

Cat 5, 6 or 7?

A University Standard for Structured Wiring.

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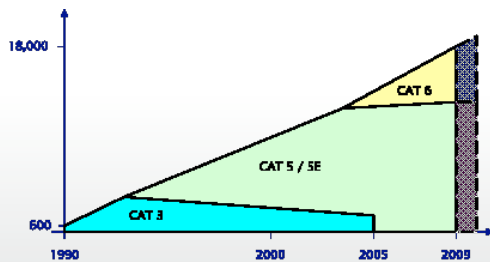
Background

- iSolutions recently formed
 - Incorporates all IT service providers within the University.
 - Focus on all ICT needs of the user and the business.
 - Uses ITIL management framework.
- Data Network Team (6 staff) cover 5 academic campuses, 4 Halls of Residence and 9 other sites. Approx 18,000 network points.
- University Capital Building Programme since 2001
 - "Landmark buildings"
 - Major refurbishments
 - Campus redevelopment



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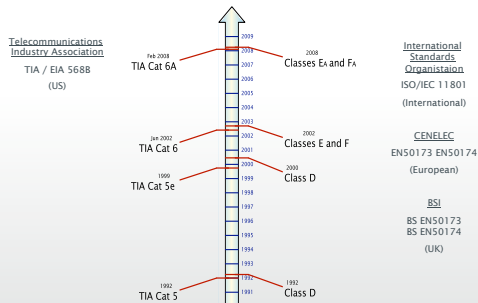
Network Points Installed



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Standards

Wiring Standards



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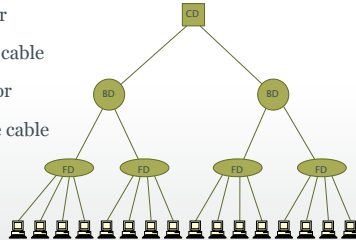
British Standards

- BS EN 50173-1 Information technology – Generic cabling systems – Part 1: **General requirements**
 - Identifies the general topology and Channel performance
- BS EN 50173-2 Information technology – Generic cabling systems – Part 2: **Office premises**
- BS EN 50173-3 Information technology – Generic cabling systems – Part 3: **Industrial premises**
- BS EN 50173-4 Information technology – Generic cabling systems – Part 4: **Homes**
- BS EN 50173-5 Information technology – Generic cabling systems – Part 5: **Data centres**

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Wiring Topology (EN 50173-1)

- campus distributor
- campus backbone cable
- building distributor
- building backbone cable
- floor distributor
- horizontal cable



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Campus and Backbone cable (EN 50173-1)

- Likely to be fibre
 - singlemode or multimode 50/125 or 62.5/125
- Channel performance designated in the standards
 - OS1, OS2, OM1, OM2, OM3
 - Choice depends primarily on distance
- We now specify singlemode everywhere
 - Simplifies choice of optics on equipment
 - Permits through-patching where network distribution layer is not required
 - Cable is cheaper, but optics more expensive

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Horizontal Cable (EN 50173-1)

- Likely to be copper
 - Unshielded Twisted Pair (UTP) or Shielded (STP)
- Channel performance designated in the standards

<ul style="list-style-type: none"> – Class D, equivalent to CAT 5/5E – Class E, equivalent to CAT 6 – Class EA, equivalent to CAT 6A 	} UTP / STP
<ul style="list-style-type: none"> – Class F, equivalent to "CAT 7" – Class FA, equivalent to "CAT 7A" 	} STP

Electrical Characteristics of the channel:

Return loss ;	Insertion loss;	Frequency;
Delay Skew;	Capacitance;	Near-end crosstalk loss (NEXT);
Power Sum NEXT (PSNEXT);	Attenuation crosstalk loss ratio (ACRL);	Power sum ACRL (PSACRL);
Propagation Delay;	Equal level far end crosstalk loss (ELFEXT);	Power sum ELFEXT (PSSELFEXT);
<small>Impedance (100 Ohm) ± 15% tolerance maximum</small>	<small>Transmission coefficient loss (1.5 dB)</small>	<small>Equal level far end crosstalk loss ratio (ELFEXT) loss (1.5 dB)</small>

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UTP or STP?

- STP is going to be more difficult to install correctly UTP
- STP is more expensive
- STP installation takes longer
- Decision: UTP

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Which Class or Category?

- Look at the applications:

POTS, alarms etc		Runs over wet string
Ethernet 10Mbps	not very interesting, except legacy end devices	minimum CAT3 / Class C
Ethernet 100Mbps	used here and there	minimum CAT5 / Class D
Ethernet 1Gbps	our standard office desktop delivery	minimum CAT5 / Class D

- Decision: CAT5 / CAT 5e is adequate at present time

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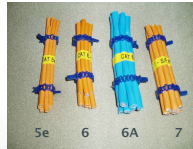
What about 10Gbps Ethernet?

- 10GBASE-T runs 100m over CAT6A / Class EA or Class F
- 10GBASE-T runs 55m over CAT6 / Class E
- 10GBASE-SR runs to 300m over OM3 fibre
- Already decided not going to have STP
- Fibre not practical for today's end-systems (or switch port densities)
- Decision: want to future-proof new buildings, ask for 6A

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Issues with 6A cable

- Size of the cables
 - CAT5 5mm
 - CAT6 5.5mm
 - CAT6A 7.62mm – 6.5mm x 8.4mm
- What about bend radius?
- What about tray and rack capacity?
- What about cost?
- Decision: Can't (yet) do 6A even in new buildings (might do 6A in a data centre)



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Summary

- Install CAT 5e in existing buildings
 - We found CAT 6 difficult to retro-fit
- Install CAT 6 in new buildings
 - Specify maximum horizontal wiring length 60m
 - Increase number of hub rooms if necessary

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More Standards

More Standards (1)

- BS EN 50173-2 Information technology – Generic cabling systems – Part 2: **Office premises**
 - Builds on 50173-1
 - Specifies Class D (Cat 5E) or higher
 - Adds description of:
 - MUTO (Multi-User Telecommunications Outlet)
 - CP (Consolidation Point)

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More Standards (2)

- BS EN 50174-1 **Information technology – Cabling installation, Part 1: Specification and quality assurance**
 - Specifies who does what (designer, installer)
 - The building environment (dust, temperature, humidity)
 - Electromagnetic and power environment
 - Pathways (trays, capacity)
 - Frames, room space layout
 - Safety, testing, documentation, labelling

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More Standards (3)

- BS EN 50174-2 **Information technology – Cabling installation Part 2: Installation planning and practices inside buildings**
 - Safety and installation practices
 - Separation of data from power cables
 - Some nice diagrams of how to locate cables into trays
 - Lots of stuff about electrical bonding

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Why create another Standard?

Why create a University standard?

- Because nobody reads the standards in detail
- Because there are still choices and adaptations to be made
- Because the building project wants a document to issue to the architects, designers and contractors
- Because of the problems we've had in the past ...

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Issues we've experienced in the past

- Hub room shrinks in size – very common
 - They needed a bigger kitchen / extra toilet
- Hub room has no ventilation or aircon
- Hub room is not finished / full of builders rubble at handover
- "Value engineering" determined hub room could be shared space
- Cable routes not accessible / plastered over
 - Architect demanded a smooth wall / ceiling finish

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Issues we've experienced in the past

- Cabling installed by electrical contractors
 - Needed complete re-termination
 - Not labelled properly
 - Joined and wrapped with electrical tape
- Over-length wiring
- Floor boxes in correct place, but on day 1 all the furniture moved by occupants
- Hopelessly in-adequate number of points installed

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Advice on creating a specification

- Get someone to create one for you
 - It'll become part of the building contract, it needs to be accurate
 - Approach your preferred wiring company . They may have outline specifications ready to go. Maybe they won't charge you!

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What's in the Specification?

Overview of wiring model

- Reflects the model from the standards
- Options for small, medium and large buildings
 - “Small” consolidates functions into 1 hub room
 - “Medium” is one BD/FD and one remote FD
 - “Large” is for multi-floor buildings; multi FD but not necessarily one per floor
- Number of outlets per desk (3)
- Density of outlets per type of space (e.g. office, lab etc)

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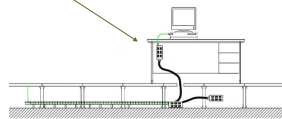
Telecoms Room Design

- Position (within building)
- Space (min 2.8m * 2.8m)
- Layout (2 racks = 336 outlets, 4 racks = 672 outlets)
- Lighting
- Ventilation (2 * 10Kw units)
- Power (2 * 32 Amp commando sockets, 2 * 12-way strips)
- Security (Locks, opaque windows)
- False floor / Ceiling void (where fitted)
- Cable management (diverse ceiling level tray entry to top of rack)

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Outlet Presentation

- Dado Trunking Specification
- Underfloor (mini-pods)
- Power pole
- Stud wall
- Consolidation point



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Ducting and Cable Routing

- Tray and trunking size calculations
- Internal and external duct construction and capacity

Components

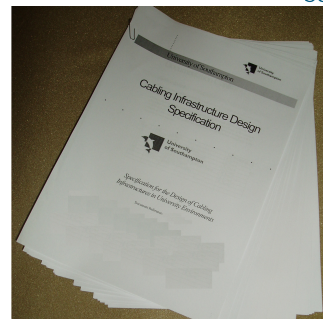
- UTP cable part nos.
- Fibre cable part nos.
- Patch panel and faceplate part nos.
- Racks, PDU's ...

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Roles and Responsibilities

- Building Designer
 - Plan hub rooms, data outlets, cable routing, etc.
- Main Contractor
 - Power, cooling, lighting, ducting, containment, etc.
- Data Contractor
 - Cable system detail design, supply, install, test.
- iSolutions
 - Technical approval, active networking equipment.
- Estates and Facilities Project Leader
 - Co-ordination, financial approval.

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Installation

Appoint an installer

- Using EU OJEC procedure, appointed three suppliers accredited to install our preferred wiring system in 2001 and 2007.
- Although large building projects undertake their own procurement exercises, these suppliers are usually invited by the building contractor to bid.
- One supplier was selected by mini-tender to undertake our day-to-day installations, and typically have at least 1 engineer on-site. These are fixed price.
- Where appropriate (e.g. >20 connections in one place), mini-tender to get a better price.

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Has it worked for us?

Has it worked for us?

- Yes, but you have to stand firm... follow the specification, or no service!
- Thank you!

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