10G the Next Generation Structured Cabling

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10 Gigabit UTP Technology

This technology paper has been produced in partnership with Belden one of the worlds leading manufacturers of structured cabling products. It is intended to provide an overview of current network technology trends and discusses the real world deployment of Augmented Cat6. This paper also provides a technology overview of the Belden 10GX cabling product.
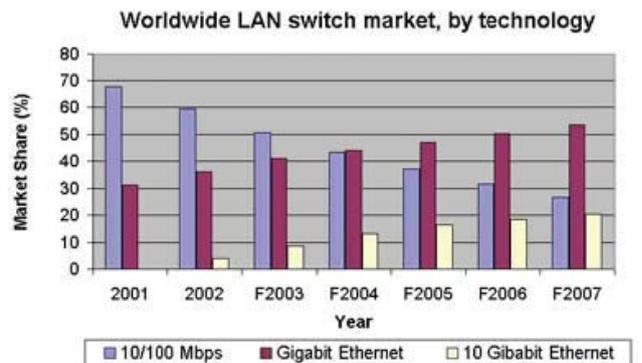
Next Generation Speeds

The speed of horizontal or "access layer" networked data over the last 10 years has risen 100 fold from 10Mbps to 1Gbps. For the majority of network infrastructures the desk top speeds have stabilized at 100Mbps with a more recent trend to migrate slowly to 1Gig as the cost per Ethernet "switch" port has fallen. The cabling medium delivering this data has been well ahead of the Ethernet "switch port" technology. Cat5e superseded Cat5 in 1999 which overnight ensured support of 1Mbps Ethernet to the desk. Whilst Cat6 was introduced in 2002 this still only accounts for approximately 25% of all new structured cabling ports.

With trends for the increase in networking speeds driven by the constant need for data rate to support bandwidth intensive multimedia applications encompassing voice, data, video and remote Storage Area Networks (SAN's), the next generation of Ethernet is moving to 10Gb/s in the horizontal and 40 Gb/s in the backbone using laser optimized multimode or single mode fibre.

10GBaseT was approved as IEEE standard 802.3an on 8th June 2006 and is a 4th generation technology which will provide 10 times the speed for approx three times the price of current generation of Ethernet.

It is expected that 10GBaseT will be well positioned to capture a large share of data centre and high end computing market, providing a lower cost alternative to fibre with the advantage of backward compatibility with 1000BaseT and 100BaseT.

Cable Standards Summary Table

Cable Specification	Year Approved	Bandwidth	Maximum Ethernet Data Speed
Cat5	1991	100MHz	100Mbps
Cat5e	1999	100MHz	1000Mbps (1 Gig)
Cat6	2002	250MHz	1000Mbps (1 Gig)
Cat6a	2007	625MHz	10Gig

Worldwide LAN switch market, by technology

Source: International Data Corp

Augmented Category 6 (Cat6a)

Augmented Cat6 is the only UTP cable that will support the next generation 10GBaseT switch technology. Augmented Cat6 is based on the existing RJ45 presentation for both outlets and patching panel and is fully backward compatible with both Cat5e and Cat6 systems and flyleads.

Horizontal / Desk Top Implementation

If you look back historically Cat5e and Cat6 cabling was in place quite a while before the lowered costs of 100BaseT network electronics made it economically possible for companies to implement. 1000BaseT technology has been around for a number of years and even in today's (2007) market 1000BaseT to the desk top is still not common place. However as costs per port for 1000BaseT continue to fall, and bandwidth demands continue to rise, it is now clear that 1000BaseT will emerge as the predominant technology to the desk top over the next two to three years.

Once 1000BaseT becomes the predominant desk top technology for the first time for many years both Cat5e and Cat6 cabling systems will be effectively have reached there transmission limit and will become a restricting factor for further network performance improvements.

10GBaseT was originally developed primarily as a low cost alternative to optical fibre for data centres. At this stage outside of the obvious storage area network (SAN) applications within the data centre, there are few industries which require or can afford the necessary hardware to implement a 10Gigabit Ethernet to the desk solution. Thus early uses for 10GBaseT and associated 10G UTP cabling include scientific research, 3D CAD design and multimedia applications.

Backbone Implementation

1Gig is now common place for backbone technology with many corporate installations also deploying 10Gigabit speeds. As 1000BaseT will replace 100BaseT in the horizontal, 10GBaseT will replace 1000BaseT in the backbone. Clearly as 10GBaseT is restricted to 100m structured cabling design principles the deployment of 10Gig copper backbones will generally be restricted to small buildings and data centre links.

Typical Augmented Cat6 Cable
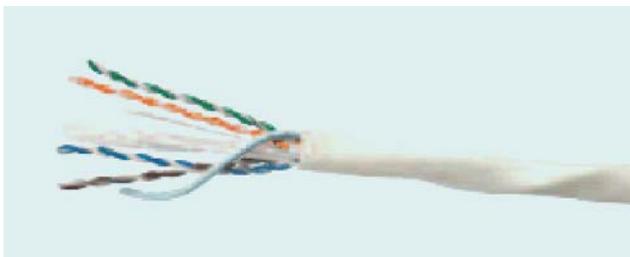
Copper Vs Fibre

10GBase T standards are still in there infancy, compared to 10 Gigabit Ethernet over fibre standard is mature having been around since 2002. With the deployment of OM3 and Single mode fibres distances of 2Km can be achieved far outstripping its copper equivalent. Fibre also has the advantage of been more secure and is free from grounding and electromagnetic interference (EMI) issues. The implementation of passive patching or through splicing within secondary cross connect points allows for a "collapsed" back bone topology further reducing equipment.
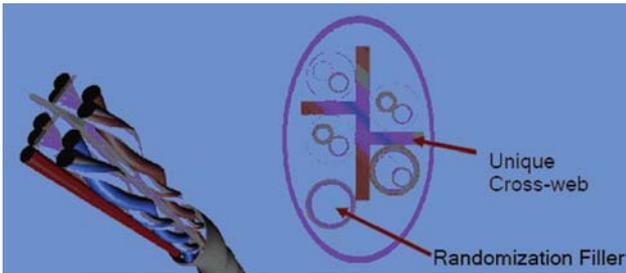
It is anticipated that fibre technology will be retained in the campus and backbone distribution but with 10G Augmented Cat6 copper becoming predominant within the data centre and smaller buildings.

Belden 10GX Cabling Product

Belden 10GX Cabling Components
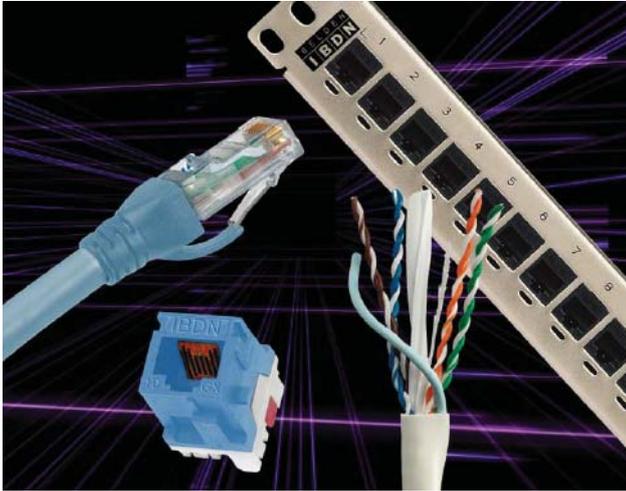
Belden 10GX Cabling Components

The Belden 10GX is a whole new system developed around a series of dynamic enabling technologies to ensure the highest level of alien crosstalk isolation and the best performance margins for a channel extending up to 625 MHz. There are a number of key aspects that differentiate the Belden system from other 10 Gigabit Ethernet offerings. These include technological leadership, performance headroom and testing done under the most stringent conditions.

The Belden solutions incorporate several key patented-pending technologies in connectivity and cabling design.

Connectivity

◆ Innovative module design with minim delay compensation for NEXT performance if up to 625 MHz.

◆ Matrix IDC design and circuit layout to virtually eliminate alien crosstalk reducing APSNEXT by 15db.

◆ Unique X-Bar to ensure consistent termination and reliable NEXT and ANEXT performance after installation.

◆ Module technologies that allow for high density patch panels within inline ports, large simplified labelling areas and proper cable management.

◆ Precision, impedance-matched plug/jack design exceeding channel return loss of better than 8 dB at 500 Mhz.

Cable

Innovative unique cross web design with optimum twist and cabling lays.

Additional integrated filler for increased randomization and inter-cable pair separation, and amazing flexibility.

Bonded-pairs have consistent centricity. This provides uniform and stable transmission characteristics, e.g. impedance, Return Loss and NEXT Loss that is unaffected by installation conditions. Conventional twisted pair designs using unbonded conductors are more prone to installation affects, such as bending, that can negatively affects cable performance.

Panels

1U 48 port patching panels specifically designed for very dense environments such as equipment distribution area's (TIA-942) Standard) or Data Centres.

Creating an effective workspace environment

Conclusions

Conclusions

The installation of any cabling system has a significant cost in both terms of capital and business disruption. Any cabling system will normally have an expected life of between 10 and 25 years.

It is inevitable that the deployment of 1000-BaseT will become the defacto technology standard for desktop network services within the next two to three years. Existing Cat5e and Cat6 deployments will only support data speeds of up to 1000Mbps (up to 100 metres).

The installation of Augmented Category 6 will deliver guaranteed support for the next generation 10GBaseT applications. However the costs of Augmented Category 6 solutions are currently between 2x and 3x compared to that of a comparable Category 6 solution.

The installation of Augmented Cat6 cabling is strongly recommended within the data centre environment where the take up of 10GBaseT technology is likely to be deployed during next generation technology refreshes.

1G vs. 10G Relative Cost Target

The deployment of 10G to the desk may be difficult to justify with typical business capital right down periods of between 3 and 5 years. Therefore at this moment in time except for those business that have the most demanding desk top applications, many organisations may feel that that they are happy to take the risk that 1000BaseT will be adequate for business demands during the short to medium future.
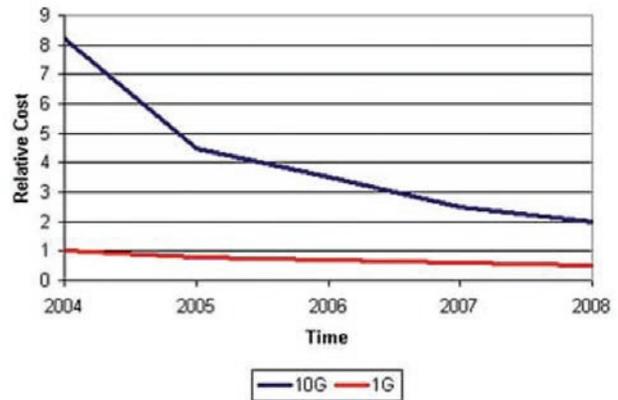
About Workspace Technology

Workspace Technology is one of the UK's leading Belden Certified Systems Vendor (CSV) partners. Workspace Technology design and deploy structured cabling systems for many top of the UK's top 250 companies. Workspace Technology deployed the first UK Belden 10G solution in 2006.

Workspace Technology also specialises and provides a range of services for Network Critical Physical Infrastructure (NCPI) facilities which include Communications, Server and Data Centre facilities.

The design and implementation of structured cabling solutions forms part of Workspace Technology's overall strategy for providing clients with a complete turnkey approach to the design and build of server room solutions.

A copy of Workspace Technology's company profile can be downloaded from **www.workspace-technology.com**.

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