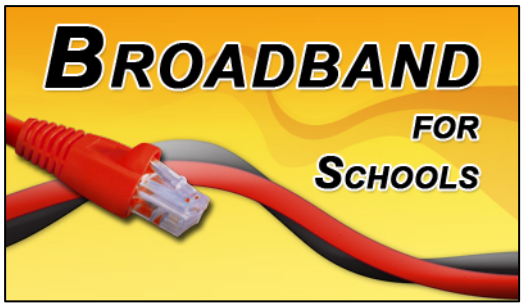
NEN – The Education Network

Selecting Broadband Connectivity for Your School

Broadband Connections

The requirements for a school broadband connection are very different from those at home, whether this is a small school with less than 100 pupils or a large school.



Schools' requirements are based on curriculum delivery and the administrative and operational needs of the school. These represent very different usage patterns, but both require a high level of reliability and performance. Loss of internet connectivity will disrupt both administration and teaching throughout the school.

This paper will describe the factors that need to be considered when evaluating a school's requirements for a broadband connection.

- What bandwidth does the school need to support the services it uses?
- Does it need as much upstream as downstream bandwidth?
- What total volume of data is used each month?
- The importance of connection management.
- The impact on connectivity requirements for multi-site or cluster working.

What bandwidth does a school need?

The line speed and capacity of the school connection has to be modelled to meet the educational, management and communications usage which are dependent on the size of the school, the applications being used to deliver teaching and learning and to support the management and operation of the school.

Schools' use varies depending on the educational strategy and management practices of the institution. The following lists some of the typical uses but is not exhaustive. When assessing broadband requirements, it is important to fully understand the applications currently supported or likely to be required to deliver the educational and management outcomes of the schools strategic development plans;

- Pupil Internet Access for research – browsing including video and images.
- Staff use for class teaching including real time applications (talking books, iPlayer, You Tube).
- Staff mail with attachments.
- Pupil email.
- School Office functions including MIS.
- School portal, website or VLE.
- Pupil use of cloud based functions VLE, Google Apps. Office 365 etc.
- Cross school or cross site working and support for ICT.
- IP communications VoIP, Video, Skype
- Closed Circuit TV.
- Schools operational systems, remote access and reporting for functions such as energy consumption, catering systems etc.
- Multi-Agency requirements.

The following model is based on providing each active user the equivalent to a home ADSL (2Mbps) service at times of peak usage – a useful minimum benchmark in calculating the capacity of the school connection.

This capacity is in line with more widespread national targets: Ofcom's *2012 Infrastructure Report*[1] includes the commitment to providing of a minimum 2Mbps across the UK:

The Government is committed to ensuring that, by 2015, almost all premises in the UK will be able to access a basic broadband service of at least 2Mbit/s, through the Universal Service Commitment (USC).'

Ofcom's report also flags how UK broadband speeds and usage are continuing to increase:

> 'The UK's average broadband speeds have been rising as a result of this accelerating take-up of Superfast Broadband (SFBB) and the average speed now stands at 12.7Mbps, an increase of 69% from the 7.5Mbps recorded in 2011.'

This shows that the average level of home broadband delivery is well above the 2 Mbps we have selected as our base comparison. We propose therefore to use 2 Mbps as a realistic and conservative target on which to base this model. The details of the model can be seen in appendix A.

Providing the equivalent of this 2Mbps service for each school active device at times of peak usage has the following results;

1. For a secondary school with 1600 pupils and 400 connected devices.

   2Mbps per user download for a school with 400 devices = **800Mb**. Allowing for 1 in 10 devices being active simultaneously at times of peak demand means that the connection capacity should be **80Mbps.**

   The requirement for a 100 Mbps connection for a secondary school has already been exceeded in that the best connected schools in the UK have 1 Gbps connections.

2. For a primary school with 200 pupils and 40 connected devices

   For a primary school with say 40 devices = **80Mb** and assuming 1 in 10 devices are simultaneously active at times of peak usage = **8 Mbps**

   Measurements taken in primary and special schools with good educational broadband use indicate that actual usage in 2012 shows peaks over 10 Mbps.

   This is a conservative and minimum provision for 2013; and one which will continue to grow. Average growth in UK schools is estimated as 30% pa.

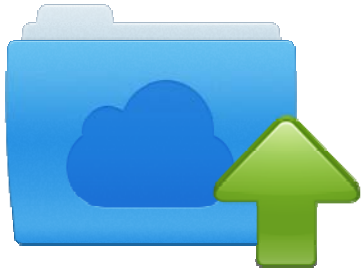
Downstream Bandwidth Requirement				
School	**Devices**	**2012 Connection**	**2015**	**2017**
Secondary	**400**	**80 Mbps**	**176 Mbps**	**297 Mbps**
Primary	**40**	**8 Mbps**	**18 Mbps**	**30 Mbps**

The above figures are neither overstated nor unrealistic on an international basis. A report by the US State Educational Technology Directors Association (SETDA), *The Broadband Imperative*[2], recommends at least 100Mbps per 1000 students and staff in 2014-15 for US schools, rising to at least 1Gbps per 1000 pupils and staff by 2017-18.

[1] http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/infrastructure-report/Infrastructure-report2012.pdf

[2] http://www.setda.org/c/document_library/get_file?folderId=353&name=DLFE-1517.pdf

Does the school need as much upstream as downstream bandwidth?



Uploads speed demands are dependent on the type of usage – if cloud computing is not widely used and most traffic is Web browsing then the upstream traffic will be significantly smaller than the downstream traffic. A reasonable assumption is that the upstream bandwidth is a quarter of the downstream bandwidth for this scenario.

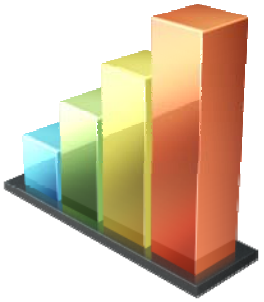
For the 400 device school, this gives a requirement of 20Mbps and for the 40 device school = **2Mbps**.

Therefore to provide a straightforward internet browsing environment, schools must have at least 80:20 Mbps and 8:2 Mbps in the above scenarios.

However, if pupils are using cloud based services – Office 365, a remote VLE, Google Apps etc. then the school will need to have significantly more upstream bandwidth, say 100Mbps and 10Mps in the above scenarios. This points to a minimum requirement of 100:100Mbps (say a 100Mbps Ethernet Service) for the larger school and a 10:10 Mbps (say 10Mbps symmetrical Ethernet, 10Mbps symmetrical LLU or an asymmetrical 40:10 Mbps or 80:20 Mbps FTTC service) for the smaller school.

Upstream Bandwidth Requirement				
School	**Devices**	**2012 Connection**	**2015**	**2017**
Secondary	**400**	**20 Mbps**	**44 Mbps**	**74 Mbps**
Primary	**40**	**2 Mbps**	**5 Mbps**	**8 Mbps**

What total volume of data is used each month?



The average usage of home broadband services has risen to download capacities of 23GB of data per month**. Schools need to ensure that any contract entered into for the provision of broadband services does not have a data cap** to avoid unexpected and potentially large bills or a suspended service when the cap is reached.

Again, from Ofcom's *2012 Infrastructure Report*[3]:

> 'Driven primarily by increased consumption of internet delivered video based services, consumers are using more data than ever: on average, residential fixed broadband customers are using 23GB of data per month (up by 35% from 17GB in 2011).'

Watching videos or downloading images takes large volumes of data. Taking iPlayer streaming as an example:

By default BBC iPlayer TV programmes are streamed to your device at a high quality rate of 1500kbps (1.5 Mbps). You can reduce the video quality from high to standard 800kbps quality video by tapping on the "HQ" option from the media player controls during live or on-demand TV playback. This will play a reduced bitrate video that can be used if your internet connection is not fast enough to play the high quality video.

At the higher definition this is means that for a 4 minute movie 45MB of data will be transferred

[3] http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/infrastructure-report/Infrastructure-report2012.pdf

One 4 minute video per pupil per week for the secondary school = **288GB** per month

One 10 minute video per class per day for a 6 class primary school = **13.5GB** per month

NB this type of usage again underwrites the initial assumption of 2Mbps per active user at peak times.

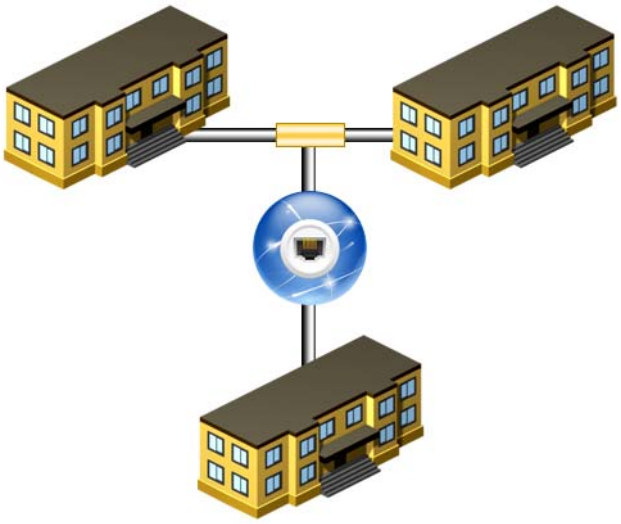
The importance of connection management

The availability of broadband to a school is an essential component in the operation of the school. A fully managed service is an essential element in achieving high availability and corresponding service level agreements form the suppliers. This implies:

- The service is supported by a 7x24 Operations Centre which monitors connectivity and both flags and instigates actions to repair faults on that basis thus ensuring that unless a school visit or in school action is required the fault fix is progressed immediately and the connection downtime is kept to a minimum. Frequently faults occur out of normal business hours and can be fixed before the start of the next business day.
- A support desk taking calls and with full online ticket reporting so that schools can see and trace progress with reported faults, poor performance and change requests. The desk should take calls both on-line and by phone and needs to be available at least during the working day (8.00 am to 9 p.m. weekdays and Saturday a.m.).
- An on-line portal showing the performance and availability of the connection.
- On-line billing

The impact on connectivity requirements for multi-site or cluster working

Many schools want to operate as a member of a cluster. You may be a multi-campus school, a group of schools in an academy trust or a cluster of schools working together with a single managed wide area network across its members. Being part of a fully managed Wide Area network enables this to be provided in a straightforward and cost effective way without traversing the Internet. The alternative of installing separate point-to-point connections between sites may be expensive.



Some sites are multi agency not only being the location for the school, but perhaps a library, a medical centre or other public sector services. Being part of a managed Public Services Network (PSN) enables connectivity to each of the agencies to be delivered over a single broadband connection with each agency having control over its own virtual Wide Area Network and different security levels to be applied as required.

Quality of Service

A managed network will also enable quality of service to be implemented across its infrastructure to enable better performance and the support of voice, video and priority applications. Typically 6 level QoS may be implemented:

Priority	Class	Description
1	Voice	Voice IP Telephony
2	Video	Broadcast Video, Real-Time Interactive Video (Cisco Tele Presence), Multi-Media Conferencing, Multimedia Streaming
3	Signalling	Call Signalling
4	Priority-Data	Transactional Data (ERP, CITRIX), Network Management and Control
5	Scavenger	YouTube, iTunes, Bit Torrent, Xbox Live.
6	Best-Effort	Bulk Data (E-mail, FTP, Backup Apps, Content Distribution), Non-confirming Data to above Classes

Where the broadband provider provides a fully managed connection with Quality of Service this enables a wider range of quality services to be supported including voice and video services, different types of applications with time dependent requirements to be supported across the network (CITRIX) and the full bandwidth of the schools circuit to be available across the network when capacity is available and demanded by the site (peak demand).

Supported by Regional Broadband Consortiums and:

ATOMWIDE Education Services CAPITA KCOM #easynet Global Services updata infrastructure MDNX