

Case Study

CNE TELECOMMUNICATIONS AND THE CITY OF ESSEN

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A NEW APPROACH FOR A CITY CARRIER



Corporate Networks Essen has offered telephone and data communication services to its customers since its foundation in 1996. Their original charter was to provide service solely to the municipal functions of the city in Essen, Germany. But in early 1998, the decision was made to expand CNE's customer base to include both the corporate and the private sectors.

It was clear that the addition of these new markets would require the creation of a powerful and reliable network infrastructure. So an ambitious and pioneering project was undertaken. Working with Magellan Networks and its partner MRV, CNE deployed a cost-effective IP based solution centered on WDM (Wave Division Multiplexing) technology in combination with Gigabit Ethernet, port trunking, and IP routing. The result: a robust and reliable MAN with a coverage area of 30-kilometers, the first of its kind in Europe.

Today, CNE Telecom provides Telephone, Data and Internet services over a network that consists of 1,100 km of copper and 130 km of fiber. CNE's current network reach some communities outside the city of Essen and future deployment will extend the network even further out to new regions.

WDM AND GIGABIT ETHERNET AT THE CORE

Ten years ago the city planners of Essen envisioned the growth of communication needs and began installing Multimode fiber cables throughout the city. They used FDDI to create a backbone linking the Token Ring LANs of each municipal building. Over time as technologies advanced, singlemode fiber replaced most of the distance limited multimode fiber and Ethernet LANs replaced the Token Ring networks. But the FDDI technology remained along with leased lines and ISDN links to isolated segments of the network. This infrastructure was the foundation of CNE's carrier network.

When CNE decided to upgrade the network and replace the older FDDI with one of the new high speed-technologies they based their decision on several criteria. The major requirements included high throughput, critical redundancy, and ease of use. The solution had to be compatible with the Ethernet switching components already in place and had to operate on the existing fiber plant. The task of designing and implementing this new MAN was given to systems integrator Magellan Networks GmbH.

Magellan considered different technologies for the backbone. ATM was initially considered but proved too expensive to implement when the total costs of equipment, training and maintenance were calculated. So Magellan began searching for a complete Ethernet solution. Together with Optical Access, Magellan came up with a design using the existing fiber optic infrastructure while providing much higher speeds using new technologies. Optical Access provided a wide range of competitively priced 10/100/1000Mbps Ethernet switches and routers in addition to affordable WDM (Wave Division Multiplexing) technology.

Using WDM devices, CNE was able to carry four channels of Gigabit Ethernet over an existing pair of Singlemode fibers. And with Optical Access long-haul fiber technology, CNE was able to cost effectively extend high bandwidth connections into areas previously serviced only with leased lines. CNE had plans to offer premium data and Voice services to their customers and they needed a network that could handle this sensitive traffic. Rüdiger Hartwig, Data Director at CNE Telecommunication commented: "Modern switching technology with Gigabit Ethernet together with a WDM backbone allow us to provide Voice Over IP service right to the individual workplace."

MRV WDM TECHNOLOGY

Wavelength Division multiplexing (WDM) combines multiple signals and transfers them over one pair of fiber thus, increasing the utilization of each fiber. WDM can handle any protocol including FDDI, SONET, ESCON, ATM, Fibre Channel or Gigabit Ethernet. The need for additional bandwidth can be satisfied without the expensive or time-consuming laying of new cables. WDM ensures a fast and simple expansion of existing networks. Wavelength multiplexers have been in use for some time in carrier applications.

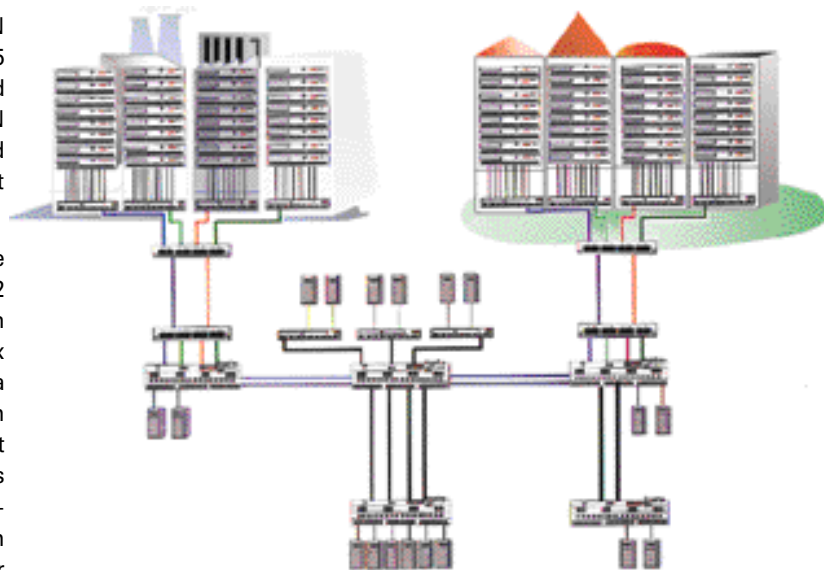
Today this technology can also be used economically in a LAN/Campus/Enterprise backbone and open new ways to increasing performance.

The GFS 3012 Gigabit Switch from MRV is a modular switch that supports a range of modules including Fast Ethernet, Gigabit Ethernet and WDM. The WDM module multiplexes four Gigabit Ethernet data streams directly from the switching fabric onto a Singlemode fiber and covers distances up to 65 km. An equivalent alternative is the WDM4 standalone device or the WDM module for the Fiber Driver both accept any four inputs from external devices.

One important element considered by the Essen network designers was Security. Carrying information from different municipal and corporate entities, data protection and confidentiality was an important factor. This concern was assured through the WDM4 device, which provides physical separation between networks. Stefan Ploder, Optical Access Vice President of Sales (Western Region), explains: "Although WDM4 is physically one unit, it provides a logical and physical separation between networks by using different wavelengths for each signal."

A TYPICAL CONFIGURATION

A typical configuration for the connection of two locations in the CNE network includes two GFS 3012 switches and WDM4. A 4-Gigabit Ethernet WDM Trunk, running on Singlemode fiber, connects the two GFS switches to each other. The WDM device uses lasers in the 1550nm window and connects locations 30 km apart. These Gigabit switches provide a backbone for the local LAN and are connected together to create a backbone for the entire network. In each LAN segment multiple Optical Access NH2025 10/100Mbps Ethernet switches are connected to the GFS with Gigabit uplinks. With VLAN and ISVLAN support, the GFS 3012 and NH2025 provide security to each segment across the network.



CNE achieved additional resiliency with the port Trunking capabilities of the GFS 3012 switches. Four Gigabit links were trunked in parallel achieving an 8 Gbps Full Duplex connection. In a standard configuration a separate pair of fiber strands is used for each Gigabit connection, one strand for transmit and one for receive. With the Optical Access WDM4 the ports are trunked together allowing the same 8 Gbps normally achieved with 8 strands or 4 pairs of fiber to be linked over just one pair. This not only increases network bandwidth but also frees up additional fibers for other use.

"The combination of Port Trunking and Wave Division Multiplexing complement each other. If one fiber strand is cut then the Port Trunking feature diverts all data through the other strand avoiding the loss of valuable data." Hendrik Sauer, Vice President of Magellan Networks, Cologne.

By successfully implementing an IP based network using Gigabit Ethernet and WDM; the city of ESSEN helped define the new city carrier model and attained a robust and reliable MAN, the first of its kind in Europe.

About MR V

MRV Communications is a world-class provider of high-bandwidth, low-cost Ethernet access solutions. These solutions include last-mile Ethernet, Ethernet over VDSL, Free-Space Optics (FSO), Media Conversion and Wave Division Multiplexing. MRV markets its products in more than 50 countries to existing and emerging service providers, as well as to enterprises requiring service aware broadband networks. As a leader in optical technology, with years of field proven success, MRV projects division is fully committed to 24x7 direct support and response to all projects needs and to taking care of special adaptation of its products to fit the Utilities Broadband Networks requirements in order to optimize the network utilization, support the whole spectrum of services and help the operator gain more revenue by providing more services to more customers more quickly.

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