Cambridgeshire County Council

School builds ICT Infrastructure and Resources Brief

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1. Overview / Target Audience

This paper provides the rationale and detailed specification for ICT provision in new build projects for primary schools. The paper represents an amalgam of data and perceptions brought together to provide the most effective 'future-proofing' possible in a rapidly changing technological context. Provision of infrastructure and resources is driven by educational considerations and the need for maximum flexibility at the interface between the physical school building, ICT infrastructure / resources, children / staff and teaching / learning. The paper is intended for use by Education Officers, Education Property and aligned agencies (architects / planners), school governors and new headteachers.

What does ICT offer learning, teaching and management in the Primary School?
A number of national agencies have reported the positive impact that ICT offers for learning and teaching:
'The positive influence of ICT in schools continues to rise and can no longer be denied. Although, as yet, ICT is by no means at the heart of our education system, it is now widely recognized as an essential tool for learning in the twenty-first century. Indeed, it is vital that today's children are enabled to take advantage of lifelong learning if they are to survive the constant pattern of change that is likely to mark their working lives. This means not only being comfortable with ICT as a medium, but also being able to exploit its potential to the full and understanding the ways in which ICT can make learning more effective.' *OFSTED – ICT in Schools – The Impact of Government Initiatives Five Years On*

'Like all good research, the findings prompt questions which take the research agenda forward, but the key findings from this review appear to be that:

- Generally something positive happens to the attainment of pupils who make (relatively) high use of ICT in their subject learning. In Primary this can be the equivalent to an additional term's progress
- School standards are positively associated with the quality of school ICT resources and quality of their use in teaching and learning, regardless of social-economic characteristics
- Use of ICT in class generally motivates pupils to learn
- Achieving positive impact of ICT on attainment, motivation and learning depends critically on the decisions of schools, teachers and pupils on how it is deployed and used.

DfES ICT in Schools 2004 – 05 / Becta

Before embarking on a detailed description of the needs for primary build it is essential to take into account informed views about how schools' utilisation of ICT for teaching and learning purposes will develop and change. Here are some of the most relevant considerations from recent research papers and publications that focus on schools for the future;

a) ***The school of tomorrow will continue to require the possibility for whole class access to ICT.*** This can be delivered through a computer suite, but such a facility provides little if any flexibility in terms of deployment of equipment. A much more flexible option is to use a set of laptops (15 minimum) that can be drawn together for class teaching, but split into groupings to allow for use in different classes as needs dictate.
b) ***The embedding of ICT across the primary curriculum will require a range of resources and a supporting infrastructure that allows for flexible deployment and utilisation.*** As we have seen in a growing number of our primary schools, laptops utilising wireless and hard wire connections offer an

extremely flexible solution to differing deployment and utilisation requirements, for teachers and pupils. An increasing range of hardware is required to provide opportunities for ICT to support learning in different subjects, for example digital microscopes, sensors and control equipment. At the top of such a list would be multimedia tools and video conferencing equipment that can pervade the entire curriculum and offer collaboration with others for pupils and staff.

c) ***The ICT infrastructure will become more significant to all in schools and although more complex, it must be accessed and utilised easily by all.*** Schools must grasp the need for technical support in order to ensure systems operate simply and smoothly. There is an opportunity when setting up the infrastructure and resourcing for new schools to ensure a continuity of approach and specification that allows the technical support issue to be minimised as far as possible and for the establishment of 'school friendly' technical environments. A good example is the use of remote support.

d) ***The school of the future will increasingly employ multimedia applications to invigorate teaching and provide opportunities for exciting and purposeful activities for pupils.*** Through the sharing of multimedia presentations and the creating of digital images, films and resources, it is possible to enhance purposeful classroom activities at the same time as engendering excitement for learning. Multimedia offers the opportunity to add an extra dimension to teaching across the curriculum.

e) ***A networked school is not just a school with a physical network, it means that for each lesson, where it's beneficial to do so, you can utilise resources from outside the school's own network or consider video-conferencing with a school anywhere in the world.*** There are increasing numbers of examples of how video conferencing has enabled collaboration between pupils, staff and school managers. There are also excellent examples of links between schools in different localities, including international link ups. The utilisation of fairly inexpensive webcams with presentation technologies such as Interactive Whiteboards opens up a whole new set of possibilities for our children and those that work in schools. There are also the potential additional benefits for workforce reform that such collaborations bring.

f) ***Collaboration provides an essential catalyst to change and learning. Collaboration between pupils, teachers, parents and others will increase as ICT is used effectively and is allowed to transform educational practices.*** ICT offers a wonderful opportunity for parents to contribute towards the education of their children, but does this always have to happen outside of school? There are very good examples of primary schools developing 'Cyber Cafes' for use by pupils and parents, especially those without facilities at home. Such a development is a tangible demonstration of a school's commitment to partnership and the significance of children learning through ICT with parents.

g) ***Account will need to be taken of the need for pupils' own 'virtual workspace'. Increasingly, pupils will have individual access to resources to support their learning, via PDAs or other such devices.*** As new resources and technologies are introduced the scope for individual learning will grow. A school for the future will need to provide enough access to the ICT infrastructure to embrace new possibilities. This can be achieved via the provision of sufficient hard wired network points in every working space combined with wireless connectivity for additional flexibility.

h) ***Community spaces will require the ability to show multimedia to the whole school or to video conference.*** Many teachers are already wondering how they ever taught without presentation technology. The school of the future will need to be able to draw upon a huge range of electronic resources for very

different purposes. These will include use of ICT in assemblies, presentations to parents, CPD for staff, governors meetings and a myriad of other uses. For this reason presentation technologies need to be available in all areas where such gatherings will take place.

i) ***Access to management information will be important for an increasing number of staff.*** The Cambridgeshire Performance Data Framework sets a standard for recording of pupil attainment data and subsequent analysis for the purposes of target setting and performance management. Schools are increasingly expected to use their Management Information System to generate information to support decisions on pupil attainment, curriculum planning, absence monitoring and financial management and planning. This in turn requires the MIS to move out of the office into the classroom for access by teaching staff or teaching assistants.

Headteachers, staff, governors and other stakeholders will continue to have different views about the precise nature and deployment of ICT resources and how these influence the effectiveness of teaching and the potential for learning. Infrastructure needs to allow for maximum flexibility to avoid unnecessary additional costs and work at a later stage.

2. ICT for a new Primary School

The following are recommendations for infrastructure and resources to be available in all new primary schools. For ease of description, different areas of the school are dealt with in turn.

It is vital that the planning, architect design and procurement is informed by consultancy from **Education ICT Service** to ensure:

- Data points are correctly positioned for all areas
- Ordering of NTL circuit is timely
- Specifications for resource purchases are completely up to date

Additionally, **Education ICT Service** offer new schools or schools that are having extensions or being refurbished a package that provides project management to oversee curriculum, MIS and technical issues during build through into the life of the school. For further information visit **www.ictsla.ccceducation.net**

2.1 Classrooms

Infrastructure:

Data outlets should be provided as follows, with similar power supply:

a. Teacher use - 2 outlets to facilitate IWB functionality with Internet close to the IWB (appendix b) and telephone point.
b. Pupil use – 2 x 4 banked outlets potentially facilitating two separate benched areas within the classroom for access (appendix c)
c. Wireless – 1 high level double outlet to provide wireless solution for flexible deployment of resources.
d. 1 outlet to facilitate use for telephone.
e. 1 outlet with a fused spur electrical point at the appropriate point to service and manage ceiling mounted projector.

Resources:

a. In order to enable use of multimedia and subject specific resources in whole class teaching and learning, classrooms will require ceiling mounted digital projection, an interactive whiteboard and speaker system
b. Teacher laptop to facilitate personal curriculum and admin management and sharing of resources with IWB system and network
c. Four laptop PCs (desktops for reception) to allow for pupil access to support grouping structures in curriculum planning and integration of ICT in the breadth of the curriculum. These may form part of a dedicated trolley to facilitate moving of laptops around the school and charging
d. Peripherals that are age related
e. Software package for teacher PC and pupil machines.

2.2 Multimedia Studio

This will need to be an area larger than one classroom and preferably the size of two classrooms to support flexible use and workforce reform, offering:

a. Pupil access to a range of resources appropriate to task, such as:
    - Library supported by appropriate software package for its administration
    - Video conferencing and digital video
    - ICT access via cluster / s of laptops to facilitate individual or group activity
b. Possible configuration into an ICT Suite
c. Flexible use by staff supporting small groups of pupils
d. Potential for workforce reform whereby children are supervised by someone other than a teacher, possibly following a video conferencing session or carrying out independent online activities
e. Possible use as a community resource.

Infrastructure:

Data outlets should be provided as follows, with similar power supply:

a. Teacher use - 2 outlets to facilitate IWB functionality with Internet close to the IWB and telephone point
b. Pupil use – outlets to match number of PCs plus 10 positioned to facilitate use as either ICT Suite or for clusters of machines to be accessed by groups
c. Wireless – 1 high level double outlet to provide wireless solution for flexible deployment of resources.
d. 1 outlet with a fused spur electrical point at the appropriate point to service and manage ceiling mounted projector.

Resources:

a. In order to facilitate video conferencing and the teaching of groups of pupils the multimedia area will require digital projection, an interactive whiteboard and speaker system. This will also facilitate discrete ICT skills input if the room was used as an ICT suite
b. Video conferencing equipment, digital video recorder and dedicated pc for these purposes
c. Four laptop PCs to allow for individual and small group activity
d. Software package for teacher pc and pupil machines.

2.3 School Office, Headteacher's Office and other similar areas

Infrastructure:
Four data points should be allowed per person / PC in these areas with similar power supply.

Resources:

a. Fileserver running the school's chosen MIS (the LAs strategy is to promote the use of SIMS)
b. Admin Computer/s
c. Colour Inkjet Printer
d. Monochrome Laser Printer
e. Head's PC / Laptop
f. Photocopier
g. Fax machine.

For more information about schools office equipment visit www.ictprocurement.ccceducation.net > Typical School ICT Kit.

2.4 School Hall

Infrastructure:
Data outlets should be provided as follows, with similar power supply:

a. Teacher use - 2 outlets to facilitate digital projector functionality with Internet at the front of the hall and telephone point
b. Pupil use – 4 outlets banked to facilitate use by groups or individually
c. Wireless – 1 high level double outlet to provide wireless solution for flexible deployment of resources.
d. 1 outlet with a fused spur electrical point at the appropriate point to service and manage ceiling mounted projector.

Resources:
In order to enable use of multimedia and subject specific resources in class or whole school sessions (i.e. assembly, PE lessons), the school hall will require digital projection, a large pull down screen and speaker system.

2.5 Staffroom

Infrastructure:
Data outlets should be provided as follows, with similar power supply:

a. CPD use - 1 outlet to facilitate digital projector functionality with Internet
b. Staff use – 4 outlets banked providing access to teachers for individual or collaborative work within PPA and other release time
c. Wireless – 1 high level double outlet to provide wireless solution for flexible deployment of resources.
d. 1 outlet to facilitate use for telephone.

Resources:

a. In order to enable use of multimedia and subject specific resources for CPD, the staffroom will require digital projection, a pull down screen and speaker system
b. Four desktop PCs (two with docking stations) to allow for network access by all staff
c. Software for staff machines as permanent features in the room.

2.6 Cyber Café

Infrastructure:

Data outlets should be provided as follows, with similar power supply:

a. 2 x 3 banked outlets potentially facilitating two separate benched areas, dependent on the location of the facility. Options may well be the reception area or the community facility / room
b. Wireless – 1 high level double outlet to provide wireless solution for flexible deployment of resources.

Resources:

a. Minimum of three desktop PCs, dependant on the seating within the area
b. Appropriate software for these desktops.

2.7 Group Rooms

Infrastructure:

Data outlets should be provided as follows, with similar power supply:

a. 2 x 3 banked outlets potentially facilitating two separate benched areas, dependant on the seating capacity of the facility
b. Wireless – 1 high level double outlet to provide wireless solution for flexible deployment of resources

2.8 All other areas

Infrastructure:

a. Four data points per person / pc for non curriculum areas, with similar power supply
b. Six data points per person / pc for curriculum areas, with similar power supply
c. Data points should be considered for corridors if these are to be wide enough to allow individual or small group activity (appendix d).

2.9 Main data cabinet/server room and additional data cabinets

2.9.1 Main data cabinet/server room

Infrastructure:

4 x data outlets should be provided on the trunking with similar power supply

Recommended size:

The cabinet and other equipment require a designated room that is well ventilated with sufficient power points. Careful consideration should be given to the location and size of all cabinet rooms to allow for future expansion, it is also strongly recommended the space be utilise as a possible secure lockup facility for ICT laptop trolleys etc. The minimum space required for a cabinet/server room is 6 square metres. This allows for a data cabinet size 800mm x 800mm and server cabinet of 600mm x 800mm with adequate access to maintain these cabinets. Ventilation should be provided to maintain a constant temperature as to not allow the room temperature to rise above 20 degrees Celsius. **This room will be lockable and will house:**

Resources:

- Cabinets
- Servers
- Appliansys CacheBox 200 (With E2BN Protex filtering)
- Entry point equipment for NTL Broadband circuit

- Entry point equipment for telecommunications (phones)
- Power
- Switchboards for IP, audio, video, TV and phone connectivity and signal
- distribution.

2.9.2 Additional/secondary data cabinets

Recommended size:
The cabinet and other equipment may require a designated room that is well ventilated with sufficient power points. Careful consideration should be given to the location and size of all cabinet rooms to allow for future expansion and to staff working in these areas. The minimum space required for a floor standing cabinet room is 2 square metres. This space allows for one data cabinet size of at least 800mm x 800mm. If the space allocated is below the minimum as specified above specialist advice should be sought from Cambridgeshire County Council internal ICT Support Service to identify exact requirements. If however the cabinet is a wall mounted then consideration should be given to allow access not only to the front but the sides of the cabinet, the recommended minimum of 1.5 metres of dedicated wall space should be reserved.

2.10 Other areas and equipment

Consideration will also need to be given to the following:

a. Additional data points around the school building and site, possibly including classrooms, to facilitate the use of IP cameras.
b. Provision of a laptop trolley used to transport laptops around the school and for charging purposes. Size dependent on the size of the school.
c. Additional data points around the school building and site, possibly including classrooms, to facilitate the use of VoIP phones.

2.10.1 IP Camera solution recommended for Schools over CCTV

If your school is considering new or planning to upgrade exciting CCTV systems, the advice and guidance for Cambridgeshire schools is an IP Camera Solution rather then outdated analogue CCTV technology. For detailed information visit www.ict.ccceducation.net > Advice > Procurement Specification, Build and Configuration Guidance > IP Camera solution for Cambridgeshire Schools (PDF 196KB)

2.10.2 Phones: Use of Network Cabling for Telephones

To enable a versatile flexible telecommunications (phone system) throughout the school, best practice dictates utilisation of the Cat6 network cabling infrastructure installed into every location within a new school build, to also deliver telecommunications. In order to use a network point as a possible telephone connection point a DP patch panel in the cabinet is required. More detailed technical description is outlined under *Cabling Specification for Schools at the end of this document.*

3 Cabling Specification for Schools (New-build/Extensions)

The purpose of this section is to outline the requirements for cabling and networking of schools.

3.1 Cabinet Specification

All cabinets should have ventilation slots/holes in both top, bottom and side panels. Access doors on the cabinet should allow from front, back and sides via lockable removable key.
The cabinet door should be lockable and be made of "see through" Polycarbonate Material. The frame of the cabinet door should have at least 25mm of metal surrounding the Polycarbonate area.
The cabinet should be constructed from metal and painted in a light grey colour.

3.1.1 Wall Mounted

These should be secured to a solid wall using 8mm "Wall Bolts", woodscrews are not considered as suitable fixings. Other appropriate fixings can be used if "Wall Bolts" are not suitable.

Depth should be 550mm minimum; height of cabinets as per Appendix A, which is based upon number of data outlets per rack – assuming rack is part of a whole school cabling installation.

A two part, hinged section rack should be used. The rear, top and bottom of the rack should have adequate access plates/holes for outgoing/incoming cable routes.

Adequate space should be provided adjacent to/around each cabinet to enable the unit to open on its hinges, thus providing staff safe access into the cabinet. The cabinet should be mounted at a **maximum 2m from ground level** to base of cabinet.

3.1.2 Floor Standing

Specification should be the same as above apart from: data racks should be 800mm (W), 800mm (D), sit on heavy duty (lockable) castors rather than directly on the floor and the rear panel of the rack should also be removable.

4. Cable Management

Cable Management Units to be provided as per Appendix A.

5. Layout of Rack Equipment and Cabling

Equipment and patch panels in the cabinet to be laid out as per Appendix A.

6. Power Specification

As described in www.icttid.ccceducation.net > Broadband/CCN Documents > Electrical Specification for School ICT Cabinets (PDF 103 Kbs)

7. Data Cabling

Note: All new cabinets and associated cabling to be installed in CAT6/Fibre-optic cabling standard. If cabling an existing school (school extension) the additional cabling must match the existing product manufacturer to ensure compliance with existing warrantees.

Only a **certified installer** who can provide a **system warranty** can install data cabling. Installers, when working on a school site, which still have children/students attending lessons, need to be CRB cleared.

7.1 Provision for Typical Primary School

The number of data outlets would be agreed with the school, however, as a guide the recommended standard is:

- **THIRTEEN** outlets per classroom (1 for Teacher, 8 for Pupil use, 1 double High Level for wireless equipment, 1 in ceiling for management of projector and 1 for telephone outlet.
- **FOUR** per person/PC in non Curriculum Areas.
- **EIGHT** in common areas e.g. School Hall or Resource Areas.

7.2 Installation Specification

- All new **CAT6/Fibre-optic cabling** will be installed to industry standards and to conform to ISO 11801 standards. Installations should have a 20/25 year manufacturers systems warranty
- All outlets must be tested to CAT6 (or higher) standard.
- **Two sets** of documentation must be provided that identifies test results, cable routings (scale 1:200 minimum) and patch panel position to data outlet locations within the school.
- Documentation and the manufacturers Warranty Certificate should be supplied within 20 working days of completion of the installation. (One copy to the school and one copy to Cambridgeshire County Council's internal ICT Service).
- Fibre-optic cables will generally be used to link cabinets creating a 1GHz backbone.
- CAT6 cables will be distributed from data racks to all areas of the school where network access is required. Cable runs should not exceed 90 metres and outlet positions will be as agreed with school representatives.
- Data outlets should be provided adjacent to power outlets wherever possible.
- All patch panels/data outlets to be clearly labelled to enable easy identification of each individual outlet. (See Appendix A for recommended numbering scheme).
- Installations should:
    - Take advantage of service ways including low voltage trunking, vertical risers, suspended ceilings, low voltage cable trays etc.
    - be installed with due regard for minimum bend ratios compliant to both E1A/TIA 568 standards and manufacturers specifications (i.e. not less than 75mm during installation and 25mm at point of termination)
    - be routed away from power devices to minimize the effects of electromagnetic interference and cleated or fixed in accordance to IEEE regulations for electrical fittings in buildings including provision of supports/ties to each side of any bend and on all routes subject to changes in level or direction
    - be installed to the standard of the building with all making good and back filling using a suitable fire retardant material
    - working areas should be kept clean and tidy and all dust, debris and packing materials cleaned up at the earliest opportunity.

- Cables will be concealed and protected with BS4678 Part 1 compliant plastic trunking, with corners and ends fitted, when concealed routes are not available.
- All trunking must be securely fixed to walls etc., using screws (or similar). A minimum of 2 screws per metre or 5 per three metre length of trunking is recommended.
- In all areas where Dado trunking is not used data outlets should be presented using appropriate faceplates; also MT2 trunking should be used as a minimum with suitable corners/jointing pieces etc. Ideally these outlets should be installed at a minimum height of 0.8m (centre) from the floor covering in all rooms unless advised differently by the architect or an authorised representative of the school.
- It is recommended that in all classrooms a minimum of 5m Dado Trunking (3 compartment) should be provided and installed (min 800mm from base to floor covering) with suitable trunking to ceiling void/cable access route. All locations etc., to be agreed with school prior to installation. The data outlets should be presented evenly over the dado length.
- Where Dado Trunking is installed under an IWB location it should be installed at 400mm from base to floor covering, with suitable trunking to ceiling void/cable access route.

8. Switch Specification

All network switch devices used are to be from the Procurve Series switch range from Hewlett Packard.

8.1 Main Cabinet Switches

The first switch would generally be:

- 24 port **ProCurve Switch 3500yl-24G** if appropriate this will be connected via fibre (ring or star topology) to other switches (via HP Gigabit Modules) on the network. However, depending on the size of the network an **HP ProCurve Switch 5406zl-48G** should be used / required – specialist advice should be sought from Cambridgeshire County Council internal ICT Support Service to identify exact requirements.

8.2 Additional/Secondary Cabinet Switches

The first switch would be a 24 port **ProCurve Switch 3500yl-24G**

8.3 Additional Switches

These should be a **HP ProCurve Switch 1400-24G**, a 24-port 10/100/1000 switch with twenty-two 10/100/1000 ports and two dual-personality ports for either 10/100/1000 or Mini-GBIC connectivity. They will be up-linked using GB ports a Curriculum port on the first switch in the relevant cabinet.

9. Outlet Contention Ratio (switch ports to outlets)

As a general rule there should be a 50% contention ratio of switch port to outlets. Although in areas of high concentration (i.e. ICT Suite or server room) this figure should be adjusted to 80%. Based upon these ratios adequate HP Procurve switch equipment should be provided.

10. Patch Leads

The following patch leads should be provided (Data):

0.5m Grey	-	35% of total installed outlets
1.5m Grey	-	35% of total installed outlets
3.0m Grey	-	35% of total installed outlets.

The following patch leads should be provided (Voice):

0.5m Yellow	-	15% of total installed outlets
1.5m Yellow	-	15% of total installed outlets
3.0m Yellow	-	15% of total installed outlets.

11. Internet Caching and Filtering (mandatory)

All Cambridgeshire schools must be equipped with a local E2BN Protex filtering & caching system which forms part of the mandatory CCN managed service.

An Appliansys CacheBox 200, with Protex filtering and licensing must be sourced through and configured by Education ICT Service.

12. Network Design/Switch Configuration

School networks will be designed to meet Cambridgeshire County Council's Corporate Network Security and Configuration standards.

In simple terms these are:

- **Pupil/Public** only allowed access to curriculum resources and the Internet.
- **Staff/Admin** allowed access to Curriculum resources (as appropriate), the Internet plus CCC Systems e.g. ICT Managed Service..

To provide this level of network security/access separate IP Address ranges are allocated to Admin and Curriculum devices and a strict device naming convention is introduced.

For detailed information about School CCN Network design, switch configuration, Network Information and Guidance visit www.icttid.ccceducation.net > Broadband/CCN Documents click on:

Diagram Overview of the Schools CCN Network
Schools CCN Information and Guidance

The configuration and set-up of new networks/additional switches must be undertaken by Cambridgeshire County Council's internal *Education ICT Service* to ensure compliance with CCC Network Security Policies.

13. Use of Network Cabling for Telephones

Category 6 (CAT6) will run fast Ethernet, VoIP, ISDN and PABX systems. To enable a versatile flexible telecommunications (phone system) throughout the school best practice dictates utilisation of the CAT6 network cabling infrastructure installed into every location within a new school build, to deliver telecommunications, therefore enabling any network point to also be a possible phone point.

In order to use a network point for a telephone connection, there are a number of factors

13.1 Voice of Internet Protocol Phones (VoIP)

Voice over Internet Protocol is a protocol optimized for the transmission of voice through the Internet or other packet switch networks and is often used abstractly to refer to the actual transmission of voice This system allows phones calls to be carried out over the network using the IP Protocol. VoIP can facilitate tasks and provide services that may be more difficult to implement or more expensive using the PSTN. Examples include:

- The ability to transmit more than one telephone call over the same broadband connection. This can make VoIP a simple way to add an extra telephone line to a home or office.
- Conference calling, call forwarding, automatic redial, and caller ID; zero- or near-zero-cost features that traditional telecommunication companies (telcos) normally charge extra for.
- Secure calls using standardized protocols (such as Secure Real-time Transport Protocol.) Most of the difficulties of creating a secure phone connection over traditional phone lines, like digitizing and digital transmission, are already in place with VoIP. It is only necessary to encrypt and authenticate the existing data stream.
- Location independence. Only an Internet connection is needed to get a connection to a VoIP provider. For instance, call center agents using VoIP phones can work from anywhere with a sufficiently fast and stable Internet connection.
- Integration with other services available over the Internet, including video conversation, message or data file exchange in parallel with the conversation, audio conferencing, managing address books, and passing information about whether others (e.g. friends or colleagues) are available to interested parties.
- Advanced Telephony features such as call routing, screen pops, and IVR implementations are easier and cheaper to implement and integrate. The fact that the phone call is on the same data network as a users PC opens a new door to possibilities.

Cambridgeshire County council has implemented the AVAYA VoIP system and all VoIP systems installed must comply/integrate with this system. **Specialist advice should be sought from Cambridgeshire County Council internal ICT Support Service upon school requirements.**

Further advice and guidance is available by visiting www.icttid.ccceducation.net > CCN Factsheets > Factsheet 10 - VoIP

13.2 Presenting the Telephone Lines within the Cabinet

Usually a telephone provider will only install their lines to a distribution point or DP. From that they will run separate wiring to the required location of the telephone.

In order to present the telephone lines onto a patch panel, a tail (link from a DP to a patch panel) is required. This is a length of cable that is capable of running multiple connections. One end terminates onto the DP and the other end terminates onto a patch panel.

To allow for expansion and the use of digital style telephone systems, current guidelines suggest that two pairs of wires are allocated per connection. Standard telephones only use one pair (two wires), but some digital systems use two pairs (four wires).

13.3 Multiple Cabinets

Where there is more than one cabinet on a site, a voice link cable must be provided between all cabinets (PABX Links/cables can exceed 90 Meters) to link them together. This is from the main cabinet out to each other cabinet. This cable is normally multicore telephone cable suitable for the number of telephone outlets required. This is essentially the same as the tail described above, but is a much longer piece of cable.

This cable would have a patch panel at either end, allowing a telephone connection to be linked across to a network socket of another cabinet.

14. Conclusion and Review

This paper provides a flexible yet clearly articulated and defined solution for ICT infrastructure and resourcing in new primary build in Cambridgeshire. Education ICT Service will offer project management and specialist support to temporary governing bodies and new Headteachers to ensure informed decisions are made about the way in which the specifications suggested are integrated into design, build, installation and implementation stages to achieve maximum benefits for learning, teaching and management.

It is essential to revisit this paper on an annual basis given the changing nature of available technologies and the understanding of how these can support the work of schools.

15. Useful contact information

ICT Service Main Office
42 West Street, Godmanchester PE29 2HJ
✉ ict.service@cambridgeshire.gov.uk
☏ 01480 376655

ICT Service procurement team
Cambridge Road, Waterbeach
✉ sales@ict.ccceducation.net
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Staff

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Gareth Davies, E-learning Manager
✉ Gareth.Davies@cambridgeshire.gov.uk

16. Portal links & searches:

Additionally, **Education ICT Service** advice and guidance documents are available by visiting
www.icttid.ccceducation.net click on School building projects
www.icttid.ccceducation.net click on Servers & Networking
www.icttid.ccceducation.net click on Broadband/CCN Documents
www.ictprocurement.ccceducation.net

17. Revision History

Amendments	Release	Author	Date
Initial Release	V1.0	Leonard Veenendaal	
Upgrade Switches	V5.0	Lee Brandrith	April 2007
Ceiling data point, VoIP, Cabinet space	V6.0	Lee Brandrith	May 2008
Addition of Protex Caching and Filtering Equipment	V7.0	Leonard Veenendaal	September 2008
Cabinet sizes to accommodate CCN Network equipment	V8.0	Lee Brandrith	September 2008

Appendix A

Any cabinet installed should only take up 70% of the total capacity. Only two data cabinet sizes are recommended for main cabinets.

1. Main Data ONLY Cabinet Sizes

1 to 48 Ports - Cabinet Size = 21U Wall mounted (min)

1U	Cable Management Unit/Fibre Tray(outlining cabinets)
2U	48 Port Patch Panel
1U	Cable Management Unit
1U	24 Port Switch
1U	24 Port Switch
1U	Cable Management Unit
1U	Protex Cache
4U	VoIP Equipment
4U	Router
3U	Spare Capacity
2U	Power Distribution Unit (PDU) Min 6 way
21U	

49 to 168 (Max) Ports - Cabinet Size = 42U Floor standing mounted (min)

1U	Cable Management Unit/Fibre Tray(outlining cabinets)
1U	24 Port Patch Panel
1U	24 Port Patch Panel
1U	Cable Management Unit
1U	24 Port Patch Panel
1U	24 Port Patch Panel
1U	Cable Management Unit
1U	24 Port Patch Panel
1U	24 Port Patch Panel
1U	Cable Management Unit
1U	24 Port Patch Panel
1U	24 Port Switch
1U	24 Port Switch
1U	Cable Management Unit
1U	24 Port Switch
1U	24 Port Switch
1U	Cable Management Unit
1U	24 Port Switch
1U	24 Port Switch
1U	Cable Management Unit
1U	24 Port Switch
1U	Protex Cache
6U	VoIP Equipment
4U	Router
8U	Spare Capacity
2U	Power Distribution Unit (PDU) min 12 way
42U	

2. Additional/secondary Data ONLY Cabinet Sizes

1 to 24 Ports - Cabinet Size = 9U Wall mounted (min)

1U	Cable Management Unit/Fibre Tray(outlining cabinets)
1U	24 Port Patch Panel
1U	Cable Management Unit
1U	24 Port Switch
3U	Spare Capacity
2U	Power Distribution Unit (PDU) Min 5 way
9U	

25 to 48 Ports - Cabinet Size = 15U Wall mounted (min)

1U	Cable Management Unit/Fibre Tray(outlining cabinets)
2U	48 Port Patch Panel
1U	Cable Management Unit
1U	24 Port Switch
1U	24 Port Switch
7U	Spare Capacity
2U	Power Distribution Unit (PDU) Min 5 way
15U	

49 to 96 Ports - Cabinet Size = 21U Wall mounted (min)

1U	Cable Management Unit/Fibre Tray(outlining cabinets)
2U	48 Port Patch Panel
1U	Cable Management Unit
2U	48 Port Patch Panel
1U	Cable Management Unit
1U	24 Port Switch
1U	24 Port Switch
1U	Cable Management Unit
1U	24 Port Switch
1U	24 Port Switch
7U	Spare Capacity
2U	Power Distribution Unit (PDU) Min 6 way
21U	

Note: Any cabinet over 21U should ONLY be Floor Standing as specified in the Main cabinet size.

3. Data and Telephone Cabinet Sizes

Were telephones lines are to be installed into data cabinets take the number of data outlets to installed and increase the cabinet up to the next size i.e. 9U Secondary cabinet containing 24 data outlets will need a new cabinet size of minimum 12U.

4. Recommended Numbering Scheme

{Cabinet} e.g. 1, 2, 3 or A, B, C.., {Outlet} e.g. 1 - xxx

5. Electrical Requirements

Visit www.icttid.ccceducation.net > Broadband/CCN Documents click on: Electrical Specification for School ICT Cabinets

Appendix B

Appendix C

Appendix D