

Application Note

The fight for **green** optical networking systems now extends to every company and every product in the networking market.



Fiber Driver – the Green Optical Multi-Service Platform

In 2006, the European Union laid the groundwork for green networking systems by banning the use of hazardous materials and substances in electronics. Related restrictions and improvements from the European Union now echo around the globe in local laws that are already moving networking systems along the road to respecting the earth and the environment.

With this first well-defined step, the fight for green optical networking systems now extends to every company and every product in the networking market. The challenge is to provide advanced products and services that consume less space and energy without compromising quality. Minimized space use is not only aesthetic, but it also leads to fewer wasted material resources and protects natural open space by reducing industrial building and real estate needs. Reduced energy use produces fewer greenhouse gas emissions to protect the Earth's environmental balance.

A green optical transport solution makes financial sense for both the customers (service providers, data center operators, enterprise, etc.), and the system vendors. The green revolution is not just cool or "in", it is also a practical need driven by economical realities. Energy, mainly electricity, is the most significant element in the basket of "green parameters". An Ovum (www.ovum.com) research estimates the cost of electricity to be approx. 2% to 3% of the Telcos operating expenses (OPEX). Electricity cost includes direct systems consumption and the very significant cost of cooling these systems. System cooling requires, on average, an additional watt of electricity for every two watts consumed by the system.

The natural increase in data traffic generated by the new applications (e.g. Internet/Intranet based video distribution) combined with extended network reach (FTTx) increases energy demands and consumption. The electricity cost increases as demand grows, which implies extended energy budgets that are even more costly today in the wake of an economic downturn.

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To address these growing technology challenges, the service providers, network and data center operators took action. They build power-hungry data centers and major network co-location centers in geographical areas with low electricity rates or with renewable energy options.

They also started to demand energy efficient systems. The Green Grid, an initiative with nearly one hundred members including industry giants Intel, IBM, AT&T, Microsoft, Cisco, BT, and NTT, aims to develop standards, measurement methods, processes, and technologies to improve the energy efficiency of high technology products mainly in data center applications.

The IEEE P802.3az Energy Efficient Ethernet initiative addresses energy savings while systems are idle. The working group suggests creating a series of new MAC level commands and responses that will allow the Ethernet interfaces on a link to coordinate a behavior change to save energy while in idle.

Verizon set the bar by issuing its own energy-consumption standards and associated measurement process for new telecommunications-related equipment purchased after Jan 1, 2009. The target is a 20% energy efficiency improvement over today's gear. The standards mandate to test and rate optical and video transport systems, switches and routers, DSLAM high-speed internet equipment, optical line termination gear, switching power systems, data center servers, and power adapters that operate customer equipment.

The Verizon standard (<http://www.verizonnebs.com/TPRs/VZ-TPR-9205.pdf>), defines the product efficiency rating (TEEER) as a direct relationship between the system forwarding capacity and its power consumption, weighted for different operation modes. The document establishes minimum pass/fail criteria values for optical and video transport systems, switch, routers, access systems, power supply solutions, data center servers, and customer premises equipment. The calculated TEEER value represents the system energy efficiency rating on a scale from 1 (least efficient) to 10 (most efficient). A measured TEEER for optical or video transport equipment should be better than 7.54.

New energy efficiency rules address direct energy consumption and also indirect costs such as cooling, rental collocation space, and power outlets. A standard power outlet rental can reach \$700 per month, while an enhanced one can reach \$1,300 each month.

Data Center Costs

Area	Percentage
Land	2%
Architectural	7%
Core and Shell Costs	9%
Mechanical/Electrical	82%

Datcenter Dynamics, 2008

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The Fiber Driver platform, packs up to 300 Gbps in just 3U of rack space. With a power consumption of 2 watts to 5 watts per 10-Gbps interface, it consumes only 20% to 30% of the brand name optical transport systems, making the MRV's Fiber Driver an undisputed environmental leader in optical networking.

Fiber Driver was carefully designed and implemented in order to address the growing needs for environmental friendly optical transport solution. The historical small-form factor and low-consumption power supplies present serious technological challenges for adding support for new transport protocols like 10 Gbps or 40 Gbps and beyond. Addressing these challenges requires chutzpah, a lot of innovation, and design intelligence. Unique system features directly address energy efficiency:

- High MTBF and design for long life, proven by more than 30,000 installed multi-slot chassis.
- Common system chassis allows the installed base to be used and re-used for emerging new protocols and technologies, thus reducing replacement cycles and waste.
- Emerging technologies (e.g. 10 Gbps, 40 Gbps) adapt to the inherited small form-factor and power supplies limits, while supporting the existing installed base technology.
- Modules that aggregate the data channels (multiplexers or muxponders) before they access the optical link, reducing the number of optical transmitters and thus the system power consumption.
- Pluggable interfaces that conserve and power-hungry optical interfaces only installed as needed.
- Signal transmission de-activated on disconnected or non-linked interfaces, saving the power burned to activate the optical or copper interface.
- Temperature-controlled fans that lower power consumption, reduce noise, and extend the system MTBF.

Other environmentally friendly features are not so obvious. Fiber Driver consolidates multiple services in the compact, energy efficient, Optical Multi-Service Platform (OMSP). Its multi-facet functionality offers a wide range of services including fiber grooming, service demarcation, and sophisticated wave division multiplexing (WDM) that inherently promotes energy and space conservation. Multi-function, multi-rate modules enhance inventory management and reduce waste. The same system and modules functionally replace multiple independent power-hungry boxes. They also share power and space to convert a copper interface to a long-haul optical link, to deploy fiber based services to remote locations through its converter-based demarcations, or to carry services over a WDM optical network. With its unified multi-service architecture, Fiber Driver is the model of a green optical transport system.



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As a result, the Fiber Driver energy efficiency as measured by the Verizon standards is very impressive:

	Fast Ethernet and 4 x E1 Muxponder	Fast Ethernet Optical Transport	Gigabit Ethernet Demarcation	Gigabit Ethernet Optical Transport	HD-SDI Optical Transport
TEEER	7.81	8.1	8.8	9.1	9.28

Chassis full with same modules	OC-48/STM-16 Optical Transport	4 Gbps Optical Transport	10Gbps Optical Transport	40Gbps Optical Transport
TEEER	9.5	9.41	9.8	9.83

Summary

“Environmental friendly” does not only mean energy efficiency. Size matters! Occupying less space in a data or a collocation center means that you can pack more services in one rack, which translates to less monthly rental (OPEX) for that space and fewer buildings to accommodate all your services. These steps can help preserve natural habitat and the environment.

MRV’s Fiber Driver Optical Multi-Service Platform does not sacrifice quality or performance for price. Its wide range of services incorporate the most advanced technologies at the industry’s best price-to-performance ratios. Turning your optical transport system green with MRV’s Fiber Driver Optical Multi-Service Platform does not break the bank; it just saves money!

MRV has more than 50 offices throughout the world. Addresses, phone numbers and fax numbers are listed at www.mrv.com. Please e-mail us at sales@mrv.com or call us for assistance.

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