Building the 21st Century Internet

WHITE PAPER

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The Internet could change the way we buy and sell, the way we learn and teach, the way we communicate with friends, entertain our children. It could touch virtually every aspect of our lives, and in doing so change the very way we relate to each other.

It could -- but will it? That depends on whether we're willing to re-examine just what the Internet is. To most, it's a vast global network, and that's a part of the truth. In fact, the Internet is a vast global information resource, wrapped in a network that connects information seekers to information providers, and also connects both types of users to each other. It is information that is the key to the Internet, and information providers on the Internet are the key to its information. Sellers must publish information to attract buyers. Buyers must receive confirmations of purchases in real time to ensure the experience of electronic commerce is credible. Teachers and students must collaborate through multimedia as nearly as effectively as they could in person.

Today, less than one Internet user in a thousand is a true contributor of information. **The great majority of users of the Internet, even business users, have two crippling shortcomings in their relationship with this new information community:**

- **Transient connection. To be an information provider on the Internet, one must first be "on the Internet" in a permanent sense**. The World Wide Web, for example, is the commercial heart of the Internet, yet most businesses in the world today have no web presence.
- **A technically complex set of Internet publishing alternatives**. **Just getting connected to the Internet isn't enough**. A company has to have its information properly presented and maintained, and its activity monitored for market research.

There are many options for creating an Internet presence, and most users find them all bewilderingly complex, and frighteningly costly. If the Internet is to be all that it can be,

we must all be able to participate in it fully, both as consumer of information and provider of information. We have to make the Internet populist.

The Internet as a Community

Why do you have a fax machine? Clearly, it's to fax and receive faxes, but implicit in both these functions is the idea that you'll have partners to perform these exchanges with. In truth, it's not the technology that validates faxing, but the community of people you can reach with the technology.

The Internet is also a community, but to date it is a very select one. While there are more than 25 million households on the Internet, and more than seven million business purchasers browse its product and service information each week, only about a million businesses are actually publishing product and service information on the Internet, and the number actually supporting electronic commerce on the 'Net is so small as to be insignificant.

The group most likely to be absent from the Internet is the very group most likely to benefit from it's scope—the nearly 11 million small businesses worldwide. These small businesses could expand their markets and profits by becoming accessible to the collection of buyers (growing daily) who browse the Internet for information. Today, fewer than one in 20 has an Internet presence.

The lack of participation of small businesses as information providers on the Internet impacts more than their bottom lines, however. The Internet is a rich source of information today, but imagine how much richer it would be if the number of publishers of information increased by one thousand percent!

It doesn't stop there. Remember the analogy of the fax machine? Commerce on the Internet today must proceed with fewer than one seller in 10 and one buyer in a thousand

being permanently connected. With a participating community so small, it's no wonder that many companies question the value of electronic commerce.

The simple truth is that the future of the Internet, the realization of all the benefits we've come to associate with the Internet, depends on getting virtually every business onto it. That's the first, essential, step to being able to buy a car, a pizza, an airline ticket, a basketball ticket, flowers, books or other products or services using the Internet. Want to check if your dry cleaning is done, if your special-order wine is in? **To make that possible, your cleaner and wine merchant will have to be on the Internet, not just dialing in from time to time.**

With sellers on the Internet, two things happen. First, buyers are attracted there, which grows the total Internet population and makes it even more attractive to have a presence there. Second, revenues from electronic commerce begin to flow, swelling the budgets of Internet Service Providers (ISPs) and allowing them to expand their infrastructure, supporting new services like multimedia.

Internet presence in a permanent sense is more important than access speed per se. While a business would surely want its access connection to the Internet to be fast enough to serve its prospects, customers, suppliers, or other partners, the first goal must be to be accessible to these partners full time.

Options for Internet Publishing

How do you get on the Internet in a publishing sense? In the broadest sense, you have two choices: self-hosting and ISP-hosting.

Self-hosting means acquiring your own Internet access connection from an ISP, and then building an Internet node that provides the full range of services you'd like to project to partners. That would include a Web server to support browser access, e-mail server, file

transfer protocol (ftp) server if partners are to pick up and drop off files at your site, and possibly a news server to support your own newsgroups. In addition to this, you'd need Internet technical components like a Domain Name Server (DNS).

The costs of the components required to self-host typically add up to more than $15,000. In addition to the one-time cost, you'd expect to pay a recurring hardware and software maintenance charge (15% to 18% of the purchase price), charges to house the facility and staff it, and the other costs usually associated with running a small computer center.

The administrative tasks associated with self-hosting are both expensive and complex. Many Internet servers are based on the UNIX operating system. While popular with university and technical organizations, UNIX has a reputation among business users of being complex in both command structures and documentation. Complexity in administering the platform itself only increases the difficulties in controlling the Internet node functionality. Many Internet servers accept only terse terminal-oriented command access to set up mailboxes, passwords, directories, etc. Many provide no user-friendly authoring software to build Web pages.

Not surprisingly, most smaller businesses have found all this too difficult and costly. In fact, nine out of 10 cannot even identify the components needed to build a self-hosted Internet node, much less describe how to set up and control one. Some ISPs are offering a variation on self-hosting that lets you install hardware at the ISP location. This can reduce communications connection charges and facilities costs, but the cost of the basic equipment and software must still be paid, and administrative tasks may still be the user's responsibility. This option is only somewhat interesting to most smaller businesses.

Full ISP hosting is the option most commonly used by those smaller businesses that have a direct Internet presence. With full ISP hosting, sometimes called "shared-host" access, your business is given part of a shared set of Internet servers. **Your cost is lower because other companies are sharing the total cost of the configuration, but you must also**

share the resources of the Internet server with those other companies. This poses three problems; performance, flexibility, and ease of use.

The performance issue is a thorny one. ISPs who offer shared-host services cannot really make performance commitments to their users because the servers are shared among a number of companies, each of which may have its own patterns of activity. If you happen to be sharing a host with a company with thousands of hits on their Web site per day, it's clear that the resources available to your "virtual site" will be less.

A more serious problem is that of flexibility. The price of sharing a computer resource (which is what an Internet site really is) among multiple companies without adverse interaction is restrictions. Some Internet features (like anonymous ftp, the ability to support partner pick-up and drop-off of files without password control) are often not available in ISP-shared-host systems. If your business needs one of these facilities, you'd have to either seek another ISP or self-host. You may not have access to all the statistical information you'd like about people who access your site, or the number of e-mail mailboxes you need, or support for Java applications.

In addition, **ISP-hosted Web sites often tend to be static** – Web pages are not updated regularly because changes can't be made easily. Dynamic publishing, in which you can change Web pages on the fly, requires computation that ISP-hosted sites cannot do easily, and requires a tight integration between your Web server and back-end database. For electronic commerce, this close interaction between your Web server and inventory database is critical.

Ease of use may be the most difficult issue with ISP hosting. While it is true that the ISP absorbs the routine systems administration tasks, users must still control their mailboxes, author their web pages, upload changes to files, monitor usage, and more. Many users report significant problems with administering their ISP-hosted sites, and some studies show that more than three-quarters of such users must pay to have some or

all of these tasks performed by outside specialists. Considering the fact that ease of use was one driver for moving to ISP hosting, the difficulty users have with the concept is troubling.

Ease of use issues may be particularly significant if it becomes necessary to change ISPs. Companies who use the Internet report an average of three ISP relationships over the course of their Internet commitment. If each ISP-hosted service offering has its own rules and restrictions, how easy will it be to move your Internet presence from one to another? A business-owned Internet node is portable from one ISP to another in a very literal sense—unplug one ISP connection and plug in the second, if the business owns its own IP addresses. It's not that easy if the ISP provides the facilities, and the new ISP may not offer all of the services of the old, or offer them in exactly the same way.

So far, our attention has been focused on the issues of becoming an information provider, but information providers also use the Internet for their own research. Most businesses who adopt ISP hosting do so to avoid the cost of a permanent access connection to the Internet. These organizations must dial in to the ISP modem pool, often sharing the pool with recreational, residential, users of the Internet. **The lower analog modem speeds and the frequent reported difficulties in connecting may interfere with attempts to use the Internet for research, or even to access your ISP-hosted site for administration.**

For users unhappy with this set of choices, there is hope. The cost of dedicated access to the Internet is declining. Most ISPs offer the option of a dedicated modem connection at a very affordable price. Most also offer ISDN access in dedicated mode, and this affordable attachment strategy provides a company with over 100 kbps of access bandwidth. Other options, including frame relay, are often available at surprisingly affordable prices, and new local access technology based on Digital Subscriber Loop (DSL) service is available in some areas already, and expected to be available nationally by 1988. More will be said about DSL later.

With access prices falling, it's time to address the other cost problem associated with self-hosting—the cost of the Internet node and its administration. With the use of e-mail for electronic commerce rising, and with companies ever more dependent on the Internet to reach their customers and suppliers, it's clear that another option for Internet attachment is needed. This option should provide users the benefits of self-hosting—flexibility of features, dedicated resources for predictable performance, and a faster access connection to support the company's own browsing of the Internet. It should also provide the benefits of ISP hosting—lower cost, simpler administration.

The Multi-Services Internet Gateway

Present and future business applications for the Internet require four basic services be provided: web publishing, electronic mail, Internet access, and support for collaborative applications like NetMeeting. This range of services will accommodate today's business uses of the Internet—promotion of the goods or services a business sells, and support of e-mail inquiries for prospect- and customer-building. They will also support the extension of these early applications into the realm of electronic commerce.

FreeGate's Multi-Services Internet Gateway products provide all these services, and the communications and directory services needed to attach them to the Internet, in a single easy-to-use solution. **The FreeGate system provides routing, firewall security, Internet access, and domain name services**—but it's more than a router. **It provides e-mail, Web publishing, and file transfer—**but it's more than an applications server. **It provides simple tools to facilitate web page development,** but it's not just an authoring system. **It even simplifies Internet administration, whether you're a user, a VAR, or a service provider—**but it's not just another Internet or network management system. **It is truly a new class of product** – the most complete answer to businesses looking to create a strong Internet presence.

The FreeGate Multi-Services Internet Gateway is a compact, rack-mountable, total Internet presence. Inside is a Pentium processor and software designed to require the absolute **minimum administrative support.** There are two hard disk drives in a mirrored configuration for **reliability**.

There are two aspects to the use of any product or product set designed to create an Internet presence: the setup and administration, and the daily use. Because businesses don't buy products to administer them, but to use them to improve profitability, we'll start with that aspect.

A FreeGate Multi-Services Internet Gateway will look to internal and external users like a full-service Internet node. The system **provides a connection to the Internet using a variety of leased-line technologies, including the hot new IDSL technology** recently adopted by major ISPs. Speeds from analog modem levels to full T1 are available, to match the range of access technologies now offered. FreeGate will also support new xDSL service offerings as they become popular. FreeGate systems can even be stacked to provide additional computing and disk storage resources.

In connecting to the Internet, the FreeGate system appears as a router/firewall. As a router, it will support the popular router topology protocols used with TCP/IP, both outward in to the ISP network and inward toward the desktop. This means that standard desktop clients can access the FreeGate system from inside the company, and partner companies or individuals can access your site from the Internet. To protect internal information assets from security breach, it provides a **full security firewall**. Sensitive internal data is protected, even if it is stored on the system.

Storage of internal data on the FreeGate system lets you link your Internet applications with those of an internal intranet. Attaching the system to a LAN creates a complete internal TCP/IP network, with domain name services, DHCP address assignment, and disk storage for web pages or storage of files. **Just adding the system makes any small**

business TCP/IP LAN more flexible, and it integrates Internet access for internal users as well.

As interesting as internal use of the FreeGate Multi-Services Internet Gateway may be, it is its value as an Internet business resource that makes it truly unique. As we noted in the previous section, most small businesses don't publish on the Internet today, and most who do have a very static and simple web presence. They're not equipped for the evolving electronic marketplace the Internet is already becoming.

The first step FreeGate system takes in building an Internet presence is in structuring the task of building a set of web pages. Any HTML, Java, or ActiveX authoring system can be used with the system, so you can build page content on any platform you find convenient. Popular software from Corel, IBM, and Microsoft all let you use standard presentation or word processing tools to create pages. Tools provided with the FreeGate system help you to organize your pages and test them internally prior to being made visible on the Internet.

When you've created pages that meet your needs, the system's tools will publish them on the Internet, making them part of the public portion of the system's disk. **This allows the FreeGate system to be used in conjunction with ISP multi-client hosting services, where it takes the guesswork out of building your own web site on the ISP's server.** You can try your pages out on your own FreeGate system, and that means you eliminate the risk that the page will contain embarrassing errors your prospects (or competitors) will detect.

E-mail is an important feature for companies doing business on the Internet. **Over 99% of business web sites solicit inquiries or even orders via e-mail, and many companies don't manage these important leads properly.** With FreeGate system's built-in mail server, a permanently attached Internet user has as many mailboxes as they need. You can also route a copy of the inquiry to a sales follow-up file to close the loop.

The combination of the permanent Internet connection provided by the FreeGate Multi-Services Internet Gateway, the built-in "mail-to" facilities of web pages, and the powerful capability offered in the system's mail server combine to create the most responsive e-mail lead management system available. Prospects who browse a web page can invoke a mail-in inquiry via their browser. The e-mail generated is received by the FreeGate system as soon as the mail transfer is completed, because the connection to the Internet is permanent. Incoming mail can be directed to the right mailbox and routed to a desktop for response within seconds of reception. This fast response to e-mail inquiries is critical to the success of web-based commerce.

The FreeGate system has an easy-to-use browser-based setup and parameterization that is actually easier than setting up most PC clients. For end users installing their own FreeGate system, this simple setup provides all the administrative support needed. But many businesses will build their Internet presence with the help of an ISP or VAR specializing in the Internet. These organizations will often provide the system, and for these providers remote management and support features will be a key to a successful and profitable relationship with their clients.

When a FreeGate system is sold, the reseller can either initialize the system locally using the user interface, or remotely by entering the initial configuration in a FreeGate secure server. In this case, the reseller will provide the customer a setup key that permits the customer to call an 800 number through an integral modem and access the configuration information on FreeGate's server and download the correct software and tables. This process can save significant time and prevent many mistakes for the reseller.

Once the initial configuration is loaded, the FreeGate system is accessible via the Internet using a secure browser interface. Through this interface, FreeGate or the reselling organization can run diagnostics, upgrade software, etc. **This remote management**

system provides users many of the benefits of on-site specialists without the cost, and reduces the start-up and sustaining support efforts of FreeGate system resellers.

Electronic Commerce

Electronic commerce is the most significant reason cited by businesses for creating and maintaining an effective Internet presence. Surveys of businesses on the Internet today show that the most successful build their commerce presence on a combination of web publishing of product data, e-mail support for inquiries, and online support options for after-market account management. Since the FreeGate Multi-Services Internet Gateway provides all these features, it's "commerce-ready" based on today's patterns of business usage.

Nothing is changing faster then the Internet, however. Businesses are already finding that the basic publishing and e-mail model of commerce has limitations, primarily in supporting the actual completion of transactions or in providing customers or prospects confidential information.

Today, there are two popular extensions to Internet technology that improve security. The first, called the Secure Socket Layer (SSL), was developed by Netscape and is supported in its popular web software, as well as software from Microsoft, IBM, and other firms. SSL provides basic encryption/decryption services for web pages and file downloads, and can be used to authenticate users and protect sensitive information. The second, called Secure HTTP or SHTTP, was developed by Enterprise Integration Technologies and is sponsored by the CommerceNet consortium of web businesses. SHTTP is believed to be more extensible than SSL in a service sense, but its currently not as widely supported.

The FreeGate system supports both SSL and SHTTP, allowing users to define web pages, files, and directories as secure, and providing automatic response to client

system use of either protocol. Information collected via secure protocols is maintained in a secure directory to ensure that confidentiality is not compromised at the storage level.

Electronic commerce is already spawning a number of innovative mechanisms for secure purchasing on the Internet. One of particular interest is the Secure Electronic Transaction (SET) jointly created by software vendors Netscape and Microsoft and credit card firms Visa and Mastercard. As these systems become popular, the FreeGate system will be expanded to support them. But electronic commerce is already successful based on traditional tools, and the FreeGate system lets businesses reap the benefits of it today, and expand to include future electronic commerce features that achieve market success.

Building Your Internet Presence

Once your FreeGate Multi-Services Internet Gateway is configured, it will run self-diagnostics on its connection to the Internet and report a "ready" status. It's now ready to be used to put your business on the Internet. There will be three basic areas of Internet interaction you'll want to review to optimize the benefits of the Internet. They are access to the Internet, e-mail setup, and web publishing.

The FreeGate system can be used to limit access to the Internet based on a number of screening criteria. A simple setup screen will let you define how clients who are permitted to access the Internet can be identified.

If the system is the only router on the site, which will usually be the case, client systems would be set up to use it as the default gateway. Instructions on parameterizing the client systems are provided in the FreeGate system's extensive help system, and all of the address values are available from easy-to-access screens. If other routers are present for internal routing, the system will advertise its Internet access routes to them, and thus make itself available as an Internet gateway through current routers to the desktop clients. Note that if the FreeGate system is not directly connected to the Internet, but rather connected

through another router which could send data to other areas, the FreeGate system's firewall may not "see" all traffic, and thus will protect only the network area it controls.

E-mail setup will require client systems setup as well. The FreeGate system's help-system and information screens will provide the parameter values to be used to set up mail connections**. It will also allow users to filter incoming and outgoing mail** to provide features like automatic reply, automatic multiple routing, and enforcement of a maximum size. The setup for these functions is based on user-friendly browser screens, with extensive help file support.

For businesses creating an e-mail based electronic commerce prospecting and lead-building system, the FreeGate system's mailbox system will allow incoming information requests to be forwarded to a number of clients for response. If the mail clients of the associated workers are configured to alert the user to incoming mail, the response to these inquiries is almost real-time.

Web publishing is another area where the FreeGate Multi-Services Internet Gateway demonstrates its unique capabilities. The task of web site setup is clearly explained in help files, using step-by-step procedures:

- Build a site map. This means organizing a simple picture of how you web pages will link among themselves. Each page is given a name and temporary description to "hold its place" until the real content is developed.

- Define directories and pages that require security authentication, and select the secure protocol or protocols to be used.

- Fill in content. Using any HTML authoring tools, Java or ActiveX development facilities, or scripting languages, fill in the content of each page with text, pictures, etc.

• Add "mail-to" links in the HTML to permit prospects to request additional information or request a sales contact. The subject line of the e-mail message can be pre-filled with a code phrase to permit script-based routing.

All of the initial pages are built in the internal portion of the FreeGate system's database. These pages can be changed, tested, and even used internally until the content and flow is optimized. When the task is complete, the system provides a simple "publish" command to move the pages to the public Internet side of the database, where it becomes available to others.

A very interesting and important set of the system's features for supporting businesses on the Internet is the extensive set of statistics on usage that are developed. It can tell you how many people are accessing you site, and with its support for web server scripts can even help you decide who's visiting, whether you have repeat visitors, and what pages are being accessed the most often. Using these statistics and the easy-to-use web publishing facilities of the FreeGate system, you can change you site to optimize access.

With the system, it's easy to change your site weekly, or even daily, to generate new content and attract visitors. Changes are made to the internal version of the pages, tested and reviewed by your own users, and then moved to the public side of the database for others to see. There's never a risk that the content of your public pages will create unexpected effects or problems, because those pages are never staged to public view until they've been certified internally.

The Future of Internet Business

About a half-million small businesses and a half-million larger ones solicit customers or provide services on the Internet today. Most are high-tech companies with enough

internal skill to integrate the complex hardware and software components that combine to create an Internet presence.

Plummeting prices for Internet access and increased competitive pressure to be "on the Net" will change this rapidly over the next five years. Carriers are reducing frame relay prices already, and the total monthly cost of frame relay access to the Internet at 56 kbps could fall to below $100 by the year 2000. DSL technology could push prices even lower. **Considering all of these factors, the number of businesses that can afford full-time connection and publishing on the Internet will quadruple in the next five years, and most of these gains will come in small businesses or branch office sites.**

As these changes in access technology and pricing make an Internet business presence more affordable, other changes will be making the task of maintaining that presence more complex. The growth in interest in secure transaction handling and the transfer of confidential information has already been noted. Major banks and credit card companies will certainly provide many tools for completing credit-card payment or a form of pre-paid voucher payment for goods and services. These changes will be reflected in the FreeGate Multi-Services Internet Gateway products, and the software upgrades and help files will be available as a download add-on feature to users.

The Internet is also a likely forum for the exchange of commercial transactions like purchase orders, shipping notices, etc. Electronic Data Interchange (EDI) standards like X.12 in the U.S. and EDIFACT worldwide are already being used by some firms for Internet commerce, simply by transporting the EDI formats within an e-mail message, but most EDI today is carried over specialized networks at a cost far higher than the Internet would impose. It is certain that more and more EDI will be transported on the Internet, and that permanent Internet connection for EDI handling alone will be a requirement for many firms, just as EDI itself is required today in many industries. EDI features will be added to the FreeGate system as the specific requirements for integration of EDI with e-mail and with local business applications are established and standardized.

The Internet itself will be changed by all of this. As companies move to the Internet, the current system of assigning addresses to new sites will come under more pressure, and it is likely that the Internet will migrate to a new standard (called IPv6) that provides ample capacity to assign addresses to the vast number of new sites coming in the next ten years. The FreeGate system will provide features to support the conversion to the new Internet numbering system as part of its router/firewall feature set, so users will not have to change their client and server software to accommodate the new protocols and address forms.

Today no technology is more important to business than the Internet, and few pose greater threat of change in the next decade. Technology is the business of the Internet, but not the business of most firms who want to use it. Coping with the changes the future will bring demands a new approach to building an Internet presence, an approach that FreeGate is pleased to provide.

* Market statistics provided in this paper are from CIMI Corporation, Voorhees, NJ USA (1997).