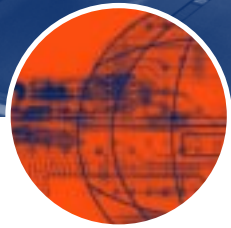


The Potential Role of Wireless LANs in Education



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New opportunities for learning and teaching

Local Area Networks (LANs) based on wireless technology will play an important part in the development of IT infrastructure in colleges and universities over the next few years. It will be especially important for those institutions that are in the process of extending their network, because wireless LANs are likely to be the most cost effective way of extending the reach of the network, both to new areas and to increase the number of simultaneous users

A wireless LAN is a method of linking computers together without using cables. Computers are linked together so that they can access data held centrally, access the Internet, use email and share resources. Usually this is done by connecting the computers together using electric cables, but it can also be done using radio signals or infrared light.

Colleges and universities are continually extending their Local Area Networks (LANs). This can be a very expensive and often disruptive process when cables are being installed. An alternative is to use wireless (radio) LANs. Not only can this be cost effective, it is also considerably more flexible because computers can be used anywhere instead of each computer having to be placed near a network socket, offering new possibilities for learning and teaching.

Wireless LAN is a relatively young technology and we are only just beginning to understand the educational advantages that it can offer. Some of these are already evident such as enabling better collaborative working among students. Institutions that are looking at student ownership and use of laptop PCs and personal digital assistants (PDAs) need to find ways to provide access to the Internet from the students' own machines. Wireless LANs are an easy way to manage this. Although few colleges or universities within the UK currently have courses that mandate use of laptops or PDAs, it is already common in the USA and is likely to start to happen here soon.

In almost all situations, wireless LANs will be used in conjunction with wired LANs to maximise the benefits for colleges and universities. A wireless LAN requires a "backbone" to connect the parts together, and in most cases this will be wired. Also, there will be locations where wiring makes sense. For example, in computer laboratories, the need to provide power cables means that laying data cables at the same time is comparatively inexpensive, and the high density of users and bandwidth requirements make wired LANs the most sensible solution.

Who this report is for

This report is aimed at senior managers who are responsible for the development of institutional strategies (ILT, ICT, learning and teaching) and want some understanding of the issues involved in providing network infrastructure on their campus including the financial and pedagogic imperatives. It is of interest to Principals and Deputy Principals in FE, Pro-Vice Chancellors for IT and Learning and Teaching in HE, Heads of Computing and IT, Heads of Information Services, Heads of Estates and those responsible for space management and the design of learning spaces.

Why use Wireless LANs?

Wireless LANs can be installed when it is considered to be economically or educationally beneficial. There are likely to be economic benefits where there is not a good existing LAN already and one is needed. Cost savings are likely to be especially great in areas that are hard to wire because of the nature of the existing buildings. This includes listed buildings, where it can be difficult to get permission to put the wiring in and there may be controls on where the wiring can go, making installation even more expensive. Buildings with asbestos or reinforced walls can be very difficult to wire and here wireless LANs can be especially beneficial.

Besides the economic advantages, wireless LANs also provide greater flexibility than wired LANs for three reasons:

- Wireless LANs provide physical flexibility, because wherever the user is working in the teaching space they are still able to use the network. With a wired network it is necessary to decide where computers will be used and install the network sockets there. Often the use of space changes with time, and then either the space has to be rewired or long trailing cables are used to get from the computer to the network socket
- With a wired network, the maximum number of users has to be determined when the space is wired and a suitable number of network sockets are installed. This tends to mean either that too many network sockets are installed, so wasting money, or that there are times when demand exceeds supply and some users are unable to use the network. With a wireless network, although the performance of the network will deteriorate as the usage increases, unless there is very high demand all users will be able to access the network
- The network can reach places that wired networks cannot, including outdoors, because the signal can be reached up to several hundred metres from

Wireless LANs allow computers to be integrated into education rather than education fitting around computers.

buildings. Also, it is relatively easy to set up an access point linked back to the campus network for use in remote premises

Wireless LANs can be especially useful in classrooms that are often re-arranged for different purposes, for example, for lectures in one session and then for discussions in another. One particularly powerful use of

wireless LANs is in conjunction with "wireless carts". These mobile carts with 10-20 laptops and an access point in them can be wheeled into the classroom where they are required providing students with immediate access to Internet-enabled PCs. This means that all classrooms can become PC laboratories when required, including specialist rooms.

Resolving issues

As with any new or emerging technology, there are a number of problems associated with wireless LANs. The two most significant are the rapid evolution of the technical standards associated with wireless LANs and the sharing of bandwidth, which means that the available bandwidth will be much lower than for wired networks.

Although standards are moving rapidly, one of the standards, Wi-Fi, is well established and many people are using it already, both in industry and education. The next likely standard (called 802.11g) has specifically been

designed to be compatible with Wi-Fi, so that investment in Wi-Fi equipment is not wasted. The other main standards are more problematic (see the corresponding papers referenced below for more details on standards).

The current recommendation is that wireless LANs should be built using Wi-Fi with 802.11g as an upgrade route.

Another potential problem is that wireless is inherently more vulnerable than wired networks. This is because a hacker does not even need to enter the premises to be able to gain access to the network from inside any institutional firewall as radio signals will pass through walls. It is also easier to monitor the radio signals than those in a wired LAN. To overcome this a standard called Wired Equivalent Privacy (WEP) has been developed. Currently, the standard has some major weaknesses and cannot provide adequate security alone. Solutions however, are available.

Recommendations

It is clear that wireless LANs will have a growing place in the IT infrastructure of colleges and universities over the next few years.

When extending a LAN to a part of the campus not currently covered by networking, or where networking is being improved, compare the costs and benefits of using Wi-Fi for part of the network with those available for a wired network. In looking to the future it is important to include in these considerations student use of their own computers (laptops or PDAs) and flexibility of operation.

About this paper

This paper is one of a pair, and is aimed at senior managers and those responsible for strategy and policy. A corresponding briefing paper, providing a more detailed account including technical information aimed at those responsible for implementation and practice, is available for this issue. Copies are distributed by and available from JISC Assist, or:

<http://www.jisc.ac.uk/pub/>

The information in these papers is taken from a report on wireless LANs produced by TechLearn (see below) which contains a much fuller discussion of the issues and the pedagogical opportunities that wireless LANs offer as well as an extensive annotated bibliography.

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