WHITE PAPER

AMP NETCONNECT

Tyco Electronics
Our commitment. Your advantage.

Next Generation Fiber Cabling Systems

A number of recent technical and market drivers are likely to result in an increase in the use of optical transmission in preference to electronic transmission in Data Centres.

These trends are reviewed and some of the new technical solutions are described.

What are the big issues facing IT infrastructure?

• Power • Cost • Density • Speed • Latency

POWER

There is a great deal of talk about green data centres, but the primary issue is the increasing cost of power and cooling.

Many vendors are producing low power, green versions of their products, but this only has a marginal effect. An alternative is to take advantage of the relatively low cost of high speed Telecom cable connections, and site the data centres in locations where power is low cost, or even free!

For example, Tyco Electronics is currently installing a 2,000Km, five terabit optical connection between Iceland and Denmark, so that Data Centres can use the very low cost geothermal sources of energy that Iceland has in abundance. This energy is carbon neutral and given the availability of cool water, Iceland is an ideal location for data processing where the latency of the telecom link is not a problem.

There are many other locations around the world where green energy is available, and because data processing does not need to be close to the customer (When you do a google search, or use hot mail, where is the data centre that handles your request?),

Data Processing is an industry that can take advantage of alternative energy sources because it is not limited to specific locations.

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COST

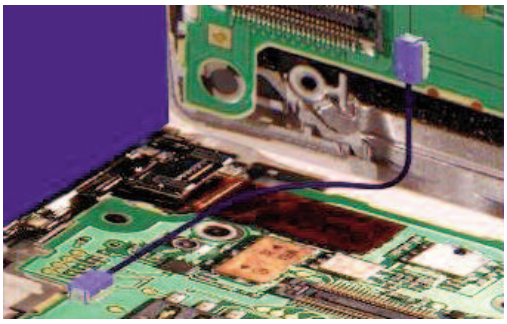
The cost of optical transmission equipment has always been higher than the cost of electronic transmission, so photons have been the particle of choice for longer distance communication.

A recent development by Tyco Electronics may change that equation.

Optical transmission is not inherently low cost – it needs a high volume market to drive down cost.

The need for high speed flexible connections in mobile devices may create that volume market.

There are 1 Billion mobile phones sold every year, and there is a need for a high speed data link between the processor and the display screen. In flip lid (hinge) phones, this link is only a few centimetres, but an optical solution can be cost effective. The illustration shows the relative size of a 2.5Gbit optoelectronic media converter including drive electronics and a VCSEL laser, compared to an RJ45 connector.



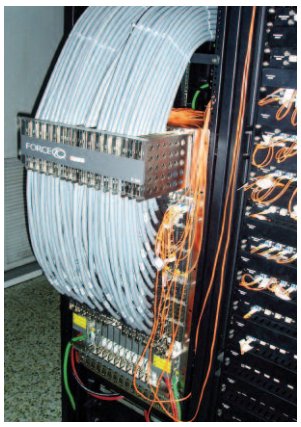
Optics can now have a cost advantage for high speed communication over distances of 2Cm as well as distances of 2,000Km.

DENISTY

At the beginning of this article I mentioned that equipment manufacturers are releasing lower power versions of their products. One way to achieve this is by increasing the density of the electronics circuitry and processing. In order to shrink the total size of the products, the density of the I/O connectivity must also be increased.

The RX-32 Big Iron switch from Foundry Networks recently won the Best of Interop Green Award (April 2008). Using Tyco Electronics MRJ21 connectivity, the RX-32 can provide 1536 ports of Gigabit Ethernet connectivity from a single chassis. This port density also results in a reduction in power consumption per port of 20%

However, switches with this density of copper interfaces create problems due to the size of the copper cables that must be connected.



Another high performance switch using the MRJ21 interface to provide high density low power interfaces is the E1200 from Force 10. As you can see from the illustration, we are reaching the limit of the number of copper cable connections we can make to a switch. However, the benefits of high density switches, for example in condensing the traditional 3 layer switching architecture of data centres down to two, combined with the reduced power per port, mean that the move to high density will accelerate.

Even if Copper cabling is capable of carrying the data, it is too large to meet the next generation requirements for I/O density.

One solution to this problem is the use of active optical cable assemblies. In an active cable assembly, the switch still has a copper interface, with all the benefits of low cost with no issues of cleaning exposed optical surfaces, or potential laser safety concerns.

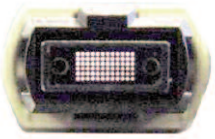
Conversion of the data from electrons to photons takes place inside the connector housing itself, using the very small low cost optoelectronics described earlier.

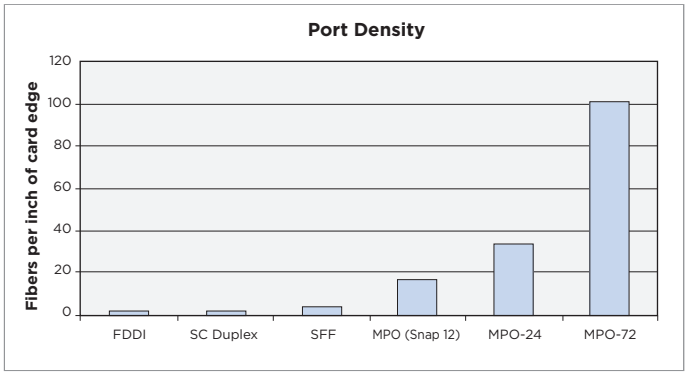
Once the signal is converted to light, the user benefits from a smaller, flexible, lighter cable, enabling higher density cable management and equipment I/O.

Next Generation of High Density connectivity

Active cable assemblies give the benefit of reduced size and weight of fiber cabling, but optical technology also offers the opportunity for even higher density interfaces to electronic equipment.

The illustration shows a Tyco Electronics ParaOptix 72 fiber connector. This connector enables you to connect 100 fibers per inch of card edge, or 50 full duplex connections per inch.





Port Density for common connector styles

In order to benefit from these very high densities of I/O, we need to develop optical circuitry within the switches themselves, to get signals from the transmitters and receivers to the fibers.

Work At Cambridge University, in conjunction with Dow Corning, has demonstrated 10Gbit transmission over polymer waveguide circuits printed onto PCB's. This technology enables multi layer pcb's to be manufactured incorporating a mixture of optical and electrical tracks.

Polymer Waveguides will find application in high density multi layer interconnect, but also in back plane and intra rack communications, as an alternative to patch cords.

Summary

Recent developments in opto-electronic and optical technology, combined with the market drive towards a greener, more energy efficient data processing industry, will result in a new generation of high density, high performance optical interconnects.

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