Idiots' Guide to Networks

Looking for a cost effective way to network more your Macs? Baffled by routers and switches? Wondering why your AirPort connection won't work? Let Rob Buckley explain everything you need to set up the perfect home network

Artwork: Sam Williams
(www.magictorch.com)

Networking is one of those words with a double meaning. To people with names like Milo and Torquil, it's another way of saying 'a trip to the pub'. But for the Mac world, it's getting two computers to talk to each other.

But why would anyone outside an office want to network their computers together? Well, it might be for something simple like sharing pictures from a digital camera. Maybe you're bored of waiting for little junior to finish annihilating 15-year-old online gamers from Korea in Unreal Tournament before you can check your email. Or is the simple reassurance that you can back up your files onto another machine before you take your laptop out on the road enough to make you set up a home network?

Creating home networks used to be the preserve, in many people's eyes, of real ale drinkers, professional beard-growers and those who can name every *Star Trek* episode in chronological and alphabetical order. It was practically impossible under Mac OS 9 to have an Internet connection and connect to a network at the same time without extra hardware. Fortunately, OS X has made it as easy as a button click to do almost everything networking-related, so settle back as we show you how to save time, money and frustration by simple home networking.

Share and share alike

The simplest network is between two computers that have no Internet access. Typically, you might get this kind of setup when two people with laptops meet and

Mac OS X networking technologies in full

802.11/802.11a/802.11b/802.11g
My, that's a lot of numbers. The first one, 802.11, is the international standard for Ethernet networking. Since wireless networking is really Ethernet networking via radio waves instead of cables, all the wireless networking standards are just derivatives of 802.11 and so that's how they get their names. 802.11b is the most popular standard, used by wireless hotspots everywhere, by most home wireless networking equipment and by AirPort. 802.11g is its successor: it's five times faster, backwards compatible with 802.11b and the basis for AirPort Extreme and some of the newer wireless networking equipment. Don't be tempted into buying 802.11a equipment – this is a renegade Intel standard that isn't compatible with AirPort.

AirPort/AirPort Extreme
This is Apple's name for 802.11b and 802.11g respectively.

DHCP
Dynamic Host Configuration Protocol. Basically, a way for your network to configure connected computers without you having to fiddle with any settings.

DMZ
De-Militarised Zone. If you're using NAT, your router faces a dilemma. While it's going to be obvious who to send most traffic to, since it will usually be in response to something that's been sent out, what about traffic that's not in response to anything? It could just ignore it, but if you're running a server or playing online games, you'll probably want that traffic to go to a specific machine. If you set up your router to do that, that machine is in the DMZ, since it is exposed to the outside world.

Firewall
A way of blocking unwanted traffic. All OS X computers have a built-in firewall that lets in traffic for well known Internet applications, such as email and Web surfing, but blocks other kind of traffic.

IP address
Anything that connects to a network needs one of these so that other computers know where to send your information. Your Internet IP address is either dynamic (different every time you log on) or static (constant between log ons). On a home network, your IP address usually comes via DHCP or the computer picks one for itself.

Kerberos
A widely used authentication system, employed by many manufacturers including Apple and (although not very well) Microsoft. It provides a standard way for you to log on to computers.

MAC
The Media Access Control address of any networked device is a unique ID that certain cable companies such as NTL use to determine which computers are authorised to use your Internet connection. If you want to use more than the authorised number of computers to access the Internet, you'll need a router that can 'clone' a MAC address.

NAT
Network Address Translation. Typically, your Internet Service Provider will only provide you with one IP address. NAT provides a way for all your network's computers to share this address.

PPP/PPPoA/PPPoE
Point to Point Protocol. When you dial up your Internet Service Provider with a modem, you use PPP to identify yourself and get an IP address. When you have a broadband connection, you may still have to use PPP but over a different medium: PPPoA is for ADSL connections, PPPoE is for some cable connections (although most UK cable users won't need it).

Rendezvous
Apple's implementation of the ZeroConf standard, Rendezvous provides a way for programs and devices to advertise their services on a network, configure themselves and for others to use them.

TCP/IP
The standard method of sending data on networks and the Internet. If you compare networking with the postal system, the envelopes are equivalent to TCP/IP.

VPN
Virtual Private Network. Back in the olden days (think *WarGames*), companies had to provide modems and phone lines so that mobile and home users could dial up and connect to the office networks. When the Internet and broadband access became popular, everyone realised it was cheaper and quicker to use people's existing Internet access to let them get onto the corporate networks. But to make sure no one else could access the network and read data, they encrypted it, creating Virtual (because they aren't actual networks and sit on top of the Internet) and Private (because they're encrypted and require authentication) Networks.

WEP/WPA/802.1X
Wireless Encryption Protocol (WEP) was the standard way of securing wireless networks until someone found a way of breaking the security. 802.11X is the next generation of wireless security, but most current equipment won't be able to use it. So an interim standard, Wireless Protection Algorithm (WPA), takes some of the features of 802.1X and retrofits them onto current equipment.

want to exchange pictures, documents and other files. All this network requires is an 'Ethernet' cable: it'll cost between £5 and £10 and you can even get them from Dixons. Make sure they're 'CAT 5' quality, though. Plug the cable into the Ethernet ports of both computers – they're the ones with "<...>" written next to them.

In theory, that should be it. Provided you have library sharing and browsing switched on in iTunes and iPhoto, your computers should be able to see each other's music and photos and let you access them. If you want to share more than that, go to the Sharing preference panel in Systems Preferences and click Personal File Sharing. This allows anyone to access the Public folder in the Home directory and copy files from it. If they want to, they can upload files into the Drop Box in the Public folder.

Of course, that is just the theory. A couple of things can cause problems. Firstly, older Macs do not have 'auto sensing' Ethernet ports, so you'll need a special kind of Ethernet cable called a 'crossover' cable to connect them. Similarly, PCs rarely have auto-sensing ports. You'll also need to do a few more things (see walkthrough on page 30) to share your files with Windows users, although iTunes for Windows can see iTunes for Mac libraries without any fiddling. Lastly, OS 9 users will make your life difficult: they'll need to ensure that AppleTalk and TCP/IP are configured to use their Built-In Ethernet card, and you'll need to enable AppleTalk over your Ethernet connection using the Network System Preferences (although OS X 10.3.3 does that by default now).

Using AirPort or AirPort Extreme is equally easy if your Macs have the appropriate cards installed. It is even easier if you want to connect more than two Macs together, since most Macs only have one Ethernet port so can only fit in one cable; yet any number of Macs can connect together wirelessly.

Ethernet connections are faster than wireless connections, however, so bearing with it can be worth the effort. To connect more than two Macs together, you'll need an Ethernet 'hub' or 'switch' that you can connect all your cables to. It will then merrily pass all the traffic around between the Macs so they remain in contact with one another. Hubs generally come with four, eight, 16 and 32 ports (with one extra, sometimes, to connect them to other hubs) and can cost as little as £20, so they're still cheaper than equipping a group of Macs that don't have AirPort/AirPort Extreme cards.

To share a little bit more than just music or photo libraries, pay a visit to the Personal File Sharing option and open up your Public folder

Open yourself up

The next step beyond this closed network is opening up Internet access and sharing it with the computers on the network. Unfortunately, this is where you have to start planning a bit. How many computers are going to have access to the Internet? Is your dial-up connection going to provide enough bandwidth for three computers? Do you want one computer to share its connection or get a piece of dedicated hardware?

Mac OS X makes it very easy to share an Internet connection. Go into the Sharing preference panel in Systems Preferences, click on the tab marked Internet, and decide which connection you're going to share. It's no use sharing your Ethernet connection over your Internal Modem connection, but the other way round will enable you to share a dial-up connection with an Ethernet-based home network, so pick correctly. Equally, if you set your Mac up as a software base station, you can share your dial-up Internet connection with a wireless home network – a far cheaper and more sensible alternative than the wacky idea of the AirPort Extreme Base Station that comes with a dial-up modem.

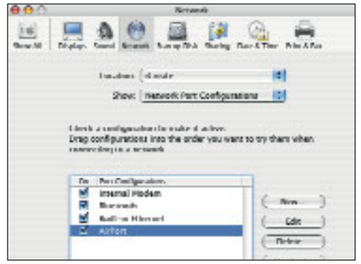
There are drawbacks to this cut-price approach, though. First, your Mac has to be switched on whenever anyone wants to access the Internet. Second, sharing your connection can slow your Mac down; the more computers on your network wanting to access the Internet, the slower it will get.

> "Apple may be proudly proclaiming its Base Station as one of the easiest ways to get onto the Internet, but the sad fact is that this isn't true"

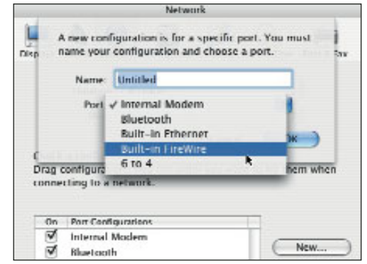
A dedicated piece of equipment called a router can get you round this problem. A router basically routes things. No big surprises there. A more detailed explanation is that it redirects traffic intended for other networks. So if you have an Internet router, all your Internet traffic will travel off the home network onto the Internet and then back again, while all your home network traffic stays on the network.

What a router doesn't do is create an Internet connection, which would make them pretty much useless for anything except office networks if they didn't usually come

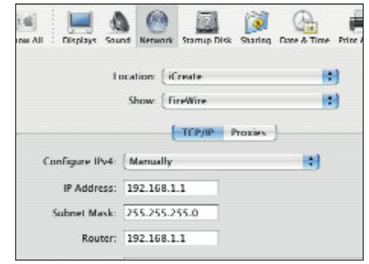
Step-by-step | Networks | Set up a simple network with a FireWire cable



1: Fire it up
The simplest network is connecting two Macs via their FireWire connectors. Just take a regular FireWire cable and plug it into both their sockets. Open the 'Network' system preferences on both the Macs and use the 'Show' menu to select 'Network Port Configurations'.

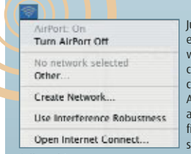


2: Name it
Now click on the 'New' button and use the 'Port' menu to create a new Built-In FireWire port with a name of your choosing. Drag the new port to the top of the list of ports and then click on 'Apply Now'. This should be all you need to do but...



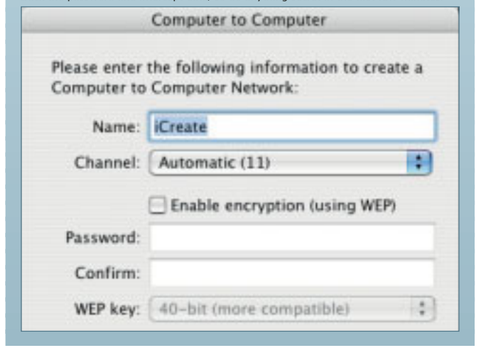
3: Back up plan
...in case this doesn't work, use the 'Show' menu again to select your new FireWire port and configure the first Mac with the details above. The second Mac should have identical details but have 192.168.1.2 as its IP address. Click 'Apply Now' again.

The software base station



Just as you can network together two suitably equipped Macs with an Ethernet or FireWire cable, without having to buy an extra hardware, so you can connect two Macs with AirPort or AirPort Extreme cards without having to buy a Base Station. Check your AirPort menu bar item (the one that looks like a radar) and see if there's an option called 'Create Network...'. first. If there isn't you'll need to go into the 'Network' systems preference panel and click the box marked 'Allow this computer to create networks under your AirPort settings'. Now select 'Create Network...' and you'll be prompted to name the network and to pick a channel – go with the default unless you get poor signal strength.

Click 'OK' and you'll have an instant network, but there's also a button marked 'Show options' that you should click to reveal security settings. Wireless networking is insecure by default, so if you are planning on swapping anything like passwords to your online banking system, you should definitely apply some security. Be aware, though that the options available are not completely secure: after enough time, someone will able to crack the password and intercept data, so do anything secret in the first few minutes.



Mac-friendly broadband deals

Name of deal	URL	Connection speed	Activation fee	Monthly charge	Length of contract	Contention ratio
Always0n@home ADSL for Mac	www.macace.net	500Kbps/1Mbps/2Mbps	£58.75	£27.99/£34.99/£44.99	12 months	50:1
BT Yahoo! Broadband	www.btyahoo.com/broadband/forhome	512Kbps/1Mbps	£0	£29.99/£40.99	12 months	50:1
Bulldog Broadband	www.bulldogdsl.com/residential/home.asp	512Kbps-4Mbps	£58.75	£21.99-£72.99	12 months	50:1 or 40:1
Demon Express for Mac	www.demon.net/adsl/expresspackages/expressmac-home.html	500Kbps	£0	£24.99	12 months	50:1
Freedom2surf Pure IP Home ADSL	www.freedom2surf.net/adsl/home.php	512Kbps/1Mbps/2Mbps	£70.50/£35.23/£70.49*	£22.50/£35.24/£69.99	1 month/1 month/2months	50:1 or 20:1
Macunlimited Broadband	www.macunlimited.net	512Kbps	£35 (£70 normally)	£25.99	12 months	50:1
NTL:home Broadband Internet	www.ntlhome.com/ntl_internet/broadband.asp	150Kbps/600Kbps/1Mbps	£75/£50 (for existing customers)	£17.99/£24.99/£34.99	12 months	20:1
PIPEX Xtreme Solo2Go 500/1000	www.solo.pipex.net	512Kbps/1Mbps	£17.57/£52.88	£23.44/£33.99	1 month**	50:1
Telewest Blueyonder	www.telewest.co.uk/html/internet/internet.htm	256Kbps/512kbps/1Mbps/2Mbps	£50	£19.99/£27.99/£37.99/£52.99***	12 months	20:1
ZenADSL Home 500/1000	www.zenadsl.com	512Kbps/1Mbps	£50	£27.99/£39.95	One month	50:1

* (£0 with 12-month contract)
** (£58.75 cancellation fee in first 12 months)
*** (offers reduced prices for existing customers)

Five reasons to set up a home network

It saves money

Incredibly, creating a network will actually save you money. A home network can cost as little as a single Ethernet cable – £5-10 pounds – but CD/DVD writers, Zip drives and Jaz drives all cost a lot more and their disks can only carry a limited amount of data. How many CDs will you need to copy over your iMovie project?

It saves time

You're in the same room, yet you have to connect to the Net, send an email, disconnect, switch computers over, connect to the Net, receive the email and then disconnect just to give your roommate a file. Then their email account protests it doesn't have enough space for the file, so you have to fire up the CD drive, go out and buy a pack of CD-Rs, throw the first CD-R away after getting a 'buffer under-run', and then try again until you manage to burn a CD just to hand over a 20Mb file. And if your roommate then changes the file, the whole process starts again to get it back to you. Life's too short: buy an Ethernet cable.

You can stream

It's like trying before you buy. Apple programs, such as iTunes and iPhoto, and third party programs such as Suitcase Server let you use files that aren't on your computer and need never be if you don't want them. You can just start up your programs, browse the files on the other computer and then use them, all without filling up your precious hard drive space.

Peripherals for everyone

You might have a digital camera, printer, DVD-writer and who knows what other peripherals, but every time someone in your house wants to use them, you have to unplug them (whoops, you just unplugged your external hard drive by accident mid-copy and corrupted your data) and cart them over to the other computer (oh no, not enough power sockets over here). But with a home network and programs like Image Capture and Roxio Toast 6 Titanium, all supporting peripheral-sharing over networks, one computer can be connected to all your gadgets, all the time, and anyone on your network can use them.

Share the Net

So two people in your house want to use the Internet at the same time. Do you have two phone lines? Unless you're rich (very rich if you have two broadband-enabled lines), the answer's no. A home network makes it as easy to connect two computers to each other as to the Net.

with a built-in modem of some variety. An ADSL router is typically a must-have for anyone with a home network and an ADSL broadband connection. Not only can these overcome the slowing down inherent to a computer sharing its Internet connection, it can also replace the USB modem usually provided by the Internet Service Provider (ISP). Most USB ADSL modems are as cheap as they are because they've been developed to make the computers to which they're attached do most of the hard thinking. The result is that computers which use USB ADSL modems are typically slower when they're online than when they're not.

Streamline the modem

Getting rid of the USB modem is particularly good for Mac users. With a few notable exceptions, most of the modems available in the UK don't have Mac drivers – or when they do, it's inevitable that they'll be for OS 9 if you use OS X and for OS X if you use OS 9. Routers, since they are usually configured using a Web browser rather than a Windows program and since they don't need drivers, are perfect for overcoming the well known problem of the ISP that doesn't support Macs. It may feel like you've stuck two fingers up at their Windows-centricness, but you've still had to buy a new bit of hardware (although routers are relatively cheap at £40 or so) and you're paying the ISP £20 a month, so it's a pretty hollow victory. It would be better if ISPs just provided routers rather than USB modems in the first place.

A router is also important if you intend to use an AirPort Extreme Base Station in the UK. While Apple may be proclaiming its Base Station is one of the easiest ways to get onto the Net, the sad fact is this isn't true. Why not? Well, despite its vaguely hippyish 'Think Different' image, inside Apple the 'if

> "Apple is consistently in the forefront of implementing new wireless standards"

it's good enough for America, it's good enough for the rest of the world' approach to product development is still uppermost. It might as well have bald eagles circling its headquarters while a giant burger grill-up takes place outside its reception. Why else do you think iPhoto's print ordering service has taken so long to get running, while Windows XP had built-in support for Jessops' UK service from the first day of its launch?

Further evidence is here: to get onto the Net, most ISPs require you to provide a username and password to authenticate yourself. With a dial-up modem, you use PPP to do this. In America, the most common way of authenticating yourself over a broadband connection is PPPoE – PPP over Ethernet. Unfortunately, most of Europe and the rest of the world with broadband connections use PPPoA – PPP over ATM (not ADSL, confusingly enough). And guess what? The AirPort Extreme Base Station, just like the AirPort Base Station before it, supports PPPoE but not PPPoA.

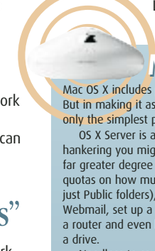
The situation is slightly less black and white than that, however. Some UK ADSL providers are moving to support PPPoE and most cable broadband providers already do, or use the set-top boxes given to customers to do the hard work; but you shouldn't think about buying a Base Station by itself until you know for sure whether your planned setup will be compatible with your ISP's technological requirements.

It's not all doom and gloom

There are still plenty of reasons to buy an AirPort Base Station, though. They're prettier than any other base station on the market. There's a very easy, Mac-based configuration program installed on every OS X computer. Apple is consistently in the forefront of implementing new wireless standards and has already provided a free update that allows the AirPort Extreme Base Station to use WPA, the latest most secure encryption standard, making Apple the first vendor to implement it. They have USB ports for sharing printers wirelessly. And they employ WDS, the wireless distribution system, which allows you to extend the range and number of clients on your network using extra AirPort Extreme Base Stations.

If you buy yourself an ADSL router, you can plug your Base Station straight into it and you'll be able to give broadband wireless access to all the computers on your network. But it's also worth looking around at non-Apple hardware. Companies such as NetGear and Belkin produce all-in-one ADSL routers that are also wireless base stations and which cost more or less the same as an Apple Base Station. Buy one of these, and it'll probably be the only bit of hardware you'll need for a home broadband wireless network. It might not look as nice, though, and the configuration will probably be a little bit harder.

You shouldn't have to worry too much about compatibility: one of the great things about Ethernet and wireless networking standards is that they genuinely are standards for the most part. So you can bring a Windows laptop with a Linksys 802.11b card onto an Apple AirPort Extreme



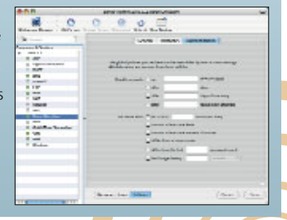
Mac OS X Server

Mac OS X includes plenty of programs to help you network your Mac and share your files. But in making it as easy as possible for you to give other computers access to your files, only the simplest possible configurations are allowed for. Enter Mac OS X Server.

OS X Server is an 'enterprise-grade' system for just about any kind of networking hankering you might experience. Not only can it help you configure your system with a far greater degree of subtlety than regular old OS X can (for instance, it can impose quotas on how much space others can fill up on your Mac and let you share more than just Public folders), it can also act as a mail server complete with mailing lists and Webmail, set up a VPN, host thousands of Web sites, stream QuickTime movies, act as a router and even let other computers boot up off an Operating System it has stored on a drive.

Needless to say, this is overkill for most people, particularly since it costs £399 to allow up to 10 people to access the server at the same time and £680 for unlimited access. And although it has come a long way since the geek-fest that was OS X Server 1.0, it still requires training and knowledge to use it.

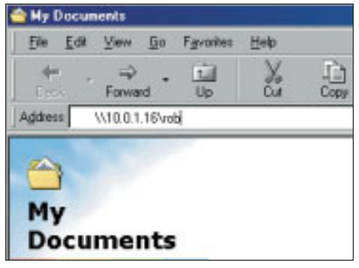
But if you know what you're doing and you need those little extras, OS X Server is the most powerful, user-friendly server system out there.



Step-by-step | Networks | Networking a Windows PC and a Mac

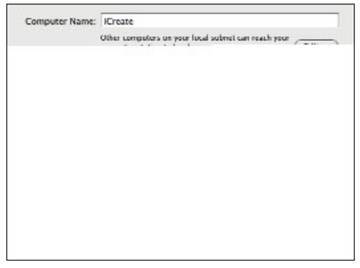
1: Sleeping with the enemy

Sharing your files with a Windows user should be easy. Just go into the 'Sharing' System Preferences panel and click on the box next to 'Windows Sharing'. Note the box at the bottom that tells you what a Windows user will have to do to access your Mac.



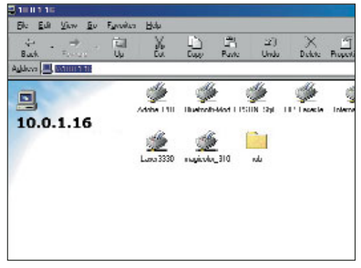
2: A question of ID

Type the address into a Windows address bar and see what happens; if it doesn't work, type the first part in. If that doesn't work, you might need to ensure the accounts on Windows and your Mac both have the same ID.



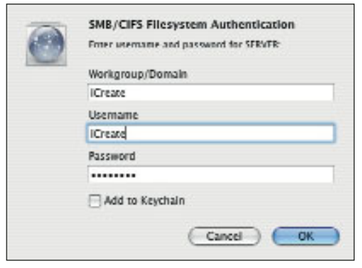
3: Print it

The good news is that it should be just as easy to share printers with a Windows PC as it is to share files. Begin the process by taking a trip back into the 'Sharing' panel and then put a tick in the 'Printer Sharing' box.



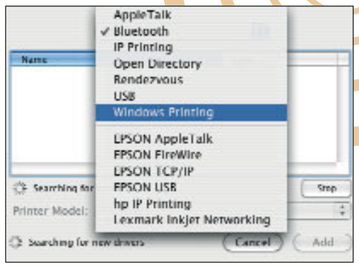
4: Successful share

Hopefully, if all has gone to plan, the printers will then be visible and accessible in Windows, ready to be used. Obviously if you then decide to cut the connection, go back to the 'Sharing' panel, select 'Printer Sharing' and click 'Stop'.



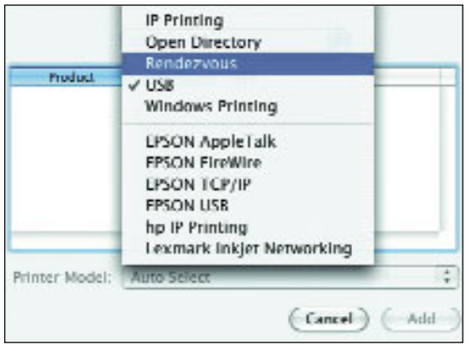
5: Back to front

Going in reserve is easy, too. Select 'Connect to Server' in the 'Finder' and then enter 'smb://' followed by the IP address of the Windows computer you want to connect to. You'll then have to enter a username and password for an account on the Windows machine.



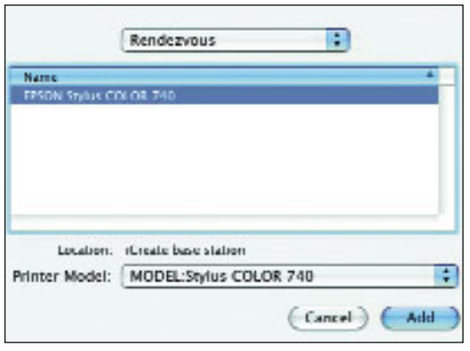
6: Print it out

Printing to a Windows printer requires a trip to the 'Add Printer' utility and selecting 'Windows Printing. Find the workgroup and machine that has the printer and log on to the printer. If you can find a driver for the printer, select it from the list and then click 'Add'.



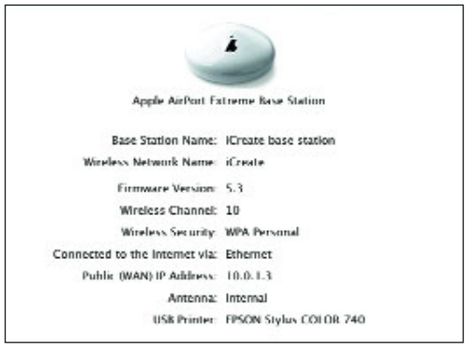
1: A printing rendezvous

You'll be pleased to know that setting up a printer which is shared using Rendezvous is as simple as setting up a USB printer. Just go to the 'Printer Setup' utility ('Print Center' in OS X 10.0–10.2) and click the 'Add' button in the toolbar.



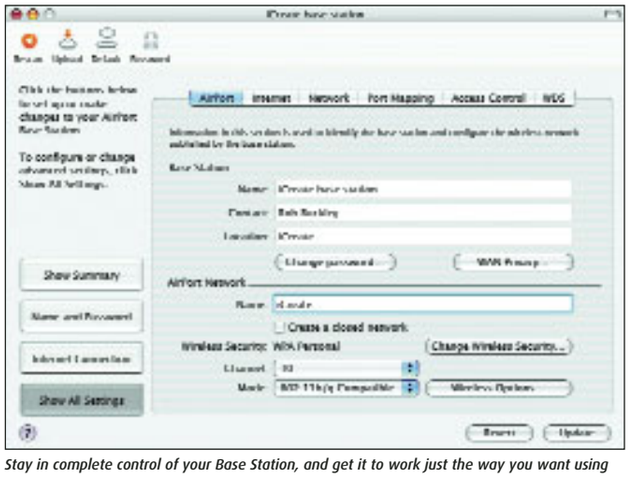
2: Locate the printers

In the window that opens, have a scan through the pull-down menu until you find Rendezvous. All the Rendezvous printers on your network should appear in the box below. Just pick the one you want and select 'Add' to use it.



3: One big family

A helpful feature of the AirPort Extreme Base Station is a USB port for connecting a printer and sharing it. If your printer is supported (check **www.apple.com/airport/printcompatibility.html**) and all your Macs use OS X 10.2.3, you'll be able to print from any machine.



Stay in complete control of your Base Station, and get it to work just the way you want using

Before you go out and buy a shiny new Base Station, make sure you check your planned ISP

network and it will still work; equally, take your AirPort Extreme-equipped iBook G4 onto an 802.11b or 802.11g network and it will work fine. And a little, closely guarded secret is that some of these routers have features that are better implemented or just not available on an Apple Base Station, such as MAC address cloning or DMZ configuration, which is less than excellent in Apple's Base Station.

> "Outside the Apple world, it's a sad fact that the better a product is, the harder it is to work out how to configure it"

As your ambitions get bigger, though, be aware that the cost savings you made at the beginning might come back to haunt you. Often, that cheapo ADSL router with 16 ports and built-in 802.11g base station that you found in the bargain bin at PC World will collapse under the weight of a heavy network load – in other words, as soon as you start any P2P software such as Bittorrent. Evaluate at the beginning what you think you're going to be using your network for: if all you're going to be doing is sending emails, browsing the Web and playing each others' iTunes, that bargain-bin trinket might have been a good find; on the other hand, if you're planning on blasting gigabytes of high quality video up and down your Internet connection while simultaneously burning a DVD across your home network using Toast Titanium, you almost certainly made a false economy at the outset. If you're going to be in the latter camp, consider breaking down your requirements into parts and buying 'best of breed' hardware for each requirement; instead of that all-in-one job, get yourself a really good ADSL router with perhaps only one Ethernet port which you connect to a 16-port Ethernet switch to keep your home traffic zipping around nicely – connect that in turn to an AirPort Extreme Base Station to share your printer and provide wireless access. You'll find the performance and stability worth the effort, and you can also save yourself a brain haemorrhage, since outside the Apple world, it's a sad fact that the better a product is, the harder it is to work out how to configure it.

Network nirvana

If your network is robust enough (and your ISP's terms and conditions allow it), your ambitions for your simple Mac may expand once you've had some experience of using it. Take a good look at the Sharing preferences panel again. Before you know it, you could be running your own FTP server and your own Web server; and although it's not in the list, your Mac has a mail server built-in that you can have up and running in relatively little time. When you're out and about, you can log in over a secure connection and get your Mac to do all sorts of crazy things – even connect to other computers on the network.

A home network can be a very simple thing to set up and produces far more benefits than are immediately obvious; as you grow it, you may find all sorts of things to do with it that you'd never thought of before. Which makes it a lot like a Mac!