

**Berg Kaprow Lewis**

Networks and communications

A network can link all the computers in your office, allowing users to share files, programs and resources such as printers and modems. Even businesses with fewer than ten computers find they benefit from installing a network.

This briefing is aimed at users who are planning to install a new network or upgrade an existing small network. See **Network servers**, IT 10, for information on choosing a network server to manage your network.

This briefing covers:

- Types of network.
- The equipment you need.
- Small, medium and large networks.
- Managing your network.

1 Network basics

There are different ways of connecting computers together.

1.1 The simplest network is a **peer-to-peer** network linking individual PCs together.

- This is a low-cost way to link your computers, but it has its drawbacks. (See box, page 2.)
Many businesses with more than two or three PCs opt for a network with a dedicated server to hold shared files, manage printers and so on.

1.2 The most usual way to set up a network is in a **star** (or hub) arrangement.

- Your system continues to work, even when

one of the computers on the network fails. This is because all of the computers, including the server, are connected to the hub at the centre of the network.

- Maintaining the server is crucial. If it fails, your whole system will fail.

1.3 Other network layouts exist for larger or more specialised businesses.

- A bus (or daisychain) arrangement connects all your computers in a line.
- A ring arrangement connects them in a circle.

1.4 You will need to choose the type of **cabling** to use. This will determine the speed of data-transmission on your network.

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- The most flexible cable to use is 10/100BaseT Ethernet. This is similar to telephone cabling. 10BaseT and 100BaseT are two data transmission speeds. 10BaseT allows transfer at 10Mb per second, 100BaseT allows 100Mb per second.

Peer-to-peer networking

A small business with a limited number of computers may not need to set up a centralised network to share files and printers.

It can use peer-to-peer networking, which allows two or more computers to communicate directly with each other.

The advantage of peer-to-peer is that it is relatively cheap and easy to install.

The disadvantage is that performance can be considerably lower than a network with a dedicated server. File access between PCs has only limited security controls; turning off a PC disables access to its files; and there is no centralised location for data back-up.

- A** All versions of the **Windows** operating system support peer-to-peer networking.
- Each computer must be configured to recognise the network.
- You need to fit each computer with a network adaptor card. Choose Ethernet adaptor cards that are both 10BaseT and 100BaseT compatible.
 - You need to purchase a hub which links each of the computers.
 - You must install cabling. Several suppliers provide 'small business network solutions' which provide all the hardware for you to connect small numbers of computers together.
- B** You can connect **Apple Macintosh** computers using AppleTalk.
- The computers configure themselves automatically once you switch on AppleTalk.
- All new Apple Macintosh computers come with an Ethernet adaptor card installed. You can use the printer port on older models, or install an Ethernet adaptor card.

10/100BaseT Ethernet can accommodate both of these transmission speeds.

- It is easy and relatively cheap to install and enables the best network management and monitoring.

1.4 Some businesses may already have **coaxial Ethernet** installed.

- This standard used to be much cheaper than 10/100BaseT Ethernet, but no longer offers any substantial benefits. It uses coaxial cable to link the computers, which is much less versatile.

2 Equipment you need

2.1 Most businesses will need to purchase a **network server**.

A server is a computer used to administer the network and store all the key files in your computer system. A standard desktop computer can be used but busy networks will benefit from installing a high-performance computer designed specifically for use as a server.

See **Network servers** for information on choosing a network server.

- A business with only a few computers (fewer than ten) may keep it simple by using peer-to-peer networking (see box).

2.2 You will need a **hub or switch** to use the star topology.

- Even if your network is currently using 10BaseT, check that your hub can cope with 100BaseT for faster transmission, in case you need to run your network at higher speeds in the future.
- Choose a stackable hub for when you want to connect more computers to your network.
- Ensure that the hub is compatible with your network management software.
- Consider a maintenance agreement for the hub as your entire network will be unusable if the hub fails.

2.3 Each computer or device (such as a network printer) needs a **network adaptor card** to enable it to transfer information over the network.

- Choose a network adaptor that supports the transmission standard you are using. As with cabling, the most flexible for most businesses will be a 10/100BaseT adaptor.

“Check that there is sufficient room to lay down cabling when you move into a new office.”
Ian Jones,
National
Computing Centre

- Each adaptor includes software to allow the computer to communicate with the adaptor.
Windows users should choose a plug-and-play adaptor that automatically configures the computer.

2.4 Each desktop computer linked to a network server needs to be **configured** to communicate with the other computers on the network. See **Network servers** for information on the kinds of software you can run over a network.

3 The outside world

3.1 A business with **more than one office** will usually need to link them together.

- Offices in adjacent buildings can be linked by connecting the two network servers.
- Setting up a virtual private network (VPN) is the easiest way to link non-adjacent offices. Use a leased line to create your VPN if reliability is a priority or if you need to transfer large amounts of data.

Setting up a VPN on a broadband Internet connection is cheaper, but reliability and data capacity can be slightly lower.

3.2 You may want your employees to be able to dial into your network while **away from the office**.

- Each remote user needs a computer with a modem that connects to the phone or to a broadband Internet connection.
- Each user needs special software to dial in. Windows 98/2000/XP is supplied with suitable remote-access software.

Conflicting standards

The type of network standard you choose does not matter until you try to connect two networks together.

You will need to invest in additional hardware and software if you want to connect computers using different standards.

- The two main standards are TCP/IP and IPX/SPX.
- Different operating systems, such as Novell NetWare, Microsoft and Unix, use different standards.
Find out which is the correct standard for your operating system.

- The network server the user connects to needs software to manage several different connections.

3.2 Linking your network to the **Internet** allows you to exchange email and access the Web.

- Businesses where everybody accesses the Internet often need a dedicated server to manage the amount of traffic generated by Internet connections.
- Draw up guidelines to prevent employees accidentally violating copyright law or wasting time.
See **An email policy for your employees** and **An Internet policy for your employees**.

4 Security

Allowing everybody to share files and resources entails some security risk.

The risk depends on the nature of your business. If you have commercially sensitive data you should discuss how to secure your network with an IT specialist. But for most businesses it is rare for somebody from the outside to hack into a system.

You are far more likely to suffer because an employee accidentally deletes some software or gains unauthorised access to confidential information.

4.1 Network operating systems allow you to give **different users** different levels of access.

- Each user has a username and a password.
- Individual users can be limited to certain sections of the network to prevent unauthorised access.
For example, you can configure your system so that only nominated users can access confidential data.

- Individual users can be allowed to decide who else may use any files they create.

4.2 Businesses that transmit commercially sensitive information may need to **encrypt** messages. For example, any business which makes sales over the Internet.

- Encryption scrambles your message so that unauthorised users cannot read it.

4.3 You may need additional software and hardware to prevent **viruses**.

➡ See **Network servers** for more information on the hardware and software you need and other aspects of security.

“To manage electronic data on a network system effectively, set up dedicated sub-directories for individuals and applications on the main server. That way, files can be stored and retrieved in a logical manner. It also provides good security, as sub-directories can easily be password-protected or hidden from an unauthorised user.”

Kevin Davis,
management consultant

See Security and the Internet.

5 A question of scale

Networks become more complicated as they grow. You need to have some realistic idea of the level of resources and support you will need.

5.1 A small network with fewer than ten computers can probably be managed by assigning one person to run it on a day-to-day basis.

A typical small network would only demand a few hours' attention each week as there is little complexity involved:

- One computer is used to store and share files. This can mean using a network server, but you can also use peer-to-peer networking (see box, page 2).
- Everybody shares the same printer.
- Every user has the option of seeing and amending every file.
- Contact-management software is used to facilitate planning and scheduling. Sharing software usually involves using a central network server to manage the data flow.

5.2 A medium-sized network of between ten and 100 computers needs at least one person working full-time to manage the network hardware and software.

A medium-sized network may involve more complex issues about who can access information and programs:

- Everybody connects to a network server to share files and resources.
- There are likely to be several printers on the network to minimise bottlenecks.
- Different groups of users are given different access rights to protect sensitive files.
- Network versions of accounts and database software have to be available to different groups of users.

5.3 You may need two or **more people** to provide network support if networked activities are central to your business:

- You may have a large customised database or groupware product which is vital to your daily operations.
- You may have a large population of users who need to access the Internet.
- You may have people on the road or in other locations who need to access your network remotely.

6 Installing a network

Installing a network is disruptive and requires careful planning.

6.1 Installing the network's cable **infrastructure** will cause the biggest disturbance and take the most time.

- You will need to employ a specialist contractor.
- Install enough cabling and outlets to see you through any planned growth phases. Spare outlets let you add new computers without cost or delay. Having to add more outlets to an existing network is both disruptive and expensive.
- Ensure that the cabling supports high speeds (at least 100BaseT).
- Ensure that you retain a detailed drawing of the cabling to speed up fault-finding.
- Ensure that all the network cable links are tested during installation and that you obtain a copy of the test results.

6.2 Install the **network hardware** once the infrastructure is in place.

- Connect the network server and one desktop computer to configure the system.
- Check that all parts of the network server are working correctly.
- Install the network adaptor cards in each desktop computer.
- Install any other communications hardware you need, such as modems and routers.
- Use an uninterruptible power supply (UPS) to protect your server from power cuts and surges. Test this and any back-up devices you use.

6.3 Install the **network software**.

- Configure the network operating system software using the test desktop computer.
- Install any network applications on the main server.
- Check that the back-up software works correctly. You need to make a back-up of the entire system once you have loaded on to it all the software you use.
- Configure one of the desktop computers.
- Configure and run any network management software you use.
- Copy the desktop configuration to each desktop once you are fully confident the system is working.
- Establish access rights and passwords for individual users.

Expert contributors

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Further help

There are other Directors' Briefing titles that can help you. These briefings are referred to in the text by name.

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