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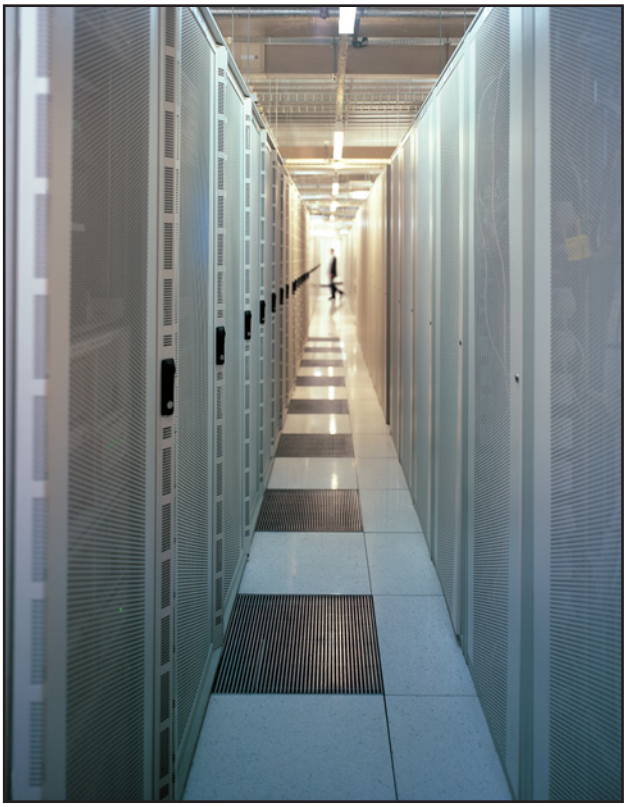

Issues Affecting the Design and Choice of Cabling Infrastructures within Data Centres

White Paper
Nexans Cabling Solutions
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Executive Summary

Planning for the unknown is always a difficult task and none more so than within the Data Centre. Over the past 5 years we have witnessed trends and changes which proved challenging and demanding and in many cases exceeded users' expectations.

This has had a major impact on how the industry meets these demands, resulting in collaboration between vendors and customers alike.

It has been observed that a change in one area has led to an impact and change in other areas, creating a need to have a better understanding across departments, technologies and suppliers.

By studying trends that have occurred throughout the industry this whitepaper sets out to examine the major issues that are affecting the Data Centre environment and to provide customers with an informed choice with regard to future cabling infrastructure design.

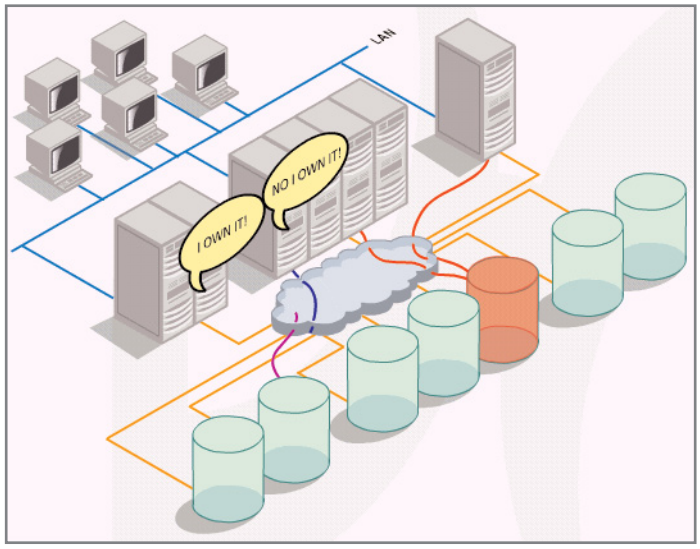
Life Expectations

Before we tackle the issues within a data centre we first of all need to know what the life expectations of the Data Centre are. Different users and organisations have differing expectations depending upon use, size, growth and return on investment. For example, small to medium size enterprises may not necessarily have the same power requirements compared with large multinational enterprises due to the fact that server requirements are on a much smaller scale. Even large scale enterprises will have differing requirements within the same organisation across the globe due to differences in use and size of each data centre.

In most instances SMEs will occupy an office block and will have a 5 to 10 year plan depending upon rent or lease agreements. With demands on storage, server, power and cooling being fairly predictable, planning for the future can be fairly easy. Long term impacts on network bandwidth and cabling requirements are easy to plan for without major upgrades along the way.

Large scale enterprises on the other hand are faced with extremely complex conditions to meet which are much less predictable moving forward. Data Centres up to 100,000sq ft in size are not uncommon and due to their cost, have life expectancies of greater than 20 years.

The major problems data centres of this size face are space, density, bandwidth, power consumption, cooling and management.



Space and Density

The growth of electronic storage has been the major factor over the last 5 years which has impacted both floor space and density. Although great improvements have been made in storage efficiency through server virtualisation this has brought about other issues.

The space savings made by server virtualisation have been eradicated by the following:

- ongoing year on year increase in demand for storage capacity which has led to more servers and storage devices being deployed
- the introduction of fabric switches to enable virtualisation and provide multiple server links as well as redundancy
- an increase in the amount of fibre cabling and patching

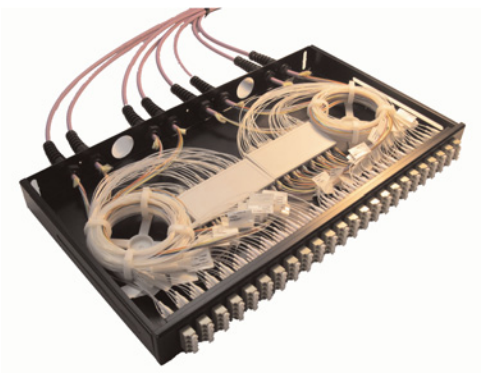
This trend is expected to continue for the foreseeable future due to large enterprise globalisation through mergers and acquisitions, which will drive the need for centralised storage in the Data Centre even further.

Nexans have addressed this issue by constantly evaluating customer needs and developing new products such as our high density 1HU patch panel, which will accommodate 48 fibre pairs. This is double the density of other industry standard products.

Although this effectively means that twice the amount of cabling will go into the same rack space new developments are ongoing to improve this even further.

The uptake of blade server technology is also creating a cable congestion problem in the backbone and with an increasing amount of servers being deployed this congestion problem has become difficult to manage.

Moving to a higher density than 24 cables in 1HU patch panels has proved to be difficult for technicians to work with without disrupting live services when adding or removing patch cords. In order to retain 24 cables in 1HU and at the same time improve density Nexans are developing a new patch panel which removes the need for cable management panels, which effectively doubles the density in the backbone.



Blade Server and Cooling Trends

When blade servers were first introduced cooling systems in place did not have the capacity to match the heat dissipation from the servers. A typical cooling level of 1.4Kw was provided to each cabinet and it was not uncommon for servers to dissipate up to 10Kw of heat.

The economics of introducing more powerful cooling systems did not work due to the extra space this would consume by the cooling system itself and the exorbitant costs involved.

Dispersing the servers around the data centre and covering them with a blanking plate at the base of the cabinet managed to get around the problem in the short term. However, as the business benefits of this new technology became apparent, the demand for them increased, which meant finding a new approach to the problem. Cabinet vendors offered various solutions including water cooled cabinets that brought pros and cons. First it needed a source of water, which although costly to implement had long term cost advantages as this would negate the need for air cooled computer rooms.

In recent times however, significant improvements have been made to the processors inside the server which are the main sources of heat. Intel for example have been shipping their 90nm silicon dual core Xeon processors which have greatly reduced heat output. They have plans to launch mid 2006 the 45nm InSb processor which will reduce heat output by a factor of 10 and increase processor power by 50%.

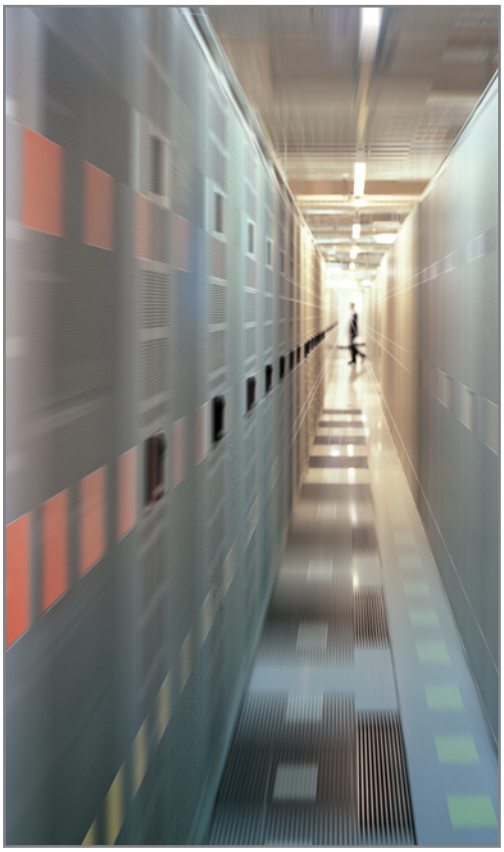
These new developments mean that users can now plan for these in cabinets with standard cooling levels of 1.4Kw.
Looking forward this means we will see cabinets stacked with new blade servers increasing the demand for cable.

Power Consumption

It has been reported that power consumption within the Data Centre has almost doubled over the past 5-10 years due to the increased year on year demand for electronic storage, LAN switches and the introduction of blade servers.
Management of power is now a pre-requisite down to the cabinet level. Cabinet management devices are now available from Nexans which will monitor current draw, temperature and humidity.

Bandwidth

Although the Fibre Channel versus Ethernet debate in the SAN is still ongoing, Fibre Channel still appears to be the preferred choice and will probably continue to do so for the foreseeable future. The arrival of FC over IP seems to have strengthened its position enabling fast back up and recovery to a remote site.



The majority of fabric switches are still only operating at 1Gbps full duplex (2 Gbps aggregate) although FC standards do exist for 4 and 8 Gbps. The next logical step in the standard is for 16Gbps although 10G has been muted to compete with Ethernet and use current fibre cabling standards.

Users are also forecasting a fast uptake of 10G over copper in servers and switches. It appears this may happen in two stages, the first being a 10G up link with 1G network ports and the second moving to 10G network port level.

Choice of Cabling

Although the majority of end users are deploying the highest available spec i.e. CAT6, there is now a need to specify a higher grade of copper cabling to support the newly ratified IEEE 802.3an standard for 10Gigabit Ethernet. Specifying a Nexans 10G or CAT6a solution will solve this.

Some vendors have released CAT6a UTP products which are still having problems with issues related to alien crosstalk. The biggest issue is how to test this in the field which is mandatory for UTP. Even if a solution to this problem is found there are additional cost penalties to pay over and above FTP or shielded systems. It will require two technicians to carry out this ANEXT testing for a UTP line.

There are other issues which need to be addressed however when planning a 10G cabling infrastructure inside a Data Centre.

The increase in blade servers has led to an increase in the number of server cabinets hanging off the LAN backbone. As these rows of cabs get longer an ANEXT phenomenon begins to manifest itself when short and long links are mixed together. The ANEXT will attenuate itself after approx 20m of cable which equates to approx 20 cabinets. However when the server in the 21st cabinet starts transmitting, fresh levels of ANEXT are induced into the cabling which has already been affected and are now victims of new sources of this noise.

To achieve high density patching in the backbone and deliver 10G at the same time is also a challenge for UTP systems. As the patch cord is the weakest link in a channel it is more prone to emitting and receiving high levels of ANEXT especially when connected to switches which are close by.

Mixing different CATEGORIES of UTP cabling with 10G can also lead to problems. Installing new 10G cabling next to legacy CAT5e or CAT6 UTP cabling could result in these services being disrupted as these legacy cables were not designed to eliminate the affects of ANEXT.

Nexans' recommendation is to go shielded. This will negate the need for special planning and installation rules as required by UTP systems. Nexans have three solutions which support 10G and can be tailored to individual customer requirements depending upon future expectations, risk avoidance and cost.

Fibre

The existing OM3 standard to support 10G is the only viable proposition for the foreseeable future. The low loss LC connector is robust and good for high density patching zones as featured in our 48 pair 1HU patch panel. Its low losses allow for combining multiple concatenated links which are common in Data Centres between the SAN and server cabs.

Further work is underway within Nexans to study the performance and relationship between the LC connector and a high density MPO/ribbon style for inter cab links Field termination can be time consuming and costly leading to project delays where high fibre counts are involved. For example, a 1HU 48 fibre pair panel can take as long as eight hours to fusion splice. Nexans have therefore introduced pre-terminated assemblies to significantly reduce installation time. Using pre-terminated factory built assemblies also ensures precision, high quality terminations, which are critical for 10G performance.

Summary

Reliable performance, bandwidth capacity for the future, multiple connection capability, small size and high density are the key drivers for cabling solutions in Data Centres.

It is clear that the growing demand for storage will continue at its present rate for the foreseeable future. It is therefore necessary to ensure bandwidth in the backbone i.e. 10G is in place and high density fibre solutions are adopted to cater for the impact of additional cabling in the backbone.

Copper cabling requirements for all types of servers and switches should be specified up to 10G minimum and must be proven to be reliable in terms of performance. They should be screened to ease planning and installation of the system and must be practicable for high density patching zones
Backbone patching needs to be specified to reflect the ever growing trend towards high density.

The benefits of specifying the correct solution for future needs will cause less disruption, reduce ongoing costs and deliver a better ROI.

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