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1

Home and Wireless Networks

We look at home networks, how they operate and what forms they take, review the benefits and drawbacks of wired versus wireless networks, and then examine wireless home networking and its sharing of resources, devices and Internet access.

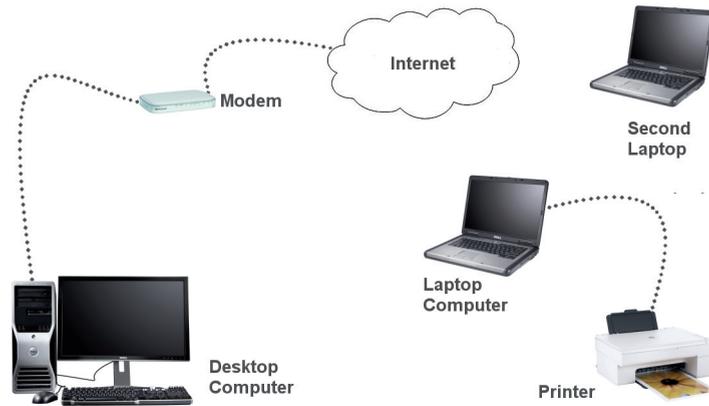
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Don't forget

When you have several computers that are not connected to one another, it becomes difficult to share data, devices or services.

What is a Home Network?

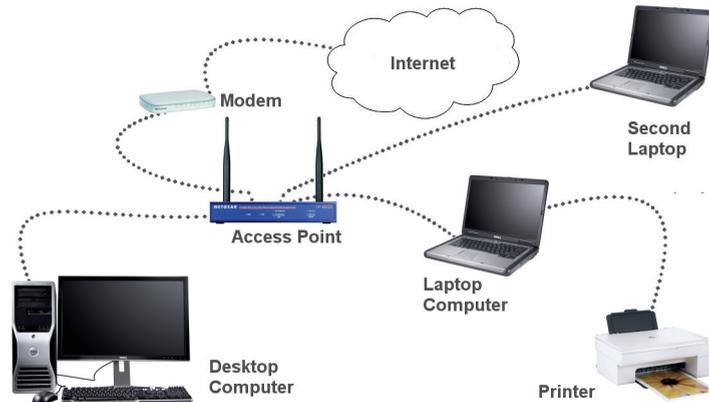
A home network is a combination of two or more computers that can share information and resources. These resources can include devices such as printers or services such as Internet access.



Without a network, Internet access is available on only one PC at a time. If you want to use a printer connected to another computer, you have to transfer the associated files via a floppy disk, CD or a data storage device such as a USB flash drive. Digital music, video, and photos can be enjoyed only on the PC containing the relevant media files, since the files concerned are usually too large for convenient copying.

Hot tip

When you establish a home network, each computer can access the Internet simultaneously. The data and devices on any one computer can be available to every computer. So you can be more productive, or simply have more fun.



When you connect the computers in a network environment, these computers can share any of their resources, including hard disk drives and other storage facilities, as well as the printer and Internet connection.

...cont'd

Network Connection Methods

In order for the computers to share their resources, they must be connected together. There are a number of ways in which this can be achieved, including:

- 1 Wired Ethernet – special purpose networking cables
- 2 Phonline Network – telephone cables around the home
- 3 Powerline Network – power cables around the home
- 4 Wireless Network – radio wave transmissions

Network Adapters

There's a need for a network connection device or adapter in each computer. The form this will take depends on the type of network connection method being used.

Network Router or Switch

It is usually necessary to have some form of router or switch that has the role of distributing the various bits of information to the appropriate destination, e.g. between the Internet and a specific computer, or between two computers. Again, the devices needed depend on the connection method.

Which Method is Best?

Each method has its own strengths and weaknesses. We will look at each of these network connection methods in turn and identify the advantages and disadvantages associated with each.

Wireless Fidelity or Wi-Fi

As you'll see, we reach the conclusion that wireless networking, using radio wave transmitters and receivers instead of cables, is the ideal setup for the home user (see page 13). It allows you to access the network and its resources from anywhere in the house, without having to worry about cabling.

However, Wi-Fi achieves its full potential away from home, at hotspot locations such as coffee shops, hotels and airports that provide the necessary wireless access points. All you require is a wireless adapter in your laptop computer.

Don't forget



Networking isn't just for computers. You can connect networked enabled storage devices or printers directly to the network. You can connect TVs and multimedia devices. Networked games consoles allow you to participate in multi-user video gaming sessions.

Wired Ethernet

Wired Ethernet has been the predominant network method in the past and so has built up a number of advantages.



Don't forget



With switches that operate in full duplex mode, you can get up to twice the rated speed.

- 1 There is usually an existing Ethernet adapter built in to your desktop or laptop computer
- 2 Ethernet networks are relatively high speed at 100 Mbps (mega bits per second), or 1 Gbps (giga bits per second)
- 3 Devices such as network attached storage, print server and digital media receiver can connect to the wired network

However, there can be disadvantages to using wired Ethernet:

- 1 Cabling can be expensive to install, especially when long cable runs are required, and changes are difficult to make
- 2 You often end up with exposed cables, which can be unsightly and create potential trip hazards
- 3 Cross-over cables may be required, e.g. to connect two PCs in an ad-hoc network, or to link Ethernet hubs, adding expense and complexity to your network

Don't forget

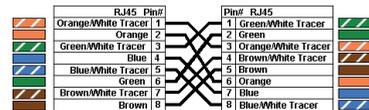


Individual computers will operate at the switch rate or at the network adapter rate, whichever is lower.

Standard Ethernet Cable



Cross-over Cable



- 4 Older equipment may be restricted to a maximum throughput of 10 Mbps, which could inhibit the performance of other parts of the network

Phoneline Network

There are two other types of network technology that share some of the benefits of the wireless networks, in that they make use of existing wiring systems to link computers.



This uses the home telephone wiring to connect computers into a network. It is based on HomePNA technology which puts computer data on separate frequencies from voice, fax or ADSL transmissions so that these do not interfere with each other.

The benefits of phoneline networks include:

- 1 You need no special wiring and no switch or hub
- 2 Speeds of 10 Mbps to 128 Mbps are possible, depending on the implementation level you choose
- 3 Devices can be up to 1000 feet apart, and up to 64 devices can be connected
- 4 You can bridge to a wired or wireless network, and connect via a router to the Internet

There are disadvantages to using phoneline networks:

- 1 You won't find phoneline adapters on your desktop or laptop computers
- 2 There's a limited number of suppliers of these adapters and associated bridges and routers
- 3 You need a phone jack in each room and all the phone jacks must be on the same single telephone line

Don't forget



This method is a popular way to provide data services in hotels and convention centers.

Don't forget



There are similar devices that make use of the television coax cable system installed around the home. Coax cable allows for higher speeds and greater distances.



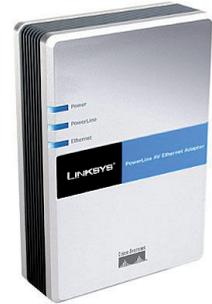
Powerline Network

Another way to transmit data around the home is to use the power supply wiring system. There are two types of powerline network adapters offered – Ethernet and USB.

With the USB adapter, you have one for each computer. It plugs into the power point, and connects to the computer via a USB cable. This creates an ad-hoc, peer-to-peer network. You'll need a bridge device to connect to the Internet modem and router.



With the Ethernet adapter, you again have one per computer but the connection is via an Ethernet cable to the built-in network adapter in the computer. An additional powerline Ethernet adapter would be used to connect to the Internet modem and router.



Don't forget



Originally developed in the USA, powerline networks are now available for most countries, whatever voltage their supply uses.

The benefits are similar to those for the phonline network, and in particular:

- 1 You need no special wiring and no switch or hub
- 2 Speeds of 14 Mbps to 200 Mbps are possible
- 3 A number of the main suppliers have products in the powerline network area

However, you can expect some problems in creating a network across your power cables. In particular:

- 1 The powerline network adapters must be on the same circuit breaker box
- 2 With the split phase wiring that is common in North America, you will have problems if some computers are connected on alternate sides
- 3 Your neighbors may be able to detect your powerline network signals, so an encryption password is essential

Beware



Your powerline network may act as a transmitter and interfere with local radio reception.

Wireless Home Networking

Wireless networking removes the constraints imposed by cabling. Some of the advantages that Wi-Fi offers include:

- 1 You can use your computer anywhere that you can pick up the signal from your wireless access point
- 2 Modern laptops have wireless adapters built in, and they can easily be added to laptops or desktops if required
- 3 There is Wi-Fi capability in various printers, webcams, video game consoles, while multimedia devices allow you to play digital music or view photos and videos on your home theater system and big screen TV
- 4 Laptops with Wi-Fi facilities can be used outside the home, via hotspots or through mobile broadband

However, there are some limitations to be aware of:

- 1 There are inherent security risks, especially if you install your wireless network with default settings
- 2 Wi-Fi connections could be slower than wired Ethernet, with nominal speeds of 11 Mbps or 54 Mbps
- 3 The further you are from the wireless access point or router, the slower the actual throughput achieved

For the home network, wireless is clearly the ideal solution. It is easy to set up and configure, there are no cables to install, and changes to the network are simple to apply. The performance gap between wireless and wired Ethernet has been effectively closed with the latest standards. For those situations where location or interference make one of the wired techniques more suitable, you can bridge the wired section to your wireless network.

The wireless adapters in your laptop computer continue to be useful when you are away from home, and allow you to link to the Internet via a municipal or commercial connection or through a variety of wireless hotspots (see page 161).

Hot tip



Your wireless access point will normally provide a number of wired Ethernet connections and so supports a mixed network environment.

Don't forget



The proposed Wireless-N standard offers 300 Mbps and a better range. Current devices built to draft specifications may need upgrading in the future.

Hot tip



Always select Wi-Fi certified devices to avoid conflicts between devices from different suppliers.



How Networks Operate

The essential elements in a network are the network adapter (one per computer or device) and the connecting facility. This can be cable for a wired network or radio transmissions for a wireless network. For computers that are located close to one another, their network adapters can connect directly, to form an Ad-hoc network (see page 48).

Hot tip



With a wired network, direct connection is only between pairs of computers, and you must use the crossover version of the Ethernet cable (see page 10).



For a number of computers or for greater separation, you need something to manage the multiplicity of links. This device is known as a Wireless Access Point on a wireless network. On a wired network the equivalent function is provided by a Switch.



Don't forget



The wireless access point provides one or more Ethernet connections, for use during initial configuration, and to allow for the connection of modem and router devices.

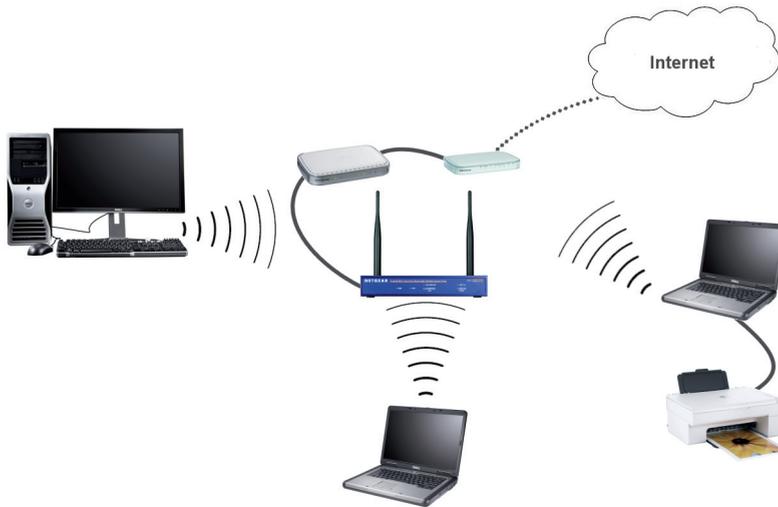
If your network includes Internet access, you'll require a Cable or ADSL Modem, which could be used by any of the computers, often at the same time.

This means that multiple responses will be sent to and received back from the Internet. To manage this and make sure the responses go back to the correct computer, you need a Router to distribute each response back to the appropriate computer via the wireless access point or switch.



...cont'd

The modem and router are connected to the wireless access point to provide Internet support to the network computers.



Hot tip



The router and modem use Ethernet cables to connect to one another and to the Wireless Access Point.

The modem, router and access point functions may be combined into a single device for wireless networks. Similarly you may have a combination modem, router and switch for wired networks.



Don't forget



The combination device usually includes some Ethernet ports, so your network could include computers with wired connections.

Other wireless devices such as a network printer can be added to the wireless network (see page 151).

Don't forget

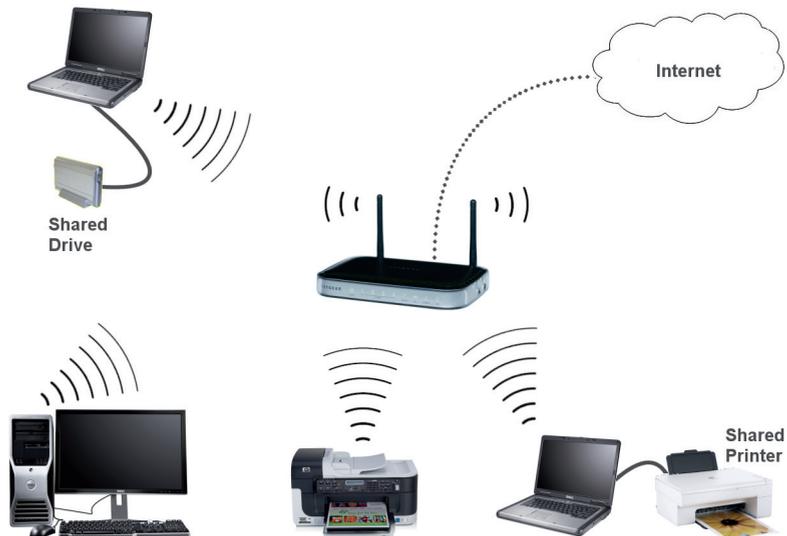
Workgroup networks are also referred to as Infrastructure networks, the term used in the Standards specification.

Peer Group vs Client/Server

There are two styles of managed networks that you could choose for your home network – peer-to-peer workgroup or client/server. Either could be appropriate, depending on the extent to which you need to manage and control your network. Each provides its own set of advantages and disadvantages.

Peer-to-Peer Workgroup

A workgroup network will normally consist of two to ten computers connected together. All the software required is included in the normal Windows Vista operating system. Each computer runs its own local applications and programs, but can share its resources with all the other computers on the network.

**Don't forget**

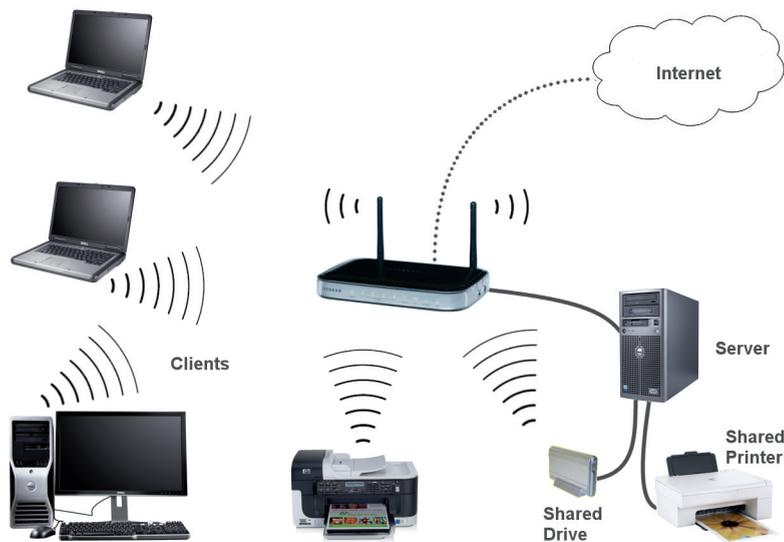
The illustrations and examples in this book concentrate on the use of peer-to-peer workgroup networking.

Sharing resources and adding new computers to the network is straightforward and uncomplicated. The network operates on the basis that all users take responsibility for the security and integrity of the network, and are required to manage their own backups. However, the consequence is that your computers are to some extent at the mercy of the least experienced or least careful user on the network.

Client/Server Domain

With the client/server network one computer (the server) shares its resources with all other computers (the clients). The clients continue to use Windows Vista, however the server requires a

...cont'd



Don't forget



Servers would normally be connected via wired Ethernet for improved security and integrity of data. Clients may be wired or wireless.

network operating system, for example Microsoft Server 2008. Data files and most of the applications are stored on the server, which has control over files, folders, printers, and other resources.

The server provides all services to the clients, and is responsible for security and authentication, managing usernames, passwords and permissions. To print a file for example, the client computer sends the request to the server, which accepts the request based on the user's permissions, then sends the print job to the appropriate printer for processing.

Choosing the Network Style

For your first network or for a small and simple network, you could start off with an ad-hoc network. This may also have a role as a temporary connection for visitors.

For most home networks, the peer-to-peer workgroup network will be the most suitable. As your requirements grow, you may decide to assign specific computers for tasks such as file sharing or printer support. This would be similar to the client/server method, but without the network operating system.

You may need more security than Windows Vista can provide, for example if you run a business from home. In this case a switch to the full client/server network with Microsoft Server 2008 might eventually become necessary.

Hot tip



You could introduce the Microsoft Home Server (see page 130) on one computer, and allow it to manage backups and share data, without requiring the full Microsoft Server 2008 software system.

Share Resources

When you have set up your home network, you can share the resources on one computer with other computers on the network.

File and Folder Sharing

There are three ways in which you can share your files and folders:

- 1 **Public Folder** – share files and folders that you move or copy from their original locations to the Public folder

There are three settings for sharing the Public folder:

- Turn on sharing so that users with network access can open files and view their contents
- Turn on sharing so that users with network access can open, read, change and create files
- Turn off sharing so that only users on the same computer can access the Public folder

The chosen setting applies to all networked users. You cannot restrict individual users or groups.

- 2 **Any Folder** – share files from any of the folders in the hard drive on your computer

This method allows you to tailor the level of access to individual users or groups of users. There are three levels of permission:

- **Reader** – the user has read access to the files and folders
- **Contributor** – the user can change files and folders, but cannot remove or delete them
- **Co-owner** – the user has full control over the files and folders, including change, add and delete

- 3 **Media Files** – share picture, music, video and playlist files so that they can be played on other networked computers or on networked digital media players

You can restrict which types of media files are available by default or for specific computers or devices. You can also restrict sharing to specified levels of the media file star ratings or parental ratings.

Don't forget



By sharing the root folder of a drive, you can give access to the whole of that drive (hard disk or other storage device).

Hot tip



Media file sharing is managed by the Windows Media Player on Windows Vista on Windows computers.

...cont'd

Printer Sharing

You can share the printer attached to one computer with users on the network. The printer is added to the Printer folder for the other computers, and can be referenced by name for printing in the same way as you use your locally attached printer.



Permissions can be assigned to each user or group of users. There are four types of printer permissions:

- Print – by default, each user can print and cancel, pause, or restart documents or files that they send to a printer
- Manage documents – users at this level can manage all jobs for the printer that are waiting in the print queue, including documents or files that are being printed by other users
- Manage printers – this permission allows you to rename, delete, share and choose preferences for the printer, and to choose printer permissions for other users, as well as to manage documents
- Special permissions – the highest level is used to change the printer owner, by default the person who installs the printer.

Password Protection

When password protection is turned on, it will limit network access to the shared folders and printers to those users who have an account and password on the computer holding those resources.

When password protection is turned off, any user on the network can use the shared printers and access the files and folders that have been shared with the Everyone group.

Hot tip



It doesn't matter what type of printer you have, as long as the printer is installed on your computer.

Don't forget



You cannot share your software defined printers such as the Fax printer or the Microsoft XPS Document printer.

Network Attached Devices

When you share a resource that's attached to one of the computers on the network, that computer must be left running in order to allow other users to access the resources, and it is usually necessary to disable power saving modes such as hibernation. The alternative is to attach the resource directly to the network.

Print Server

Some printers have an Ethernet port or a wireless adapter, either built-in or as an add-on option. This means that they can be directly attached to the switch or wireless access point and accessed as a network printer.



If there's no network adapter offered, then you can use a separate print server device that includes a parallel port or a USB port for printer connection plus a wireless or Ethernet network connection.



The print server is attached to the switch or wireless access point, and the printer is attached to the print service device. The printer can now be directly accessed by computers on your network.

Network Attached Storage

Similarly, you can provide file storage facilities directly on the network. A network attached storage (NAS) device contains one or more hard drives and a network adapter to connect directly to the switch or wireless access point. This means that computers on the network can store and access files without requiring any other computer to be powered up.



Many NAS devices also come with one or more USB ports, which means you can expand the device's storage space by

Hot tip



See page 151 for an example of installing, configuring and accessing a wireless printer.

...cont'd

attaching an external USB hard drive. The NAS device can also be used to network a USB printer.

Digital Media Files

Windows Vista programs such as Windows Media Player and Windows Media Center can broadcast digital media over the network, so that other Windows Vista computers on your network can pick up and play that stream. However, you can also use a digital media receiver (DMR) to access a media stream being sent over the network and then play that stream through connected equipment such as speakers or TV. Examples of DMRs include the Xbox 360, the Play Station 3 and some MP3 players or digital picture frames.



Hot tip



An alternative way to store and access media files is on the Windows Home Server, which can be installed as part of your home network (see page 130).

There are also specialized digital media players that can store and stream videos, music and photos from Internet sites such as YouTube and play them on your TV or HDTV.

Internet Telephony

You can use Skype software and the Internet to make unlimited free domestic and international calls to other Skype users, and low cost calls to other telephone users. Until recently such Internet calls were made and received using a headset or handset plugged into your computer. However, it is now possible to attach a wireless telephone handset so that you can make your Internet calls via your broadband modem, without being tied to the computer. Depending on the telephone type, you may be able to make and receive conventional calls on the same handset.



Don't forget

Sometimes shown simply as DSL, ADSL stands for asynchronous digital subscribers line. The Asynchronous term means that upload and download speeds are unequal.

Internet Access

There are a number of ways in which you can access the Internet from the computers on your network.

- 1 Connect via a locally attached (ADSL or cable) broadband modem



You can share access with other users on the network, but the host computer must be always on and connected.

- 2 Use a broadband modem and router on the network

This is an always-on network attached device that works independently of the computers on the network. Any one of these can access the Internet via this device.



- 3 Plug a mobile broadband modem into one computer on the network to provide high speed Internet access



This uses the cell phone network rather than the landline. You can attach the modem to a desktop machine, but it is most useful with a laptop or netbook computer, since it can be used anywhere that has cell phone reception, not just at home, and still receives high-speed broadband Internet access.

- 4 Use your cell phone to connect your computer to the Internet

You'd connect the cell phone to the computer using bluetooth, or infrared or a data cable. A smart phone or PDA device provides a good interface to the Internet, wherever there is suitable cell phone reception. However, this type of connection cannot be shared with other computers on your network.

**Hot tip**

You may be able to share the Internet access with other computers on the network, while you are at home.