Paper#: 2010

Title: Building a Windows NT Internet Server

Author: Jeremy Klein

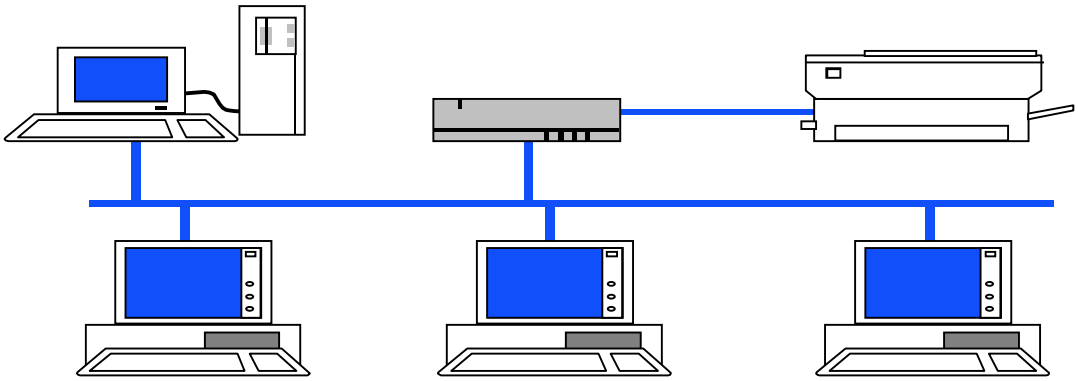
Company: Open-Ended Systems Corporation
546 North Oak St.
Inglewood, CA 90302

Phone#: 310-419-5903

Win InterNet®

A NINE STEP APPROACH TO INTERNET CONNECTIVITY SUCCESS WITH WINDOWS NT

Presenting a no-nonsense, plain and simple guide towards an Internet connection with Windows NT. This package includes straightforward instructions without obnoxious jargon on all of the steps required to have you cruising the Information Highway in no-time at all!!



Brought to you by:

OESC
OPEN-ENDED SYSTEMS CORPORATION

Microsoft Windows NT 3.5
The Internet Platform for Today's Business Needs

According to some estimates, over **30 Million people** now have access to the Internet. The Internet is a public network that is used by universities, government agencies, businesses and individuals. Its growth rate has been explosive and promises to be even more explosive in the future as more commercial uses evolve. Businesses, that do not join the Internet, risk falling behind on the technology and missing out on an important communications medium. The Internet may well be as important an invention as the telephone in terms of the advancement of commerce.

If you are reading this article, you are probably interested in establishing a presence on the Internet. It can be difficult to figure out where to start. The Microsoft Windows NT operating system is one of the best, low-cost solutions for businesses and individuals who want to stake a claim on the fast-paced, ever-changing Information Superhighway.

Windows NT is extremely versatile on the Internet. It is a great server, client and platform for future generations of custom applications on the Internet. This paper will explain where to find some of the tools and information to help you use Windows NT Server to create Internet solutions for your company. It will also help you use Windows NT Workstation to create an on-ramp to the Information Highway for yourself!!

With Windows NT, it is easy to connect to the Internet. Its ease of use and inherent features like TCP/IP and Remote Access Service with SLIP and PPP can have you surfing the Internet in very little time. These features along with the scalability, security, manageability, ease of use and architecture of Windows NT Server allow you to create a server on the Internet that anyone can connect to.

Windows NT is your most flexible solution for the Internet. Whether you need to set up a complete hypertext system representing your company, provide Internet access for users on your LAN or remote clients, or just browse some of the 3.3 million hosts on the Internet, you can use Windows NT right out of the box to start solving your problems and creating new opportunities. The Microsoft BackOffice Platform complements your server with an integrated, powerful platform for the development of new applications.

In conjunction with public domain Internet server software, Windows NT is the operating system available today that can put your business on the Internet right out of the box. The FTP Server in Windows NT allows your business to create a broadly accessible data server when installing Windows NT. The FTP and Telnet client software in Windows NT are basic utilities that allow you to "bootstrap" yourself onto the Internet. You simply gather the information and tools available on the Internet itself to complete your Internet solution.

This paper presents an approach that tries to help you understand the steps involved in connecting a Windows NT-based site to the Internet. Open-Ended Systems Corporation (OESC), a Microsoft Solutions Provider, has developed a methodology called Win InterNet® that divides the Internet connection process into a group of manageable subsets of tasks. The paper presents the Win InterNet methodology and is not intended to be a comprehensive treatise on Internet connectivity. As a result, the paper is intended to show how you can use your easy to understand and easy to manage Windows NT Server/Workstation as a cost-effective and relatively easy to implement foundation for your electronic commerce network.

Getting Started: What Are You Going To Do When You Get There?

As you will see later, the first two steps in the journey to Internet access have to do with choosing the kinds of services you will either provide or have access to once you are connected. This section contains descriptions of the most common Internet services as they relate to Windows NT. However, before actually describing those services, we will draw some useful distinctions regarding exactly who will be using the service: your users or users from another site. We will also discuss services provided for security (firewall) purposes as opposed to the primary services provided by using the Internet. In this initial review we look at your site as a whole.

Internet Access Options
(User Services vs. Provider Services vs. System Administration Services)

The amount of investment and work involved in connecting to the Internet varies depending on the extent to which services are made available to users at your site and the extent to which you become a provider of services to users outside your site. For the purposes of this discussion, it is useful to divide the Internet services that your site must provide into three categories: User Services, Provider Services and System Administration Services. **Figure 1** illustrates the kind of services in each category. Note that these appear to be the same for both user and provider; however, looks can be deceiving. Providing Internet access as a user service involves the use of client software, while being a provider involves the use of server software. Being a provider of Internet services is considerably more complex and time consuming than being a user. Please also note that systems administration services, including security and domain name services, are considered separate from the user and provider services for the sake of your discussions.

Generally speaking, user services are those services your employees (your users), using your client computers, are able to perform using data that originates outside of your company. For example, if your user is able to obtain a file from outside of the company using FTP or able to send a file by FTP to another site, we would consider that to be a user service. If a user at another site is able to perform the same service from their computer to yours, this is considered a provider service, since you are providing an FTP server for outside use.

E-mail services are bi-directional, but we will call e-mail a special case of user service because one must be able to both send and receive e-mail for it to be a useful service.

On-Line Internet User

The most common view of providing Internet Access is to allow one or many users at your company to use the following list of common services:

- Electronic mail
- FTP
- Telnet
- Gopher
- WAIS
- WWW (World Wide Web)

Your users would use software that resides on their PC or some shared computer. You would either own the software or it could be located at your Internet Service Provider. Employees can send and receive e-mail, logon to other computers using Telnet, transfer files to and from other computers using FTP and access the WWW homepages of others using some sort of Web browser such as Netscape or Mosaic.

On-Line Internet Provider

The most common, and usually the only service that most companies provide to others is WWW access to their homepage. The reason for this is the amount of work associated with operating servers for such services as Gopher, FTP, Telnet, etc. Notable exceptions are companies with multiple sites that must provide these services to other offices. Offering these services increase the difficulty and expense of operating an Internet connection.

Systems Administration Services

Domain Name Services are similar to the phone directory assistance provided by telephone companies. Given an Internet "Domain Name", such as **oesc.com**, a Domain Name Server must be used to *resolve* the name into an address such as 198.202.212.3 which is the IP address for a node on the Internet.

System security including the use of firewalls, which is essentially guarding against unauthorized access, both by your own users and those outside of your site, is becoming an increasingly important concern. The Internet Access Planner must select the appropriate level to suit your own needs.

Internet Access Options

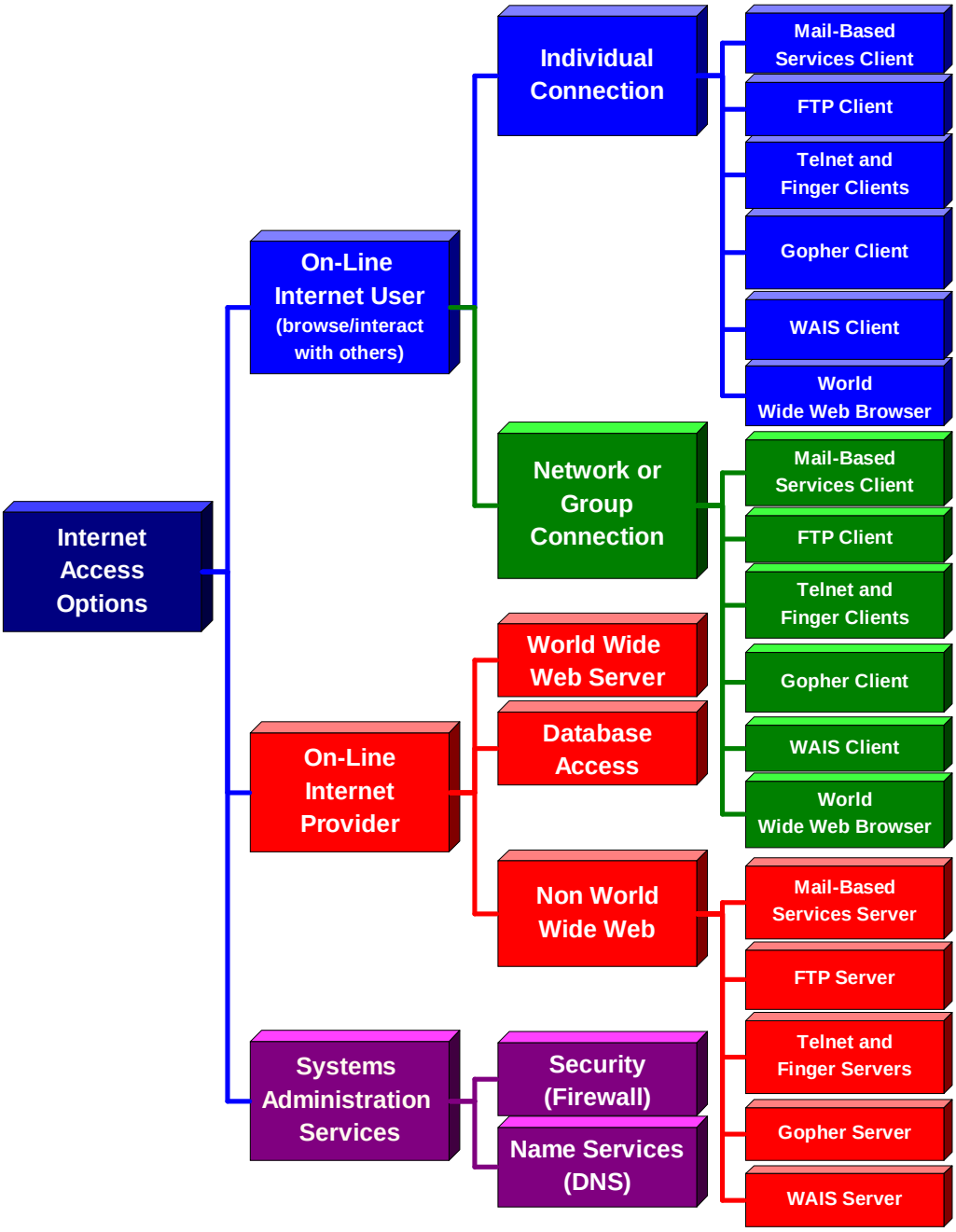


Figure 1

Internet Services

An excellent assortment of Internet access services is available in an environment is which Windows NT is used as a server. What follows is a survey of those services and a description of how they might be obtained:

DHCP Server

The Dynamic Host Configuration Protocol (DHCP) server is included with Windows NT Server 3.5. It uses the DHCP to make network administration easier. Using a Windows NT-based DHCP server on the network, users can easily install TCP/IP on their individual machines and choose automatic configuration. The DHCP server does much of the work: it provides an IP address, subnet masks, default gateways and other information. By reducing the time required to define network addresses and installing TCP/IP on every user's system, DHCP drastically reduces the cost of deployment for Windows NT Workstation-based Internet systems.

Telnet Server

Telnet is the worldwide standard protocol for interactively logging on and performing tasks over a network connection. A Telnet server for Windows NT 3.5 by Software Innovations will be available soon. This server will allow clients, that support the Internet Telnet standard, to connect to the server, log on, and run commands using a simple command-line interface.

Gopher and Web Servers

Gopher is an information retrieval protocol used to find resources or information on the network. Gopher offers distributed file serving features with a much better end-user interface than is possible with FTP. Information is presented to the user as a simple menu, with each menu selection being either a new piece of information (a file) or a pointer to a sub-menu somewhere on the network. The Windows NT 3.5 Resource Kit contains a Gopher server by EMWAC. Web servers are more document-oriented and are designed to provide both simple and hypertext documents with links to other documents around the world using the HTTP protocol. The World Wide Web is an interactive hypermedia system built upon the Internet. The WWW is where homepages are collected and viewed. Browsers, such as Netscape and Mosaic, are included with your basic Internet connection from your Internet provider. If this is not the case, they can easily be downloaded and registered from the Internet. Microsoft's WWW server, **www.microsoft.com**, and Gopher server, **gopher.microsoft.com,** are also running on Windows NT Server 3.5. The Gopher server completes full-text searches of an index of 5000 articles in 0.2 seconds. These Windows NT Server systems are among the busiest hosts on the Internet today.

FTP Server

FTP stands for file transfer protocol and allows file transfer between servers and clients. An FTP server is included with both Windows NT Server and Windows NT Workstation. It supports a large number of users since improvements have been made over Windows NT 3.1. FTP is the best way to make documents, software or other files available to the broadest group of users on the Internet. Microsoft runs its FTP server, **ftp.microsoft.com**, on Windows NT Server 3.5 and handles 130,000 users a week, making it one of the most accessed servers on the Internet. The server handles close to 300 simultaneous FTP sessions and over 200,000 file transactions in a week.

Domain Name Services (DNS)

Internet Domain Name Servers (DNS) communicate with each other, synchronize themselves and pass queries to other nameservers in a manner that is transparent to most other nodes on the Internet. A Windows NT-hosted DNS server will be included in the Windows NT 3.5 Resource Kit. DNS handles mapping between host names (such as **oesc.com**) and IP addresses (like **192.0.0.3**) This information becomes available over the entire Internet. Local host information can be managed without worrying about registering with a central location or retrieving copies of a master database. Not only does DNS allow an NT-based machine to become a DNS server, it can also be used to enable communication between a Windows network and a UNIX network. Now, a company can truly be on one network and on the Internet using Windows NT!

WAIS

WAIS servers offer content-indexing services to clients who connect over the Internet. WAISTOOL provides the same content indexing to Gopher and Web servers. Both WAIS server and WAISTOOL, written by EMWAC, will be available in the Windows NT 3.5 Resource Kit.

FTP and Telnet Clients

Windows NT Workstation 3.5 ships with two basic Internet clients in the box with which to get started. The Windows NT 3.5 FTP client and Telnet client are fully compatible with Internet protocol standards. Windows NT Workstation 3.5 has several other connectivity applications including **finger**, **rcp** and **rsh**. These allow users of Windows NT to interact with and use resources on hosts across the Internet. Windows NT Workstation also has some TCP/IP diagnostic tools which are highly useful when diagnosing connectivity problems or outages.

Gopher Clients

A Gopher client allows you to connect to thousands of Gopher servers so you can get information and software from various sources. Gopher is easier to use and more flexible than FTP. There are many free Gopher clients available on the Internet and some of them can be found by FTP on sites provided by OESC.

WWW Clients

WWW clients also provide information and software but are page-oriented rather than directory-oriented. Web documents are hypertext documents written in HyperText Markup Language (HTML) and contain links to other documents, other sites, software and more. The Web is actually a fascinating phenomenon that is growing at a remarkable rate. There are new servers every day with everything from music and electronically-published books to shops that advertise and sell their products. There are various WWW clients available, some of them free on the Internet.

When discussing an Internet connected Windows NT Server, there are two major, uniquely related areas of security and they can collectively be referred to as “firewalls”. First there is an opportunity to restrict access to your network by installing certain firewall features in the router. Routers are typically external devices or computers that work the same, no matter what kind of server or operating system you have on your network. Thus, there is no difference between Windows NT Server and any other computer in this regard.

What Getting Connected To The Internet Means

Figure 2 illustrates what getting connected to the Internet is all about. Every site already connected has some combination of the products shown on the right hand side of the figure. In order to successfully connect you need the mirror image of the same set of services, illustrated on the left side of the figure.

In order to understand your objective lets look at **Figure 2** in detail. Starting in the middle, we see that some type of phone connection from your site to another site is required. Usually this site is the Internet Service Provider (ISP), however it doesn't have to be. All we need to do to get connected to the Internet is to connect through some site that is already connected. In our example, we are using a leased line connection, therefore we will need a channel status unit/digital status unit (CSU/DSU) on our side of the circuit and this will "talk" to the CSU/DSU at our ISP's site.

The next matching point of connection is the router; we will need a router that "talks" to the ISP's router. The following step is optional and is our firewall which may or may not be a separate computer. Finally, we select the user and provider service software which don't all have to be on the same computer.

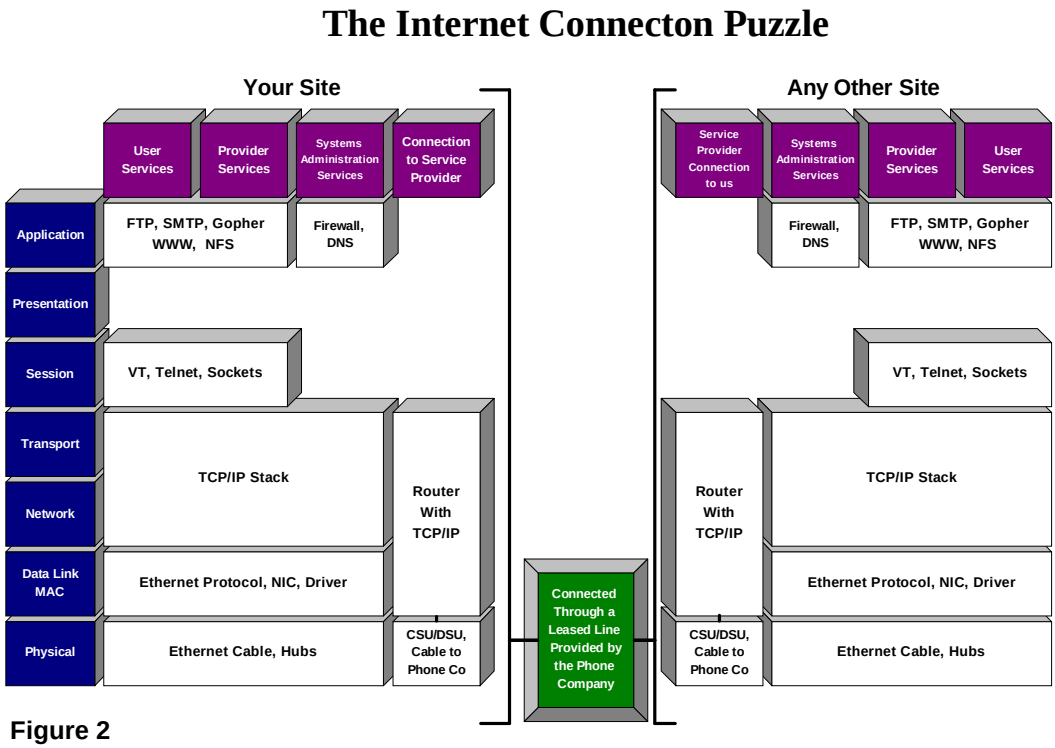


Figure 2

Nine Steps To Connect

The steps involved in connecting the users and computers in a Windows NT installation to the Internet are always the same; however, their content can vary depending on the type of services to be provided, the speed of connection and other factors. In order to simplify the explanation, we have chosen a typical environment shown in **Figure 2**. On the right side is a picture of what other sites already connected look like from a hardware and software point of view. We have to build the left side if we want to communicate with those sites. Open-Ended Systems Corporation (OESC) has divided the steps involved in getting your site onto the Internet into a nine step methodology. The approach is called Win InterNet. It divides the process of setting up your site for Internet access into manageable subsets. Getting on the Internet is very similar to getting phone service installed in a new office. The steps are listed below:

1. Select User Services
2. Select Provider Services
3. Select Internet and Telephone Service Providers
4. Setup Network for Communicating with Service Provider
5. Connect to Service Providers
6. Configure User Services
7. Train Users
8. Configure Provider Services
9. Maintain User and Provider Services

Figure 3 illustrates the steps we will use to install Internet access for a hypothetical company using Windows NT.

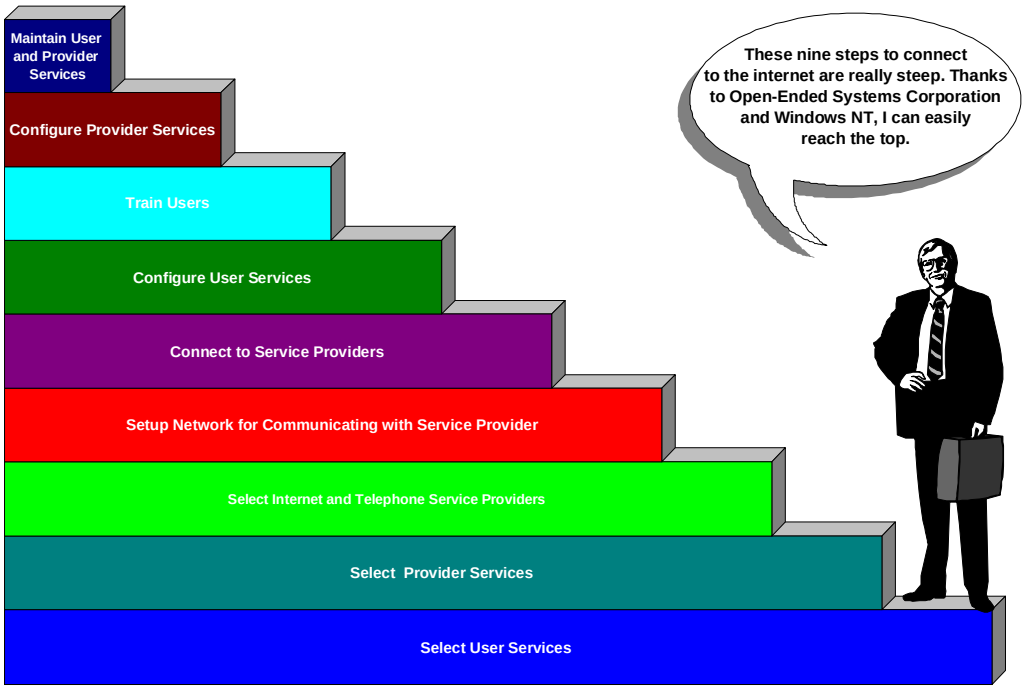


Figure 3 **Internet Connection Plan Steps**

The Nine Steps - Explained in Greater Detail

OESC has developed some helpful forms and checklists, that we find useful in planning and managing an Internet connection project and these are available from our offices.

1. Select User Services

User services are described above. In this step you select the services you want users at your site to have. These services may include client access to services such as e-mail, Telnet, Finger, FTP, Gopher and World Wide Web.

2. Select Provider Services

Here you must decide if your site will *offer* server services such as FTP archives, a WWW home page, WAIS, Gopher or access to your databases on-line. You are free to offer no services, all services or any combination thereof. Most sites offer either no services or only WWW by making a home page available.

3. Select Internet and Telephone Service Providers

You will need two types of services to connect to the Internet: telephone and Internet. In many cases Internet Service Providers have resale arrangements with telephone service providers, therefore both types of service can be arranged through the ISP. During this step you place an order for the appropriate type of telephone circuit and you establish a contact at the ISP who will connect you when your phone service is ready. The wait for the phone line to be installed is often the most lengthy part of the entire Internet connection process.

Here you must get an IP address and Domain Name that will uniquely identify you for access. The IP address will look like **198.202.212.nnn** and the Domain Name will look like **oesc.com**. You must also purchase line access devices (CSU/DSU).

4. Setup Network for Communicating with Service Provider

This is the most difficult and time consuming step. Here, you must configure the computers and router with your assigned numbers and name. Keep in mind that each and every computer needs a unique address. You must prepare internal routing to ready the Internet connection. This is also the point at which the security firewall is installed and configured. Finally, you must set up Domain Name Service (DNS) software to get domain information for your users and setup SMTP to distribute e-mail. You must identify hardware and software products that will perform these functions at each type of node that you will use at your site. The tasks we need to accomplish in this fourth step follow:

- Configure the computers and router with assigned numbers and name
- Prepare internal routing to utilize the Internet connection
- Setup DNS software
- Setup mail transport - SMTP
- Setup firewall

Prepare internal routing to utilize the Internet connection

Some services, such as mail, will have all communications to the outside world performed at one chosen node that will either forward the outbound mail to the "Internet" or store inbound mail to internal nodes. These functions will need to be configured at this point in the procedure.

Setup DNS software

Many choices need to be made with regard to name services. If the chosen Internet Service Provider is to provide those services, this step is fairly simple. You need to tell them what your node names and addresses will be. If you are to provide your own name services you will need to set that up at this point.

Setup mail transport - SMTP

Configuring mail can be very complicated. Regardless of which mail transport product you use, you will have to make some choices here and configure the product(s) accordingly. For example, does all in-bound mail need to be stored at the service providers site, at one of your nodes or at each individual node?

Setup firewall

Choosing, installing and configuring an Internet firewall is a time consuming specialization. At this point, you or your chosen consultant must set up the firewall and perform preliminary tests to ensure its proper operation.

5. Connect to Service Providers

In Step 3, you selected your Internet Service Provider and your Telephone Service Provider. Once this was done, you should have ordered a phone line from your service provider. Once the line becomes available, someone comes out and connects your CSU/DSU to the phone line, thus to your Service Provider and thus, to the Internet.

6. Configure User Services

Distribute and install software on user/client computers to allow use of desired services and configure your Internet Access Server to provide shared-user services. Security features must also be configured.

7. Train Users

It is your responsibility to train your employees on how you want them to use the various Internet services.

8. Configure Provider Services

Here, you set up e-mail and FTP, author a homepage and set up a WWW server.

9. Maintain User and Provider Services

Finally, you must monitor the services you are providing to your users and to those outside the company and make necessary improvements, repairs and changes.

Summary

Today, Windows NT Server 3.5 is the best and easiest platform for Internet servers. The Windows NT 3.5 Resource Kit will provide everything you need for a top-of-the-line Internet server. Windows NT Workstation 3.5 is Internet-ready and client software is readily available and easy to use.

OESC has created a methodology called Win InterNet that divides Windows NT connection to the Internet into nine manageable steps. Part of that methodology includes forms and checklists that will help you identify and keep track of the many products you will need to make your project successful.

Although the steps needed for you to connect to the Internet are reasonably easy to describe, as with most disciplines, much specialized knowledge is needed at various stages. For example, choosing the correct firewall approach, setting up your own domain name server and installing and configuring site-wide electronic mail can get very involved. Don't be afraid to ask for help! Consultants are available to help you through this entire process. Some firms, such as OESC, can provide a complete turnkey installation for you. Regardless of whether you do it yourself or work with a consultant, you might find that the OESC Win InterNet approach will help you organize your work, so that you can effectively manage your project.