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WHITE PAPER

IBM's Repositioning of Notes for the Internet

Internet Opportunities Program



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IBM's Repositioning of Notes for the Internet

(An INPUT White Paper)

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London • Cornwall House, 55-77 High Street, Slough, Berkshire, SL1 1DZ, England, Tel. +44 (0)1753 530444, Fax +44 (0)1753 577311

New York • 400 Frank W. Burr Blvd., Teaneck, NJ 07666, USA, Tel. (201) 801-0050, Fax (201) 801-0441

Paris • 24, avenue du Recteur Poincaré, 75016, Paris, France, Tel. +33 (1) 46 47 65 65, Fax +33 (1) 46 47 69 50

San Francisco • 1881 Landings Drive, Mountain View, CA 94043, USA, Tel. (415) 961-3300, Fax (415) 961-3966

Tokyo • 6F#B, Mitoshiro Bldg., 1-12-12, Uchikanda Chiyoda-ku, Tokyo 101, Japan, Tel. +81 3 3219-5441, Fax +81 3 3219-5443

Washington, D.C. • 1921 Gallows Road, Suite 250, Vienna, VA 22182, USA, Tel. (703) 847-6870, Fax (703) 847-6872

Abstract

Lotus Notes is currently the dominant platform for groupware applications, but is facing a growing threat from Internet-based products and World Wide Web technology.

The Web now competes directly with Notes for the attention of businesses looking to provide distributed access to information and applications to their staff. Many organizations are evaluating the two and, attracted by the low-cost flexibility offered by that platform, are opting for the Web solution. Some existing Notes users are re-evaluating their decision in light of the growth of "intranets" driven by a Web infrastructure.

This paper is a preliminary examination of the Web versus Notes issue, which is being investigated in detail in a current research project.

This report contains 26 pages, including 6 exhibits.

Published by
INPUT
1881 Landings Drive
Mountain View, CA 94043-0848
United States of America

Internet Opportunities

IBM's Repositioning of Notes for the Internet

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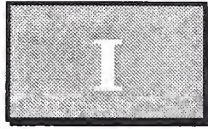
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The Internet versus Notes

A

Introduction

One of the biggest growth areas in IT that reflects well the integration of computing and communications is groupware—software that allows networked work teams to collaborate on information-based projects.

Lotus Notes is currently the dominant platform for groupware applications, but is facing a growing threat from Internet-based products and World Wide Web technology.

The Web now competes directly with Notes for the attention of businesses looking to provide distributed access to information and applications to their staff. Many organizations are evaluating the two and, attracted by the low-cost flexibility offered by that platform, are opting for the Web solution. Some existing Notes users are re-evaluating their decision in light of the growth of “intranets” driven by a Web infrastructure.

Lotus has recognized the threat and has embarked on an aggressive campaign of Notes/Web integration to address the weakness in its offering that is becoming apparent to a growing number of organizations. If Lotus cannot keep up with the pace of innovation seen in the Internet world, IBM may begin to regret its \$3.5 billion investment in the creator of Notes. However, if Notes can be successfully integrated into the Web environment, it will succeed in maintain a strong position in the emerging Web-based groupware product market.

This paper is a preliminary examination of the Web versus Notes issue, which is being investigated in detail in a current research project.

B

Objectives

The objectives of this report are to:

- Identify the areas in which users are turning to the Web in place of Notes
- Identify the uses to which the Web and Lotus Notes are being put and the overlap between them
- Compare the strengths and weaknesses of both environments
- Analyze IBM/Lotus' strategy for Notes with respect to the Internet
- Outline the future Web/Notes marketplace

C

Scope

This paper looks at use of Web technology and Lotus Notes for companies distributing information and working collaboratively internally and externally. It excludes analysis of non-Notes groupware products such as Netscape Collabra Share, Microsoft Exchange and Novell Groupwise.

The paper looks only at the areas in which the Web and Notes compete directly. It therefore does not discuss use of Notes for applications currently impossible on the Web—for example, highly structured database applications.

D

Methodology

This report is based on the results of vendor, developer and user interviews carried out during December 1995. These interviews were supplemented by continuous secondary research.

Vendor interviews were conducted with leading suppliers of relevant technology and products. Developer interviews were conducted with consultants and developers including Lotus Business Partners currently engaged in developing Notes and Web solutions for clients. User interviews were conducted with companies currently evaluating both the Web and Notes, or who have an existing Notes network and are evaluating the Web.

E

Related INPUT Reports

Other INPUT reports and related material include:

- *Will Lotus Notes Change Electronic Commerce? Connectivity World*, February 1995
- *Using the Internet for Business Processes*, 1995
- *Platform Shift: Revolutionary Migration of Applications to the Web*, Research Bulletin, December 1995
- *Notes' Survival in the Internet-enabled Enterprise*, 1996 Internet Opportunities Program report, begun December 1995

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II

Executive Overview

A

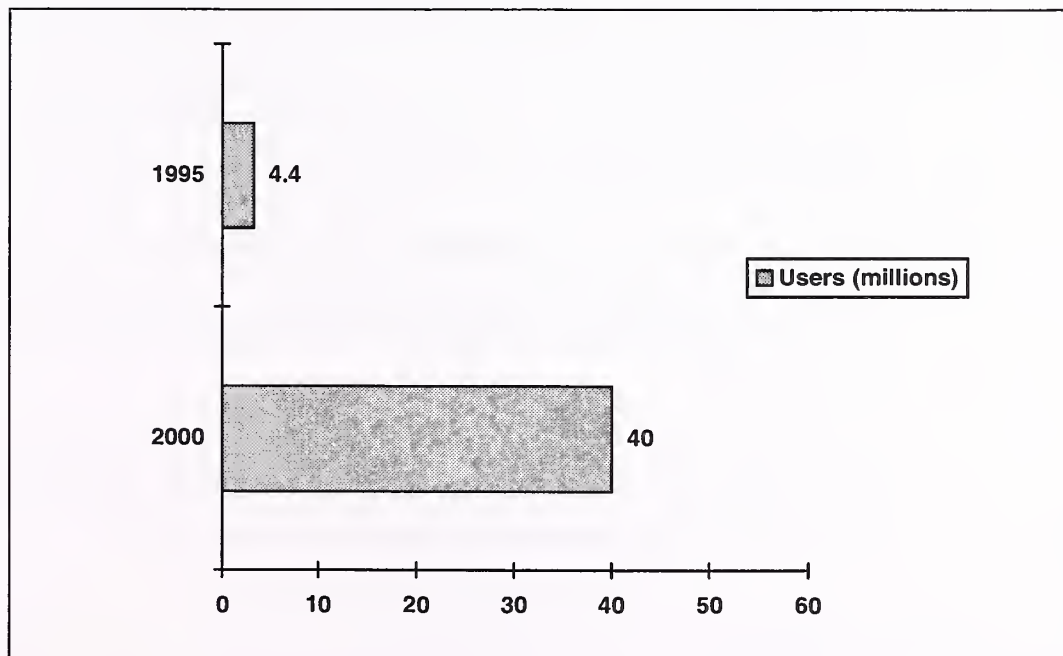
Notes Will Not Die

For groupware applications, the Web does not begin to approach Notes' installed base. Amidst the current hysteria surrounding the Notes-versus-Internet issue, predictions of Notes' imminent demise have been rife. The reality is that Notes will survive until at least the end of the decade—there is room for the Web and Notes:

- Notes has an installed base of 4.4 million clients and this is showing strong growth.

Exhibit II-1

Notes Users, 1995-2000



Source: INPUT

- Notes still surpasses the Web's functionality in many key areas and although it will not still have this lead at the end of the decade, the gap is great enough to capture considerable business.
- Corporate users are conservative and are reluctant to adopt unproven, first-generation technology. Notes is a known quantity from a big-name brand. The Web is still an unknown quantity to be viewed with suspicion, for many organizations.
- IS budget, planning and upgrade cycles do not encourage rapid switches of major IT investment. For the company that has taken three years to adopt Notes, a change on a similar scale to Internet technology will take the same time.
- IBM and Lotus have developed a strong strategy for incorporating Internet technology and connectivity into Notes. Notes is now inside, not outside, the Internet circle.

B

Notes Will Face a Tough Competitive Future

Lotus' competition in the future will come from Internet-based groupware products and from existing products as they, too, make the shift to the Internet platform. Future competitors include Netscape's Collabra Share, Microsoft's Exchange and Novell's Groupwise XTD.

The driver for Internet-based groupware is the same as the driver for all Internet-based applications. A platform shift is taking place from proprietary networks, applications and data formats to pure Internet environments, and the Web will become the preferred platform for all applications. (By 2000, over 50% of all current applications will be available in Web form.)

This shift will encompass groupware from an early stage—groupware is an ideal application with which to exploit the growing connectivity trend and can be addressed by both existing vendors such as Lotus and by new vendors such as Netscape.

Although the Internet-based groupware market will be a highly competitive one, Lotus has a significant head start on most rivals in terms of installed base, brand awareness and maturity of technology.

C

Notes Is Moving to an Internet Future

IBM has committed to embracing Notes within its own network-centric view of the world, which gives Notes significant leverage to position itself and to compete in the emerging Internet application marketplace.

A release of the Notes server due in 1996 will support all key Internet protocols and services, including HTTP, HTML and, following IBM's licensing deal with Sun, Java. TCP/IP is supported already. All of these critical technologies will be supported natively within Notes.

This native support places Notes squarely in the Internet applications market and changes the way the product is perceived by businesses looking to future-proof (ensure against obsolescence) their infrastructure and investments. Notes can now be considered 'just' another groupware offering playing in the same field as the Web servers, Collabra, etc., currently in vogue. IBM and Lotus have future-proofed Notes itself.

D

Notes-to-Web Migration Stemmed

The realignment of Notes with the Internet world will have a serious and negative effect on user migration from Notes to the Web, the beginnings of were seen during 1995.

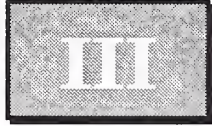
Notes is now more attractive to businesses with neither a Web nor a Notes infrastructure, but the benefits of a Web environment are still great enough to attract a very large number of these organizations for groupware and information-sharing applications.

User migration and purchasing trends during 1996 and beyond will be balanced between four categories:

- Users upgrading from Notes 3.x to Notes 4.x
- Users migrating from Notes to the Web
- New users adopting Notes 4.x
- New users adopting the Web for groupware

The biggest area will be the first, the upgrade to Notes 4.x. IBM and Lotus have ensured the mid-term future survival of Notes with a Notes/Internet strategy that will see the product through at least one major product upgrade cycle. Though intranets will continue to grow for a wide variety of new and

existing applications, the emphasis for groupware is still firmly on Notes—Notes will remain the leading groupware product for at least the next two years.



Analysis of Current and Future Usage

A

Introduction

1. Internet Infrastructure

We are witnessing an explosive trend toward the adoption of pure Internet technology within organizations of all sizes (see *The Internet Will Shape the Enterprise* and *Platform Shift: Revolutionary Migration of Applications to the Web*, Internet Opportunities Program Research Bulletins, December 1995).

- Enterprise networks are moving to TCP/IP
- TCP/IP client suites such as NetManage Chameleon are being used to access existing mainframe and Internet back-end servers
- Web servers are being implemented to share information internally

This platform shift is taking place first at the infrastructure level with TCP/IP-based networks. When such enablers as Java, database integration and objects are widespread in the Web environment, the application shift will take place in earnest.

The application shift will be dramatic. By the year 2000, over 50% of all current PC-based applications will have migrated to the Web.

A critical driver of this migration is Java. The shift will start with a coding exercise, the straightforward porting of standalone personal productivity applications, and will progress rapidly to the redesign of all applications to the networked environment.

2. Groupware

All organizations are affected to some extent by the groupware explosion. But the term groupware describes only the product aspect of the larger issue: collaborative working.

An IT environment that can support collaborative working encompasses not only the server and client elements of the groupware application software, but network infrastructure, messaging, objects, e-mail and database architecture.

Current groupware products like Lotus Notes and Novell Groupwise are proprietary, closed systems that are expensive and difficult to manage. Their proprietary nature means that their requirements spread further than the platforms on which they run. They essentially force collaboration by creating the entire network platform in addition to the groupware component. They not only add considerable overhead in terms of hardware, software, and network requirements, but add the expense that these requirements incur.

The Web platform, conversely, is ideal for collaborative working and groupware applications. Since any program developed on a network-based platform inherently takes on collaborative potential, groupware products are going to be among the first applications to be targeted in the platform shift to the Web.

B

Groupware Uses of the Web and Notes

Lotus is the undisputed leader in groupware. Notes is a strong product and offers all the key elements of a groupware environment: messaging, distributed databases, compound documents, application development environment, multilevel security, and remote access. Nearly any typical groupware application is achievable within Notes, although development efforts and resources required may differ widely.

A standard Web environment can rival much but by no means all of Notes' functionality. It is a measure of the Web's power that it can rival Notes in many areas without containing a specific, productized groupware element. A consideration of groupware applications running on top of Web servers is a competitive product issue and is beyond the scope of this paper.

Examples of Notes and internal Web applications are discussed below.

1. United Parcel Service (UPS)

UPS typifies the classic large company IT infrastructure today. It runs a data center housing IBM and plug-compatible mainframes, has a number of IBM AS/400 and UNIX servers and runs a variety of desktop platforms, mostly PCs. Company sites around the world are connected through a mix of frame relay and X.25 links.

UPS is also in the same phase of infrastructure planning as most large organizations. The company resisted the temptation a few years ago to replace its mainframes with midrange servers in the downsizing rush of the early 1990s. The mission-critical core applications still run on the mainframes, and the process of distributing applications and data across the enterprise is a gradual, not rushed, process.

The company is aware of the benefits to be gained from moving to an Internet environment and it has put in place experimental internal Web and Notes projects. Its immediate plans comprise three phases:

- Phase I—relatively low-key use of Notes within some departments for internal information sharing, primarily sales contact information.
- Phase II—development of Notes applications to allow the European and U.S. marketing departments to work collaboratively on marketing projects and to share common data
- Phase III—access for external parties to UPS' internal environment to exchange information and possibly collaborate through shared applications

The company is in the middle of Phase II at the moment.

In addition to internal applications, UPS runs a parcel tracking application accessed through the public Web and tied in to the mainframe back end. Customers (in the U.S. only) can place a delivery order through the Web to initiate a package transfer, and customers anywhere in the world can, regardless of parcel source or destination, view the process of their packages through the Web.

This system does not involve Notes: Web interaction is routed directly to one of UPS' internal Web servers, which links directly into the back-end mainframe.

UPS is not about to move its databases and applications off the mainframe. Its databases, which total around 1.3TB of information, could not possibly be run efficiently—if at all—from any current Notes or Web back-end server.

The company, like the vast majority of large businesses, is adopting a wait-and-see attitude. It will evaluate the progress of Notes and Web products while running small pilots of both technologies. Specifically, UPS is keeping a keen eye on the progress of Java, which it believes will have a big effect on the role of Web clients and applications.

2. Halifax Building Society

The Halifax Building Society in the U.K. uses Notes primarily to access market research information supplied to the company in Notes format. Notes has not been deployed enterprise-wide, but is used in small pockets throughout the company, mostly within the IS department.

Halifax is starting to using Notes for collaborative work: as users become more familiar with Notes to access information, they are beginning to explore its groupware facilities. The company is still in pilot mode in terms of deploying Notes as its corporate information platform.

The company has no internal Web servers, although it is putting a lot of effort into its external Web pages—its public face. It also sees little potential at present for internal Web servers. The company's highest priority is functionality. At the moment, Notes has the edge in this respect, albeit for higher cost. Yet cost is not a great issue for the company: the Notes installation is currently fairly small, and the difference between a Notes and a Web infrastructure would be a small proportion of the total IS budget.

Halifax sees Java and future Internet technology as having a great effect and will reevaluate its plans accordingly, but does not see Internet technology becoming mature or functional enough for a major company reevaluation in the next three years.

3. NetInfo

NetInfo is an Internet systems developer and integrator and is in partnership with a Lotus Notes VAR.

The company is developing an integrated Web-to-Notes exhibition registration application. Delegates can connect to the publicly available registration page on the Web and fill in details on an embedded form. The details are sent automatically into the back-end Notes database and from there forwarded to the exhibition organizers. The organizers can then extract individual user details to print badges, send out confirmations, register participants for exhibition seminars, etc.

The registration form was created using InterNotes. From the data structure of the Notes database, a Notes form was easily created. InterNotes then automatically created the equivalent form in HTML to be stored and accessed on the public Web page.

The company does not consider Web servers able to provide the functionality, robustness or security required by this type of application and regards a Web front end presenting InterNotes-generated Web forms connected to a Notes server as a highly effective solution.

C

The Web and Notes on Trial

Below, we take a look at the Web versus Notes situation from the point of view of both sides and present a picture of the current and future battle.

Exhibit III-1

Web versus Notes Feature Comparison

Feature	Web	Notes
Architecture	Open	Proprietary with open support
Client support	No client limit	Maximum 900 clients per server (Release 4)
Internal/external connectivity	No distinction between internal and external	Internal only, external connections through the Web
Platform independence	Multiple platforms as supported by any vendor	Multiple platforms as supported by Lotus
Functionality	Still based on publishing	Strong publishing and application development
Infrastructure	Seamless Internet/Intranet integration	Requires Internet add-ons

Source: INPUT

1. The Case for the Web

The Web and surrounding applications will eventually replace Notes in a large number of organizations in which Notes is currently the only suitable solution. The main reasons are:

1. The Web is an open system with multiple vendors providing solutions. Being open, the Web environment is extendible and the subject of rapid innovation. Where there is a need, a solution will be offered by one of many vendors at a necessarily competitive price.
2. HTTP is a stateless protocol, which means that there is no limit on the number of clients that can connect to a server. After a user opens and downloads a Web page, the link to the Web server is dropped; there is no start-to-end session relationship between client and server. Notes 3 supports only 100-150 clients per server, though Notes 4 is planned to support up to 500-900.
3. HTTP is a common protocol that can carry data within and outside of an organization, using the same software for both. This is not possible with Notes.
4. The Web is platform independent. A Web server does not need to know what type of client—DOS, Windows, Mac, UNIX, Sega Saturn game console, interactive TV etc.—is connected to it. All that is required is an HTTP-compliant front end on any client platform.
5. The Web will soon match the functionality of Notes, driven by the progress of Java, other object types, object-oriented databases, and the rapid growth of Web-related tools and skills.
6. Businesses are investing heavily in Internet infrastructure and applications. Many companies have installed TCP/IP networks already and many more are in the process of moving to a 'pure' Internet environment.

2. The Case for Notes

The Web is not yet mature or functional enough to support high-end database applications and is best used only for networked publishing.

1. The Web is an open system and may suffer the same standards wars and in-fighting that we started in 1989 among the UNIX vendors. The Notes standard is well defined and a proprietary brand is usually the 'safe' option for IS planners.
2. HTTP is an insecure protocol that doesn't discriminate among clients accessing a Web server as Notes does. As many clients can be accommodated as needed through the use of replicated Notes servers.
3. With the InterNotes add-on, Notes documents—including embedded graphics and audio— can be translated automatically into HTML documents for publication on the Web.

4. The range of platforms supported by Notes is growing, and Notes already works on the most popular business platform—the PC.
5. Notes is the dominant groupware application and has been established for ten years. The Web has been widespread for only three years and only been taken seriously as a business environment in the last year. Few companies will risk their critical business applications on unproven technology.
6. More companies today have a Notes environment than have a Web environment, and that will not change for some time. Although not a 'pure' Internet-based product, Notes will run on a TCP/IP network.

3. The Case for Reality

The Web versus Notes is one of the most keenly debated current topics, yet some of the most critical points are often ignored. The move to a Web environment for collaborative working using typical company-critical databases will not happen on a large scale until some of these crucial aspects are addressed.

IS planning cycles—it has taken many large companies several years and heavy investment to plan and implement an infrastructure and application upgrade to an environment like Notes. Although upgrade cycles are shortening, a majority corporate migration from Notes to the Web is not going to occur this year or next among large businesses. Such organizations are conservative (and many lag at least one generation behind current technology).

Synchronization—this is currently addressed in a Notes environment through replication, but the issue is wider than replication alone. Document and database management tools are much more mature for Notes than they are for the Web. Multiple Notes replicated servers will communicate database changes to each other and manage data contention and record locking. This is not yet widely available in a pure Web system. Replication on the Web at present is limited to caching files, which incurs the transfer of the whole file. Partial, synchronized file update capability with record locking is being addressed, but is not generally supported in Web environments today.

Security—it is not difficult to put in place systems that support secure transactions and E-mail over the Internet, and most fears of Internet insecurity are misplaced today. Yet like most aspects of the Internet and unlike private networks, no guarantee of security can be given. Packets traveling over the Internet can be intercepted and re-ordered, and if low-grade encryption is used (which is currently the case everywhere in the world except the U.S., although this situation will change), messages can be decrypted with enough computing power and time. In practice, this should

not be of the greatest concern to businesses—the Achilles heel of any company's security is always internal staff, not external hackers.

The reality of the Web versus Notes battle is that:

- For groupware, the Web has not yet made serious inroads into Notes' territory. Notes is still by far the dominant platform.
- The Web will in time become the preferred platform for network-based applications, including, from an early stage, groupware.
- Against other Internet groupware products and against Web server products, Notes will put up a very strong defense within large organizations due in part to corporate economics, culture and functionality issues.
- Notes is rapidly being integrated into the Internet environment. During 1996, Notes will undergo a platform shift and will compete in the network applications market on an equal basis with other Internet-based groupware products.

D

IS Cultural Aspects

In a technological utopia, new ideas and technology would be accepted and adopted as and when there was a need. But this is rarely the case. Legacy investments, support skills, infrastructure, applications, user training and, perhaps most difficult of all to resolve, culture, are some of the major reasons for corporate lag. For all of these reasons Notes has at least a medium-term future. The cultural aspect may prove to be the biggest single factor stopping Web platforms from taking over all network applications.

There is a comfort factor associated with Lotus Notes. The Notes product and process are familiar and fit into existing IS culture and operations (at least in those companies with PCs on the desktop and not still mainframe-driven terminals). Managed centrally by the IS department, a proprietary, branded product is installed on the server and a proprietary, branded product is installed on each desktop. The common factor is centralization, the subtext control.

- Growth and upgrades are managed (controlled) centrally
- Applications are written and deployed (controlled) centrally
- Data is stored (controlled) centrally

Breaking out of this centralized control structure will not happen naturally within IS departments, nor to many companies as a whole. As is the case with all major paradigm shifts, the change will come from outsiders, not from existing and trusted proprietary suppliers. The same problems inherent in such a shift apply to the Web versus Notes issue as to any other:

- No tradition of using such technology for internal business
- Little brand awareness; “big name” comfort factor
- IS fear of losing control
- Little cost/benefit analysis data available
- The “new technology” syndrome—users are cautious and most want to adopt, not pioneer

These factors are timeless—they applied to the move from mainframes to PCs, for example—and will be inhibiting influences on the nascent intranet market.

A related, critically important factor affecting the takeup of intranets is economic. Large organizations often run at least one generation, often two, behind current leading-edge technology. Heavy IT investment is not written off as soon as the next generation of technology appears.

Just as many large businesses formulated their plans to deploy minicomputers just when UNIX servers started to make serious inroads, so many companies today are in the process of evaluating or implementing a Notes infrastructure at the time when intranets are establishing a presence.

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IBM/Lotus Notes Strategy

IBM and Lotus have fully recognized the threat to Notes from Web technology and applications built on the Web and are currently in the midst of redefining their Notes strategy to counter this threat.

IBM and Lotus are pursuing a single-minded Notes strategy—the integration of Notes into the Web environment. The two companies have started to shape and position Notes as a Web platform, and for the future success of Notes it is critical that it be positioned inside the Internet world (which includes the Web), not outside.

The strategy of Web/Notes integration demands that Notes be seen not as a proprietary groupware server and client but as a Web server and client with the added functionality of Notes. The integration must be strong enough for a Notes server to be able to be used as a Web server and a Notes client as a Web client (or 'browser').

Lotus could not carry out this integration strategy on its own. The company does not have the Web-related experience or products required. Its focus has been on the development of Notes as a sophisticated but technologically isolated groupware product.

IBM can provide much of the required Internet-specific skills and technology. Only with the combination of Lotus' groupware skills and IBM's Web and Internet skills, development resources and financial backing can Notes be transformed into a Web-integrated platform.

In the future Web-based groupware product market, Lotus will rely heavily on its greatest asset—its installed base. IBM and Lotus claim a worldwide installed base of 3.3 million Notes clients. Furthermore, they are looking to grow this user base aggressively and anticipate more than doubling the number of Notes clients each year. If this growth is realized, Notes' installed base will grow to over 55 million by the end of the decade.

Growth will not continue at that pace, however. Notes will face stiff competition from Web-based groupware products currently in their infancy, as those products grow rapidly in the emerging Web-based applications software market. These products include Netscape's Collabra Share, Novell's Groupwise XTD and Digital's Workgroup Web. Notes will maintain a leadership position for two years, after which the market will no longer be dominated by one vendor. The number of Notes clients by the end of the decade will be approximately 40 million.

The most important tactical elements of the Web/Notes strategy, many of which were announced in December 1995, are:

- InterNotes, a tool with which users can produce Web pages from a Notes database with little or no intervention. The pages can be stored on a public or internal Web server and look, to the viewer, no different from hand-coded pages.
- The bundling of InterNotes into the Notes server product (starting from Notes Release 4.x). InterNotes is currently an optional add-on, priced at \$2,995.
- The integration of Internet protocols above and beyond TCP/IP into Notes, to be delivered during 1996 as a Notes 4.x release. This Notes 4.x release will support native HTTP, HTML and Java.
- The addition of a native Web browser into the standard Notes client. This browser (InterNotes Web Navigator) satisfies the strategic requirement for a Notes client to offer the same functionality as existing Web browsers.
- Support for mobile workers with Notes Mail, a lower-cost Notes client based on E-mail and Lotus' InterNotes Web Navigator.
- Strengthening of the application development framework within Notes. Application development is an area in which Notes currently excels, compared with the Web. IBM has licensed Java from Sun for use in all its Internet products and Lotus will incorporate Java into Notes in addition to enhancing Notes' native development language (LotusScript).
- Price alignment of Notes with the Internet client/server pricing model. In December 1995, Lotus halved the price of the Notes Desktop client to \$69 and increased the price of Notes server software for single-processor machines to \$495 and for multiprocessors to \$2,295. Web and Notes clients and servers are now similarly priced.

These tactical elements, which will be implemented in Notes during 1996, address nearly all of the key requirements of groupware products as all applications software undergoes a platform shift to the Web environment. These demands, that will have to be met by any network-based application provider, include:

- The demand for Internet infrastructure to be supported natively at all levels
- The demand for both open access from any client and prioritized, restricted access
- The demand for seamless translation between document and data formats, specifically HTML, databases and objects
- The demand for competitive pricing at all levels, from client to server; when any client can connect to any server, pricing becomes a key choice determinant, alongside functionality
- The demand for cross-product application development tools such as Java

In their current Notes strategy, IBM and Lotus have succeeded in meeting these demands. Most importantly, they have communicated a very strong message: Notes has an Internet-based future and is undergoing the platform shift to the Web now and through 1996. This is the only way forward for Notes, and IBM and Lotus could be congratulated not only for realizing this, but for taking positive action.

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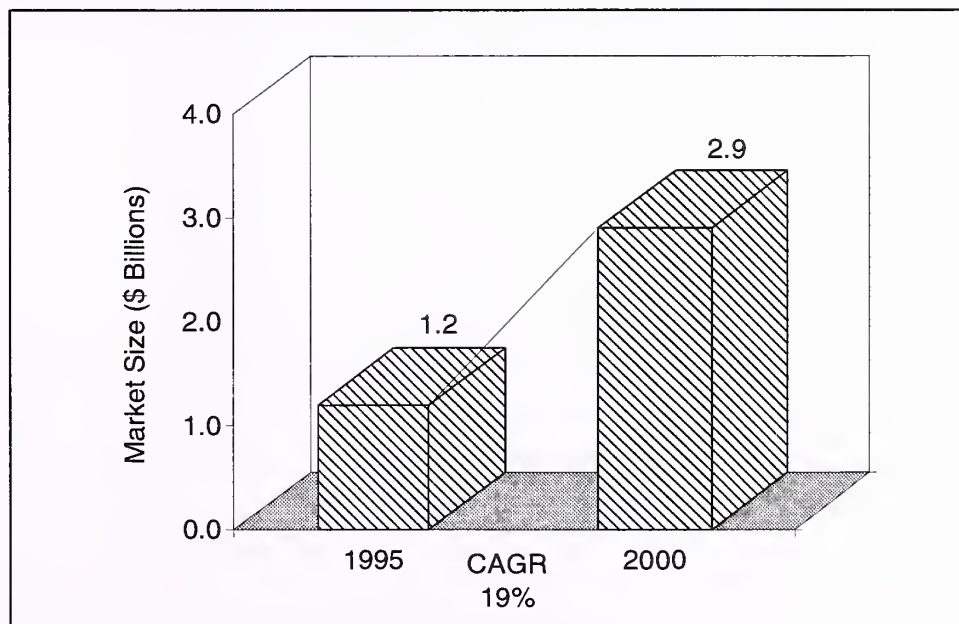
The Future

INPUT has identified the growth of four Notes-related markets from 1995 to 2000. Market forecasts are based on an installed base of 4.4 million clients in 1995 and 40 million by 2000.

1. Notes Software Products
2. Professional Services
3. Systems Integration
4. Network Services

Exhibit V-1

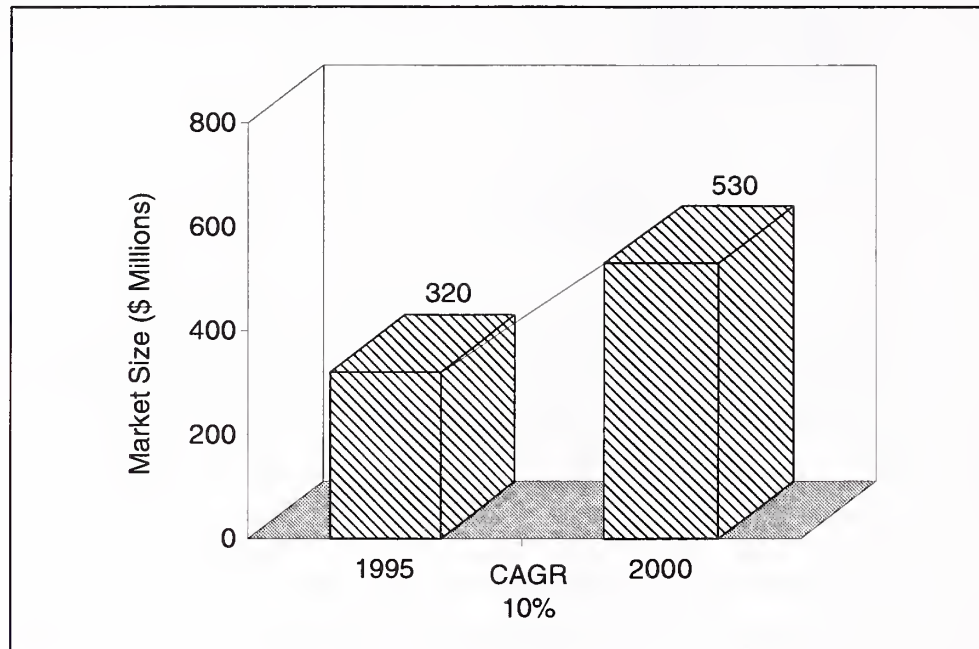
Notes Software Products Market Growth 1995-2000



Source: INPUT

Notes software—the Notes market (Notes itself plus related software and applications) will grow at a CAGR of 19% from 1995 to 2000, increasing from \$1.2 billion to \$2.9 billion. Aggressive price reductions from Lotus accounts for this conservative growth.

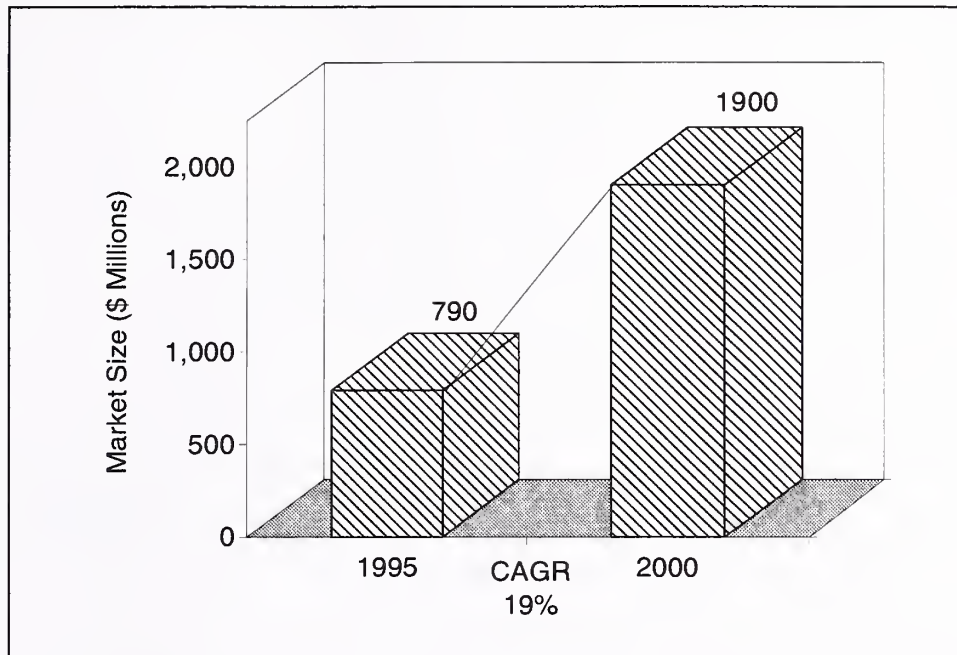
Exhibit V-2

Notes-Related Professional Services Market Growth 1995-2000

Source: INPUT

Professional services—the market surrounding Notes will grow at 10% CAGR, from \$320 million to \$530 million. An increase in network complexity will fuel this growth in part. The professional services market will show signs of instability toward the end of the decade as programmers become more abundant and as salary premiums fall.

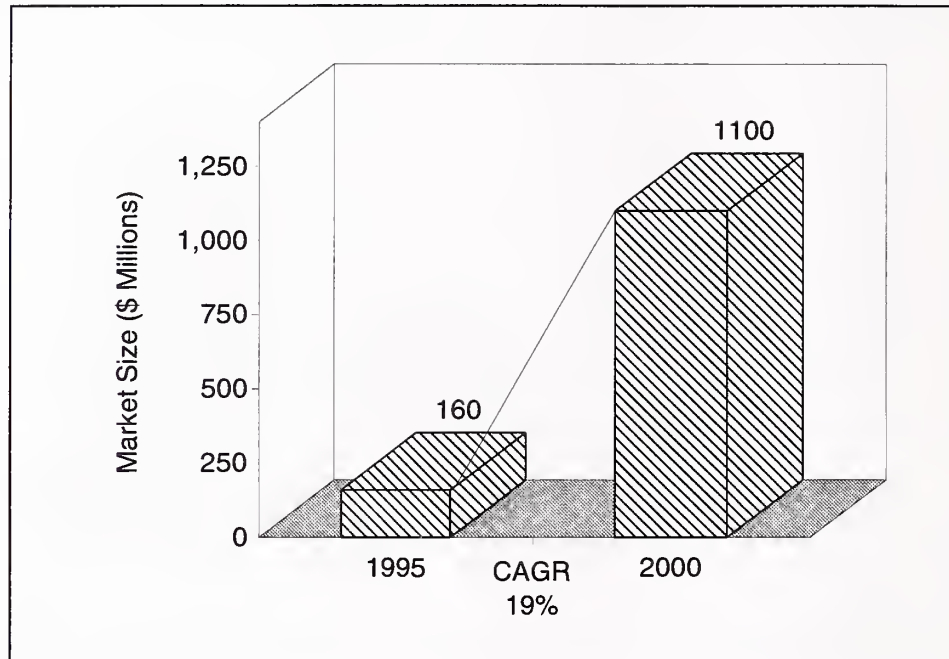
Exhibit V-3

Notes-Related Systems Integration Market Growth 1995-2000

Source: INPUT

Systems integration—the market related to Notes will grow at 19% CAGR from \$790 million to \$1.9 billion. Most systems integration will be carried out by a growing cottage industry of small companies, as is the case with Novell NetWare today.

Exhibit V-4

Notes-Related Network Services Market Growth 1995-2000*Source: INPUT*

Network services—the market for Notes-related network services is growing rapidly today. The mass move to Internet infrastructure is good news for network services suppliers now, but as the migration passes over the bell curve, growth will slow down greatly as users implement their own connections and services. The Notes-related network services market will grow at a 48% CAGR from \$160 million to \$1.1 billion.

