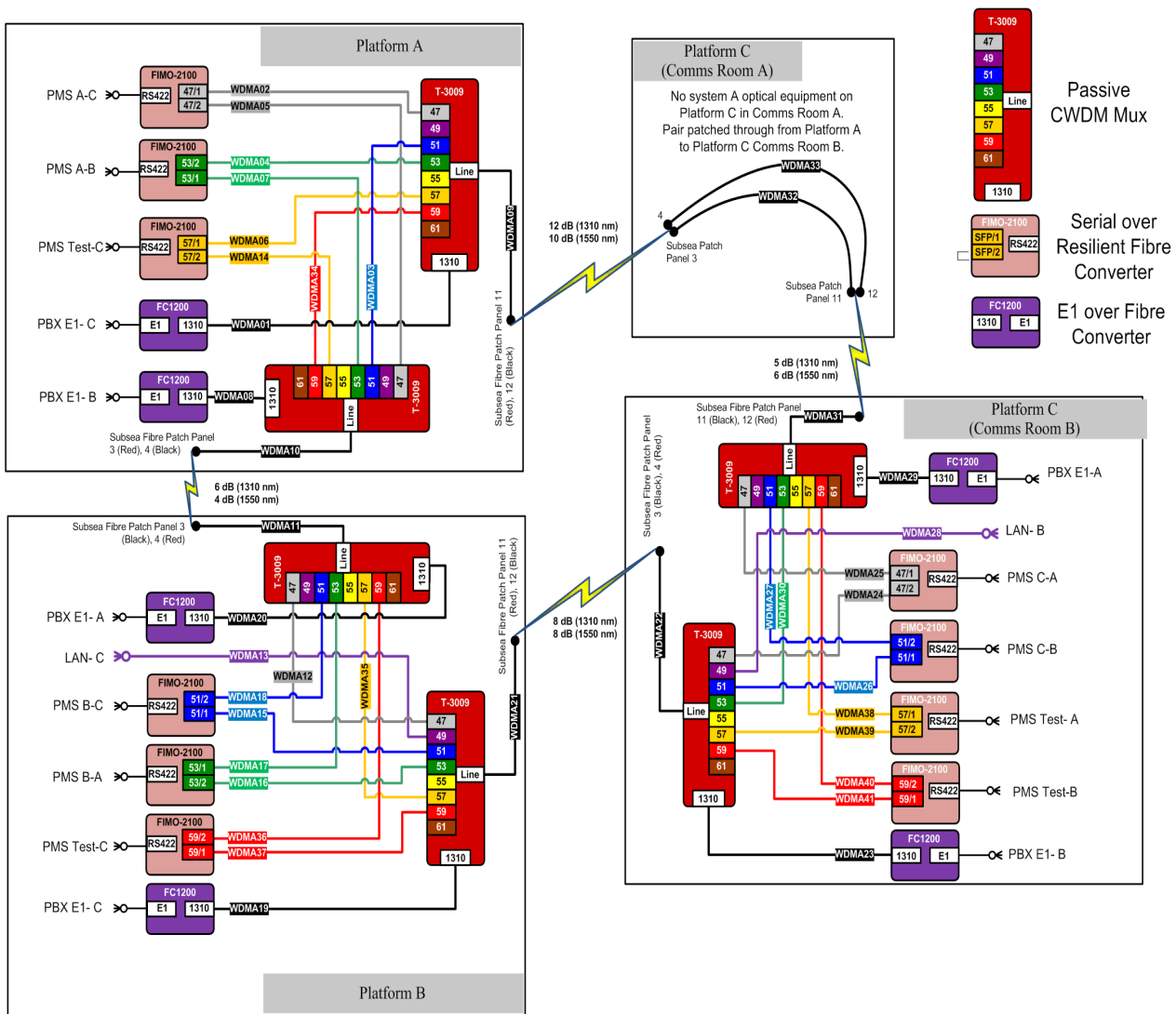
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Fibre Monitoring ports were provisioned within the network and test equipment was also provided so that the network could be pro-actively checked without interfering with any of the live applications.

For maximum possible resilience, two separate networks were created across two available subsea fibre pairs between each platform. Each network was itself configured as a resilient ring, with each ring carrying multiplexed elements of a proportion of the total network. Overall, the network could experience two simultaneous fibre and/or equipment failures without any loss of integrity. There is considerable expansion capacity available via additional CWDM wavelengths. Other expansion possibilities include the use of the CWDM lower band (1290nm to 1430nm), or splitting out further wavelengths using DWDM via the currently spare 1550nm CWDM wavelength.

A schematic of one of the ring systems, carrying PBX Voice Traffic and both Alarm and Ethernet Data is shown below.



CWDM Resilient Ring Configuration. Each input dual-homed to separate multiplexers, in turn independently connected to 'neighbouring' platforms

All network equipment for the project was sourced by Metrodata Network Solutions, together with specialist test, inspection and fibre-cleaning equipment. Patch panels and fibre cross-connect patch leads were provided to enable a full pre-installation staging at Metrodata's premises in Egham, Surrey. User Acceptance Testing was hosted and conducted at this facility prior to shipment of the equipment to the offshore platforms for final installation.

Passive CWDM Technology

In a 'Wavelength Division Multiplexed' (WDM) network, individual services are deployed across a common fibre backbone using distinct light wavelengths. Both 'Coarse' (CWDM) and 'Dense' (DWDM) variants of the technology are in common use. The latter, as the name implies, supports a greater number of discrete wavelengths of communication per physical connection and is generally used in 'Telecoms Carrier' applications.

Additionally, multiplexers are available in both 'passive' and 'active' variants. Active multiplexers are powered devices which incorporate active re-transmission of optical signals, allowing extensive networks to be built. In contrast, Passive multiplexers are completely unpowered, and optical signal propagation is reliant upon the transmission power of the optical transceivers used at ingress to the network.

In reality, the 'signal loss' associated with Passive multiplexers themselves is not great, typically in the range of -2 to -4 dB, and end-to-end transmission distances (i.e. between interface device optical transceivers across the multiplexed network) of up to 80km are readily realisable over Single-mode fibre networks using the 'small form pluggable' (SFP) type transceivers generally deployed by Metrodata Network Solutions. Greater distances still can be achieved using higher powered transceivers.

The CWDM multiplexers offered by Metrodata are small, lightweight, unpowered devices, offering from 4 to 16 service connections multiplexed to a single backbone. Completely unpowered, these 'passive' devices offer excellent reliability, and network set-up is pure 'plug-and-play'.

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About Metrodata Ltd.

Founded in 1989 and based near London, Metrodata Ltd. designs and manufactures communications equipment, primarily for applications in interoperability and interconnectivity. The company's clients include Service Providers, Governmental organisations and Private Enterprises worldwide. For product information, visit www.metrodata.co.uk

About Metrodata Network Solutions

A Division of Metrodata Ltd, Metrodata Network Solutions is a leading Networking and Communications Integrator within the UK marketplace. The Division's goal is to provide efficient and effective solutions which optimise customers' voice and data communications whilst minimising their costs. For further information, visit www.metrodatanetworks.co.uk

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