

School Broadband Requirements

The National Education Network

September 2010



What features do schools require of a broadband supplier?

A local or regional authority may be considering a public service network serving schools as well as other partners. A school may ask if a commercial provider could provide appropriate educational broadband services.

This paper is intentionally short. For further information, please contact your Regional Broadband Consortium or Local Authority.

The National Education Network site provides contacts and will publish future editions of this paper: www.nen.gov.uk

The National Education Network

The National Education Network comprises the 13 schools' broadband networks in England, Scotland, Wales and Northern Ireland. The NEN community drives the development of digital communications infrastructures and services to support the safe, effective embedding of ICT into teaching and learning. Issues such as safeguarding and copyright are managed.

NEN offers a number of unique advantages for schools:

- Secure and safe environments where teachers, pupils and parents can work confidently together.
- Networks sized and maintained to meet the bandwidth and media demands of the education sector, within limited budgets.

The NEN is a partnership between schools and local authorities, working in regional collaboration with national partners like Becta, DFE and JANET(UK).

Schools' Broadband Requirements

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The factors important to schools when designing broadband networks

Capacity

Connection Bandwidth: Before 2007, the mantra was “2 Mbps primary and 8 Mbps secondary, uncontended, symmetric bandwidth”. National Education Network research indicates that these requirements are increasing rapidly and that 10 Mbps for Primary and 100 Mbps for secondary are now better targets for carrier bandwidth. Actual usage varies with pupil age, size of school and the educational emphasis given to ICT.

Measured bandwidths (99th percentile used to remove peaks):

- One local authority recorded 7 Mbps for a primary school of 400 pupils, but under 1 Mbps for an infant school of 70 pupils. Some large primary schools have upgraded to a 100 Mbps fibre carrier, but with a bandwidth cap of 20 Mbps to limit costs.
- For a large, ICT aware secondary school 49 Mbps was recorded, with few using under 10 Mbps. 1 Gbps fibre carriers are being installed into some secondary schools.

Applications: Firewalls, filtering systems, DNS, email relay can add latency to their data paths and need to be scaled to cope with the throughput expected.

Rate of growth: The NEN reported rapid growth in bandwidth demand. A growth rate from 30% p.a. to 50% p.a. is typical for schools, with video increasing the most rapidly.

Suitability

Contention Ratio: A school's bandwidth must be uncontended at the point of use, in other words there are no capacity headroom limits from school to the Internet. Occasionally schools challenge these requirements, believing that 'business broadband' is available at lower prices. However lower-price commercial provision has turned out to be contended at some point. For network design purposes only, a contention ratio of 3:1 for the backbone may be acceptable, but in operation links should be monitored and kept below 70% capacity (99th percentile).

Symmetry: It is becoming ever more important that bandwidth is symmetric, with learning platforms, video conferencing and remote backup all requiring good upstream bandwidth. On occasion recorded upstream bandwidth now exceeds downstream.

Latency: Schools have moved more quickly into audio and video than other public services. Videoconferencing is probably the most demanding area where, for example, the ability to synchronise lip movement with sound may be important in languages. The most demanding broadband networks specify a round-trip time (RTT) <20 ms, on the basis that a videoconference with a school the other end of the country traverses two LA networks plus JANET, and a total RTT of 50 ms would be a good latency figure. In practice this could be relaxed to say 150 ms RTT over the whole national path, or 50 ms on each WAN. The ability to apply QoS is important.

Reliability / Availability

A decade ago, the initial enthusiasm for on-line learning nearly stalled as school networks connected via ISDN were overloaded or the circuits proved unreliable. A school broadband connection should have an availability over 99.9%, which gives teachers confidence to plan on-line learning. Not all school local area networks are this reliable, unfortunately.

Time to Restore Service

The ability to restore services rapidly after a break is important and access from the start of the day following a break is a minimum. 5 hours Mean Time to Restore Service is a reasonable figure.

Security and Safety

Schools requirements for security will include:

- Pupils and staff using the system – inappropriate content and contact.
- Personal data and coursework – data loss or access by unauthorised persons.
- ICT systems – from accidental and intentional attack, internal and external.

A balanced approach including policy, education and systems strategies will be required.

Educators expect access to appropriate materials to be as open as is reasonably possible.

Security features should not limit legitimate and planned educational access. A stated policy objective must be to enable access by default, unless there are clear reasons not to.

Longevity and Stability of Network Provision

The academic year cycle may mean that a teacher devises and tests a programme of study for use in several following years. Internet access is as important as electricity! Schools and the local authority must plan for connectivity and educational services to be a constant facility, always with enough capacity to respond to educational demands from schools.

Advice and Support

Wide area networking expertise is still relatively rare, as is expertise in security and safeguarding. School staff require responsive and sensitive support services that complement the skills of the local ICT support teams. Service delivery should be reported on a monthly basis.

Affordability / Value for Money

Naturally schools will want all of the above at a low cost. It is important that schools realise that they make considerable demands on a network; typically schools may generate more than four times the traffic of their local authority! Commercial Internet service providers may say that they can provide the same service at lower cost. However it is unlikely in practice that the service would actually be comparable, even in simple matters such as contention and in security. The response of a commercial ISP to this paper should be evaluated very carefully!

Educational Applications

The wide area network is only the transport layer for the learning services required by schools. These may include: Videoconferencing, Email Relay, Firewalls and security measures, Filtering, Anti Virus, and Learning Platforms. Services may be provided by the local authority or third parties, or the school itself, all of which may require configuration of the broadband service.

More recently administration applications are being hosted at local authority data centres with access via thin client. Remote backup and LAN support are also increasingly important.