

A decorative graphic consisting of three overlapping blue circles of varying sizes, arranged in a diagonal line from the top right towards the bottom right. The circles are composed of concentric layers of different shades of blue. Two thin, light blue lines intersect at the top left corner and extend diagonally across the page, one passing through the top-left edge of the largest circle and the other passing through the top-left edge of the smallest circle.

Network Connection

Complete documentation on setting up a home network including Internet connection, print and file sharing and Security

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There are three basic types of Internet connections in homes; modem connections, DSL lines, and Cable Modems.

Modems

Modems have been around for more than two decades now. These connect your computer to an ISP (Internet Service Provider). There are several ISP's out there. The one you choose will be dependent on where you live, and what type of service you are looking for. Some provide email and other services, some just give you a connection.

Modems can be used for setting up a home network, but it is not recommended. The speed just isn't there for multiple computers to use the connection at the same time. The routers you would use for these types of connections use what is called "On Demand Dialing". Which means, that when one of the computers on your home network opens a browser or checks email, the request for Internet connection tells the router to dial the connection number through its internal modem. This means that the first person to request network connection has to wait awhile for the connection to be established through your ISP. Anyone after that, while the connection is still established will have a much faster response time.

DSL

DSL connections are much faster, and convenient than the Modem connections we talked about above. DSL still uses your phone line (so if your phone service goes out, your Internet connection is down as well), however it does not require a dedicated line, and you can use your phone while an Internet connection is established. Also there is no "On Demand Dialing" hassle. The connection remains on, all the time.

Speeds for DSL service vary. You may here that DSL is slower than Cable, but really it depends on what DSL connection you are comparing to what Cable connection. DSL speeds rely greatly on the distance from your house to the telephone exchange. This restriction is more dominant with the higher speed connections. Cable has problems of its own, and we will discuss them shortly in the Cable connection section.

DSL comes in several variations. There is; xDSL, HDSL, SDSL, ADSL, RADSL, VDSL, VDSL2 ... you get the picture. If you are really interested in all the types of DSL services, and some information on the technology, you can check out WikiPedia's

Page on DSL <http://en.wikipedia.org/wiki/DSL> . You are probably going to be most interested in ADSL. Once you have figured out with your service provider which DSL they offer, and what you want to afford, then hooking it up to your network is a snap.

Cable modem

Cable Internet connection is also very fast, and much more reliable than modems. Many areas in major cities also have High Speed, or High Definition Cable service, adding reliance and speed to the Cable modem option.

Internet connection using Cable service is again very easy to hook up. In fact the directions are almost exactly the same as using DSL.

Modems

A modem (a portmanteau constructed from modulate and demodulate) is a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information. While Cable and DSL technologies are much different than your basic telephone line modem, the devices are still classified as modems, since they do utilize analog/digital conversion (falling asleep yet?).

Basically, you need a modem, no matter what type of service connection you are going to use, and depending on that type, is the type of modem you will purchase. If you are going for the DSL, or Cable option, your ISP (Internet Service Provider) will probably offer you a modem for sale or rent. You can also purchase one of your own to use from any computer store (or online).

Routers

The router is what makes networking possible. The router is a device that sits between your Modem, and your computers. It takes care of the traffic, sending the signals to the proper sources, and even handles some levels of security. In fact, even if you are not going to setup several computers on your network, it is wise to have a router between you and the Internet connection (modem).

The router does two basic jobs for us. First, it creates our Home Network, by connecting each of the computers in your house to each other, as well as any network devices you might have (printers, networked hard drives, etc). Each of the computers and devices are connected to the router (either through a network line, or wireless) and the router connects them to each other.

The second job of the Router is to connect your home network (which it creates) to the Internet Network, allowing each of the computers in your home the ability to access the Internet at the same time, on the same connection.

Network Cards

We don't need to know a great deal about Network cards, just like we don't really need to know a great deal about how modems work or how routers keep your web page requests from going over to someone else's computer. We just need to know enough to get one, and install one.

Network cable is called 10Base-T, or RJ45, depending on who you are talking to. It looks like a thick phone line, with the same type of connection. Running 10Base-T around your house is a pain (trust me on this, I know of what I speak). Unless you are able and willing to run it through the walls and do a professional job, expect to be tripping over it, and replacing it as it become chewed on by various pets. A single pin prick in a 10Base-T line and you start having network connection problems.

If you have the choice, go wireless. It is just about the same cost these days, and it is much better for the home environment, and the love for your pets.

A network card (thought I forgot about them huh?) is the device that allows your computer to talk to other computers through the network router. These can be internal cards, or external devices. Wireless network cards can be internal or attach to the USB port of your computer. There are many types, but they all do one simple job, and that is to allow data to transfer between your computer and the other network devices.

Installing a 10Base-T internal network card in your desk top computer is probably not necessary. If you purchased it in the last couple of years, odds are that your computer has one already. Same goes for your laptop. If your desk top computer does not have one, installing them is very straight forward.

First open the case (I'm laughing hysterically as I write this, because opening the case is probably the hardest part of this job).

Some cases have screws in the back, some have slider buttons, some have panels that come off of the side. Figure out yours and open the case.

Blow out all the dust and collected dirt in there with some compressed air (you can get some compressed air at most computer stores, and you might want to do this outside). Set the open computer on a flat surface. Look at your network card. Find a slot that is the same size as the slot needed by the network card. Remove the 'placer' panel next to that slot, so that the card can be accessed from the outside. Using constant, steady pressure, push the card into the slot without damaging any of the electronic components on the card. Close up the case, and start your computer up.

Your card will come with step by step instructions. They really are fairly easy to install, and if you feel comfortable working on your computer, this should be a breeze. Again, make sure you don't already have a network card in the computer before going out and getting one.

Setting Up Windows XP

Networking is one thing that XP does very well. In fact that is the single reason that I started using it on my home computer. If you have a network card, and you install it, XP finds it on start up, and gets it running. Its that simple. You don't normally have to do anything to setup the computers. Most of our setup work is going to be in the Router (and there is very little of that).

I know that sounds like I'm skipping a great deal of information on you, but the fact is that networking has been around so long that much of it is automated now. If your XP computer recognizes that you have a network card, it will setup a default setting for the card and a connection to the local network. The setup will have DCHP client, and the basic TCP/IP settings. This is all you need. It will also setup a Work Group name, which defaults to WORKGROUP. Unless you really want to learn a great deal about networking, leave these alone. I'm not saying that learning more is not a good idea (and it is), but you don't require more to setup a small home network.

The Router uses, DHCP(Dynamic Host Configuration Protocol), which is a nice acronym for "I know what I'm doing, let me do it". Most Routers come with this setting turned on by default. If you just install the router as instructed, using all of the default settings, and plug your network cables into the router, connecting them to the computers, your network will probably go live instantly (it won't be secure at all, but we'll get to that). There is a bit more to setting up the Router, but not much. Seriously, this is very easy stuff, for the level we are at. Home Networks don't need a great deal of bells and whistles. We just want to get email and surf the web.

If we are not using DHCP then we have to set the IP address for each computer. This is not the best way to go. Static IP addresses are a hassle for computers. Printers, and some network devices require static IP addresses, and we will talk about this a little further on.

Putting it all together

Once each of your computers has a network card, and your cable (if you are using cables) have been laid out through the house, then we are ready to start hooking things up.

To setup your Router you are going to need a computer near it, and the cable that comes in the Router box (even the wireless router will need this). If you have a laptop, they are usually best for setting the router up. Your Router may come with an installation CD. It is important to note that this CD will only need to be installed on one of your computers, just to get the initial settings done on the router. None of the other computers need this CD to be "network ready". It is only for the Router setup.

Most Routers of the Home Network type have a browser interface. This will be used after the initial setup to alter settings as required.

For wireless routers we will definitely be using the browser view to setup security features if required.

Once the router is setup using the instructions given to you by the manufacture, we can go through the XP requirements for simple networking.

First, to find your "Network Connections", select "My Computer" from the start menu, then select "My Network Places" and finally select "My Network Connections". From your Network Connections, select your network adapter and then select "Change Settings of this Connection".

Be sure 'Client for Microsoft Networks" and "File and Printer Sharing" are both installed. If they are not installed, click the "Install Button" to install them now. - You should also check to ensure the XP built in firewall is DISABLED. This is in the ADVANCED tab.

Next, select the "Internet Protocol (TCP/IP)" and click Properties. You should now see a screen like this one. If you have a network that uses a STATIC IP ADDRESS schema you will see information here. Most likely, your screen should look just like this.

Leaving the default settings will work with most Home Networks. If you change anything from these defaults make sure you understand why you are doing it.

Next, click the Advanced Button

Select the WINS tab. Under the "NetBios Setting" area, select the "Enable NetBIOS over TCP/IP"

And we are done.

Do this with each of your computers and check them to see that Internet connection has been established. Again, these are default settings, so you probably went through those steps and didn't need to change anything. If the settings you have are different, and you find you can not make connection to the Internet, make notes of

how the settings are, then set up the computer as described here, and restart the computer. More than likely you will establish connection afterwards.

Sharing a printer

Now that we have a network, we can start utilizing some of the benefits of networks, such as sharing printers and folders.

To share a printer, on the computer which is directly connected to the printer:

1. Click Start -> Control Panel -> Printers And Other Hardware -> Printers And Faxes.
2. Click the printer you wish to share.
3. Click Share This Printer in the Task Pane.
4. In the printer's Properties dialog, click the Sharing tab.
5. Click Share Name and OK.

Once a printer has been shared you can access it from other computers on the network. To do so:

1. Click Start -> Control Panel -> Printers And Other Hardware.
2. Click Add A Printer.
3. In the Add New Printer wizard, when asked whether the printer is a local or network printer, select the latter.
4. In the next screen, select the option to Browse For A Printer and click Next.
5. Select the appropriate printer from the list and continue with the wizard.

Sharing files and folders

Sharing a folder is even easier than sharing a printer:

1. Open a folder (such as My Documents), click Make A New Folder in the Task Pane and name your new folder.
2. With the new folder highlighted, click Share This Folder.

3. In the Sharing tab of the Properties dialog box, select Share This Folder On The Network.

4. Provide a descriptive name for the folder. This name should make it easy for others on the network to recognize the folder; it doesn't have to be the same as the folder name you selected in step 1.

5. You can let other people on the network view and edit your files or view them only. If you want to protect your files from tampering, remove the check from Allow Other Users To Change My Files.

There are a variety of ways to access a shared folder. Here's one way:

1. Click Start -> My Network Places -> View Workgroup Computers.
2. Click the computer whose files you wish to access and then click the shared folder.

You can create shortcuts to shared folders to make them easier to access.

Be wary of sharing files and printers if you have an always-on Internet connection. Doing so can make your files vulnerable to outside access. If you do enable sharing, make sure you use password protection, that you don't share the root (C:) folder of any computer on the network, and that you install and use a strong, commercial firewall.

Network IP Addresses

IP Addresses are a set of 4 numbers which can range from 0-255. They look something like this 192.168.0.1 (there is no dot after the last number set). Each computer on an IP network requires an IP address.

IP Addresses which start out with 192.168 (like the demo one I have here), are called "Internal IP addresses". These are for internal networks. No computer connected directly to the Internet can have an address that starts with 192.168. This was setup as one of the first security measures. This is also why routers make a very good defense against Internet intrusion. Routers provide what is called NAT(Network address translation) addressing. This allows a LAN (Local Address Network -- your home network) to have Internet access without exposing the individual computers to direct access from outside the LAN.

Let's say that your computer has a local address of 192.168.1.100 (this is a fairly typical internal network (LAN) address. When you go onto the Internet however, your address past the router could be 72.197.209.180. There is a small utility which shows what the Internet world thinks your IP address is at (<http://www.glennhefley.com/ip.php>).

When setting up your home network, you will want to use DHCP for your IP address maintenance. What DHCP does is assign addresses to each computer that requests one. Once setup, when your computer is turned on, part of the Boot process will be a request for a IP address. The router will respond to this request by going through the list of available addresses, and sending the next address on the list.

This means that your internal IP address could change on a daily basis, which is fine. However this doesn't work so well for network printers and devices. So one change we are going to want to make in our Router default setup (after everything else is already working ... this is important ... get the basic setup done first, make sure all of your computers can access the Internet ... then make changes) is to change the DHCP IP number list.

Going into the router through the web access is a little different. You use the address <http://192.168.1.1> (this should be documented in your router's setup instructions). It will ask for a user name and password (again, this should be noted in your setup instructions, what the default password is, and how to change it).

Change your DHCP lowest number to 192.168.1.100, and while you are there, set the maximum number of computers which can connect using DHCP to 1+ the number of computers you have. I always setup to plus one, because I have several guests who come over with computers. We don't what the world connecting to our network, or anyone we don't know about. So setting these options is one more line of defense.

Static DNS

DNS is Dynamic Name Server, which are the servers which translate Names, to IP addresses. For example, you are on www.d-a-l.com, but that isn't the real address of this server, nor do you want to try to remember all of the IP addresses of your favorite sites. In order to find the site by name however, you need a DNS server. You get that address from your ISP, and it is required to set up your Router.

The ISP will give you two, a Primary, and a Secondary. Call them before starting to setup your router and get those addresses.

Basic Security

We have already talked about NAT(Network address translation). What else can we do? If your router has a Firewall system, then that is the best place to start. What I do recommend is that if your router has the Firewall, don't also use a Firewall program on your computer.

The two will often conflict and you will have several frustrating hours trying to get both of them to allow you Internet connect. On top of that, Firewalls slow your computer down to a crawl.

Firewalls are going to slow down your connection a bit, no matter where they are. On the router, they tend to work better. What exactly a firewall is, and how they work is a topic for a future article. Your router will come with instructions on how to set yours up.

What Firewalls first provided was NAT, and that took two network cards, installed on the same computer, and then setup as a Proxy.

What firewalls provide now, is NAT (on routers) and Port Blocking.

Ports are portals across an IP network. For example, if you are using your browser on the Internet you are using port 80. If you are sending your email, you are using port 25. Getting your email from a POP3 connection, you are using port 110. Using FTP is port 21. There are literally thousands of ports. However, you don't require all of those ports to be open, nor do you want them to be.

Closing all of the ports except the ones you use is a good idea.

Trouble is finding out the ones you use. Some Internet games, file sharing and other network related software require ports to be open.

The best way to find out what you need is to open the ones you know about, then find out what broke. Do some research on the application that is no longer working, and open the port it requires.

This is also a good way to keep children from using programs (such as files sharing) that you don't want them using.

Besides the ones already listed, you probably want these ports open as well.

443 -- Secure HTTP (Web pages that are secured)

995 -- POP3 Secure (getting email from a secure server ... such as Gmail)

465 -- SMTP Secure (sending email to a secure server)

Now, a guarantee you that once you block everything except the ones We've listed, something is going to break. Home computers with Internet access require all kinds of port usage, but the more you can block the better.

If things go wrong

Verify that the Internet Connection Firewall (ICF) or Windows Firewall (WF) feature is not enabled on the adapters that you use to connect the computers to the home network. If these features are enabled on these adapters, you cannot connect to shared resources on other computers in the network.

Use the ping command to test connectivity between two computers on the network. To do this, follow these steps:

1. Go to Start, click Run, type cmd, and then click OK.
2. First we will check that networking is installed and working correctly on our computer by pinging a loop-back address. 127.0.0.1 That is our own computer (no matter what our real IP address might be).

If this doesn't work, then you probably have more problems than this article can help you with, and you should head over to our Help Forum and start a thread there for further help.

Next we will check to see that we can ping our router. The address is typically 192.168.1.1

If you don't receive a reply from the router, then:

1. Check to make sure all the cables are secure
2. Unplug the power to both your router and modem
3. After 30 seconds plug the modem back in and wait for the Internet connection light to become solid.
4. After the modem is active and read, then plug the power back in to the router and wait for it to make connection as well.
5. Try to ping the router again.

If you can ping the router, but still can't get Internet access, then check the setup instructions provided earlier and make sure you are using the default settings.

If you can get Internet access, but can't make connection to other computers in your home network (for folder and printer sharing for example), then you will want to check the Workgroups used on each of the computers.

The default Workgroup is called WORKGROUP. Workgroups establish computers as being able to connect to each other. A computer not on the same workgroup as another will find it very difficult to share resources.

Go to Start, and in the menu right click on My Computer, and then choose properties.

Click on the Computer Name tag in the applet that will pop up and insure that every computer in the home network has the same workgroup name. Capitalization (they say) isn't important, but I don't believe them, so capitalize all letters in the workgroup name and restart the computers.

Also you will want to make sure that each computer has a unique name. In the same tab you will see what the computer's name is. You can change this if you wish, but make sure that each of them is one word, and unique.