Ethernet and other LANs

What it is and what it can do

Once a company grows past the point at which it needs more than one PC, or it needs to connect that PC to other equipment such as a server or machine tools, it should start thinking about an intra-office data network. This is normally called a Local Area Network (LAN) and has, until recently, generally been provided by running cables between all the devices that need to be connected. The logistics of this often frightens SMEs off and they continue to use a set of unconnected PCs, transferring data between them on floppy discs or even retyping the information into another machine. This is a major barrier to flexibility within an office (or factory) and can be an even greater obstacle to flexible working when connection to external networks is needed.

Key messages for SMEs

- Once there is more than one PC and one printer in an office, it makes sense to interconnect them to allow sharing of resources and information. Ethernet LANs provide a simple way to do this. Wireless LANs are an increasingly popular alternative.
- Bluetooth may make interconnection much simpler by providing easy-to-use wireless links, but it still needs some development.
- Once devices are interconnected, the need for good security against malicious or accidental interference is increased.

Installing and running a cable-based LAN is no longer the daunting task that it used to be. The cables and connection devices have been developed to the point where it is almost a 'plug and play' operation. Nevertheless, most SMEs should consider getting a professional IT contractor to install and set up the network. However, once installed, the network should require very little attention. The software, which controls the way PCs talk to each other, is reasonably user-friendly and anyone with basic computer skills should be able to use it. Obviously it makes sense to have a maintenance contract, so that professional help can be called in quickly if anything does go wrong.

The most common form of LAN is an Ethernet. To install this, a Network Interface Card is needed for each device to be connected (e.g. a PC) and a switch (or hub) is needed to route the information between the devices. The devices and the switch are interconnected by cable similar to telephone wiring.

Ethernet starter kit for small businesses, containing hub, cables, network interface cards and software
Courtesy of SMC Networks

Typical Ethernets operate at 10Mbit/s or 100Mbit/s[1], although it is important to remember that the bandwidth is shared between all the equipment connected to it. If lots of large files are being sent over the network simultaneously, the response times may slow down but this unlikely to be a problem in a small business. If larger businesses with, say, 50 or more people using the network experience

[1] As a comparison, a 10 Mbit/s LAN carries data at about 250 times the speed of an ordinary modem connecting a PC to a phone line

persistently slow response times, the problem can be overcome by splitting the network into two or more interconnected sub-networks.

Alternatives to wired networks are also commercially available. The most common methods use infrared or radio signals to interconnect devices. Many of today's portable and palmtop computers include an infrared communications port, which they can use to send information to each other or to peripherals, such as printers and video projectors. This is very useful for nomadic workers because it avoids the need to carry a bag of connecting cables but infrared devices only really provide a link between two devices rather than networking a number of devices together.

Wireless LAN adapter card for laptop PC (courtesy of Proxim)

Wireless LANs are also commercially available. Although they are not yet as common as Ethernet, they are becoming increasingly popular. The most common system is known as IEEE 802.11b or 'WiFi'. It uses a central base station capable of linking dozens or hundreds of devices, and credit card sized adapters that slot into the sides of the individual devices to offer a cable-free 'plug and play' networking solution.

There are other variants of 802.11b that are starting to emerge and that you may see mentioned.

> **IEEE802.11a** provides a higher bandwidth than IEEE802.11b. It carries 54 Mb/s and therefore can move information around at about 5 times the speed of IEEE802.11b, or give 5 times as many users the same level of service. However, the part of the radio spectrum that this standard needs (about 5GHz) is not as freely available in Europe as it is in the USA, where the standard originated.
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> **IEEE802.11g** also provides the same higher bandwidth that IEEE802.11a does, but uses the same freely available part of the radio spectrum as IEEE802.11b. At the time this briefing is being written, the standard has not been completely agreed, although some manufacturers are introducing products based on an early view of the standard.

Another wireless system known as "Bluetooth" is also being widely promoted. Originally conceived as a wireless alternative to infrared links for establishing ad-hoc connections between PCs, printers and other devices, it is developing into a sophisticated networking protocol that can automatically accept (or reject) requests from 'visitors' to join the network. See the FlexWork Bluetooth briefing for more information.

Some manufacturers are also promoting solutions that use the power cables within a building to carry data.

These new ways of building networks within sites are making it much easier to put the hardware where it is needed and to make changes when they are needed.

Advantages and Disadvantages

A Local Area Network makes it much easier to exchange information between the people working in a building. It also makes it possible to share expensive pieces of equipment, such as a high quality colour printer, between large numbers of people.

The most common LAN technology is Ethernet, which is well understood and is widely available.

The biggest disadvantage of Ethernet is that cables have to be installed and reconfiguring the cabling to add new users or cope with changes in business activities can be disruptive. Alternatives, such as wireless LANs, are easier to install but are more expensive.

A possible concern about wireless LANs is security. However the 802.11b technology has its roots in military applications, and manufacturers claim that the security provisions built into their wireless LANs make them more secure than most wired LANs. Nevertheless, you should take professional advice about how to make your wireless LAN secure against eavesdroppers or even casual use by

people not working for you but within range of the LAN. Bluetooth also incorporates security procedures that allow you to control who can connect to or listen to signals on your network.

What to buy

Most computer suppliers stock a range of LAN equipment. Larger suppliers should be able to provide advice on suitable equipment for a small business, together with an installation and maintenance service. Small businesses are therefore advised to contact their supplier to discuss their requirements.

An Ethernet is probably the cheapest solution to a small business' requirements for an intra-office network. A starter kit, containing everything needed to connect two PCs, costs around €40 and it costs between €20 and €50 to connect up each additional user. An IEEE 802.11b wireless LAN is more expensive. The central hub costs between €150 and €700 and the cards needed to connect the individual PCs cost around €70 each. However it is much simpler to install and may be a cost effective solution, especially if the network is likely to need frequent extensions or reconfigurations.

The range of Bluetooth-equipped devices is growing rapidly and their price is falling. Bluetooth based solutions are now similar in cost to wireless LAN solutions but the technology is still difficult to set up and manage for inexperienced users.

Questions to ask suppliers

- What hardware and software do I need to connect my computers, printers and other peripherals? (and list all of these devices that you want to connect)
- How much will this solution cost?
- Would you recommend a different solution if we expect our network to grow significantly in the next couple of years or if we expect frequent reconfiguration of the network?
- What protection does this network offer against eavesdropping or hacking?
- What work is involved in installing the hardware and software in my computers and other devices?
- Do your products interwork with those from other manufacturers or do they only work with each other?
- Do you offer an installation and maintenance service and, if so, what does it cost?
- Is there a help line to advise on installation and maintenance problems?