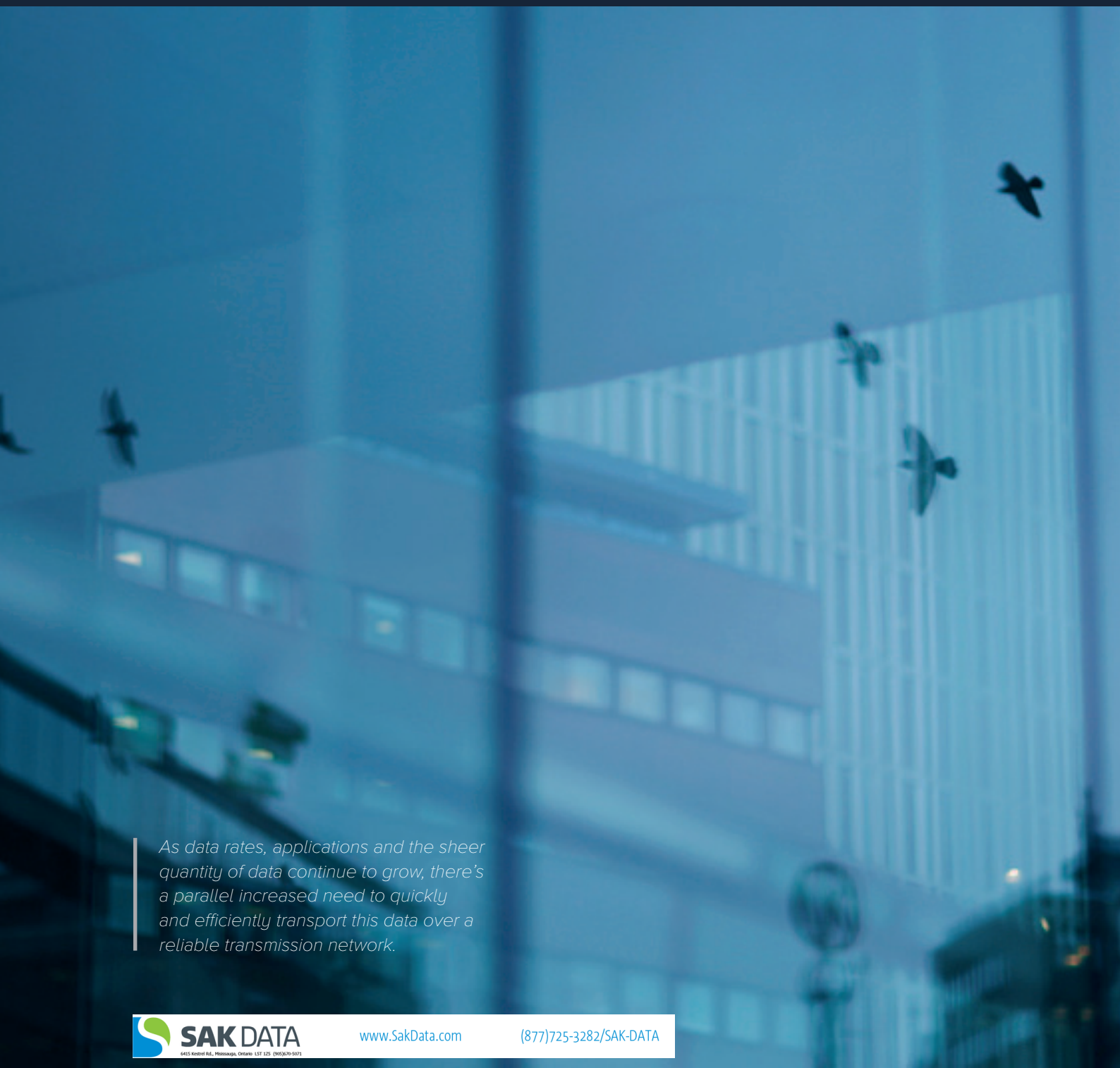
smartoptics

Solution Brief

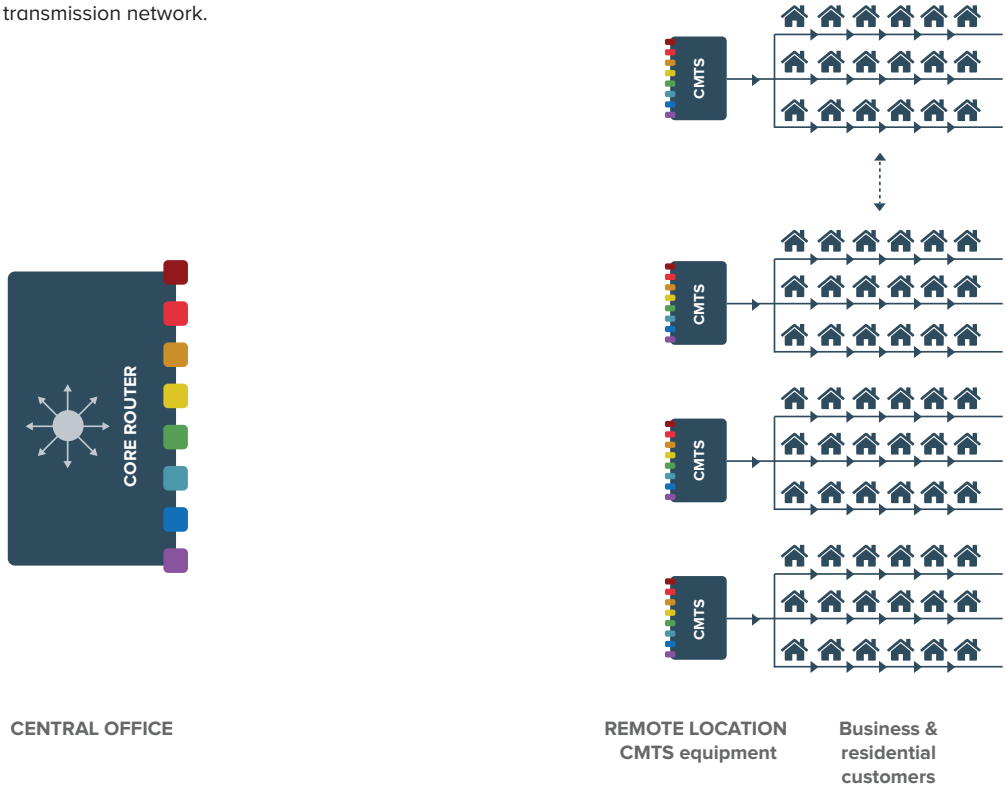
CMTS Traffic backhauling: Versatile architecture for asymmetrical networking



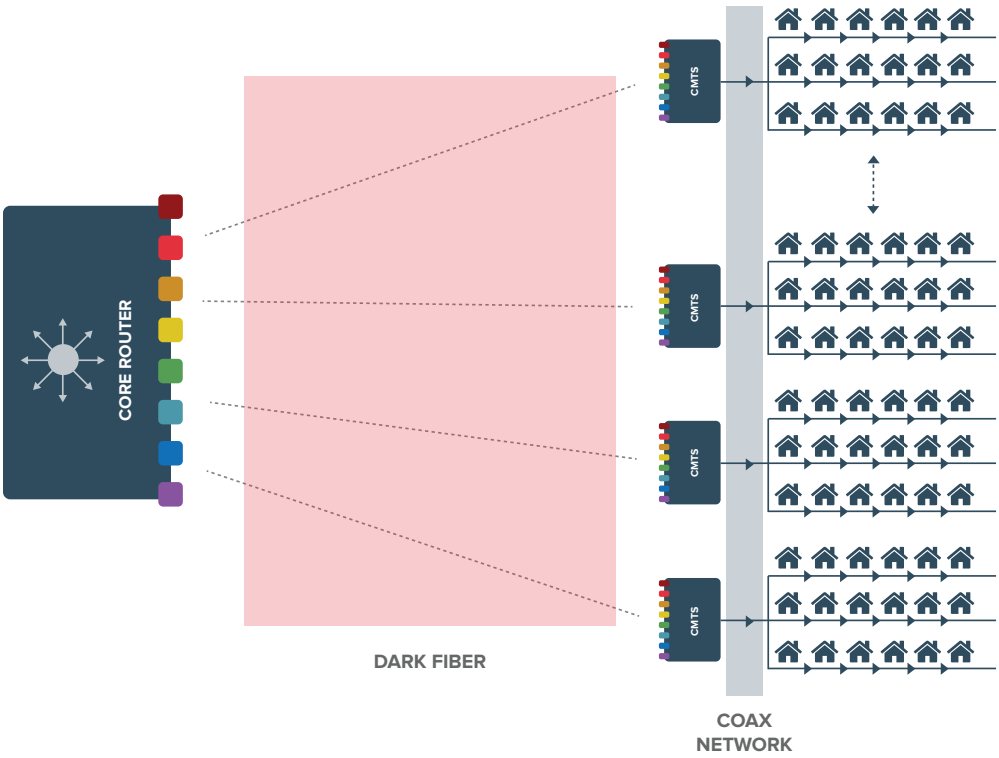
As data rates, applications and the sheer quantity of data continue to grow, there's a parallel increased need to quickly and efficiently transport this data over a reliable transmission network.

The dilemma for Cable TV operators

Cable TV operators and MSOs (multiple system operators) need to transport vast quantities of data from cable modems at remote CMTS (cable modem termination systems) access sites to core router at head end, central office sites. The CMTS allows operators to provide high-quality data services to cable subscribers. The core router sites are normally composed of Ethernet equipment for data handling and CATV headend equipment for content handling. The CMTS sites handle the content delivery to the various end locations. As data rates, applications and the sheer quantity of data continue to grow, there's a parallel increased need to quickly and efficiently transport this data over a reliable transmission network.



In order to meet these needs, operators typically run what is known as a HFC network, a Hybrid Fiber and Coax network. Coax cable is usually used to connect the shorter distances between homes and businesses in the regions. Fiber is then used to transfer the accumulated data from the CMTS over longer distances back to the regional head ends. This helps to meet the data requirements as they continue to grow.



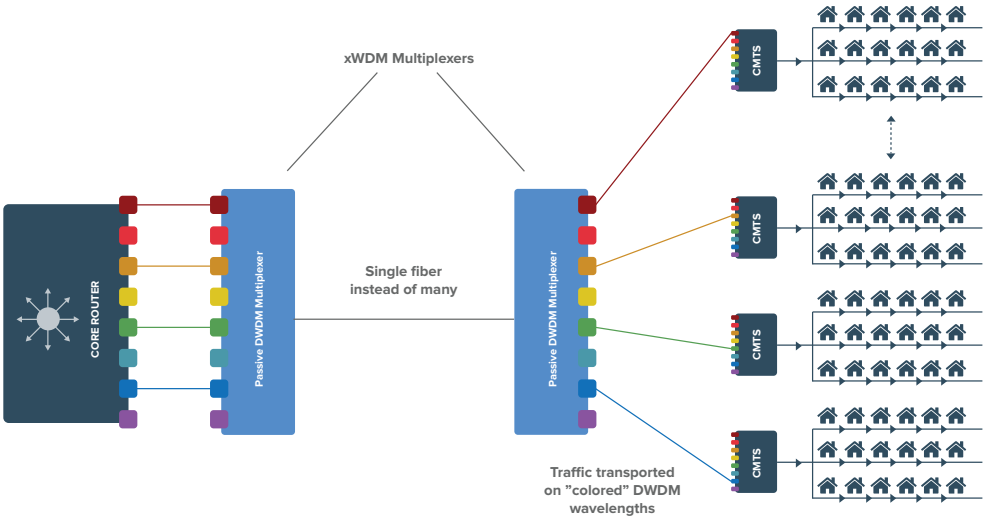
Fiber-efficient connectivity

Efficiency of a network is key to being a successful operator. There are two main factors that determine that efficiency: the quality if the fiber network, and the choice of transmission equipment that will help shape performance as well as ongoing costs. Cable operators must be able to provide a high-quality service at a competitive price, even as services and speeds increase. Running fiber services is extremely cost-sensitive.

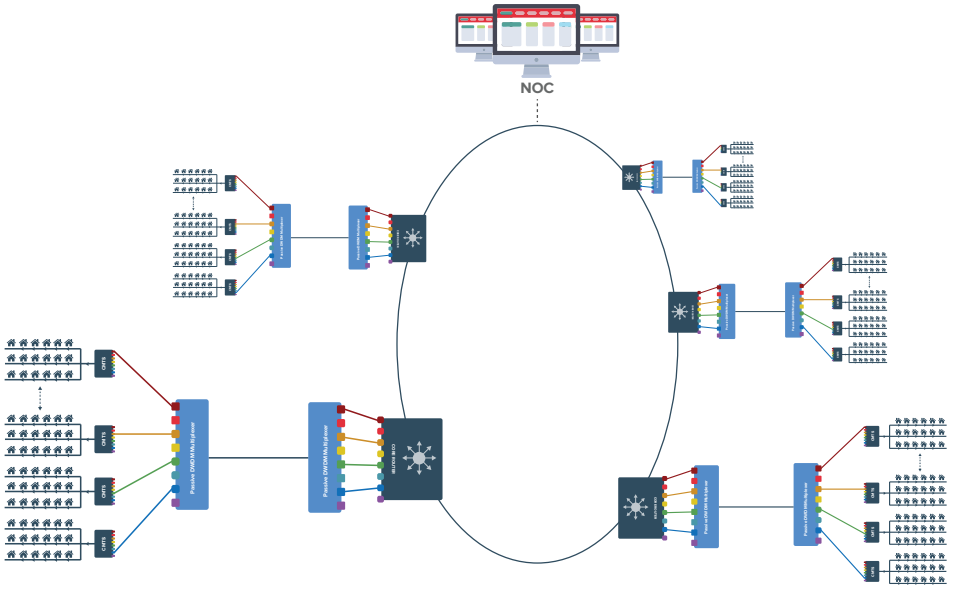
Owning a fiber network means a considerable financial outlay, so it's important to maximize the financial payback of that network. If there isn't enough capacity, then the operator won't be able to offer a competitive product, and customers will go elsewhere.

Operators also typically need to run networks over geographically large areas, which adds another dimension to the pressure on that network. The cost of installing fiber is very high, so the operator will normally try to run as much traffic as possible on it. Running a CMTS service requires many head end sites serving many remote CMTS sites.

So instead of running individual fibers to each and every CMTS site, DWDM (dense wavelength division multiplexing) is used instead. DWDM is a technology that allows multiple "virtual fibers" or wavelength channels to be connected through a dark fiber network so that multiple traffic channels can be handled at once, rather than multiple fiber networks being built. To do this a multiplexer is required to combine the traffic together at each end.



The traffic from the CMTS sites is transported back to the backbone network (hence the term "backhauling") and from there, the traffic is managed at the NOC (network operations center).



There are typically two technology options when it comes to DWDM connections: an expensive traditional transponder-based system, or a passive DWDM network. Neither of these are ideal, which means this can present a dilemma for an operator, who needs both capacity and cost-efficiency across a large geographical distance. The traditional transponder-based system provides all the capacity needed, but is expensive and overly complicated. The passive DWDM network allows an operator to connect all the necessary traffic, but there are two limitations:

A. There are restrictions in how much distance there can be between sites
B. There are no channel monitoring features available – this is a key requirement in running a CATV network.

Moreover, operators need to run fiber networks that address needs as the network continues to expand and increase. This means planning for the ability to deliver high-speed services and handle longer distances that exceed the capabilities of a passive multiplexer. It needs to do this while remaining a quality product at a price point customers still see as desirable. The network also needs to be versatile enough to compete against rival operators, such as business Ethernet services in their local areas. The transmission system is at the heart of the fiber network, and this means it can't be the bottleneck to offering a world-class service that can meet present and future needs.

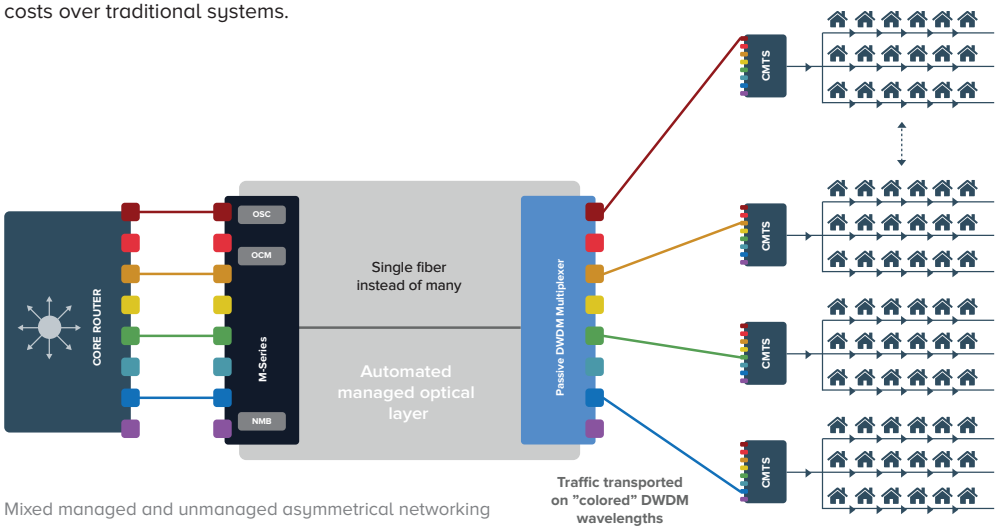
Introducing M-Series, the best of both worlds

Smartoptics M-Series was designed for exactly this type of application. It combines the simplicity of a passive multiplexer with the features of a more traditional transponder-based DWDM platform. It has a 1U multiplexer with integrated management, amplification and signal conditioning that is the perfect fit to CMTS type backhauling applications. It's simple and low cost, yet also intelligent enough to monitor the network and alert the operator of any problems.

The beauty of M-Series is that it can work both with and without DWDM transponders, making it ideal for open line system networking using alien wavelengths. Without transponders the core routers and CMTS simply have a DWDM SFP+ connected to the corresponding port on the multiplexer. No transponders are required and the link monitoring is moved in to the M-Series. And because the transmission costs are lower, the operator can roll more services out to more homes.

Versatile architecture for asymmetrical networking

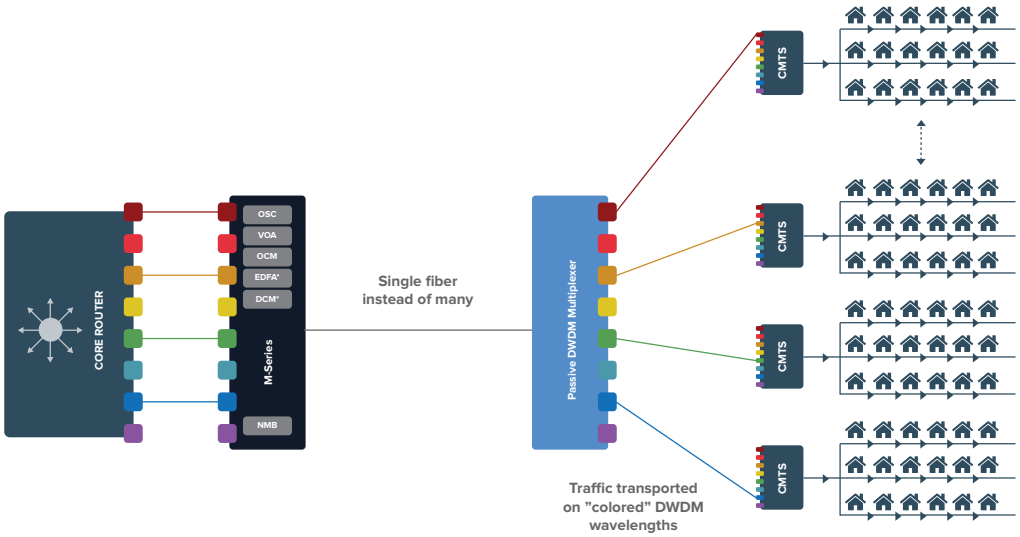
The first major advantage to the M-Series is its use of colored DWDM transceivers directly in the core routing and CMTS equipment. The second, and most significant for scaling and customization is that the Smartoptics approach allows for asymmetrical architecture. This means that the transmission equipment at Site A doesn't need to match what is at Site B, so that there isn't any need to put active equipment at remote customer sites. M-Series with OCM (optical channel monitoring), can be placed at the core sites with line monitoring capabilities. Then operators can place a passive multiplexer without power requirements can be placed at remote sites, keeping cost and power requirements down. It also minimizes the need for serviceable parts at remote sites, which can reduce service and maintenance costs over traditional systems.



Mixed managed and unmanaged asymmetrical networking

Amplification for longer distances

If longer distance networking is required, M-Series can be configured with amplification and signal conditioning. If pre and booster amps are added to the M-Series at the core head ends, this increases the achievable distance between sites to approximately 80km. This still allows operators to use passive multiplexers at remote sites and minimize cost and maintenance requirements.

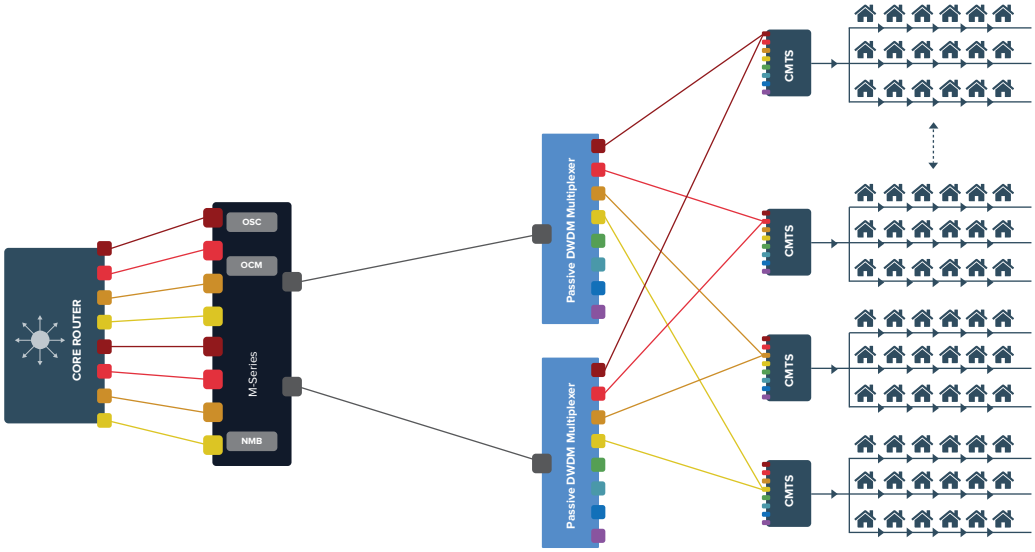


M-Series with embedded amplifiers for longer distance networking

Protection switching for improved service levels

Operators like to run protected services whenever possible, so that in the event of a fiber cut or equipment malfunction, services can run uninterrupted. This protection switching is handled at the IP level in the CMTS and router equipment in the central office (CO). This means that the transmission equipment, in this case the transceiver and M-Series/passive multiplexers do not need to incorporate any kind of protection switching.

Moreover, under normal working conditions, when both fibers are up and running, the system is operating at double capacity (Ether-channel or link aggregation protocols in the Ethernet layer produce double capacity for 1+1 protection). Only if there is an unwanted fiber cut does the capacity drop to a "normal" level. Offering protected services can be prohibitively expensive for such applications.



Dual routed fibers for optical protection

Conclusion

When it comes to content delivery, operators have to balance network performance with quantity and quality of data. DWDM offers the most impressive performance for traffic aggregation for this requirement. But traditional, active telecom systems are incredibly complicated, and passive systems are simply not reliable. Smartoptics M-Series intelligent multiplexer platform delivers the best of both worlds. It allows for a truly open networking architecture where any combination of transponders and embedded DWDM signals can be connected together on the same system. In addition, it offers the ability to use passive architecture at the remote sites. This reduces cost and power, as well as alleviating service requirements.

ABOUT SMARTOPTICS

Smartoptics offers optical transmission solutions making networks more powerful. Expanding bandwidth without the upfront investment or hassle of traditional WDM. Our products allow corporate data centers, governments, hosting solution providers and ISPs to build simple, straightforward and cost effective solutions to fulfill their ongoing and future network capacity needs. Headquartered in Oslo, Norway, Smartoptics is an international provider with thousands of installations all around the world. Our award-winning approach has helped companies from every industry sector stay ahead of expanding network demands.

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Ryensvingen 7
NO-0680 Oslo
Norway
+47 214 174 00

info@smartoptics
smartoptics.com