MICROSENS

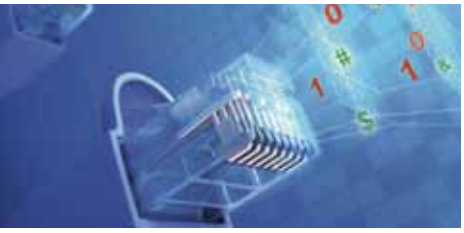
Data Center Interconnect

MICROSENS fiber optic solutions -
intelligent, reliable, high-performance

EFFICIENCY IN THE DATA CENTER GROUP

ON THE WAY TOWARDS “ZERO DOWNTIME”

MICROSENS OPTICAL TRANSPORT PLATFORM



SAFETY FOR FIBER OPTIC LINES

MICROSENS

EDITORIAL

Dear reader,

Today, data centers are indispensable hubs of modern communication, where many important business processes converge. They house systems of critical importance for the company such as distributed databases, virtualised environments and data storage and are thus subject to the strictest requirements regarding security and malfunction redundancy.

The connection of data centers is assuming increasing importance in this context. This is due to modern geo-redundancy concepts requiring a high-performance network infrastructure between the individual data center (DC) locations, in order to guarantee rapid restoration times. If one looks at the current topics in IT, for example, “big data”, the making useful of large quantities of data, it quickly becomes clear: The exponential data growth of recent years will require much larger bandwidths between data centers in the future. Under the influence of modern clustering technologies, the requirements for reduced latency and longer range will also increase. Due to falling equipment prices and constant technological advances, optical wavelength-division multiplexing has been able to assert itself as the reliable de facto standard for the interconnection of data centers.

Another paradigm has also arisen in recent years: whilst the available computing power used to be the main criteria for DC operations, economic aspects are now increasing in importance. In particular, energy efficiency, as in addition to important environmental aspects, this also has a massive impact on the operating costs of data centers. In these terms, CWDM/DWDM systems contribute to increased cost efficiency, as they make it possible for operators to optimally utilise local IT-resources independent of the location.

As a German developer and manufacturer of high-performance fiber optic systems and an experienced specialist for optical multiplexing, MICROSENS offers regional proximity, innovative products and professional consultation through experienced and specialised engineers. In close cooperation with operators of data centers, institutions and companies, MICROSENS enables economical networking concepts with a complete solution offering in WDM and innovative TDM over WDM technology.

In the following you will learn more about how you, as a decision-maker or operator, can realise future-proofed and scalable network structures with the optical transmission platforms from MICROSENS.

Enjoy reading this brochure!

Dipl.-Ing. Hannes Bauer
Technical Director and founder of MICROSENS GmbH & Co. KG

Efficiency in the data center group

xWDM networking as a contribution to cost reduction

Where conventional MPLS concepts bound to providers quickly reach their economical and technical limits, optical multiplexing offers scalable transmission capacities, extended distance and low latency.

Inter-site utilisation of IT-resources

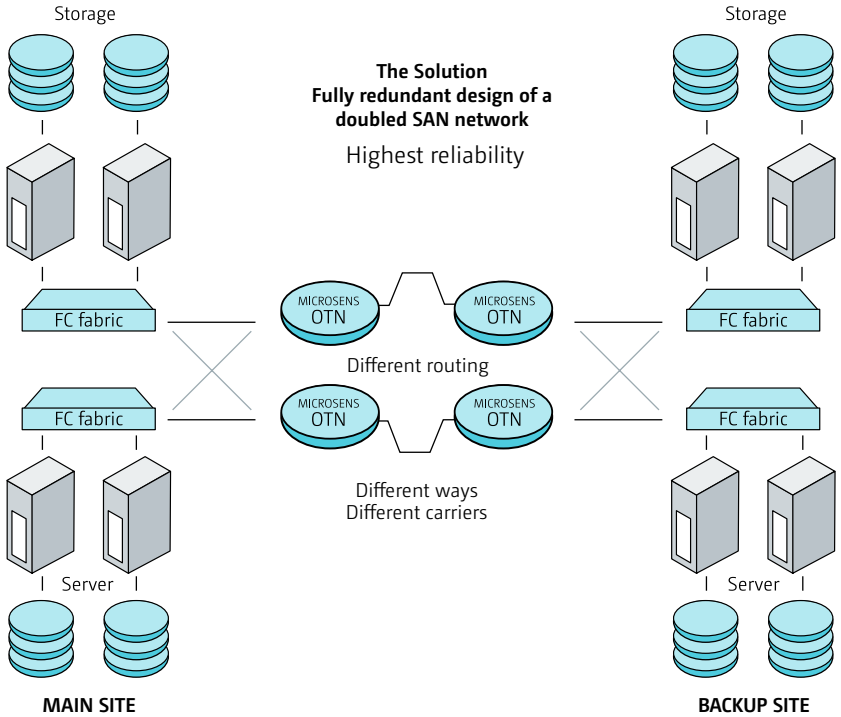
For operators of data centers, increasing requirements for power density, energy and economic efficiency more often involves a balancing act. The connection of data centers with DWDM technology creates new flexibility within the data center group and overcomes the capacity threshold of location-related limitations. Optical wavelength-division multiplexing thus plays a key role in the optimisation of data center processes. This is because, due to the provisioning of high transmission rates and ranges with low latency independent of the protocol, the optical wavelength-division multiplexing enables the inter-DC load distribution of all IT-resources present in the group. For operators, the optimal utilisation of the server structures made available in the data center group results in considerably improved overall energy efficiency, an efficiency increase that has a direct impact on the energy costs and thus decisively determines the economic efficiency of all data center operations.

Agility in the provision of bandwidth and services

In addition to a variety of technical considerations, confidence in one's own optical networking infrastructure offers another important advantage for operators of data centers and affiliated companies: Contractual and operational independence as the basis for a flexible provision of bandwidth and services that is oriented to actual needs. The modular structure and scalable bandwidth of the optical transmission platform from MICROSENS allows for a "start small" investment concept that enables a step-by-step expansion of transmission capacities with 10, 40 or 100 Gbps at any time, without initial investments being lost.

Comprehensive dark fiber network as the basis for one's own WDM infrastructure

The basis for a captive networking infrastructure with DWDM technology, namely the nearly comprehensive availability of fiber optic lines, was continuously expanded upon in the past. DC operators can today find a broad offering of affordable, unlit fiber optic lines (dark fiber) in country for the physical connection of data centers.



On the way toward “zero downtime”

Optical transport as the basis for modern disaster recovery management and data storage system connection

The high dependence on always available IT-systems for the business as well as legal regulations concerning conformity and strict testing criteria put the traditional concept of single, centralised data centers more and more into question. This is because the narrow corridors for system availability and restart times resulting from professional bodies such as ITIL or Sarbannes Oxley can often only be realised by geographically distributed data centers.

Emergency management and expanded redundancy concepts

Localised hazards such as earthquakes, major fires or other forms of force majeure can threaten the data stock of a data center and thus place the viability of an entire company in danger. In order to be prepared for such crises in the context of preventative emergency management, the principle of geographical redundancy has been developed in recent years. Various concepts for geographically redundant failure safety currently exist, whether twin data centers, disaster recovery centers or SAN to SAN data replication — all concepts have one thing in common: none of them can be implemented without a sufficiently high-performance network infrastructure.

Optical multiplexing for progressive DC connection

MICROSENS Optical Transmission Platforms combine shortest possible latency with total protocol transparency, thus giving you the perfect basis for integrating backup data centers, distributed databases and remote storage. This is because, due to dynamic routes and fluctuating latency, conventional layer 3-based WAN/MAN networking solutions are no longer suited to depict the challenges of modern computer centers with a correspondingly high degree of virtualisation. Progressive disaster recovery technologies, such as the real time migration of virtual machines, require the inter-site maintenance of broadcast and spanning tree domains. This ensures that, in the event of damage or loss, business-critical applications can be transferred seamlessly from location to location, keeping them available to users with practically no interruption.

Fiber Channel and WDM separation of storage data and payload without additional lines

Although TCP-encapsulated SAN protocols, such as FCoE (Fiber Channel over Ethernet), iSCSI and AoE (ATA over Ethernet), are gaining ground, one decisive technology still dominates the market in the data center environment: Fiber Channel. This offers a high degree of reliability, has a lower overhead and a lower bit error rate than Ethernet-based protocol types. Current solutions can master transfer rates of up to 16 Gbps with multi-level backward compatibility. In many respects, the WDM process is the perfect basis for the transmission of Fiber Channel, as it enables the separate transmission of payload and storage data without having to rent additional lines for the separation of services. The technologies compliment one another with regards to latency periods: especially as for the synchronous transmission of Fiber Channel, important Ethernet typical transport mechanisms are absent, the latency periods increase in importance, particularly in the long haul range. This is because they have a direct impact on link performance, data consistency and memory reliability. With an optimised single-chip muxponder, the ultra-low latency design of the MICROSENS transport platform ensures the stable transmission of storage data even over long distances.

MICROSENS Optical Transport Platform

The ability to network is one of the key factors in raising productivity and cost efficiency in data center operations. With the scalable Optical Transport Platform from MICROSENS, operators of data centers are offered a future-proof basis for constantly increasing bandwidth requirements. In the process, failure safety and redundancy are just as important as long term financial acceptability in the context of IT-cost planning.

2 U Carrier Class Chassis

4 U Carrier Class Chassis

7 U Carrier Class Chassis

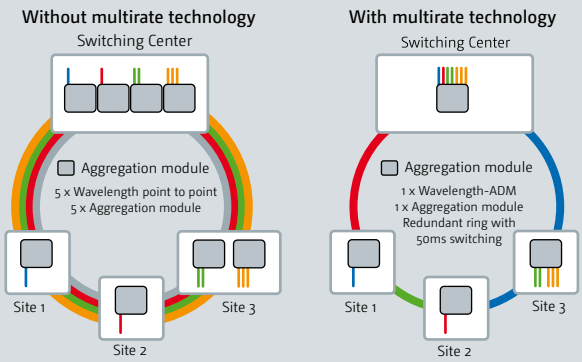
Needs-oriented expansion of transmission capacities

With its modular structure, the MICROSENS Optical Transport Platform enables expansion of the capacities of fiber optic lines that reflects actual needs. The wavelength division multiplexing enables the parallel transmission of several light frequencies on one fiber pair. Each light frequency or wavelength thereby provides a transmission rate of 100 Mbps to 100 Gbps. This makes it possible to increase the capacity of fiber optic lines by many times. Individual services are thereby transmitted on non-overlapping wavelength channels. Each wavelength channel offers the full bandwidth without a side effect to any other channel. Companies and operators can thus balance their bandwidth needs with their investment levels while retaining flexibility in terms of additional capacities. When requirements for transmission capacities increase, the system can be expanded step-by-step to capacities of several hundred Gbps without the need to rent additional fiber optic lines.

Increased cost efficiency through intelligent technologies

The MICROSENS Optical Transport Platform is designed to provide reliable transmission of high data volumes while optimising per-bit costs. The system maintains this positive transmission capacity-to-total cost ratio through a combination of complementary technologies that help significantly reduce operating and capital costs.

- **Brocade center-ready** — Interoperable with Brocade data centers
- **Green IT technology** — the single-chip technology helps reduce energy costs in operation by up to 25 per cent compared to conventional multi-chip solutions.
- **Low-latency chip design** — for the transmission of latency-sensitive applications
- **ROADM support** — for the flexible setting up of meshed optical networks with fault tolerance
- **TDM multiplexing** — parallel transmission of various protocols (Ethernet, SDH, Fiber Channel) and data rates (100 Mbps – 100 Gbps) on a common wavelength. Depending upon the network structure, reduces the infrastructure costs for aggregation and operation by up to 60 per cent.
- **Interoperability with legacy systems (SONET/SDH)** ensures the reliable operation of WDM technology on SONET/SDH infrastructure via native or foreign wavelength.
- **Hut-skipping technology** minimises the number of intermediate stations for signal processing (range of up to 300 km without optical amplifiers), thus reducing operating and infrastructure costs
- **Next-generation FEC (Forward Error Connection)** provides a signal gain of 10–12 dB instead of the standard 6 dB. The system largely operates without dispersion compensating fibers, thus improving latency and eliminating costs associated with dispersion compensation.



Safety for fiber optic lines

Cryptographic processes and optical monitoring for fiber optic networks

Due to their spatial proliferation along motorways or railway lines, fiber optic lines offer a big target for physical attacks. The optical medium itself may be the target of such attacks, but the monitoring outlets of optical transmission systems are also at risk. Cryptographic real time processes protect storage data and payloads against access by third parties. Optical security solutions offer an affordable alternative for detecting the manipulation of fiber optic lines.

Cryptographic processes and optical monitoring

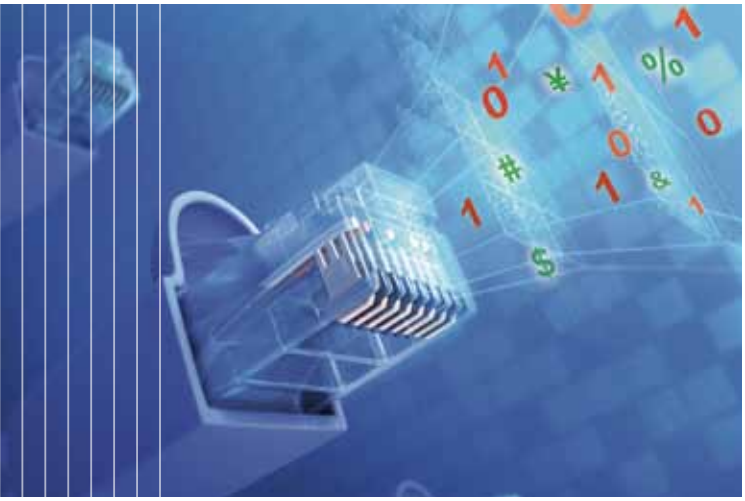
Since fiber optic lines usually bundle the entire data volume of several locations or data centers, successful spy attacks, for example, directed at unencrypted storage data are a particularly serious matter. After all, losing company secrets or facing claims for damages could have disastrous financial consequences. Depending on your particular security needs, MICROSENS monitoring systems with backup procedures or certified cryptographic solutions can secure fiber optic lines.

Optical detection processes

With the Optical Power Monitor (OPM) from MICROSENS, the optical power level along the fiber is measured continuously and attempts to manipulate the transmission medium thus detected. Tapping of the fiber causes additional attenuation, which reduces the light intensity arriving at the OPM, thus triggering an alarm. A line switchover to a substitute path to be carried out automatically would then be the logical consequence. The optical measurement method of the MICROSENS OPM offers high resolution of 0.1 dB and is thus many times superior to integrated level measurements, for example, on a SFP basis.

Cryptographic processes with wire speed encrypting for latency-sensitive applications

The MICROSENS encryption solution offers certified security with 256 bit AES encryption in real time. This solution is approved by the Federal Office for Information Security according to the standard VS-NfD (NATO Restricted) and thus offers the highest degree of commercially available security. With this solution, even a successful bugging attempt would not cause any damage, as the encrypted information could not be used for subsequent processing. The native support of Fiber Channel makes the solution particularly interesting for the securing of backup data, for example, for the connection of remote storage or DRCs (Disaster Recovery Center).



- High-performance encryption in real time at wire speed
- Protocol support for ATM, SDH, Ethernet and Fiber Channel
- Supported data rates: 100 Mbps to 10 Gbps, transparent to VLAN, MPLS, etc.
- No overhead due to encryption
- Simple integration without intervention in the network infrastructure
- Support for pluggable SFP/XFP interfaces
- Conformity with FIPS 140-2 L3, CC EAL3, BSI, NATO restricted

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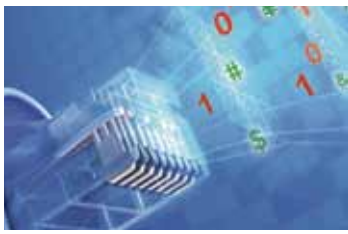

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