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Convergence & Evolution Doing More With Less

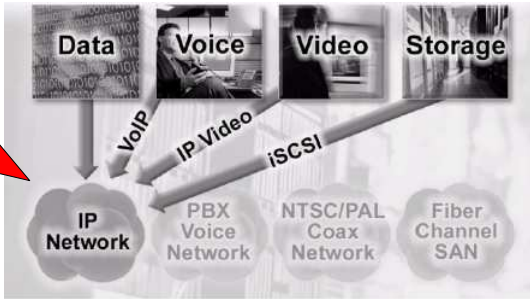
Mike Carter
Transmission Engineer
ADC KRONE



Technologies are Converging

- Voice - VoIP
- Video – Digital TV, HDTV, video conferencing
- Security, CCTV – IP cameras
- Storage SAN - iSCSI

Power - PoE



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A Common Cable and Connectivity Approach



- Traditional Network Cabling is now being used for control and transport systems for other networks
- HB25 blocks are being used to wire security systems
- They are also being used for video over twisted pairs



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Requirements in IP Convergence



- Security for every aspect of the business
 - All aspects of the business are now on the same IP network
 - Authorized access needs to be strictly controlled
- Reliability is essential
 - When the network is the business it can't stop working
 - Every layer now needs to be rock solid
- Speed to keep up with demands
 - Networking speeds will soon be put to the test like never before
 - Applications will be expected to run real-time

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Check list for Smart Building



- ✓ Early Participation with Cabling Vendor
- ✓ Clear Direction from Owner, with Effective Decision Maker for the Integration
- ✓ Adjustment to Design Team and Contactors
- ✓ Clearly Identify the Systems
- ✓ Adhere to the Foundations of Open and Standard Cabling, Network Protocols, Databases and Web Access
- ✓ **Use Latest Cable Technology**
- ✓ Segregate the Comms Cabling and Power Pathways
- ✓ Plan To Remove Abandoned Cable in Renovations

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10 GBASE-T



- IEEE, TIA and ISO Augmented Cat 6 runs 10GBE on UTP
 - ✓ Distance up to 100 m channel at 20 deg C
 - ✓ 4 connectors in channel
- IEEE 802.3an requirements were set by a broad range of users, equipment manufacturers and cabling vendors
- IEEE 802.3an Standard for 10GBASE-T published Sept 2006
 - ✓ Switch manufacturers use this for 10GBE requirements

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Augmented Cat 6 UTP - Cat 6_A



Transmission Performance Requirements for 4-Pair 100 Ohm Augmented Category 6 Cabling

- ISO 11801 Amdt 1 for Channel only
 - ✓ Approved February 2008
- ISO 11801 Amdt 2 for PL & components only
 - ✓ Due October 2009
- TIA-568-B.2-10 Transmission Performance Requirements for 4-Pair 100 Ohm Augmented Category 6 Cabling
 - ✓ Approved February 2008
- ISO and TIA Class E_A Test Parameters
 - ✓ already loaded in current tester software

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Augmented Cat 6 UTP - Cat 6_A



- ISO/IEC 11801:2002 Amendment 1
 - Classes E_A & F_A Channels pass marks well known
 - Cable lengths:-

Table 31 Minimum and maximum length

Segment	Minimum m	Maximum m
FD - CP	15	85
CP - TO	5	-
FD - TO (when no CP)	15	90
Work area cord ^a	2	5
Patch cord	2	-
Equipment cord ^b	2	5
Total of all cords	-	10

^a If there is no CP, the minimum length of the work area cord is 1 m.

^b If there is no cross-connect, the minimum length of the equipment cord is 1 m.

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Augmented Cat 6 UTP - Cat 6_A



Transmission Performance Requirements for 4-Pair 100 Ohm Augmented Category 6 Cabling

- ISO/IEC 11801:2002 Amendment 2
 - Classes E_A & F_A Permanent Links
 - Category 6_A & 7_A components (cables, connectors, cords)
 - Dependent upon mathematical modelling of cabling / components
 - LC connectivity requirement at the TO for new installations
 - OM4 optical fibre cable under discussion
 - Planned publication date October 2009

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Augmented Cat 6 UTP - Cat 6_A



- Advantages of Cat 6_A UTP Cabling
 - ✓ Longer distance than Cat 6 for 10GBE
 - ✓ 10 x times the application speed capacity of Cat 6
 - ✓ Installation techniques and times comparable to Cat 6
 - ✓ Better ANEXT external noise suppression than C6
 - ✓ Pathway requirements comparable to STP C6
 - ✓ No earthing & bonding issued as with STP C6 & C7
 - ✓ Larger conductors are better suited to PoE Plus
 - ✓ 30% small dia C6_A UTP cables are available if required

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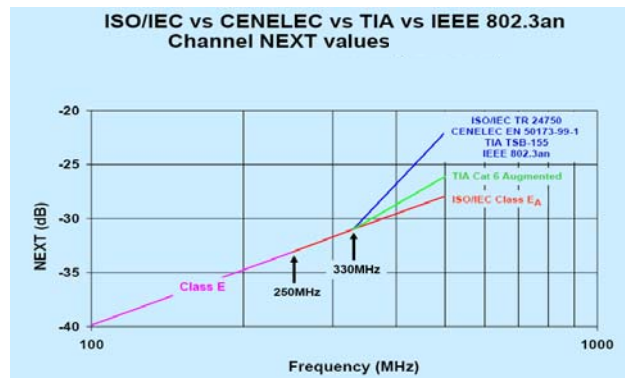
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Augmented Cat 6 UTP - Cat 6A



- Called Cat 6_A by ISO, called Cat 6A by TIA
- TIA Cat 6A requires better NEXT performance than IEEE
- ISO Cat 6_A requires better NEXT performance than TIA



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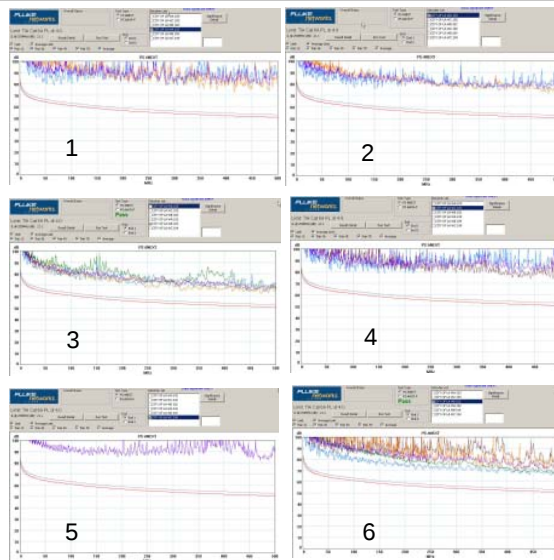
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ANEXT Testing



- Testing the ANEXT effects of all 6 cables around 1 victim
- Testing more than 6 around 1 is not necessary because the contribution is insignificant further out



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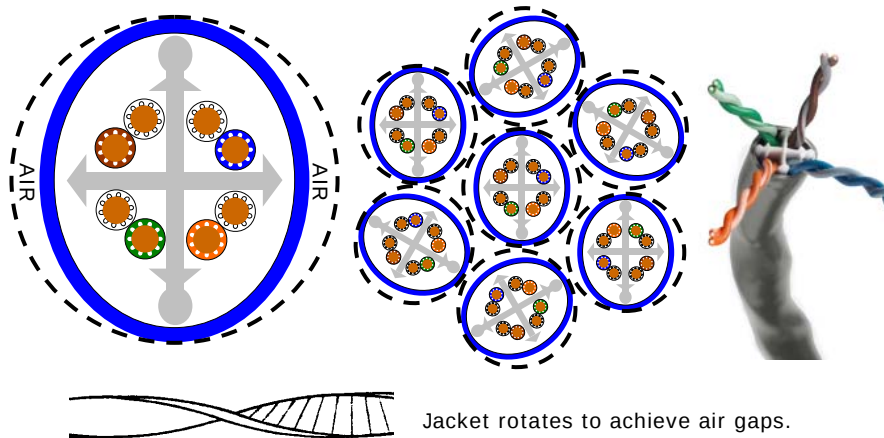
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State of the Art Copper Cat 6_A UTP



ADC utilises air was between the jacketed product to mitigate Alien Crosstalk

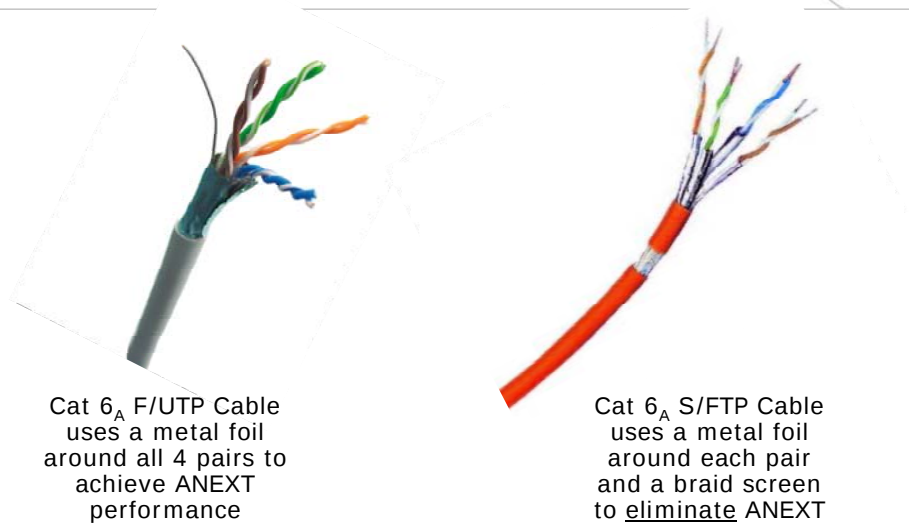


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ADC State of the Art Copper Cat 6_A S/FTP



Cat 6_A F/UTP Cable
uses a metal foil
around all 4 pairs to
achieve ANEXT
performance

Cat 6_A S/FTP Cable
uses a metal foil
around each pair
and a braid screen
to eliminate ANEXT

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Standards Publication dates



- IEEE 802.3an (10GBASE-T) - **PUBLISHED** **September 2006**
- Installed cabling to support 10GBASE-T
 - ISO/IEC TR 24750 - **PUBLISHED** **July 2007**
 - TIA-TSB-155 - **PUBLISHED** **March 2007**
- New Class E_A / Augmented Category 6 cabling
 - ISO/IEC 11801:2002 Ad.1 (channel only) **PUBLISHED** **May 2008**
 - » De facto channel standard since September 2007
 - ISO/IEC 11801:2002 Ad.2 (links, components) **Due April 2009**
 - TIA-568-B.2-10 **Published April 2008**

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Standards Publication dates



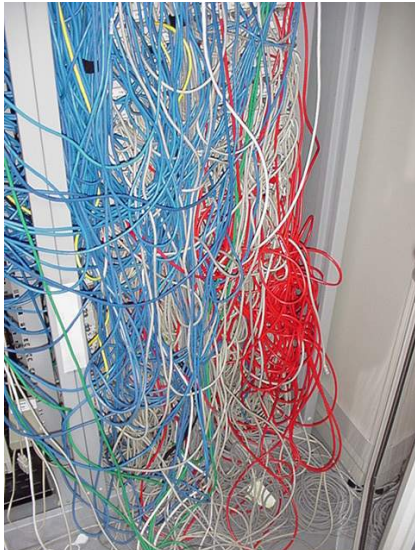
- IEEE 802.3at (PoE Plus)
 - Planned publication date December 2008
- IEEE 802.3az (Energy Efficient Ethernet)
 - Planned publication date November 2009
- IEEE 802.3ba (40/100GBASE-*)
 - Planned publication date May 2010

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Seen This Before?



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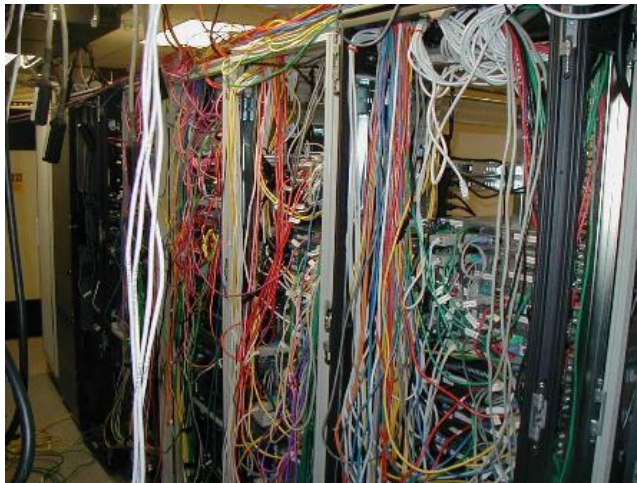
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Good Products, Bad Practices



But what happens if poor cable management blocks airflow?



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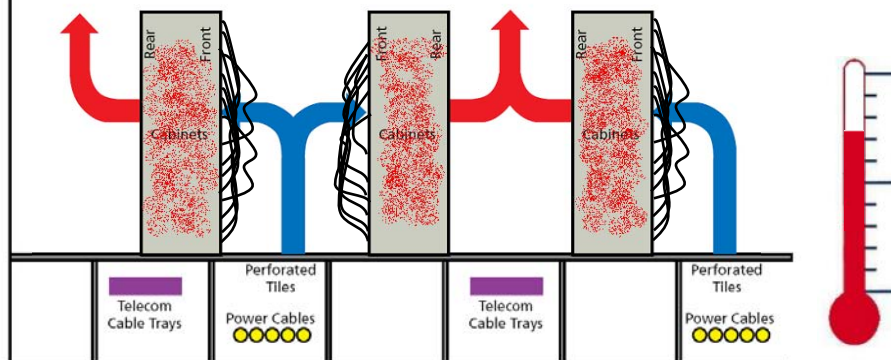
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Reliability of Data Centre Equipment is Directly Tied to Proper Cooling



Cables blocking air inlets and exits will raise the temperature of switches and servers lowering their reliability!

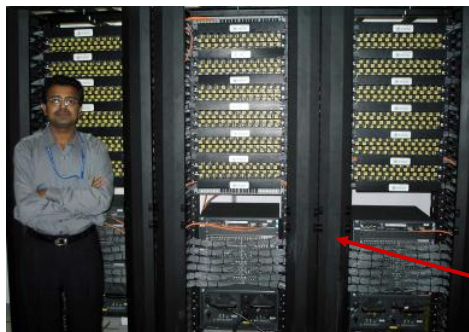


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When it's done right the first time!



- Ideally a Data centre should not only be designed and installed in a tidy user friendly manner
- But also be maintained to the same level of installed manageability!



Wall-mount Cat 6_A
Distribution Frame

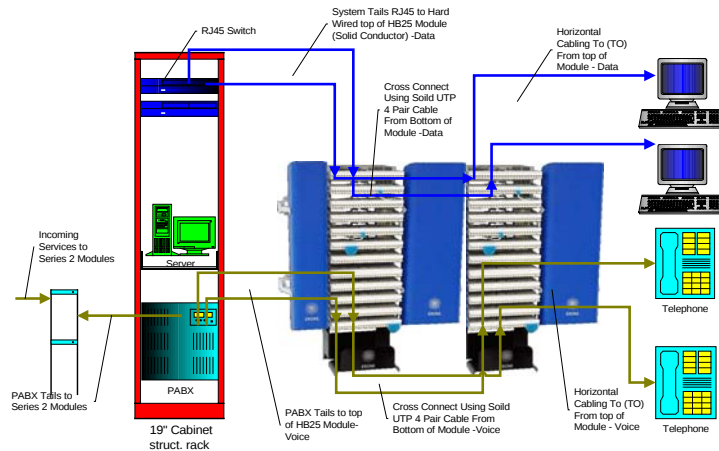
Glide Cable/Cord
Management

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Wall Mounted Distribution Frames



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Trends in Data Centre Design - Cabling



- Designed to TIA-942 Standard [ISO 24764 under review]
- Emphasis on higher levels of Uptime (Tier 3 and 4)
- Only use Cat 6_A and OM3 Fiber as a minimum
- Higher concentration of cabling (High Density Servers)
- Designed to support 10 Gigabit Ethernet and beyond

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ISO / IEC 24764 Data Centres



- ISO/IEC 24764
 - Data centre cabling
 - » Requires minimum of Class E_A cabling
 - » Requires minimum of Class OF-300 cabling with OM3 optical fibre cable
 - » Requires LC connectivity in general for multi-mode optical fibres
 - Planned publication date March 2009

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Data Centre Reliability Tiers



This chart illustrates Tier similarities and differences

	TIER I	TIER II	TIER III	TIER IV
Number of delivery paths	Only 1	Only 1	1 active 1 passive	2 active
Redundant components	N	N+1	N+1	2 (N+1) or S+S
Support space to raised floor ratio	20%	30%	80-90%	100%
Initial watts/ft ²	20-30	40-50	40-60	50-80
Ultimate watts/ft ²	20-30	40-50	100-150	150+
Raised floor height	12"	18"	30-36"	30-36"
Floor loading pounds/ft ²	85	100	150	150+
Utility voltage	208, 480	208, 480	12-15kV	12-15kV
Months to implement	3	3 to 6	15 to 20	15 to 20
Year first deployed	1965	1970	1985	1995
Construction \$/ft ² raised floor*	\$450	\$600	\$900	\$1,100+
Annual IT downtime due to site	28.8 hrs	22.0 hrs	1.6 hrs	0.4 hrs
Site availability	99.671%	99.749%	99.982%	99.995%

*Excludes land and architectural costs. Assumes minimum of \$5,000/ft² of raised floor, and ceiling grid plus one story filled out with typical equipment, but with backbone designed to allow expansion to reach the ultimate capacity.

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Network Engineer Concerns within the Data Centre



- Scalable
 - Density of equipment, cabinets, frames
 - Fast and Accurate Moves, Adds, and Changes
- Thermal
 - **Problematic in most data centres (designed before Blade Servers)**
 - **Poor Air Flow is the largest concern**
- Reliability/Uptime
 - Can't afford any downtime even during expansion
- How can ADC positively impact each area of concern?

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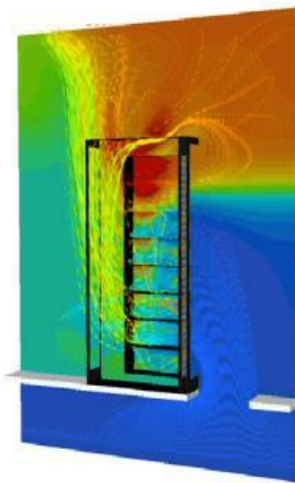
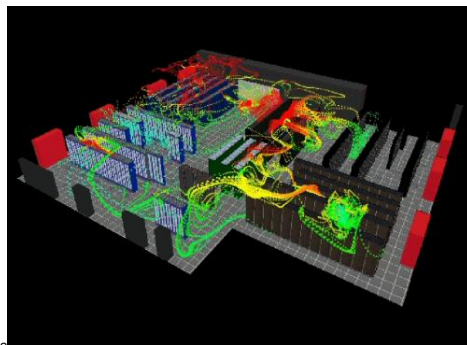
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Cooling Requirements



- Higher density, more heat
- Equipment selection and airflow become critical as space becomes a premium



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Helping with Thermal Loads



- **Air below the raised floor needs to be pressurised to properly cool the Data Centre Equipment**
- During walk-throughs look for open spaces in raised floor and cabinets where air will escape
- Proper Cable Management promotes good air flow
 - **Overhead Fiber cabling through FiberGuide eliminates “Air Dams” below the raised floor**
 - **Glide Cable Management organises cables so they don’t restrict airflow to switches and servers**

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Horizontal Distribution Area Detail



- Cat 6_A CopperTen Patch Panel
 - For 10GBE performance
 - Full ANEXT Compliance



← **Glide Cable Management**

- Increases cable density
- Provides proper cable management
- Improves cooling pathways

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Backbone Cabling Detail



- TrueNet Laser Optimized Fibre
 - Low Smoke Zero Halogen (non-PVC)
 - OM3 Laser Optimised 50 micron Multimode Glass, enhanced for 10 Gigabit transmission over distances up to 300 or 550 metres
 - Greater bandwidth allows 10 Gigabit Ethernet signals to travel greater distances than standard Multimode glass that is designed only for LED transmission



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Equipment Distribution Area Detail



- TrueNet Fiber Panel
 - 1, 2, or 5 RU Fiber Patch Panel, Angle Left/Right, removable vertical cable guides, rear access, slack management
 - Aggregates and manages jumpers from servers and SANs. Accommodates backbone cabling for field termination or splice



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Main Distribution Area Detail



- MTP/MPO Solutions
 - 12 and 24 fiber MTP-LC Cassettes
 - Compatible with three standard Fibre panel chassis
 - Ideally paired with 12 Fiber Microcable



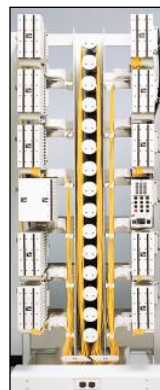
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NGF

Next Generation Frames for Optical Fibre Density



- Ideal for Equipment Rooms and Data centres
- Superior Cable Management
- Up to 2304 terminations
- Small foot print



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Specs & Tech Data Available



- Installation Specifications for Class D, E, E_A projects
- Specs for testing Copper Cabling - PL and Channel
- Specs for testing Fibre Cabling - 1 & 3 Ref Cord Methods
- Case Studies to see why and how others did their installs
- White Papers on industry topics
- Templates for various labels

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**ADC KRONE has a well engineered
product selection to support your
Data Centre design and installation**

Questions ?

