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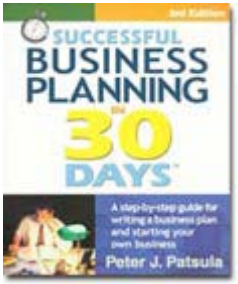

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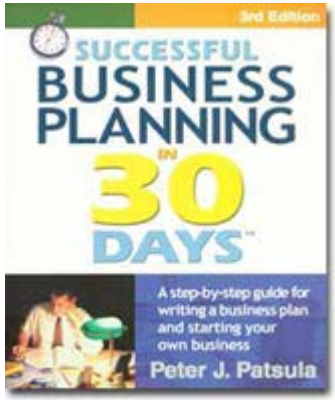

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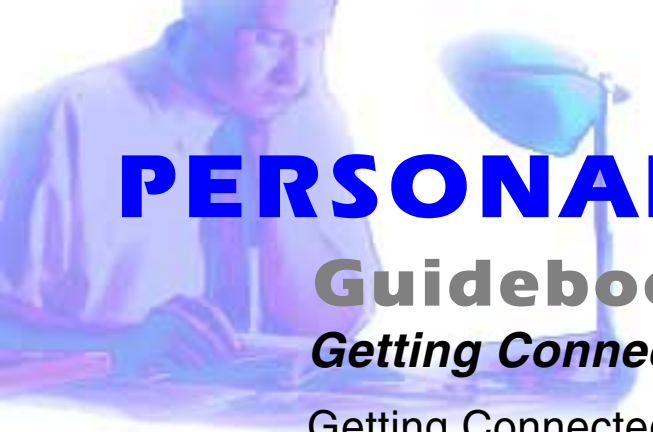

PERSONAL PLANNING

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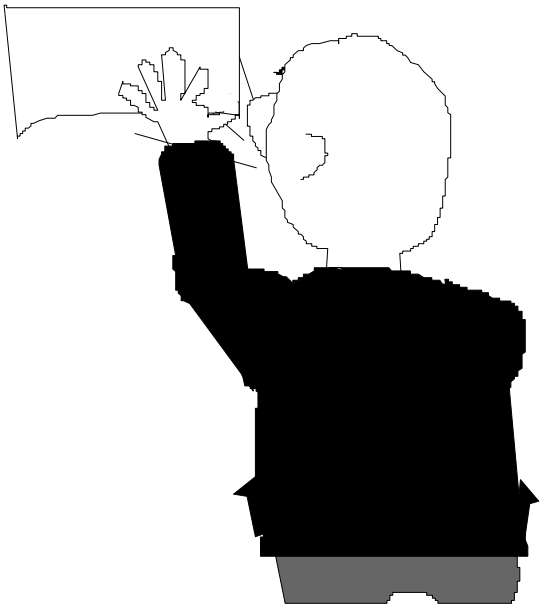

“Hey! How come your friend Shirly keeps e-mailing us photos of Mel Gibson’s BUTT!”

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GETTING CONNECTED

THE COMMUNICATION needs of today are vastly different than the needs of yesterday. Presently, most telephone companies operate using analog-based equipment. Analog-based systems were fine forty years ago, but now with the world's increased need to send large amounts of computer data through telephone hook-ups, analog systems just don't cut it. The future is digital. The future is the Internet.

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GETTING CONNECTED BASIC EQUIPMENT

THE BASIC equipment of the digital age center around the following three computer parts:

- Fax Add-on Cards
- Modems
- Multi-Function Cards

Fax Add-on Cards

A Fax add-on card, usually combined with a modem card, turns your computer into a fax machine. With a fax add-on card, you can dial a number and transmit pages of text, graphics, and charts to a conventional fax machine, or to another computer that has a fax add-on. However, unlike conventional fax machines, you don't have to feed sheets of paper into the device. You use your word processing program, paint or drawing program, or DTP program to compose your fax message. Once your message is composed, you then tell the fax software to send the file you created.

The rapid growth of the Internet, for the most part has made BBS services defunct.
FUNFACT

Similarly, when you receive a fax message from another computer, or from a conventional fax machine, your computer collects the message as a file. You can then display the message on your screen or print it.

PROs of Fax Add-on Cards Compared with Fax Machines – The main advantage of using a fax-add on card is the increased speed of sending information. Instead of first printing out a document to be

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faxed on your fax machine, you simply fax it straight away from your computer. No time wasted printing.

Fax add-on cards also offer several features that are normally not available on conventional fax machines. For example, most fax add-on software allows you to store hundreds of phone numbers and dial them automatically, just by choosing the number from a list. Also, while most conventional fax machines limit the number of sheets of paper you can feed into the machine, fax add-on software makes it possible to send thousands of pages unattended.

As of mid -1996, there were more than 22 million pages of content on the World Wide Web. Over 1 million new pages are added each month.
DATAQUEST

Another benefit of using a fax add-on card compared with a fax machine is the increased quality of the printed messages you send. Because you don't feed the message into a mechanical device that might distort the image, your electronically prepared message comes out much more crisp and readable at the receiving fax machine.

CONs of Fax Add-on Cards Compared with Fax Machines – Sending a fax from a computer is not difficult. However, receiving a fax has its problems. In addition to tying up your computer while receiving a fax, it can also create some hectic situations. In a worst case scenario, it might end up working like this: Someone calls you and tells you they want to send you a fax. You then run and turn on your computer and start the fax software, turn off your answering ma-

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chine and warn all family members (if your office is in your home) not to pick up the phone. Then when the phone rings it turns out to be your Uncle from Nebraska and from inside your computer you hear a little voice saying "Hello! Hey what the #%$* is all this beeping?"

Creating a Fax Information Service – When your callers need access to pages of information (real estate listings or product literature, for example) consider setting-up a fax-back bulletin board. You'd do best be dedicating an independent computer system and phone line to the task.

A Fax Information System works this way: you scan in your documents (if they weren't created original on your computer and create a voice menu of choices. Callers dial in with a fax phone, select the brochure or material needed, and your fax board downloads the correct document. Keep your system in your closet, and the computer and fax board work tirelessly passing along information 24 hours a day.

The speed in which you can access the Internet using an ISP depends on: the speed of the ISP's server, the speed of your computer, the speed of your modem or connection, the number of users on the server and the size and type of connection to the Internet.

POWERPOINT

Two products to look into, currently available for PCs only, are the *Mulit-Com Boards* from Speaking Devices or *Robofax EZ* from Fax Quest.

Fax Software – Two of the big names in fax software, to get the most out of your

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fax add-on card, are *Winfax Pro* and *UltraFAX*.

Modems

The term modem stands for MOdulater/DEModulator. A modem lets your computer send and receive data through the telephone lines. To send information, it modulates (translates) the data into a form which can be sent through the phone lines, like you do when you speak. To receive information, it demodulates the incoming information, translating it into a form, which your computer can understand, like you do when you listen.

About 2,000 students will be hired over three years to help small businesses plug into the Internet and get hooked up to the World Wide Web in a program financed by the Canadian federal government, the private sector and universities. Students will earn up to $7,500 and businesses will be charged a modest fee of about $100 for three days of training under the program, called student Connection.

FUNFACT

Because a modem can convert any information – text, numbers, or graphics – into electrical impulses, you can send any type of information to any other computer around the world. With a modem, you can get free advice on how to make your computer work. You can also "download" free programs off the Internet. Modems even let two completely different types of computer communicate.

Connecting a Modem – A modem requires three connections. It must be connected to a:

- power supply

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- computer
- telephone line

Although any telephone line will work, modem users frequently find it convenient to use a separate phone line so they can still have use of their phone while the modem is sending and receiving data.

Presently most Internet Providers offer the same services. It's like having 20 radio stations in your city but they all play the same music.
SUPERTIP

Selecting a Modem – When selecting a modem you need to consider the following factors:

Baud or Transmission Rate – The rate at which a modem talks or transmits information is called *baud*. Baud translates to bits per second. Each character that is transmitted is made up of eight bits of information and then some. A good rule of thumb, when determining how fast a modem will actually translate data is to take its baud rate and divide it by the number 10. For example, a 14.4 modem which can handle up to 14,400 bits per second (in a best case scenario) cam handle about 1,400 characters per second. This means that a 1MB file or picture, being downloaded off the Internet, would thus 1,000,000/1,400 = 714 seconds or about twelve minutes. Not very fast is it? Therefore, although you'll pay more for a modem that has a higher baud rate, you'll save money in toll charges.

Currently, you should not buy a modem with a baud rate lower than 28,800 bps, even though you might be able to get your hand on a 14,400 bps modem for peanuts. A 14,400 modem is fine for send-

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ing and receiving e-mail. However, if you plan to surf the net, you need at least a 28,800 bps modem (it makes no sense to get anything less).

Hayes Compatibility – The Hayes modem, made by a company called Hayes Technologies, has set the standard in the modem market. Because of its popularity, most communications programs are written exclusively for the Hayes modem. When buying a modem, the first thing you must make sure it that it offers Hayes compatibility. If it doesn't say, it isn't.

Experts believe that the number of sites on the World Wide Web is doubling roughly every three-to-five months.
***PC MAGAZINE** (1997)*

Internal or External Unit – An internal modem is handy because it's out of the way and requires no interfacing other than a standard four-wire telephone cable between the modem and the phone outlet. It is connected to the computer through one of its expansion slots, making it an integral part of the computer. It can also be inconvenient because it takes up an expansion slot, draws power from the computer power supply, adds to the buildup of heat, and is accessible for troubleshooting and reconfiguring only be opening the computer.

Buying an external modem is a good idea if you plan to use your modem on several computers, if you have no expansion slots available, if you have a free serial port open (not occupied buy a mouse or other device), or if your power supply is being severely taxed by other add on cards.

Generally speaking, external modems

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are favored by experienced users. Not only are they easier to install, (you simply connect the modem to your serial port and install software), but with all its flashing lights, it makes your computer look right out of Star Wars.

Practically speaking, this means that if your modem hangs up on you, and it will sooner or later, the high-tech indicator lights let you know at a glance. Another advantage of buying an external modem is that you can reset it if something goes haywire (turn the power on and off), without shutting down your entire computer.

For the fastest downloads, choose a site that is close to you or one where the local time is not prime time.
SUPERTIP

Voice Capability – Most modems nowadays also offer voice capability, which when used with the software that comes with them, allows you to turn your PC into a fully functional voice mail system and even a speakerphone. You can set up literally hundreds of messages and mailboxes and turn a one-person home office into a corporate empire. The software can even be programmed to beep you or forward faxes to another number. Some models even play music when you put callers on hold.

How much should you pay? Although this wasn't the case a few years ago, a good modem can now be bought for under $100. For $100 you can get a modem that is reliable and do most everything you need, but may lack a few bells and whistles. If you opt for a more expensive top of the line modem, before spending extra money on features that

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you don't really need, get a better idea of what you expect to be doing with your modem.

Multi-Function Cards

If desired, you can turn your PC into a fax-voice, mail-data, modem-audio, answering machine communication center using a multi-function telephone card. Mutifunction telephone cards can give your small business or home office a big-league sound. Incoming calls are automatically switched between your fax, voice mail and modem so you don't have to bother manually. It uses just one phone line, which saves you the time and expense of adding extra phone lines or numbers.

When buying an add-on card pay close attention to its features and bundled software. It is the bundled software that makes the difference.

SUPERTIP

Furthermore, a multi-function telephone card can also offer you unlimited voice mail and messages (limited only by available disk space) just like the telephone companies who charge you hundreds of dollars per month.

MediaMagic's Telmetry-32 – MediaMagic's Telmetry-32 which includes four CD-ROM interfaces, stereo microphone input, audio jacks, dual RJ-11 telephone jacks, a game port and a stereo microphone. The software includes Voyetrás *Multimedia Sound Software* for Windows, and voice and fax action are handled impressively by Syncro Development's *Multimedia Connect* with three-way call discrimination. *Multimedia Connect* is clearly patterned after high-end voice-mail systems. The Telemetry-is rec-

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ommended for any small business that wants to sound big.

The TyIN 2000 – The TyIN 2000 board is an advanced PC communications center that ties together the operations of a high-end fax machine, a data modem and an answering machine, and supports business audio and scanning. It relies on its own powerful on-board microprocessor instead of your PC's CPU, meaning you can communicate while you work, wWith no Loss in PC Performance. It's easily upgradable. Its RAM-based design assures you of future software upgrades. Just download the code.

A new Internet business site called Strategis (http://strategis.ic.gc.ca) established by Industry Canada with private sector partners contains more than 60,000 reports and more than two gigabytes of statistical data. It will showcase Canadian companies and products abroad.

FUNFACT

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A Few Web Terms Untangled

Domain Name – A name assigned to your server by Network Solutions, the registration branch of the Internet Network Information Center INTERNIC. This name will generally follow the standard form http://www.yourcompanyname.com.

Firewall – Software that restricts traffic between the Internet and your private network for security reasons.

FTP (File Transfer Protocol) – The protocol used to transfer files across the Internet.

HTML (Hypertext Markup Language) – A standard format for authoring Web pages that uses text codes to format documents, insert graphics, and provide links to other sites or file downloads. More simply put, HTML is the language allows you to turn basic text into a Web page.

HTTP (Hypertext Transfer Protocol) – The protocol that forms the basis of the Web. HTTP enables users with Web browsers to access HTML documents.

IP (Internet Protocol) Address – The numerical address that identifies systems connected to the Internet so that traffic is routed correctly.

Java – A programming language developed by *Sun Microsystems* designed to create system-independent applets that execute on the fly on Web pages. It allows Web designers to create games, animations and multimedia applets and insert them on their Web pages. The only requirement for the client is a browser with a built-in Java interpreter such as Netscape's *Navigator 3.0* and Microsoft's *Internet Explorer 3.0*.

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GETTING CONNECTED TO THE INTERNET

THE **INTERNET** is a global network of more than 50,000 interconnected computer networks, that essentially gives users access to astronomical amounts of data. However, so far its primary attraction has not been the information it stores but rather the access the people they can reach through it.

Experts believe that the number of sites on the worldwide web is doubling roughly every three-to-five months.
PC MAGAZINE

NOTE If you want to get a good idea of the services offered on the Internet consult Don Littmen's *Whole Earth On-line Almanac*. It is one of the most comprehensive reference for on-line services. You might also run down to your local drug store and pick up one of the many new on-line or web-site magazines that list popular web-site descriptions and addresses.

Bandwidth & Content – The real issue using the Internet is related to bandwidth and content. Bandwidth relates to the amount and speed of information while content refers to the type and quality of information. Since it's difficult to imagine that localized content is really an issue considering the vastness of the Internet, the real winners, in the ISP business, will probably be those who can provide the fastest access at the lowest cost.

Do You Need to Get Connected? Interest in the Internet has novice PC users everywhere convinced that they've got to get connected. They may not know why or

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even what it means, but they're sure they want to do it.

However, as a business owner, don't jump on the Internet bandwagon too fast. The problem is that for many users, the Internet doesn't offer sufficient value or diversity to keep them interested once the novelty of "getting connected" starts to wear thin. Although, there will always be a solid core audience who rely on the Internet for technical support, and there always will be special-interest groups that will use their websites as common meeting halls, mass popularity – the kind enjoyed by television – isn't in the cards until on-line services make some fundamental changes.

File compression programs can lower your modem/fax phone bill by reducing the number and size of the files to be transferred and thus reducing the amount of time spent on line.

SUPERTIP

Current offerings simply aren't' good enough. In fact, for many users, once they've figured out how to work around all the technical hurdles of the Internet, they discover there really isn't much of interest to be found on-line. Sure the Internet has access to tremendous amounts of information, but finding out that there are 40,000 articles on a topic of your interest is just as useless as finding no information at all. And the irony of this situation is that from a technical standpoint, there's nothing left to hold on-line services back.

On-line service providers need to revolutionize their marketing approach. They need to provide more FREE services to attract and maintain interest. They need to be able to help users

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access information that most closely fit their. FREE useful content is the future of the Internet.

What is an Internet service provider (ISP) and how do they work? An Internet service provider is someone who buys an Internet feed from either another ISP or from a telecommunications carrier and resells Internet services to consumers. The feed line is usually hooked up to a satellite system via a satellite dish. The ISP then buys several to a hundred or more high speed servers with thousands of gigabytes of storage and sets up each server to handle as many calls as it can.

On regular copper telephone wires, data transmission is limited to a speed of 28,800 bits of information per second. But up to 10 million bytes (there are eight bits in a byte), can be sent on one channel of a coaxial cable, which may have capacity for 50 to 60 channels. That means photographs that now take minutes to be received by phone could be transmitted in seconds.

FUNFACT

Types of Internet Service Providers – There will likely be three basic types of service providers in the future. These include:

- cable companies
- smaller local Internet service providers (ISPs)
- telephone companies

Cable Companies – Cable modems use the high-capacity cable line used for cable TV. A cable modem can hit speeds and transfer rates 1,000 times faster than conventional modems (anywhere from 4 to 30 megabits per sec-

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ond). Although this option is presently, more expensive than regular ISPs, in the future it will probably become the norm, making modems obsolete.

Independent ISPs – Considering that the telephone and cable companies already control too much of the communication markets, expect many consumers and businesses to prefer the smaller service providers since they are likely to be closer to the heart of their communities. Smaller ISPs are run by techies, marketing gurus and basement hackers who want a high speed connection themselves, and resell part of it to help pay for it.

Telephone Companies – Expect the

The Internet War that Most Certainly Looms in the Future

THE INTERNET really hasn't yet established itself. The market is in its infancy stage. However, what happens when multi-nationals open up shop? What if these multi-nationals have competitive pricing, a multi-million dollar marketing plan and enough capital to sell at a loss until the competition dries up? What if big companies are waiting in the wings, sitting around while the little guys do all the footwork and build the industry, attract the user base and bring the market to maturity, then they will step in and squash them like bugs . . . or maybe acquire one or two, the good ones so the don't have to reinvent the wheel? Maybe computer users should wait awhile if they don't really need Internet services right away? Wait for the price wars to begin, then get connected?

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telephone companies to offer larger bandwidth than regular ISPs but also at a higher cost.

Choosing an Internet Service Provider – When choosing an Internet service provider, evaluate the following (print out "ISP Rating Sheet on **the last page**):

- *Do they offer free technical support?* If you're new to using the Internet, technical support can make or break your relationship with your ISP as well as the general quality of your experience using the Internet. Find out if the ISP offers any free seminars, voice support or e-mail support. Another item worth looking into is the quality of any guides they provide that outline the installation process and use of software.
- *Do they offer free web space?* Many Internet providers are now offering space on their servers, which gives you the opportunity to create your own site on the World Wide Web. With your own web page you can share your insights with the world, or more importantly join the latest marketing revolution and open up your company to the entire planet. Some even offer to design your own Web page for you.

For specific information on communication standards and practices in the U.S. contact the Federal Communications Commission (FCC).

SUPERTIP

NOTE Be warned that many ISPs charge for data transfer (once you've gone past a certain limit e.g., 1000 MB). If your site is

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really popular, swallowing up huge amounts of bandwidth e.g., you just registered with a new search engine and for the first month your hits sky-rocket, this can quickly add up to some serious cash. For example, if your ISP charges 5 cents for 1MB of transfer over your limit, and there's no ceiling to what they can charge, then if 500,000 people visit your site and each download 200k of data for a grand total of 100,000MB, then you will have to fork over 99,000 MB x $0.05 = $4,950. It is therefore important to research the entire cost of housing your Web site before going on-line.

A 100MBps bandwidth is usually considered good for an ISP.
POWERPOINT

- *How big is their connection to the Internet?* Technically speaking the size of the ISPs connections is referred to as bandwidth. If a provider has a small connection to the Internet, an information bottleneck could develop if too many of the provider's clients are transferring information at the same time. It should be noted that some ISPs overload their Internet connection, so while you might get past the busy signal, everything runs really slow.

  To figure out if an ISP might have this problem ask for their bandwidth in bits per second. Then divide the bandwidth by the number of lines they claim to have. If the number is less than the speed of your modem, it's probably going to be slow when the system is running at peak capacity.

- *How fast is their connection?* At a

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minimum, the ISP you choose should offer a speed of 56Kbps. Faster ISDN lines can easily quadruple this speed while cable lines can increase this speed by a thousand times (the fastest commonly-used links to the Internet deliver 45 megabits per second).

However, although a fast connection speed is highly desirable, for the most part it is better to ignore high-speed claims and take a hard look at price.

The fact is a 30-megabit per second service will not, most of the time, deliver data 1,000 times as fast as a 28.8 K modem, even though, in theory, it can. The reason for this is that the Internet itself has clogged arteries (bottlenecks) which simply can't deliver data at anywhere near that speed.

The practical difference between a one megabit per second and a thirty megabit per second service is not that significant, considering that many other components of the Internet can't move much faster than one megabit per second.

In other words, the practical difference between a one megabit per second and a thirty megabit per second service is not that significant, considering that many other components of the Internet can't move much faster than one megabit per second. This is likely to remain so for at least the next couple of years until these bottlenecks are solved.

NOTE Remember, the speed of information transfer is dictated by the lowest common denominator. In other words, if you just ran out and bought a 56 Kbps modem but your provider only sup-

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ports 28 Kbps your information throughput will only be 28 Kbps.

- *How fast is their server?* Access speed will also depend upon the speed of their servers (processor speed and hard drive speed). An old 486 will not perform as fast as a Pentium system. Likewise, an old Pentium 120 MHz system will not perform as fast as some of the more expensive UNIX servers or newer Pentium II 300MHz systems.

A service provider that has a high ratio of subscribers to phone lines means that every time you dial up and try and get on the Internet, you will likely get a busy signal.

- *How much do they charge?* Month-to-month charges for modem hookups (service to 56Kbps) are usually in the range of $20 per month. For that charge you generally get unlimited access to the Internet (or anywhere from 25 to 50 hours free with each additional hour above your monthly limit costing $1.50), an e-mail account, and possibly 2 to 4MB of free web space (free web space is often offered only if you sign a 6 month or year contract). If you choose an ISDN service (service at 64 Kbps or 128 Kbps) expect your monthly charges to triple or even quadruple. Also, expect to pay a $50 to $100 setup charge.
- *What is their subscriber to phone lines ratio?* A service provider that has a high ratio of subscribers to phone lines means that every time you dial up and try and get on the Internet, you will likely get a busy signal. Sometimes

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during peak periods, you might have to wait half an hour or more to get a free line. Experts thus recommend choosing a service provider that has a ratio of 1 phone line for every 15 subscribers. This ratio significantly minimizes the potential of busy signals.

NOTE It is a good idea despite the ISP's claims of few busy signals, to phone it up during the times of the day when you plan to use the Internet the most.

- *What kind of software do they give you once you sign up?* Most providers supply their clients with some software necessary to access the various aspects of the Internet. Typically these will include electronic mail, a news and discussion group reader, a File Transfer Protocol (FTP) tool and possibly a graphical browser such as Explorer or Netscape. Find out the size and scope of the software provided and if there is any cost associated with its acquisition. Also, check to make sure that the software is pre-configured. This can save you hours of frustration.

If you're just thinking about getting on to the Internet, the easiest way to start is by asking a friend to log you on to his or her computer, and show you the basics of using a search engine, linking and bookmarking. You'll be flying on your own in a few minutes. It's that simple.

SUPERTIP

Bulletin Board Services

A BBS is a service that allows computer callers to upload and download programs,

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send and receive electronic mail and even play games. In the past, individuals often set up a BBS just for fun, but many businesses (especially computer dealers and software publishers) have electronic bulletin boards for their customers to use to leave suggestions and questions (it should be noted that for the most part the Internet has taken over this role).

For other businesses, if several branches of a company share information, a BBS can help them keep up-to-date on the latest news and breakthrough. A BBS can also be set up to advertise new products or to sell products not available at local stores.

A BBS is a service that allows computer callers to upload and download programs, send and receive electronic mail and even play games.

NOTE BBSes are easier to understand than the Internet (unless the BBS is really poorly designed), but presently they are islands unto themselves, at least when compared to the capabilities of the Internet. And even though a BBS service can provide news services from the Internet, increasingly blurring the division between BBSes and the Internet, they still don't really allow users to explore what's going on in the rest of the world. To their further disadvantage, it seems that every BBS is beginning to look like every other BBS: the same downloadable files, the same e-mail networks and the same on-line games. As a matter of fact, if you've seen one BBS you've seen them all.

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Digital Networks

It's called ISDN – Integrated Services Digital Network and it has been an idea for along time but only recently has gained popularity. ISDN allows you to simultaneously use voice, fax, data and real-time video all through your existing telephone wires and it won't cost you much more than two regular business telephone lines.

With analog lines there is also a limit to how fast you can communicate with a modem: 19,200 bps is a best case scenario with real world limits around 9,600 bps.

Why go Digital? Until now, the link between your telephone and the rest of the Internet has been analog. If order to communicate using digital information, your data must be converted to analog than sent over the phone and converted back to digital at the other end. That's what a modem does. Analog signals, however are prone to noise and distortion, that's why modems use techniques like MNP5 and V.42 to try to catch errors introduced during transmission, but even these techniques have their limitation. With analog lines, there is also a limit to how fast you can communicate with a modem: 19,200 bps is a best case scenario with real world limits around 9,600 bps.

The solution is to create a telephone network that is purely digital from one end to the other. ISDN doesn't require any special wiring, but it does require a new type of telephone, called a terminal adapter. Both Hayes and Northern Telecom make such equipment. It allows you to simultaneously use both a regular telephone handset and an RS-232 serial

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interface. The adapter will tell your phone company what type of call you want to place: digital or analog, and will allocate the proper channel. However, if you choose digital communication, you can only talk to another ISDN subscriber. If you choose analog, its' just like placing a normal telephone call.

Types of ISDN Services – ISDN services come in a variety of speeds ranging from 64Kbps to 128Kbps and faster. Northern Telecom offers two ISDN services:

- Micro Link
- Mega Link

Micro link is designed for small businesses and offices while Mega link is for larger companies. Either service allows you to set up remote LAN stations i.e., your file server is in Chicago and a LAN station is in Denver. Not only will files transfers be faster than using a modem, but your applications will come up faster. Also remote-access, screen refreshing will become almost instantaneous. For commercial businesses that call long distance to do E-mail transfers every day, the cost savings can be incredible.

The new highways of the future are digitized information highways, not highways you drive your car on.
POWERPOINT

Micro Link – Micro link has a combined bandwidth of 144 Kbps ten times faster than a 14,400 bps modem. For more information contact Northern Telecom 1-800-Northern or visit any Computerland outlet

Mega Link – Mega link has a total band-

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width of 1.4Mbps (comparable to the speed you'd get over a LAN using a coaxial cable. This type of service is used to line up universities and large corporate computing centres.

Is your part of the country wired for ISDN? Each district in the country is hooked up to a "central office." This is where your local wires interface with the larger network – trunk cables fiber optics etc. Unless your central office is using DMS100 digital switching equipment, you can't use ISDN. Most of the country is ISDN-ready, especially the downtown cores of large cities.

Faster Ethernet standards exist, including the 100VG AnyLAN standard and the so-called Fast Ethernet 100baseT standard. Although 100baseT seems to be more popular, proponents of 100VG can lay claim to a superior technology.

FUNFACT

Electronic Mail Systems

Electronic mail (e-mail) is a system of hardware and software that allows you to send messages through modems or LANs to other e-mail users – the number of e-mail users you can communicate with depends on the size of your e-mail network.

Most often, a central computer controls the flow of the e-mail messages. This central computer uses e-mail software to receive incoming mail and to route messages to users of the e-mail system. Each user of the e-mail system has an electronic mailbox. The mailbox is similar to a directory on a hard disk. Just like a real mailbox, your e-mail mailbox contains incoming and outgo-

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ing messages. You can add and delete messages, read messages sent by other users, send messages, and reply to messages sent to you.

It should also be noted that rather than writing your message while connected to the telephone system (and paying the phone bill for the time), most e-mail applications allow you to compose a message in your favorite word processing program and then send it through the e-mail system when you ready, minimizing your connection time.

Most e-mail applications allow you to compose a message in your favorite word processing program and then send it through the e-mail system.

You can also attach a program file to your message and send it along to other e-mail users as well as have the option of sending your message to just more than one person at a time.

Commercial E-mail On-line Networks

– Commercial e-mail networks such as:

- AT&T's Interchange
- America Online
- CompuServe
- eWorld (for Mac users)
- The Microsoft Network
- Prodigy

span numerous states and support thousands of users.

Each on-line service uses its own software for creating, sending, receiving and organizing E-mail. This eliminates the need for you to purchase a separate data-communications package as these mail functions are integrated with your interface to connect to and navigate

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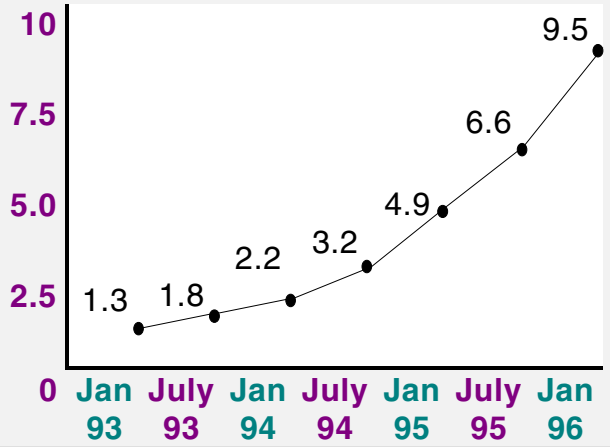
through the service. All you need to buy is a modem. Like BBS software, you use your modem to call a central computer that manages the e-mail system.

NOTE Commercial e-mail services charge fees for their use. You may have to pay an annual subscription fee and/or a fee based upon the amount of time you are on-line. To save yourself money, it is thus important that the on-line service provider uses software that allows you to compose your e-mail messages off-line.

Internet E-mail – The Internet is the e-mail communication KING. All you need is a modem, a TCP program like *Trumpet Winsock*, an e-mail program like *Eudora*, and a mail-box at a ISP (Internet Service Provider). In itself, the ease with which you can communicate with others, makes getting connected worthwhile for almost every business.

Two free Internet e-mail service providers that are gaining large numbers of fol-

The Spectacular Growth of the Internet



Internet Host Computers
SOURCE: Network Wizards

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lowers include:

- www.hotmail.com (over 8 million users; recently acquired by Microsoft)
- mail.yahoo.com

LAN E-Mail Systems – LAN e-mail software applications, such as cc:Mail, allow you to send and receive messages and files to other users. LAN e-mail systems enhance the communication in-office setting, providing a way to send memos to groups of employees, schedule meetings and reduce the paper flow in the office.

For the price of sound card, modem, microphone, speaker system and a copy of any one of dozen of a new line of special software programs, you can turn your $3,000 computer into a $30 phone.

Internet Phones

For the price of sound card, modem, microphone, speaker system and a copy of any one of dozen of a new line of special software programs, you can turn your $3,000 computer into a $30 phone. The advantage of this is you can talk to someone via the Internet for pennies, across the globe. In other words, you can avoid thousands of dollars in telephone bills. You can talk to suppliers in Thailand, consultants in Australia, and sales reps in Malaysia and England, for hours. If you were paying a long-distance carrier, the calls would cost hundreds of dollars. But over the Internet, you can reach out and touch people all over the world for the price of a local phone call – plus a few cents worth of connect time.

NOTE Most people aren't likely to flock to

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this new technology just yet. Connections aren't always easy and the sound often falls between the cracks of the Internet circuitry.

How can you get started? First, go out and buy and install a $49 piece of software like *Internet Phone.* This program runs only on Windows machines and requires a microphone, modem and a special piece of hardware called a sound card with full-duplexing (check out *Gravis Ultrasound Plug'n Play*), which means you can talk and receive at the same time. A similar program, *NetPhone*, runs on Macintosh computers without extra equipment.

Most people aren't likely to flock to this new technology just yet. Connections aren't always easy and the sound often falls between the cracks of the Internet circuitry.

Next, sit down at your computer, patch into the Internet, slide on a pair of headphones, pull a microphone close, and speak into your machine like a walkie talkie. Both programs permit conversation in only one direction at a time, like a walkie-talkie: you talk, then click your mouse, and the people at the other end talk. Roger and out.

NOTE Five other company's that make Internet phone software include: *ts intercom* by Telescape Communication; *Iphone* by VocalTech, *DigiPhone* by Camelot; *WebPhone* by The Internet Telephone Company; and *CU-See Me* by White Pine Software. Telescape's product, *ts intercom*, is licensed but can be downloaded for free from the company's web site (until they change their marketing strategy). Telescape is hoping to get people using the software and develop a loyal

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following, before they start charging for upgrades.

NOTE Internet phone software and hardware is maturing to the point that pretty soon using an Internet phone will not be that different from using a phone (a fact that telephone companies are very worried about).

On-line Services

For a fee, you can subscribe to an on-line information service such as America On-line, CompuServe, the Dow Jones News Retrieval, or Prodigy. These services may include an on-line database that provides files for download, and may also let you buy and sell stocks, shop, make travel reservations, and access encyclopedias, newspapers, or magazines articles from around the world.

Free or really cheap technical support can be available in the electronic world. Not that long ago, business people had to rely on Chambers of Commerce, associations or user-groups to get help, before they turned to high-priced technicians for support. Now, experts abound in newsgroups and can be found on the Internet in forums on an on-line service, and on BBSes.

SUPERTIP

The three big on-line service providers are Compuserve, America On-line and Prodigy. Compuserve is known in the technical community as the best resource for technical and software support. America On-line is known for their low unlimited US $19.95 per month marketing campaign which resulted in a huge flood of customers and well-publicized growing pains.

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Types of On-line Services of Particular Interest to Entrepreneurs or Investors – Services of particular interest to the entrepreneur or investor may be:

- The Strategy Investor
- Quote Track from Prodigy
- CompuServe's Dun's Electronic Business Directory, American Business Information and Nexus all of which can bring powerful research capabilities to your desktop

However, accessing the above resources can be costly. Prices range from $25 to $100 and more a month, depending on usuage.

America On-line –

Phone: 1-800-827-6364

URL: http://www. aol.com

Compuserve –

Phone: 1-800-554-4079

URL: http://www.compuserve.com

Prodigy –

Phone 1-800-PRODIGY

URL: http://www.prodigy.com

"Information is Power." And people with access to the Internet have more power than people who don't.
ROBERT EARLEY

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Fibre Optics vs. Copper Cable

STRANDS OF GLASS, each thinner than a human hair, will soon give the world blazingly fast Internet access. The technology is called fibre optics. Fibre optics uses laser light pulses travelling through glass fibres to transmit voice, data and image information at very high speeds. Conventional telephone cable use electricity traveling through copper wire.

Why Optical Fibres Better?

- Light can travel much farther before a costly amplifier is needed to boost the signal.
- Optical fibres aren't affected by electrical or radio interference or lightning.
- Optical fibres can carry more information. A half-inch-thick fibre optic cable that includes 72 pairs of fibres can transmit 3.5 million conversations. On the other hand, a conventional 3-inch-thick telephone cable, which contains 1,200 pairs of copper wires, can only carry 14,400 telephone conversations.

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A Few Network Terms Untangled

10BaseT – Ethernet local area network (LAN) that uses twisted-pair wiring. This is the most common Ethernet implementation. 10BaseT networks are laid out in a star topology. The wiring is connected to stations using a plug that resembles a phone jack called an RJ-45.

10Base2 – Ethernet LAN that uses coaxial RG-58 A/U wiring (like televisions cable). Also known as thinnet (thin Ethernet). Uses the bus topology. Cable is attached to devices using metal twist-on devices called BNC connectors.

100VG-AnyLan Ethernet – This is an AT&T and Hewlett Packard designed approach to higher speed networking. Like Fast Ethernet, it allows for a 100 Mbps transfer rate. However, it can operate on lower grades of media from category 3 up, allowing it to interconnect with existing Ethernet networks.

AppleTalk – This is a network protocol for linking Macintosh computers and peripherals. There are two implementations: LocalTalk (230.4 Kbps) and EtherTalk (10Mbps).

Ethernet – A LAN that connects computers and peripherals and operates over twisted-pair or coaxial cable at speeds up to 10 Mbps. The Ethernet specifications came from Xerox's Palo Alto Research Center. Currently Ethernet is the most widely used network access method.

Fast Ethernet – Fast Ethernet is a 100 Mbps implementation of the Ethernet standard.

Protocol – Protocols represent the rules for transmission of data across a network.

Router – This device interconnects different access methods and protocols. Routers act like bridges. They are used to build wide area network (WANSs).

TCP/IP – Transmission control protocol/Internet protocol. A protocol used to link dissimilar computers across many kinds of networks. Developed in the 1970s by the U.S. Department of Defense, TCP/IP is the transport protocol employed by the Internet.

Topology – The physical or logical configuration that describes a LAN. Common types are bus, ring and star.

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INSTALLING A LOCAL AREA NETWORK

A LOCAL AREA NETWORK (LAN) connects a group of computers usually located in the same room or building through wiring similar to television or telephone cabling. One large computer called a file server – with multiple hard drives and even multiple processors – can serve as the brains for the whole system, or each computer can function independently yet at the same time be connected to the whole.

Not that long ago the networking industry was still struggling for a consistent definition of what constituted a LAN; now it's possible to walk into a neighborhood computer store and walk out with a shrink-wrapped LAN in a box.
FUNFACT

Working on a network is not much different than working on an individual PC. You run programs and create and edit files just as you would on your own computer. The only difference you'll notice is that you'll have more hard disk drives to access. However, a network provides several added benefits over a system of independent computers.

These benefits include:

Information Sharing – Networking a group of computers gives users the ability to share files and data. Users can access documents and data as needed from any computer on the network. Without such a system, users would be busy running around passing floppy disks back and forth (called a "sneakernet"). It is also important to note that networks pre-

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vent multiple versions of the same file or database. Imagine what would happen if each computer had its own separate copy of a file or database. Eventually, you would end up with slightly or entirely different copies of the same file or database containing different information. This would occur whenever two users added different information to their separate copies. Thus by storing it on one computer, whenever anyone needs to use or update a certain file or database, any changes made affect only that one file.

Networking a group of workstations allows users to share the power of a single super mini-computer.

Hardware Sharing – Networking a group of computers allows various kinds of hardware to be shared by all workstations. Several or more networked computers can share a single laser printer, CD-ROM drive, tape-backup device, or any other peripheral device used only occasionally by each user. Even hard drive space can be shared. For example, if one machine is running low on disk space, the operator can save files to a different, perhaps newer machine which has a lot of free space. Overall, by sharing hardware, companies can cut costs.

NOTE Some network software even allows the sharing of modems. If at some point you decide the company could benefit from a direct connection to the Internet via an ISDN line, a network allows all members to access the connection.

Power Sharing – Networking a group of workstations (which have no processors or hard drives), allows users to share the power of a single super mini-computer.

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Simpler Backup Procedures – Networking a group of computers allows you to back up all the data that is important to your business at the same time from one central location, making the entire backup process much more efficient. Since most backup devices come with a set of utilities that allow you to run the backup automatically at a specified time, you can set it to turn on in the middle of the night so it won't interfere with regular operations. Then each morning someone checks that the backup was performed correctly and swaps the tape for an older one, putting the latest one in a briefcase, safe or handbag to be taken off-site at the end of the day.

Networking a group of computers allows you to back up all the data that is important to your business at the same time from one central location, making the entire backup process much more efficient.

E-mail – Networking a group of computers gives users the potential to access one of the most powerful communication tools in modern history. That tool is e-mail. All you need is some additional software like *MS Mail* or *Lotus Notes*.

Although, some people – who haven't used e-mail much and perhaps prefer the aestheticism of an antique quill and a bottle of India ink – might think that e-mail is merely just another silly fad through which ideas can be expressed and information exchanged, the business world has discovered it to be the next best thing since the paper clip. No more irritating voice mail. No more telephone tag. No more forgetting exactly who said what.

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To make this new communication tool even more appealing, additional software and hardware can provide a networked community with access to the outside world via the Internet as well as dial-up access to their business. Dial-up access can be particularly handy if someone in your company wants to work at home, keep in touch with what is going on in the office or transfer files back and forth.

Groupware – Networking a group of computers allows the administration to use a new kind of software called groupware. Groupware is software that supports and helps coordinate work among members of a workgroup.

LAN systems have replaced mainframes for two very important reasons: they are cheaper to install and maintain and they are more versatile.
POWERPOINT

An example of groupware that has proven useful to various small businesses is group scheduling or calendaring software. This kind of software allows members of a team to input meetings and other events into their own workstations. Once inputted, everyone can then look at the calendar (at their own workstation) and find out things like where their colleagues are, what their time commitments are, how their latest work assignment is coming along, and when they might be free for a meeting or discussion.

The Five Main Components of a Network

Network systems are made up of five main components:

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- file server(s)
- network cabling
- network interface cards
- network software
- individual workstations

NOTE When purchasing the main components of your LAN system, examine several options to determine which will do the best job for you at the most reasonable cost. Stick with name brands to the extent that you can. Several LAN system and component manufacturers are already defunct.

A file server is a powerful dedicated machine shared by users on the LAN.

File Server – A file server is a powerful dedicated machine shared by users on the LAN. It provides access for files for all the workstations in the network. It usually has a large hard drive or multiple hard drives, tons of RAM, and at least one blazingly fast processor and in some cases multiple processors. It also stores and runs the software that controls access to files in the network. Servers can also carry out specific functions such as controlling print jobs, being used as a data repository, and as the access control to e-mail, voice mail and Internet Web sites.

NOTE Your file server – which includes a very large hard disk – is likely to have logical drives from C to Z. A logical drive is a division of a physical hard drive. The operating system treats each logical drive as a separate drive. By partitioning a physical drive into several logical drives, you make the physical drive more man-

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ageable. Many network administrators reserve one or more of these drives for programs and restrict each user to storing information on a single drive.

Network Software – LAN software acts like a traffic cop, making sure information flows smoothly between the workstations and the file server. For larger networks, the most popular operating systems are *Netware* and *LAN Manager*. For smaller networks, popular operating systems include *LANtastic*, *Net/30*, *LANsmart*, and *Web NOS*. However, with *Windows 3.11 for Workgroups*, *Windows95*, and O/*S2 Warp Connect* providing basic network connectivity, older software solutions are quickly losing their market share. Macintosh *System 7.x* also supports network connectivity.

Although there are many various kinds of network interface cards, the most popular network card by far is the Ethernet interface card.

NOTE If you have a variety of machines and some are older PCs, perhaps 286s or even XTs, you can buy a networking operating system from sources such as *Artisoft* or *Novell* that will allow you to incorporate all these machines on one network. There is also DOS-based client software available from Microsoft that will allow you to connect machines running DOS to newer systems running Windows.

Network Interface Cards – A network interface card allows the network cabling to be connected to the workstation's internal bus rather than to the serial port, thereby increasing the speed of communication between the operating system of the main file server and those of the less powerful workstations. Although there are many

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various kinds of network interface cards, the most popular network card by far is the Ethernet interface card. Ethernet is a networking specification that defines cabling and signaling parameters. Ethernet has become the most popular method of networking PCs.

NOTE Most network cards being manufactured today are supported by *Windows 3.11 for Workgroups*, *Windows95* and *O/S2 Warp Connect*. However, if you plan to operate your networking using *OS/2*, *Windows NT*, or a version of a PC-compatible *UNIX*, make sure to check that any network card you purchase is supported by that operating system.

The distinction between network card-based peer-to-peer networks, and those that use a direct connect cable are blurring because of the added functionality of LapLink-type software.
FUNFACT

Ethernet Cards – Ethernet cards come in 10Base2, 10BaseT, 100BaseT, ISA and PCI models. Some Ethernet cards have a 10Base2 coax connector (thinnet), some have a 10BaseT connector, some have both coax and 10BaseT interfaces. Having both types of interfaces gives you more options when setting up your network system.

There are also a large number of cards that can support both 10BaseT and 100 base-T networking. If you have an existing 10BaseT network in place and have future plans to move to 100 Mbs networking, the premiums you pay for these cards may be well worth their while.

10Base2 Ethernet Cards – The 10Base2

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Ethernet card uses coaxial wiring similar to television cables. The standard 10Base2 card is rated at 10 megabits per second.

10BaseT Ethernet Cards – The 10BaseT type of Ethernet card is popular for several reasons. It's cheap, reliable, offers support for the most popular operating systems, and most importantly uses cabling (resembling telephone wire, complete with a slightly oversized facsimile of a modular phone-jack connector on each end) which is considerably less expensive and less bulky than coaxial cable. The standard 10BaseT card is also rated at 10 megabits per second.

The simplest computers to network are Macintoshes, which have built-in networking functionality.
SUPERTIP

NOTE Software configurable Ethernet interface cards are generally preferred to hardware configurable cards. If you have to make a change, you won't have to open up all your machines and pull out the cards.

100BaseT Ethernet Cards – 100BaseT Ethernet Cards support the Fast Ethernet Standard. They are rated at 100 megabits per second.

ISA and PCI Network Cards – Network cards come ready for two basic types of computer buses, ISA and PCI. ISA cards are usually used in older 486 machines (which typically contain the Vesa Local-bus) and even 386 and 286 machines. You can also use ISA cards in newer machines such as Pentiums and later model 486s which contain the PCI bus. In fact, this is a pretty much a standard practice due to its economy. However, the advan-

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tage of buying a PCI-network card is typically they offer greater speed. Most 100BaseT cards are PCI-based.

Notebook Cards – For PC Ethernet cards (for notebooks) look into cards made by *Fujitsu*, *Megahertz* and *Xircom* which all work well under *Windows95* and *Windows 3.11 for Workgroups*.

Network Card Manufacturers – Some of the bigger vendors of network interface cards are 3Com, Asante, C-Net, D-link, Farallon, GVC, IBM, Intel, OvisLink, SMC, Surecom and Wisecom. Many of these companies specialize in networking products.

Some of the bigger vendors of network interface cards are 3Com, Asante, C-Net, D-link, Farallon, GVC, IBM, Intel, OvisLink, SMC, Surecom and Wisecom.

NOTE When purchasing a network card, research the quality of the documentation that comes with it. Documentation can range from a one-page fold-out to a hefty 200 page guidebook. If you're lucky, and the installation and setup of all your network cards goes off without a hitch, then documentation is not much of a concern. However, if you run into difficulty, you will appreciate a detailed manual with a comprehensive, troubleshooting guide.

How Much Does a Network Interface Card Cost – Ethernet interface cards for desktop PCs are available for as little as $50. One popular model is called the *Genius LAN*, which has both a coax (thinnet) thin Ethernet) and 10BaseT connectors. As well, it can be configured either by jumpers on the card or by software commands. The

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card retails for about $79 Canadian.

Network Cabling – Network cables are specialized cables, which allow high-speed communications between the file server and the various workstations. They come in three basic categories which are determined by the quality of the wire and its corresponding data rates and reliability:

- Category 3 cabling will handle voice and LAN traffic up to 10 Mbps.
- Category 4 handles data up to 16 Mbps.
- Category 5 handles newer 100 Mbps networks.

Network cable costs about 50 cents a foot.

The distinction between network card-based peer-to-peer networks, and those that use a direct connect cable are blurring because of the added functionality of LapLink-type software.

FUNFACT

Workstations – Workstations come in two basic types:

1) a fully independent computer system connected to other fully independent computer systems with high performance cabling
2) a computer system consisting of little more than a monitor and a keyboard connected to high a performance file server along with other similar systems with high performance cabling.

Direct-cable Connection Network Systems

The smallest and simplest network can be created when two machines are connected

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via a direct serial-to-serial cable, and software such as Symantec's *pcAnywhere* or Traveling Software's *Laplink*. Windows95's *Direct Cable Connection* facility also allows computers connected via a direct-cable connection to behave as through they were shared on a network.

Connecting two computers in the above fashion essentially means that the other computer's hard drive, printer, CD-ROM and/or other resources become available to the "remote" user.

However, if using *Laplink* and *pcAnywhere* software, numerous other features add to their greater utility when compared with the Windows95's *Direct Cable Connection*. For example, *pcAnywhere* allows you to remotely log onto a user's machine, diagnose any problems and fix them.

NOTE All the above products can also work over a modem.

A peer-to-peer local area network (LAN) is typically found in smaller companies in which all computers are equal.

Peer-to-Peer Network Systems

A peer-to-peer local area network (LAN) is typically found in smaller companies in which all computers are equal. A file server is not required. Once connected, other users' hard drives, printers, CD-ROMs and/or other resources become available to others in the group. With many new operating systems, such as *Windows for Workgroups 3.11*, *Windows95* and *O/S2 Warp Connect* allowing peer-to-peer networking right out of the box, this type of network has become very simple

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and inexpensive to set up.

In fact, if you presently have any one of the above mentioned operating systems running on your machines, all you need in order to set up a network is some network interface cards, some cable and possibly a device called a hub or concentrator. If all goes smooth you can get individual computers operating on a network in about 20 minutes per machine. And if you're confident enough you can do the job yourself.

If all goes smooth you can get individual computers operating on a network in about 20 minutes per machine.

However, if you lack the experience and technical know-how, or have no desire to invest hours (possibly days) trying to understand the basics and get things going, do yourself a favor – concentrate on your competency and hire a professional to hook up your machines. Occasionally, hardware and software conflicts can make installation exceedingly complex and stump even the most experienced computer professional.

Network Topology

Topology is a fancy networking term used to describe the physical or logical configuration that describes a LAN. Ignoring today's cutting-edge, high speed, high priced technology, you really have three basic choices:

- bus network using coaxial cable
- star network using a hub or concentrator (the most popular being a 10BaseT network
- ring network (the most popular being a

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token-ring network)

NOTE There are many other configurations possible and combinations of the above configurations.

Bus Networks – Often referred to as a 10Base2 type network, this network is an excellent solution for a small workgroup as it is quite easy to install and requires less cabling to construct that other kinds of networks.

Answer to Frequently Asked Questions (FAQs) about Networks can also be found on the Internet. One sight worth trying is: www.smartpages.com/faqs/LANs/ethernetfaq/faq.html
SUPERTIP

In such a network, all devices share a common path. This is set up by stringing a single coax cable from computer to computer.

Typically, the coax cable is connected to a "T-shaped" connector, in which one of the three ends connects to the card, another end connects to the coax cable which in turn connects to another computer, and the third connector has either a second coax cable to connect to a third PC or a terminator.

In the end, no matter how many computers are networked together in this "daisy chain" fashion, two terminators are always required (one at each end of the chain); otherwise, the network won't work. A major drawback to this type of network, is that as the network grows, you increasingly run the risk of running into a bad length of cable or a dysfunctional network card. When this happens, the entire network collapses and finding the exact location of the problem is

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like trying to find a dead light bulb on a string of Christmas tree lights.

NOTE Two or more Mac users can quickly form a bus network by simply connecting their computers via so-called LocalTalk cables (Macs have built-in network interface cards). Once connected, every user in the group can share each other's resources or files on each other's hard drives. The rate at which the computer can communicate depends on whether the Macs support AppleTalk or EtherTalk. AppleTalk can transfer data at a few hundred kilobits per second. EtherTalk (apple's name for its Ethernet networking functionality) can transmit up to 10 megabits of data per second.

One way to safeguard against getting stuck with a bus network that becomes too troublesome as your network grows, is to buy network cards that support both the BNC connector required by thin coax, and the RJ-45 connector required by 10BaseT.
SUPERTIP

Star Networks – To address the major drawback of the bus network, many small offices (or workgroups within a larger network) employ what is known as a hub or concentrator in what is called a star network (a common variety of a star network is known as 10BaseT). This hub, as its name implies, becomes the center to which every computer on the network or workgroup is connected to (with each computer attached to the central hub by a single cable, the resulting configuration ends up looking like a star).

In a star network, data travels from one

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computer to the next only after it passes through the hub. The advantage of this type of setup is that if a connection, cable or a network card fails, the rest of the network will still function. However, since the network does hinge on the hub, or hubs, functioning correctly, should one fail a large part of the network will fail with it. Therefore, network administrators should be cautioned against trying to skimp on a cheap hub. A good hub for a small workgroup will cost about US$150.

A good book worth reading to enhance your understanding of networks is "Handbook of Local Area Networks" by John P. Slone, 2nd edition (874 pages). Although, not for the technically uninclined, this book is one of the most comprehensive books on the subject.

SUPERTIP

NOTE The initial cost of a star network is higher than a bus network because, in addition to the cost of purchasing a hub, quite a bit more cable is required.

Ring Networks – In this type of network data travels from computer to computer within a closed loop until it returns to its source. Advantages of this type of system are the ability to self-correct if the cable is broken, and little attenuations due to signal regeneration at each station. Disadvantages include large cable requirements and short wiring distances between each node.

The most popular type of ring network is the token-ring network. It uses a supervisory "token" that is passed from station to station around the ring. Computers must have the token in order to transmit.

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Although this type of network is not generally a consideration for a small business as it requires additional equipment and there is a big premium on the price of its network interface cards, it is however used by many middle to large businesses due to its efficient use of bandwidth and fault tolerance.

Client/Server Systems

A Client / Server system or architecture is a design model for applications running on a LAN, in which the bulk of the back end processing such as performing physical searches of a database, takes places on a powerful central file server. The front-end processing, which involves communicating with the user, is handled by smaller programs distributed to the client workstation, and lesser powerful computers.

Some hubs can support both Ethernet and Fast Ethernet standards, and five some users access at 100 Mbs, and some access at 10 Mbs.
POWERPOINT

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ISP Rating Worksheet

Pricing	ISP #1	ISP #2	ISP #3
Monthly Fee	$	$	$
# of Free Hours			
Overtime Surcharge Rate	$	$	$
Set-up Fee	$	$	$
Connectivity			
Bandwidth			
Connection Speed			
Subscriber to Phone Line Ratio			
Software Provided			
Pre-configured Software			
Commercial Software			
Cost of Software			
Personal Web Pages			
Amount of Free Storage Space			
Web Page Set up Fee			
Data Transfer Fees			
Technical Support Provided			
Free Seminars			
Phone Service			
E-mail Service			
Software Guide			
ISP Hardware			
Type of Server			