MICROSENS
fiber optic solutions

No. 3, December 2002

**Dear Readers,
Dear Partners,**

The undiminished global economic slump in the IT area is continuing to encourage crisis management rather than new flights of fancy.

Those who fall prey to this prevailing mood, thinking it wise to realize savings in the technology and distribution areas at this point, will possibly be sorry down the road when it becomes clear that saving in the wrong place at the wrong time can have deadly consequences.

Difficult times challenge us all to act globally. Focusing exclusively on domestic sales is not a future-proof strategy from today's vantage point. However, at the same time, the increasing globalization of the markets has lead to more intense competition.

MICROSENS is introducing a large number of new products. We consider this the only appropriate action for taking on our steadily growing competition - making new investments into the development of market oriented systems. By introducing innovative functionalities, we differentiate ourselves clearly from our competitors in this market.

Companies have to seize existing opportunities for growth, regarding competition as an ongoing challenge that keeps us fresh. We hope you enjoy reading our new newsletter!

*Yours Thomas Kwaterski
Marketing & Sales Director*

Contents

New introduction: Intelligent CWDM/DWDM-Integration

The MICROSENS system now offers a soft migration by combining CWDM and DWDM technologies intelligently.

In its basic version, the current system offers up to 8 CWDM channels. When capacities need to be expanded, each individual CWDM channel can be expanded by up to 8 DWDM channels.

Given its modular design, the system can be configured for a wide range of applications. In addition to simple point-to-point applica-tions, complex linear add/drop and ring structures can also be built with this system.

New office switching family with VLAN functionality

MICROSENS, well known as a pioneer for innovative „Fiber To The Office" (FTTO) solutions, has now released new switches with with management, data priorization and full VLAN functionality.

This offers the first time complete new possibilities to implement neworks with a high security standard or to realize VoIP solutions.

The new features are available for the desktop-, industrial- and installation switches.

MICROSENS Is Expanding

Since its founding in 1993, MICROSENS has been focusing with increasing success on the development and manufacturing of active optical components for data, telecommunications and network technologies.

In order to continue to drive this market strategy, MICROSENS opened a North American subsidiary based in Toronto on October 1, 2002.

In recent years, the number of employees has continued to increase, above all, at the Hamm headquarters, in addition to the distribution centers in France, Poland and Singapore. The R&D (Research and Development) department was recently moved to an additional building. MICROSENS has proved once again that continued development of the company also leads to new qualities in the Research and Development and Customer Service areas.

MICROSENS opens subsidiary in North America

Since it was founded in 1993, the company headquartered in Hamm, Westphalia, has focused, with ever-increasing success, on developing and producing active optical components for data, telecommunications and network technologies.

Only a short time after its founding, MICROSENS started strategic distribution centers in international markets. This includes France for Western Europe, Poland for Eastern Europe, as well as Singapore for Asia.

To continue its global market strategy, MICROSENS accomplish its international infrastructure and has established its new subsidiary in North America.

This step was made necessary by the constant increasing demand on the north American market for MICROSENS products. With the distribution of its actual fiber systems and the new CWDM and DWDM systems, MICROSENS places itself and their innovative technology on this worlds strongest market.

MICROSENS Inc. is located in the Toronto area which is recognized as one of the leading metropolitan areas within North America. Toronto offers with his excellent infrastructure access to all major and economical areas within North America.

MICROSENS Inc. is headed by Mr. Heller who is responsible, as Managing Director, for Business Development, Marketing and Sales in North America.

Mr. Heller has received his BA degree in science in Germany before he started his career within the Telecommunication industry, 14 years ago. He has held several managing position in technique and sales within telecom and IT environment in Europe and North America.

New subsidiary in North America f.l.t.r.: Mr. Thomas Kwaterski (Marketing Director MICROSENS), Mr. Jurgen Heller (Managing Director MICROSENS Inc.)

MICROSENS Expanding into Additional Building for R&D

While the company has not even celebrated its 10-year anniversary, its headquarters at Hamm, which were put into service as recently as 1998, have become too small for the requirements created by the growth of the company. The number of employees has been growing steadily over the past few years.

And despite difficult market conditions, the R&D (Research and Development) department was moved to an additional building. More than 600 m² of office and laboratory space provide ideal working conditions for our engineers.
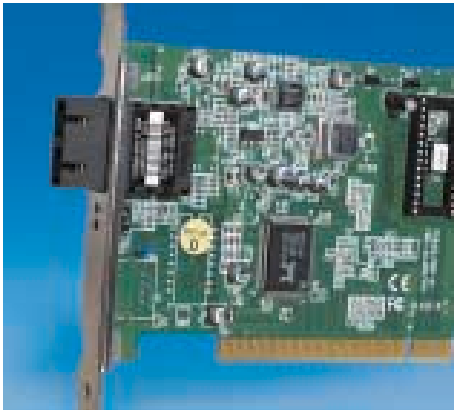
The building's flexible floor plan perfectly accommodates the developers' requirements for creativity and focus. And of course, the network of the new building is connected to the company HQ's by means of a fiber optic cable.

The space thus freed up in the central building has provided new capacities for Marketing and Sales. MICROSENS has proved once again that the continued development of the company also leads to new qualities in the Research & Development and Customer Service areas.

Picture left: Aerial photograph HQ MICROSENS in Hamm, Production (right), Main building (middle) and Research & Development (left top).

100Base-FX Network Adapter

1000Base-SX Network Adapter

10/100Base-TX to 100Base-FX Bridge

The MICROSENS Fast Ethernet adapter card offers the direct connection of end devices with fiber according 100Base-FX (IEEE802.3u) standard (Fiber to the Desk).

The connection of the adapter card is done with ST- or SC-connector. Using multimode fiber it is possible to cover distances up to 2 km.

An extended version of this card offers the connection to single mode fiber. Then it is possible to transmit over distances up to 125 km.

This card supports 32-Bit bus master architecture and provides a good performance combined with low purchase costs. Additionally this adapter has a socket for an optional Boot ROM.
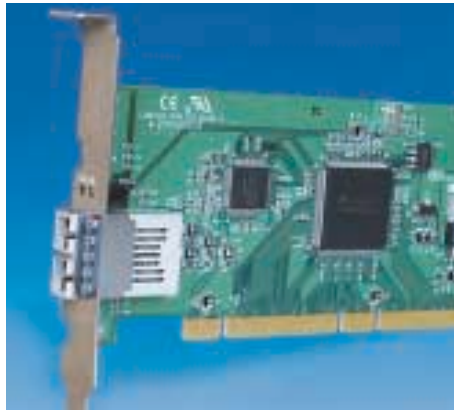
One of the further features is the Wake-On-LAN function.

The Gigabit Ethernet PC adapter card allows the end device connection with optical fiber according 1000Base-SX (IEEE802.3z) standard. This new card is suitable for all applications with higher requirement for bandwith such as server applications or graphic workstations.

This card supports the 64- and 32-Bit PCI-Bus structure. The integrated controller provides a good performance combined with a low CPU utilization. At delivery the driver for all common operating systems are included.

The connection of the adapter card is done with SC-connector. Using multimode fiber it is possible to cover distances up to 550 m (50 µm fiber). An extended version of this card offers the connection to single mode fiber.

The new Mini Bridge of MICROSENS offers an easy and cost effective integration of 10 Mbit/s Ethernet equipment into modern fiber based Fast Ethernet networks. In addition to the media conversion a speed adjustment is done. This adjustment includes the 10 and 100 Mbit/s speeds as well as the half and full duplex modes. Existing length restrictions for Ethernet (5 km) and Fast Ethernet segments (412 m) are eleminated by the bridge (segment splitting).

Beside the multimode version there are several single mode versions developed for „Fiber To The Home" (FTTH) projects. With the standard 10/100Base-TX interface, the enduser can use internet services, Video on Demand and VoIP applications.

Further information at:
www.microsens.com/uk/produkty/
NIC100FX_RTL.htm

Further information at:
www.microsens.com/uk/produkty/
NIC1000SX.htm

Further information at:
www.microsens.com/uk/produkty/
mnbr.htm

Features 100Base-FX NIC

- cost effective design
- low CPU utilization
- PCI plug-n-play compatible
- optional Boot ROM
- half- and fullduplex support for data rates up to 200 Mbit/s
- multimode max. 2 km, single mode versions up to 125 km
- ST-/SC-connectors, optional LC, VF-45 and MT-RJ

Features Gigabit NIC

- high performance with low CPU utilization
- 32- and 64-Bit PCI Bus
- half- and full duplex support
- multimode (1000Base-SX) and single mode (1000Base-LX) versions available
- SC-connectors, optional VF-45 and MT-RJ

Features Bridge

- compact desktop chassis
- segment splitting and speed adaption
- Auto-Negotiation 10/100Base-TX
- half- and fullduplex mode manual configurable
- multimode max. 2 km, single mode versions up to 125 km, optional with simplex fiber (WDM)
- ST-/SC-connectors, optional LC, VF-45 and MT-RJ

Installation switch with management, data priorization and VLAN functionality

The MICROSENS installation components allow an intelligent combination of glass fiber and twisted pair cabling and represent a secure, long-term investment.

Thanks to the conversion of the fiber connections coming from the central distribution to copper ports, it is not necessary to connect all end devices such as PCs, laptops, printers and IP telephones with fiber ports. They can be connected with standard twisted pair patch cables to the installation switch.

The autonegotiation and auto-crossover funtions of the switch adjust the speed and the pinout automatically. The manual configuration is no longer necessary. Because each fiber connection is converted to four copper ports, this solution reduces, in comparision to the pure fiber installation (Fiber to the Desk), the number of fiber ports necessary in the central distribution drastically. Additionally this solution offers a very high flexibility, because end devices with different electrical interfaces can be connected.

VLANs

In addition to switching functionality, the new generation of installation components provides expanded options for configuration and monitoring.

Among the most important new developments is the implementation of port-based VLANs allowing the total integration of switches into company-wide VLANs.

The use of VLANs (= virtual LANs) allows logical segmentation of local networks independent of their physical topology. For defining a VLAN, it is given an ID-Number, the so-called VID. Individual ports in the net can then be assigned to such a VLAN.

The data received through a port will be transferred only to connections with the same VID. By the same token, the port will only receive data packets from its own VLAN.

For determining to which VLAN a data packet belongs, the VID is inserted into the packet by the port (the so-called tagging process) and transferred together with it inside the network. Based on the VLAN-ID, each switch in the network decides to which ports it may transfer the data packet. That ensures that each data packet is accessible only to users located in the same VLAN.

By using VLANs, network security can be increased considerably since, provided they have been configured appropriately, all users can only access the data intended for them. Access from outside the own VLAN is thus prevented.

In addition, the network efficiency can be increased so that broadcast is transferred within each respective VLAN only.

Each port of the installation switch can be assigned its own VLAN. The associated VID is then inserted automatically into all data packets received (tagging). The switch uplink port functions as a VLAN trunk, i.e., all data packets are transmitted through it transparently, independent of the VLAN. The filtering of the data exchange is performed by the switch itself.

An additional security aspect is that the internal switch management port is assigned its own VLAN. This effectively prevents unauthorized access to the management agent. The switch can be re-configured only by the administrator of the respective VLAN.

Data Priorization

For time-sensitive applications such as VoIP applications, the data packets can be prioritized for transmission within the switch. The MICROSENS installation switch supports three modes for priorization:

• Based on Layer 2, priorization is achieved by setting the priority field in the VLAN tag according to IEEE802.1q.

• The Differentiated Service mode (DiffServ) is based on a type of service field in the IP header (Layer 3).

• Hardware-based port configuration: general priorization of the port over the other connections of the switch (Layer 1).

The internal weighting of the priorization can be adjusted in several stages.
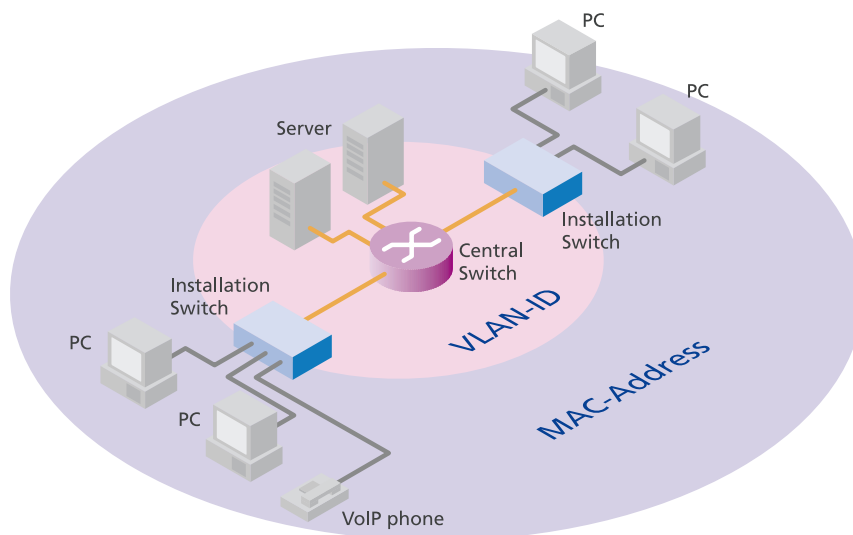
Fiber to the Office

Management

For this purpose, the auto-negotiation mode, the speed (10/100 Mbit/s) and the full- or half-duplex mode can be set for each port. In addition, each port can also be deactivated individually.

In addition to the Device Manager, all status information can also be visualized web-based using an integrated http-server.

The implemented ALM function (Advanced Link Monitor) allows a targeted identification of potential failures of the fiber optic connection.

When the switch loses its incoming fiber optic link signal, it turns off its fiber optic transmitter.

For monitoring of on-going operations, detailed statistical values such as data throughput and failure rate are collected.

Each switch has its own IP address, which can be configured manually or assigned by DHCP.

An individual identification string can be stored permanently in the device. This string may contain the ID-No. or the location of the device so that the device can always be identified unambiguously. This number is stored permanently in the device and will also remain unaffected by interruptions of the power supply.

Since the twisted-pair connection modules swivel, the installation switches can be mounted in horizontal as well as in vertical installation systems. This minimizes the mechanical stress on the out-going twisted-pair cables.

Auto Crossover

The auto-crossover function of the twisted pair ports on the switch renders the differentiation of the patch cables (between cross-over and 1:1) superfluous. The switch automatically recognizes the assignment of the cable attached and adjusts correspondingly. If necessary, the auto-crossover function can be deactivated, and the ports can be assigned permanently.

The switch is supplied with power by a built-in switch mode power supply with a direct 230 V input. Through rigorous use of energy-efficient components, an additional reduction of energy consumption was realized. The max. current draw is below 5 VA.

The fiber optic port for connecting to the central distributor runs at 100 Mbit/s and can be operated in half- or full-duplex mode (200 Mbit/s) depending on requirements.

Further information about "Fiber to the Office" can be found at www.microsens.com/uk/ftto.htm

Further information about the described switch can be found at: www.microsens.com/uk/produkty/inst_switchBJ_M.htm

Features Switch

- compact design, installation in cable trunks and sub floor tanks
- horizontal/vertical mounting
- integrated Management-Agent, SNMP/web based
- manual/automatic configuration of all ports
- implementation of the full VLAN functionality
- data priorization (CoS) for VoIP applications
- auto crossover of the TP ports configurable
- ALM function (Fiber-Port) configurable
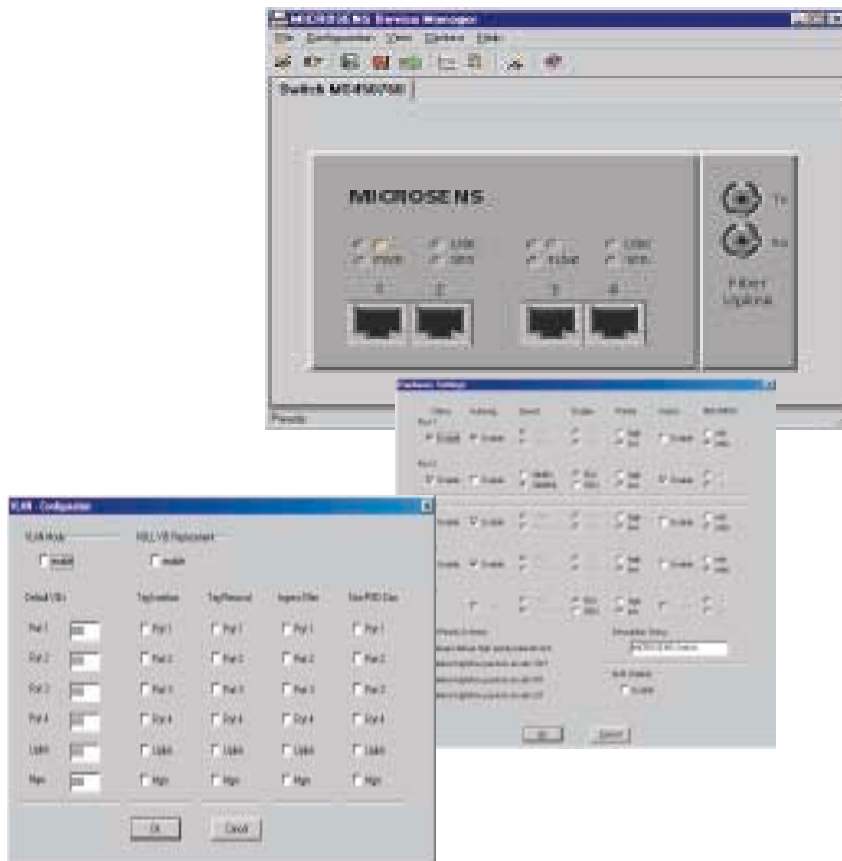
Modular Access Platform

Today's network infrastructures require open systems based on fiber optics that can be installed easily, and adapted flexibly to changing requirements.

MICROSENS supplies modular converter systems with a multitude of functionality modules for LAN and WAN applications as well as for the conversion of telecommunications and industrial interfaces.

The modular concept of this platform allows the selection of the optimum solution for current and future applications for all bandwidths, fiber optic parameters, and connectivity demands.

This guaranties a maximum flexibility and protects the existing investment. Depending on the model, the converter modules can do media conversion, speed adaption, distance extension and wavelength conversion.

Wide Range Retimer

For the realization of point-to-point connections over long distances with high data rates the use of signal regenerators is necessary. In addition to the amplification of the optical level, the timing is regenerated. Due to the complete signal regeneration (3R) of the converter the signal distortion caused by the transmission over long distances is compensated.

This offers the possibility to connect communication equipment such as switches, routers and bridges with single mode fiber in the LAN, MAN and WAN area.

The new MICROSENS product supports applications such as ATM, SONET/SDH (155 and 622 Mbit/s) and Gigabit Ethernet (1.25 Gbit/s). The use of pluggable optical transceivers (GBICs, optional SFPs) offers the highest flexibility for the implementation of different transmission distances.

Additionally MICROSENS offers a wide range of GBIC and SFP transceivers for multimode and single mode applications with stepped optical parameters. Due to the construction it is possible to install the transceivers during operation (hot swap).

Converters available to-date have only supported 2R signal regeneration (reamplification, reshaping). MICROSENS complements this functionality by adding 'retiming' to its product range of multimode/single mode and single mode/single mode converters. The process of complete signal regeneration is usually called '3R' (reamplification, reshaping, retiming) and regenerates the amplitude, the curvature, and the timing of the transmitted signal.

The deployment of converters with retiming functionality enables the implementation of far longer transmission distances, in particular for data volumes in the gigabit range, and allows cascading several long-distance converters with sub-segment lengths of up to 120 kilometres each.

3R converters can also be deployed wherever poor signal quality requires complete regeneration. This applies to both long-distance single mode connections, and local multimode lines. This solution enables the operation of gigabit multimode lines beyond 550 metres.

The new 3R converter forms part of a wide product range of functionality modules for installation in modular rack systems available from MICROSENS. In addition to single and twin desktop cabinets, 19" racks for the housing of up to 12 inserts are also available. If a multiport rack is used, the converter may be combined as required with all other inserts of the same series.

The converter can be integrated as an option in existing web-based SNMP management systems. For additional direct monitoring external alarm systems can be connected via floating relay contacts.

Flexible GBICs for data transmission with speeds up to Gigabit

MICROSENS offers several modular transceivers according to GBIC standard for long haul and short haul applications.

The concept of the GBICs (Gigabit Interface Converter) is based on a pluggable transceiver solution (optical transmitter and receiver). Due to the multisource agreement (MSA) of different manufacturers there is a standardized mechanical and electrical interface defined. So the exchange of modules from different manufacturers is possible.

Many active network components, especially in the backbone area such as switches or routers, are equipped with slots for taking up the optical transceivers. Using GBIC transceivers the customers reaches the highest flexibility in terms of network configuration. Their construction allows to install them during operation (hot swap).

The current transceivers of MICROSENS offer the transmission over multimode and single mode fiber up to Gigabit speeds. Depending on the version it is possible to transmit high speed services over a distance up to 120 km.

The optical transceivers of MICROSENS meet the Gigabit Interface Converter (GBIC) specifications in the revision 5.4. Furthermore they are compatible to the Gigabit Ethernet specifications according IEEE standard 802.3® and the Fibre Channel specifications FC-PH, PH2, PH3 and FC-PI 10.0.

Depending on the model, the GBICs are available with different wavelengths. For multimode applications such as Gigabit Ethernet and Gigabit Fibre Channel there are VCSEL lasers used with a wavelength of 850 nm. With this technology it is possible to cover distances up to 550 m (50/125 µm fiber). For single mode applications there are high quality lasers available with 1300 nm and 1550 nm. These lasers offer the possibility to cover distances from 10 km to 120 km, depending on the model.

Further information at:
www.microsens.com/uk/produkty/
gbic.htm

Prestigious Paper Manufacturer Using MICROSENS Gigabit Extender

Clairefontaine, the paper manufacturer known worldwide for its high-quality papers, currently has 3,500 employees and produces more than 200,000 metric tons of paper a year. From the year of its founding in 1858, the company has pursued constant improvements in quality in the paper production process hand in hand with progress in the technology area. In order to meet the market requirements with regard to quality and price, they are constantly investing in larger and more current machinery.

Clairefontaine has the same high quality requirements for its data processing system, resulting in a very early use of optical fiber in its various factories. Given their favorable characteristics - above all, longer transmission paths and protection from interference by electromagnetic radiation (production machinery) - fiber optics represent the optimal solution for such networks.

Multimode fiber optics were used formerly for the LAN nets because of the moderate cost of their active components, and sufficient distances of up to 2 km. In those systems, a large number of switches was connected via a fast Ethernet (100 Mbit/s) uplink.

Constantly increasing numbers of users meanwhile require higher transfer rates in the backbone area. Increasingly, active components with Gigabit Uplink (1000Base-SX/LX) are being used to connect users via 10/100Base-TX. Due to the dispersion effect, the distance for multimode fiber optics is reduced to 550 m for the higher transfer rates in the Gigabit range.

In the context of a migration, Clear Com (Nancy, France) was hired by Clairefontaine to design a cost-efficient and future-proof solution.

In order to avoid expensive recabling of the premises with single mode fiber optics and to retain their existing structure, Clear Concept - the engineering office of the Clear Com group - suggested implementing MICROSENS Gigabit Extender technology.

Further information about
Clairefontaine:
www.clairefontaine.com

Modular Optical Multiplexer
8 channels CWDM/DWDM

In recent years, CWDM technology (Coarse Wavelength Division Multiplexing) has established itself as a cost-efficient solution for multiple use of fiber optics. Due to the rough (coarse) channel distance (20 nm), however, these systems are limited in the number of usable channels. Depending on the quality of the optical fiber, between 8 and 16 channels per fiber can be used.

Whenever a customer's capacity requirements exceeded that, in the past, a radical switch to cost-intensive DWDM technology was called for. This resulted in very high capital investment costs since a completely new system was necessary.

CWDM/DWDM Integration

The MICROSENS system now offers a soft migration by combining CWDM and DWDM technologies intelligently. In its basic stage, the current system offers up to 8 CWDM channels. When capacities need to be expanded, each individual CWDM channel can be expanded by up to 8 DWDM channels, allowing the implementation of up to 64 optical channels in the maximum stage.

This multiplexer has been designed into an extremely compact 19" chassis with a 1 U form factor. The basic system allows transferring up to 8 data channels at a transfer rate of 2.5 Gbit/s each in protocol transparent mode. All the usual

protocols such as Fast Ethernet, ATM OC-3/OC-12/OC-48, Gigabit Ethernet, ESCON, FICON, and Fibre Channel are supported. Its optimized design provides an optical budget of 24 dB, thus making transfer distances up to 80 km possible.

Given its modular design, the system can be configured for a wide range of
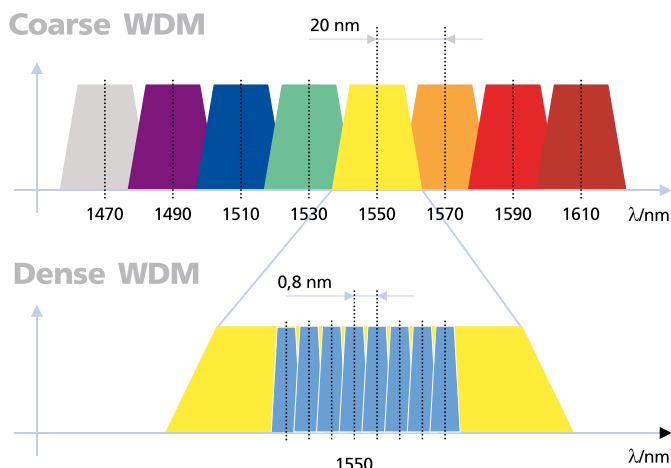
Coarse WDM

20 nm

1470 1490 1510 1530 1550 1570 1590 1610 λ/nm

Dense WDM

0,8 nm

1550 λ/nm

applications. In addition to simple point-to-point applications, complex linear add/drop and ring structures can also be built with this system.

Point-to-Point-Topology

In this standard application the data channels are transferred between two locations in parallel (Illustration bottom right). Standard multiplexers/

demultiplexers are used in the terminal nodes to bring the channels together and separate them again optically.

Linear-Add-Drop-Topology

This is an extended point-to-point topology in which further nodes are inserted between the terminal nodes in order to remove and insert flexible, individual channels (illustration next page). Therefore it is possible to switch individual transfer channels between two nodes in the network using the appropriate design. Standard multiplexers/demultiplexers continue to be used in the terminal nodes. For dimensioning it must be considered that each add drop multiplexer has an insert attenuation that correspondingly reduces the maximum dimension of the total route.

Ring-Topology

The implementation of networks in the shape of rings is particularly preferred in the telecommunications sector because this allows high security with minimum fiber routes (illustration next page).

If the ring is broken at one point the data traffic between all the nodes can be maintained if the design is correct.

Optical add drop multiplexers must be used at all nodes to set up ring networks. If the correct design is used individual channels can be switched between any two nodes in the ring.

Flexible Interfaces

The optical interfaces of the individual data channels are designed as pluggable transceiver modules (SFPs - Small Form Factor Pluggable) allowing the user to adapt flexibly to different optical interfaces.

Low Initial Cost

This system requires very low initial capital investments since, due to its modularity, only the number of channels actually used is provided. This also results in savings potential in the areas of storage, maintenance and service cost.

Further information at:
www.microsens.com/metro

The multiplexer fulfills all requirements for increased failure-proofness. Its power supply is provided by two redundant power supply modules. Modules for 230 V AC as well as 48 V DC are available.

Line Protection

With this kind of transfer protection between two locations data is transferred in parallel over two redundant fibres. The two fibers should be run in separate lines to achieve appropriate protection. One of the two channels is selected on the receiving side using an optical switch. If the active links are interrupted the switch changes to the second, intact line automatically. The switching time must be below that defined for SDH networks of 50 ms.

This kind of protection is excellent at protecting against interruptions in the fiber connections. It is also relatively cost-effective to implement because it simply requires one additional optical switch. However it does not protect against failures in the active transfer components, such as the laser, and can only be used for point-to-point connections. A considerably higher investment is required to protect against a failure in active components right up to ring topologies.

Channel Protection

With this type of protection each individual transfer channel rather than the whole fiber at once is protected. This occurs through two active channels being operated in parallel. On the receiving side a decision is made as to which of the two channels is used for the transfer. At the maximum level of design two complete systems can be operated in parallel so that if a total failure occurs in one of the

systems the second takes on the complete data traffic.

The channel protection therefore allows the data connection be protected from end to end. Because it can be used separately for each channel it can be deployed particularly effectively in linear add drop and ring topologies.

In general it has been proven that the higher the requirements with regard to failure protection the higher the expense required because finally all the components requiring protection must be designed in double format. This must be considered even when planning the transport network because the level of protection against failure can become a significant cost element.

Monitoring

Via a built-in management module, the multiplexer may be monitored using SNMP (Simple Network Management Protocol) and web-based management. Their trouble-free integration into SNMP

management platforms is guaranteed. Two potential switching contacts have been provided for connecting external alarms with two defined alarm levels - a minor alarm contact for status changes that are not critical to function, and a major alarm contact for signalling critical faults.
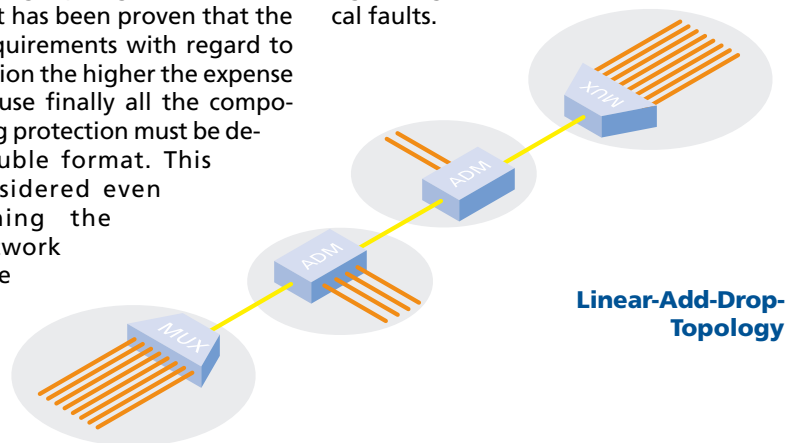
Linear-Add-Drop-Topology

Further information at: www.microsens.com/uk/produkty/ 8CWDMmodular.htm
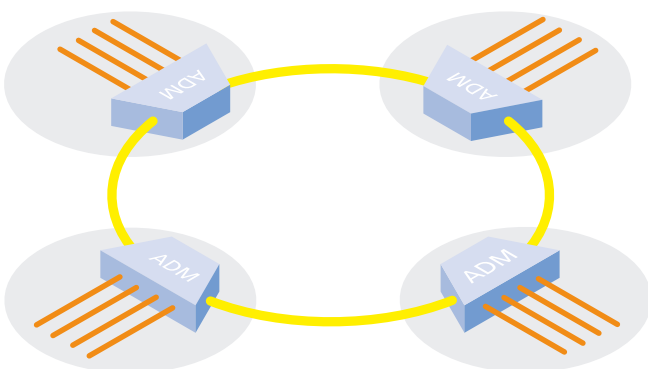
Features Modular System

- low entry costs due to CWDM technology according ITU G.694.2
- low initial costs - only the actual used channels are installed
- upgradeable up to 64 channels with DWDM technology
- protocol transparent for applications up to 2.5 Gbit/s
- optimized construction, therefore distances up to 80 km possible
- Point-to-Point, Linear Add-/Drop- and Ring structures possible
- optional Line-, Channel- and System-Protection

Ring-Topology

Hamburg Gas Provider Bets on CWDM Solutions from MICROSENS

HEIN GAS Hamburger Gaswerke GmbH is one of the largest regional gas utility companies in Germany. The HEIN GAS name stands for know-how, experience and innovation in the gas industry. Communication plays an essential role at HEIN GAS, with business partners as well as with the general public—and so, of course also in the IT area at HEIN GAS.

That is why they were looking for an efficient solution for connecting the headquarters located in downtown Hamburg with the branch locations and plants, which have been placed close to their customers in more remote areas of the city.

With approx. 700,000 customers in the Hamburg area - which includes, in addition to the Hanseatic city itself, the south of the state of Schleswig-Holstein as well as the north of the state of Lower Saxony - HEIN GAS had sales of EUR 987 million in the 2001 business year. 32,773 million KWh's worth of natural gas flowed through a 12,880 km network of pipes. The largest partner in the company, which presently has 1,150 employees, is E.ON Energie AG, München.

Connection of Locations

The "Tiefstack" location, a technology support center and home to various technology-oriented subsidiaries, as well as the "Bergedorf" location, in which HEIN GAS operates a natural gas storage facility (with an approx. capacity of 350 million cubic meters) at a depth of between 600 and 800 meters, were to be connected with the administrative building.

After intensive talks had been held and a number of different solutions reviewed, the decision was made to go with a fiber optical connection using the so-called wavelength division multiplexing (WDM) technology. This technology allows optimal utilization of the fiber optical connection by transmitting different services (data, storage and telecommunications) simultaneously on one fiber.

These two locations were specifically to be connected via broadband to the existing high-speed backbone by connecting these "outposts" redundantly to the two data processing centers in the administrative building. The connection was to be routed from the Bergedorf (C) location via the Tiefstack (B) location to the two rooms of the data processing center. This required several dedicated Gigabit connections –

for the B location itself and in addition, for the continuation of the transmission to the C location.
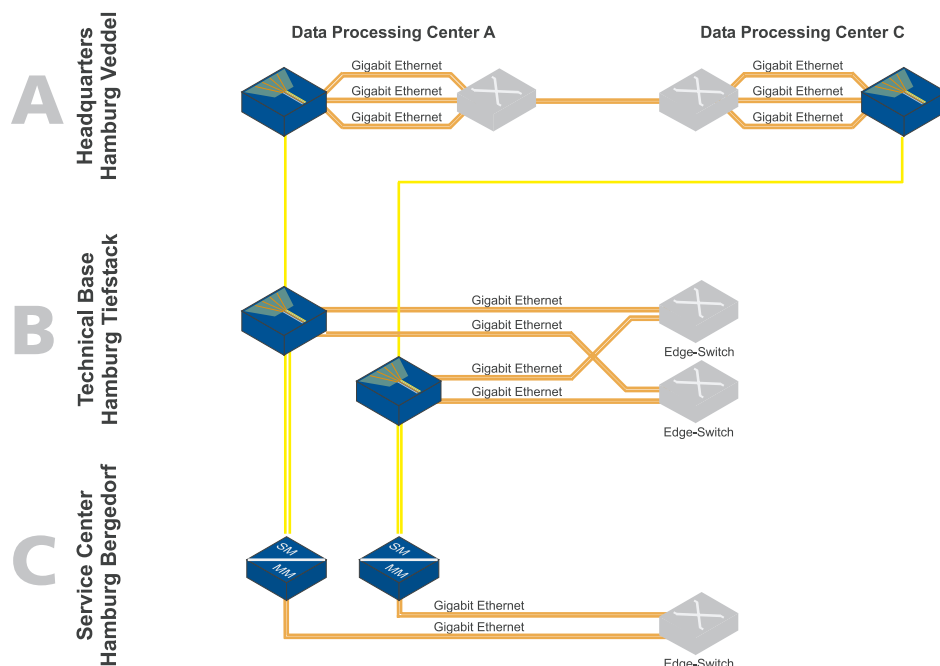
Two Solution Approaches

There was a choice of two concepts for implementing this project. One potential solution was based on using additional dark fiber optical connections. Its alternative consisted of a better utilization of already existing fiber optics connections with the help of active wavelength multiplexing technology from MICROSENS.

Peter Mohr, who is responsible for network technology and administration at HEIN GAS, and his team were charged with finding a cost efficient and, at the same time, future-proof solution. "Together with Purchasing, we reviewed several providers and made the decision to go with the current CWDM systems product line from MICROSENS. By using these systems, we are able to write off the purchase cost against the operating costs that would have been due otherwise," said Peter Mohr. "Leasing additional glass fiber optics connections, especially for the more remote locations, would have been too expensive in the long run."

WDM Technology

In addition to their known advantages of high bandwidth over long transmission distances, fiber optics have another advantage which allows an additional considerable increase in capacity. Since light of different wavelengths does not interfere with each other, transmission capacity of an optical fiber can be multiplied by transmitting data simultaneously at different wavelengths.

		Data Processing Center A	Data Processing Center C
A	Headquarters Hamburg Veddel	Gigabit Ethernet / Gigabit Ethernet / Gigabit Ethernet	Gigabit Ethernet / Gigabit Ethernet / Gigabit Ethernet
B	Technical Base Hamburg Tiefstack	Gigabit Ethernet / Gigabit Ethernet / Gigabit Ethernet / Gigabit Ethernet	Edge-Switch / Edge-Switch
C	Service Center Hamburg Bergedorf	SM MM / SM MM / Gigabit Ethernet / Gigabit Ethernet	Edge-Switch

HEIN GAS

This process is called wavelength multiplexing or WDM (Wavelength Division Multiplexing).

The number of channels available simultaneously on an optical fiber is theoretically limited only by its technological realization. If a very small distance between wavelengths is chosen, a high number of channels can be placed in a single optical window. The DWDM systems (Dense WDM) based on this technology are primarily used in the long distance transmission range.

A critical technology factor of a DWDM system is the stability of the optical components, above all the transmission laser. Achieving wavelength stability in the nanometer range requires extensive electrical and thermal stabilization measures, rendering the components complicated and expensive.

Another current process in the wavelength multiplexing area is CWDM (Coarse). In these systems, the distance between the channels of the individual wavelengths is several orders of magnitude larger (20 nm) when compared to DWDM technology. This reduces the requirements for the laser technology used, resulting in drastic effects on the cost of the entire system as well as its electricity consumption and heat generation.

In comparision with DWDM systems, the price of this current CWDM technology is cheaper by a factor of up to five.

This opens this technology up for new target groups. Not only telecommunications providers, but also private customers with large-area networks or several locations dispersed over a city are already using this cost efficient solution. The current CWDM systems from MICROSENS allow the realization of up to 16 transmission channels at a max. speed of 2.5 Gbit/s per channel and direction.

Integration

The installation was done by the integration partner, ABB Netserv GmbH. In addition to installing the existing components, ABB has also taken on their complete service. This includes, among others, the repair of potential failures with a response time of less than four hours.

"Our investments have already amortized themselves. The compact design of the CWDM systems has enabled an unproblematic start-up and has had favorable effects on the service. We were thus able to write maintenance contracts with the integrator with short service times." says Peter Mohr from HEIN GAS.

Meanwhile, the project is in its third expansion phase. Based also on the experiences of 9/11 and the problems encountered with non-local redundant data storage of some of the WTC computer centers during the catastrophe, the HEIN GAS management has opted for another expansion stage. In it, a SAN solution based on Gigabit Fiber Channel was implemented, which is also connected over large distances via optical multiplexers from MICROSENS. Based on their positive experience, HEIN GAS have opted to use the same technology for connecting additional locations in another, third expansion stage.

In the current implementation stage, additional MICROSENS CWDM systems will be used connecting additional de-centralized locations in the Hamburg area redundantly to the HEIN GAS computer centers. In addition to optical transmission of IP-based services such as Gigabit Ethernet, the phone systems will be connected in another project phase. For this purpose, new multi-range systems will be used. In addition to the transmission of high data rates in the Gigabit range, these also allow transmissions of low bit-rate protocols such as E1/T1 (2 Mbit/s).

Further information about Hein Gas: www.heingas.de

The project team: beside the network and server administrators from Hein Gas, there were employees from ABB Hannover and Capricorn involved into this project

The used hardware (from top to bottom): modular SM/MM converter systems (3HU), 3x CWDM multiplexer with a redundant power supply unit (RPSU)

Events in autumn 2002

Networks Telecom
24.-26.09.02 Stockholm

MICROSENS had together with its partner Catway a very successful exhibition Networks Telecom in Stockholm, Sweden.

During the three exhibition days more than 1400 contacts were made and the main part of them are located in the professional IT area. Thus the quality of the visitors can be rated as very good.

During the exhibition promising discussions were held, which offer a successful development of the Swedish and Scandinavian market.

Opto 2002
22.-24.10.02 Paris

It was the first time that MICROSENS participated in this trade fair for optical components and systems. Although the market for suppliers of optical transmission systems was relatively transparent, MICROSENS was able to present their new modular CWDM system very successfully. The systems shown at the stand were actively linked to the fair's OptoCity demonstration network, which was used for a live video transmission via Gigabit Ethernet. During that task, the CWDM system was able to distinguish itself clearly from competitors' systems.

Networld+Interop
06.-08.11.2002 Paris

Networld Interop, the world's most prestigious event in the IT industry was, as was the entire telecommunications industry, also affected by the continuing turbulences of the market this year.

This was signaled clearly by a decrease in the number of exhibitors, which also lead to a reduction in exhibit space.

MICROSENS, however, has once again been able to prove - against all prevailing market tendencies - that one can resist all trends and succeed even in a global market.

The number and quality of visitors exceeded our expectations by far. Our experience shows us clearly that in times of crisis, customers do remember high-performance partners and continue to count on them as the successful operators of tomorrow.

exponet
19.-21.11.2002 Cologne

From 19th to 21st of November the most important autumn event of the IT sector has taken place in Cologne.

As the manufacturer of international successfull systems MICROSENS has presented its solutions for enterprise networks (LAN), access area up to metro networks (MAN).

Despite of negative news from other IT events in Germany the exponet Cologne 2002 kept once more its important position.

The visitors in Cologne have used this opportunity to get a complete overview about technologies, economical benefits and future trend of the IT sector.

With our know how and the experience of many years we advise you on all questions about fiber based network technology and help you to find the right solution for your requirements.

Latest information about exhibitions and other events at: www.microsens.com/uk/ events2002.htm