BELDEN

Data Center
Market Solutions and Success Case

About BELDEN

Belden produces and sells a comprehensive portfolio of connectivity and networking products into a variety of markets, including industrial, enterprise, and broadcast. Belden people add value to its highly differentiated, high-performance products through unsurpassed design and engineering, manufacturing excellence and customer service. In conjunction with its partners, these core strengths enable Belden to create end-to-end signal transmission solutions that meet the most demanding standards for data, sound, and video applications.

Belden's business is structured in four product platforms: industrial connectivity, industrial IT, enterprise connectivity and broadcast. Belden's connectivity business includes a wide range of copper, fiber and coaxial cable solutions and fiber and copper connectors for the enterprise, broadcast and industrial markets. Belden's networking business is made up of intelligent wired and wireless products that include Industrial Ethernet switches and related equipment, fiber optic interfaces and media converters used to bridge fieldbus networks over long distances as well as load-moment indicators for mobile cranes and other load-bearing equipment.

Belden, A Reliable Brand

We are honored as a professional solution supplier mainly as we always put our customers in the first place. Our work is to offer innovative standardized products needed by our customers continuously. We can off the most extensive signal transmission products. We also can offer all the necessary data and support to help you make correct decisions for specific applications. Besides, wherever you are, you can get the Belden products.

Belden is continuously growing. We are extending our success in cords to all the signal transmission technologies such as copper cable, fiber and wireless. Our product line covers the complete system solutions including connectivity, accessories, cable pipeline and rack. Today, Belden has more than 30000 types of products including Brilliance AV products, IndustrialTuff industrial and automation products, Belden generic cabling products and New Generation smart building cords.

In the field of AV, Belden established the standard of industry and market, share 87% of the North American market and over 50% of the global market. Our customers include all previous sessions of FIFA, all previous sessions of Olympic Games, all previous US Presidential Elections, CNN news center, Hong Kong TVB, CCTV, STV, etc.

In the field of data networking, Belden’s generic cabling products combine the technical quintessence of Belden and IBDN for hundred years. The precursor of IBDN is the generic cabling department of Nortel Networks Corporation Canada, always positioned in the leading place of the industry and enjoying a great reputation. In 2004, Belden merged with CDT and acquired the famous IBDN. The Belden products include the whole series of CAT5e, CAT6, 10 Gigabit copper cable, fiber cable and wireless solution, and the electronic distribution system of whole series of copper cable and fiber cable. Belden’s products have always been famous for the optimum performance price ratio. The products are the first to certified by the third party technical certification by the internationally recognized individual authority and the third party technical certification by Quality Supervision and Testing Centre of Data Communication Products of Ministry of Information Industry. Belden offers the longest product warranty in the industry of 25 years. It has more than 20 thousand typical cases around the world, including the Palace Museum, Shanghai Citigroup Tower, National Grand Theater, NASA Headquarters, Beijing Oriental Plaza which is the largest cabling project in Asia, etc.

New Generation smart building cords products include audio, security and alarm cable, special fire alarm cable, control cable and special air conditioning cable. These products have non shielded and various shielded combinations and various flame-retarded ratings. Our customers include Shanghai Pudong International Airport, Shanghai Hang Lung Plaza, etc.

Using environment-friendly materials is one of Belden's principles. Almost all the Belden products conform to the requirements of ROHS Directive and California Proposition 65. Belden products also conform to the requirements of China ROHS.

Faster .
Easier .
Better .

Meeting the Critical Needs of Data Center – Belden Data Center Solution

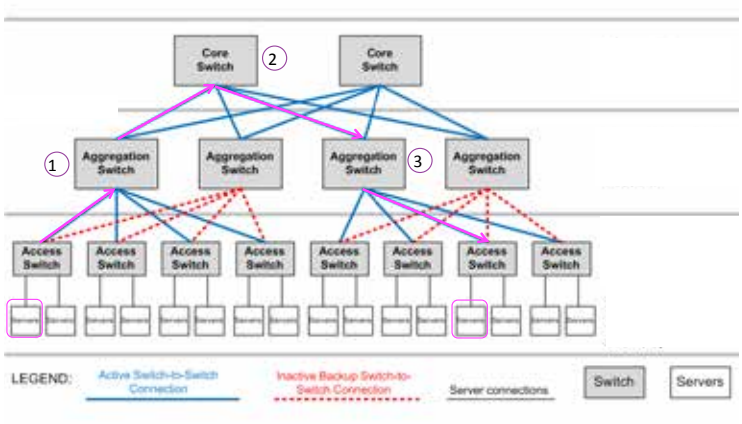
Data Center Network Architecture Has Changed:

Adoption of cloud computing and server virtualization technologies is changing the networking landscape

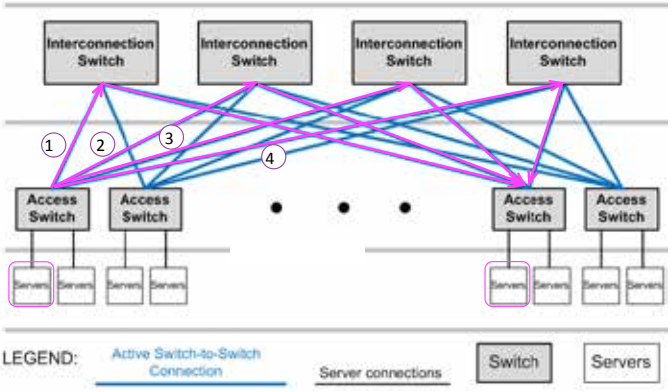
Applications can reside on virtual machines anywhere in a data center. East-West traffic is increasing. Data center traffic has changed from north-south (into and out of the data center) to predominantly east-west (server-to-server)

The Data Center Standard TIA-942-A has also evolved accordingly. Data Center switch fabrics are designed to meet the needs of virtualized networks and to keep up with ever-increasing application and traffic loads, it has become leading architecture vs. traditional 3-Tier Switch Architecture.

The change of Data Center structure



Traditional 3-Tier Switch Architecture



Data Center Fabric: Fat-Tree Architecture Example

Challenges:

- Infrastructures do not meet flexibility of business
- Margin erosion due to high power consumption
- Low ROI due to poor management capability
- Stability & Continuity of business built on redundancy too much

Data Center Ready ——Faster, Easier, Better

Belden’s unique Data Center Ready approach can save your valuable time and money. Rest assured knowing all of the components have been manufacturer-tested and are backed by the industry-leading 25 years warranty. With Belden, you can get the complicated job done in simply 7 steps:

Step 1: Using Data Center Ready template, the project requirements are defined

Step 2: Recommendation from Belden (fiber, copper, power, air flow, enclosure, cable management)

Step 3: Submittal drawings and solution BOM sent from Belden

Step 4: Once customer approves solution, Belden manufacturers

Step 5: Once order is placed, system comes with unit identification specific to data center lay out

Step 6: Delivery, logistics (load up, packaging type, delivery services)

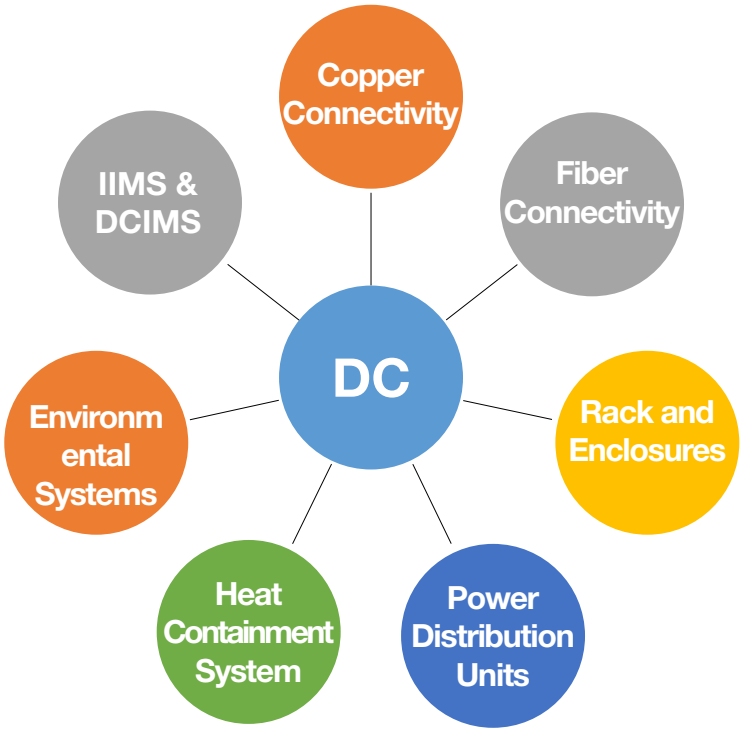
Step 7: Designs are stored for future customization / deployment

Customer Benefits:

Contractor	End User	System Integrator	Distribution
• Lowers the cost of material handling • Less on site waste • Less packaging material to remove • Faster, more repeatable installations • Factory installed and tested systems • Allows for faster deployments • Easier installations • Better schedule roll outs	• Faster, repeatable deployments • Faster installations • Factory tested and assembled parts • Bundled pricing discounts • Simplified ordering • Manage roll outs easier • One stop shopping	• Faster deployments • Factory tested and approved systems • Less install time • Can ship fully assembled to make onsite set up time minimal • Single part number for entire systems • Manage roll outs • Reduce onsite work due to improper installation of networking physical infrastructure • Single part number reduces disordering of parts of extra parts on site	• Single part number ordering • System ships with all Belden parts installed • Ships direct to end users to reduce warehouse inventory • Simplified ordering process • Faster shipping • Factory tested and installed parts • Integrates with other value added services but taking the labor out of the installing basic network infrastructure • Easier to follow pricing and invoicing • More favorable shipping terms
More Time for Value Added Activity	**Faster, Easier, Repeatable Deployments**	**Faster Deployments, Less Call Backs, Factory Tested**	**Simplified Pricing, Single P/N, Easy Ordering**

Understand More About Belden Data Center Portfolios

As leading industry solution provider, Belden has not only complete portfolios to cover all aspects of Data Center demand, but also can best fit the new trend of Data Center architecture, and solve customer’s major concerns.



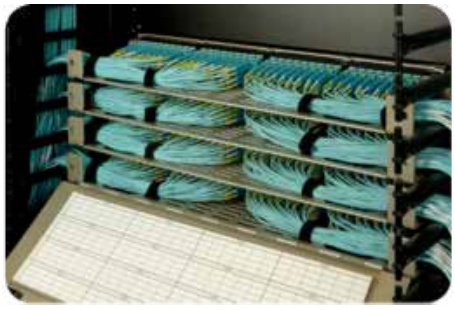
Belden 10Gx Copper Pre–Term Solutions Advantage:

- 2 Key Components:
- 10GX RJ45 Coupler, best in World!
- 10GX Pre-Term Cable Assemblies
- Easy Termination, Easy Configuration Ordering and Deployment
- Modular Design, Compatible to Existing Resources
- Save Time and Money by 90%
- 625MHz guaranteed, exceeding CAT6A standard
- Certified for extremely short runs (1 meter between couplers)
- Allows up to 12 couplers in a 100 meter channel!
- Extremely short channel of 2.6M, with 3 couplers possible in Cat 6A (TIA Std Min: 19M)

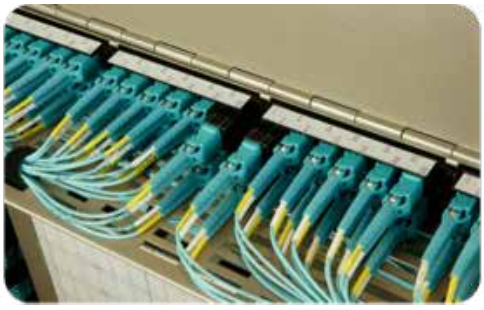
Traceable Patch Cords

- Available in 10GX and CAT6+ for end-to-end Belden 10GX, 4800, 3600 and 2400 systems
- Exceptionally bright, efficient LED light for easy identification in both bright and dark environments
- Belden Bonded-Pair technology for extra robustness, performance and reliability
- Bar code tagging on each end of the cord compatible with DCIM systems
- Low-profile plug boot supports ultra-high density 48-port 1U patch panels
- 100% factory tested and certified for Category 6A and Category 6
- Replaceable battery with 7-year life expectancy or 1,000 activations
- Available in a variety of colors and sizes, with custom lengths available to 250 feet
- Backed by superior support and a Belden 25-year IBDN Certified System Warranty

Belden FiberExpress UHD Solution



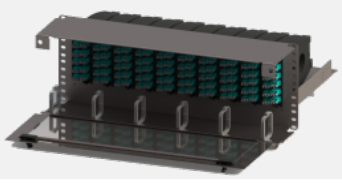
Density



Usability

Accessibility

FX UHD Housing
- Feature-Rich
- 1U – 4 Module, 72LC Duplex (144F)
- 2U – 8 Module, 144LC Duplex (288F)
- 4U – 16 Module, 288 LC Duplex (576F)



FX UHD Shelf
- Cost-Effective
- Std. or Recessed
- 1U – 4 Module
- 4U – 10 Module (vert.)

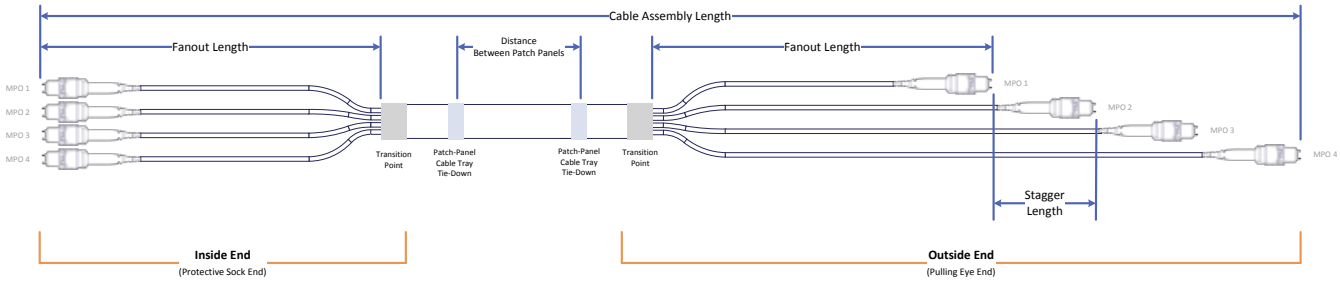
Ultra Frame
- Up to 12-Port (24f)
- 1" Pull-Out
- LC, SC, ST & MPO

Ultra Frame
- 18-Port (36f)
- Fixed
- LC & MPO

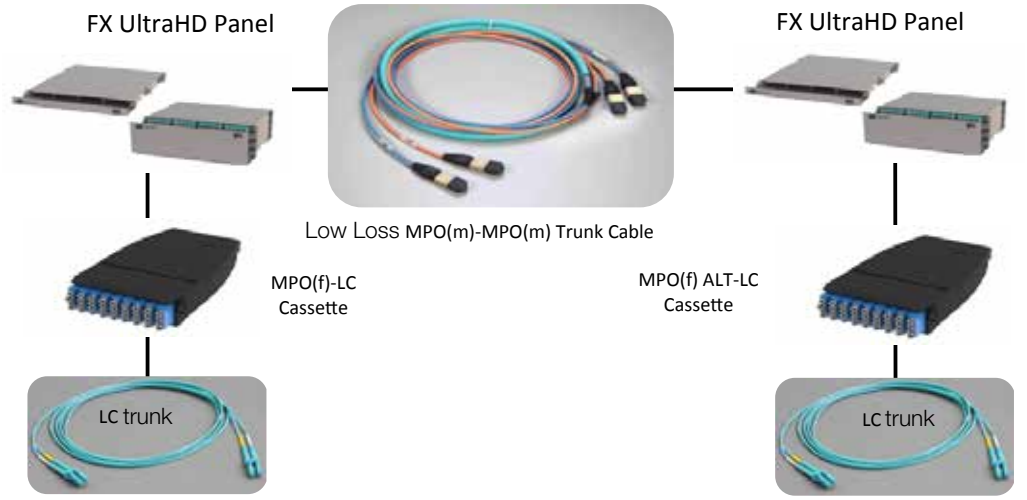
Ultra Cassette
- Up to 12-Port (24f)
- 1" Pull-Out
- LC, SC, ST & MPO

Ultra Cassette
- 18-Port (36f)
- Fixed
- LC & MPO

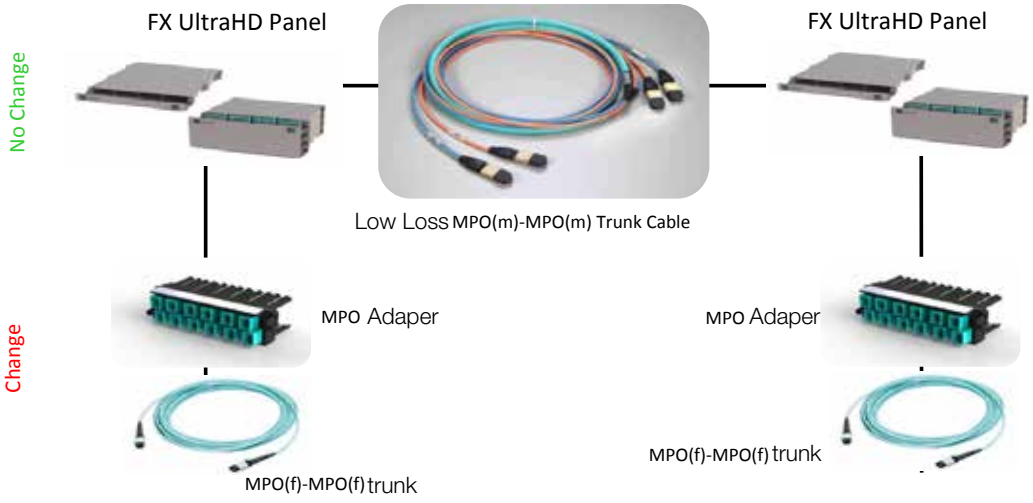
FiberExpress Panel & Adaption Connectivity



FiberExpress Pre-Term MPO Assemblies



10GNetword Architecture



Easy & cheap migration from 10G to 40G

Racks & Enclosures

Racks and Enclosures are the key to setting up a good data centre. All active devices, which are the primary reason why a data center exist, are housed inside these “metal cages”. They are typically arranged in rows and can house variety of active devices. Different equipments may need different types of enclosures.

With a wide range of products (UltraFlex, XN, XS series) designed to address customer concerns, Belden is no.1 choice for some leading data centers that can solve your concerns:

- Density & Flexibility
- Floor Weight and Load bearing capacity
- Airflow to equipments
- Logistics
- Security

UltraFlex Series Features & Advantages:

- 600 X 1000, 600 X 1200
- 800 X 800, 800 X 1000, 800 X 1200
- 42U & 47U
- Totally Knock Down condition – easy & cost effective transportation
- The best Weight (110KG) to Load (1200KG) ratio for an enclosure – 1:11+ - better loading
- Over 1000 Sq-in, open area in the front and back door – better air circulation
- Available with 0U panels – improve density

IIMS+DCIMS

Intelligent Infrastructure Management Solution (IIMS) is next level of sophistication in passive cabling infrastructure. IIMS is adding a layer between the NMS and Layer 1 cabling to provide real time visibility to the entire infrastructure, including mapping all IP devices in real location, adding an extra layer of physical security and reliability. It resolve the key concerns and has also the benefits as follows:

Key Concerns:

- Increased network complexity
- Business continuity and reliability is a must
- Maximized asset utilization
- Connectivity management across premises

Benefits:

- Automated and accurate infrastructure documentation
- Real-time connectivity control
- Current location of all IP-driven devices
- Physical layer security capabilities

Faster .
Easier .
Better .

NetView – Belden IIMS Solution

Planning, provisioning & daily operations.
Consists of:

- Belden IIMS cabling components
- NV4E intelligent hardware
- Belden’s software solution suite

Includes a broad range of options for every requirements:

- CAT 6a, 6 and 5e
- UTP & STP copper cabling
- SMF, MMF optical cabling supporting MPO, LC, SC & ST connectors

- Provides a complete and accurate view of network connectivity
- Modular design offers optimal solution for any network size
- Allows the user centralized management of multiple remote locations

Belden’s Software Solution Suite

PDU & Environmental Sensors

PDU provides the requisite power to all the key active equipment inside the data centers. They can be quite complex, because of the design requirements. They vary based on voltage, amperage, phase, receptacle type, level of intelligence, measurement accuracy, number of power ports, reliability etc.

Belden now offers IEC C13 and C19 receptacles with an integrated locking feature. Built within the receptacle housing, the integrated locking mechanism protects the power cords against vibration and external elements that can easily dislodge external locking clips or guides. This self-contained locking mechanism works with any standard IEC plug. IEC standards allow plug removal forces from as low as 4.5N to as high as 60N. This wide allowable range means plugs can be dislodged with just 1lb of force applied. This means some could conceivably fall out easily from the weight of their cord alone. The security of locking receptacles is a must for environments with stringent uptime requirements.

Environmental Sensors are key to monitoring the Data Centre activities and preventing unforeseen situations There are host of environmental challenges a Data Centre faces, including inadequate cooling, power outages, water leaks, security threats, etc.

Adaptive Enclosure Heat Containment System (AEHC)

Cooling is the second most critical aspect of a Data Centre (after Power) and which can cause significant cost implication for any DC. As the need for computation increases exponentially, the server density also increases. Requiring more efficient cooling techniques. Belden AEHC offers a very easy, cost effective and simple solution to address the ever growing cooling need.

By physically separating the supply and return air, saves energy and lower the cooling cost by 30-50%:

- Separation – predictable airflow paths, Controlled/Stable environment
- Eliminates “Bypass Air” and “Air Recirculation”
- Reduce or eliminate cool air oversupply (2.6 to <1.2)
- Elimination of hot spots, increase IT equipment availability

- Allows for high density deploy (up to 30KW/rack) without "precision cooling"
- Increase supply air temperature (better use of economizer loop, 8-10 degree)
- Increase return air temperature to CRAC (increase CRAC efficiency)
- Dissociate ability to deploy high density rack to location in the data center (increased flexibility)

Key Differentiator: Customization

Unique to Belden Solution

- Tilting panels
- Universal mounting system
- Ability to design to customer specifications

Flexible System Design

- Fixed and tilting panels
- End of row door options
- Color options to match Belden racks
- Hot or cold Aisle Containment
- Vertical (ducted) or horizontal (POD) designs

Our complete solution is tailored to the customers needs.

Unique Feature: Tilting Panels

System is connected to fire suppression to quickly move out of the way to allow fire system to work and not become a hazard in the room

1. System Running

2. Fire alarm goes off

3. Panels Tilt Out

- No trip hazard (egress)
- Testable
- Resettable
- Faster release of panels
- NFPA75

Project List

Belden is one of the only brand that is qualified supplier for all the top 3 Internet companies' data center project. Belden has been involved in hundreds of data center construction in recent three years, here listed two signature cases:

A Company Thousand Island Lake,Data Center

September, 2015

A Company Thousand Island Lake,Data Center is located in the Thousand Island Lake, Chunan County, Hangzhou City. It covers 3175.75 square meters, named the most beautiful data center. Thousand Island Lake Data Center is a leading new-generation green data center in the country. It is cooled with the deep lake water and uses the customized hardware of Alibaba. The design annual mean PUE (Power Usage Effectiveness) is lower than 1.3, and the lowest PUE is 1.17, which saves power of tens of million kilowatt-hour in a whole year and saves more than ten thousand ton standard coal compared with normal data centers. It is also one of the most energy-saving data center in the subtropical belt of the country.Besides energy saving, another great characteristic of Thousand Island Lake Data Center is water saving. The design annual WUE (Water Use Efficiency) can reach 0.197. It breaks the lowest record of WUE0.28 kept by Facebook Oregon Data Center.Belden supplied fiber solutions for the 40G and 100G applications with MPO24-core conversion modules and MPO pre-fabricated cables.

B Company Cloud Computing (Yangquan) Center

2015

B Company Cloud Computing (Yangquan) Center is located in the East Zone of Yangquan Economic and Technological Development Zone, Shanxi Province. As cloud computing is one of the latest trends in high technology, the daily data processing throughput at B Company has reached a level of tens of PBs, taking a lead in the industry. After completion, B Company Cloud Computing (Yangquan) Center will extend full support to the online business of B Company on the one hand by dynamically distributing computation and storage and enhancing the stability and reliability for data processing at B Company, and will also provide a verity of services to the public on the other hand, including B Company cloud storage, cloud operating system, B Company App Engine (BAE), analytics-based operation, cloud testing, etc.

The project construction period is four years. The Phase I project for the center features 120,000 m2 of overall floor area, achieving the first level in Asia in terms of scale of data storage, computing power, and environmental and energy conservation. After completion, B Company Cloud Computing (Yangquan) Center can store more than 4000 PB of data, equivalent to more than 200,000 folds of the total collections at the National Library of China. As a result of the adoption of high-performance, low-power servers independently developed by B Company, this data center will accommodate 700,000 CPUs in total, including more than 3,000,000 processor cores. Moreover, the center has also applied a number of new technologies that fit the environment in China and local codes and regulations, improving the overall energy efficiency at the data center, saving energy by up to 43%, and meeting the top level in Asia in terms of environmental protection.

NASA Kennedy Space Center

Belden's state-of-the-art 10 Gigabit structured cabling system — the first to guarantee 625 MHz network performance — is installed in NASA's missioncritical Operations Support Building II in Merritt Island, Florida.

The five-story, 190,000-sq-ft building houses training facilities, as well as operations, for 960 engineers and other professionals who play a crucial role in NASA's space program and the shuttle launches at the Kennedy Space Center (KSC). The communications network is essential to NASA's missions, and a robust structured cabling infrastructure is critical to the reliable performance of their network.

NASA's goal for this project was to migrate to a highperformance, integrated communications system. The system had to be capable of supporting all current voice, data and broadband video functions, and offer sufficient headroom to accommodate additional data-intensive applications in the years ahead. A change in NASA standards drove the move to a 10Gb copper solution.

In early 2005, Belden introduced its IBDN® System 10GX®, a revolutionary UTP cabling solution designed to support 10 Gigabit Ethernet. Belden backs this new system with an unprecedented guarantee of reliable performance up to 625 MHz, which goes far beyond what any other manufacturer can support. Most vendors will certify their Augmented Category 6 systems to only 500 MHz.

Each workstation in the Operations Support Building II is equipped with a MediaFlex faceplate and three Belden IBDN® System 10GX cables — two for data, one for voice. To date, 4,000 drops have been tested and all performed beyond 625 MHz without a single failure.

According to installers at NASA's Operations Support Building II, the IBDN® System 10GX® cables are run through cable trays configured in a star topology to the offices on each floor, where the majority of workstations are equipped with three 10GX cables — two for data and one for voice. The 10GX cables are also used to support broadband and video applications on the building's 5th floor.

The main telecommunications room, located on the first floor, houses 2,400 incoming copper pairs, as well as 288 incoming fiber strands from an installed fiber optic backbone in which Belden FiberExpress® panels and connectors are utilized. Belden GigaBIX hardware is installed in the main telecom room and in each floor's telecom room to provide space-saving voice terminations and cross-connects.

As the System 10GX installation neared completion, with all horizontal links installed. All performed beyond 625 MHz, with not a single failure.