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The fertile hothouse of the Internet yields lush growth. None has been juicier for the last year than push technology. This particular innovation promises plump profits. Push startups can cash in on the frenzy for a while, but the big boys of software—Microsoft and Netscape Communications—have integrated the technology into their browsers.

Other big names incorporate push as well. Reed Elsevier will distribute data via Microsoft's active desktop. The Wall Street Journal Interactive Edition uses BackWeb Technologies' tools to deliver filtered information to customers' desktops. Dow Jones thus joins more than two dozen other firms in licensing this information newcomer's software to flip over the "pull" model of information. The concept is simple. Customers set up a profile of what information interests them. BackWeb's software does the rest. Each time the user logs on, the BackWeb client polls Dow Jones's server and sends the latest information directly to the customer's PC. Chalk one up for the promise of better use of time and one more way to deal with today's information overload.



PUSH POINT OF VIEW

Point of view is important in understanding the rhetoric swirling around push technology. Marketers who understand the television model of advertising can now get their message in front of managers. Entrepreneurs perceive a new publishing technology that can deliver just what the customer wants in real-time. The bills can be paid by advertisers who want their message included with the pushed content, or by a subscriber who is willing to pay for information selectivity—a scarce commodity on the Internet today.

Within organizations, push technology can replace paper memoranda or printed updates to policy and procedures manuals. With the right software, a news story can be linked to a client profile resident on an internal

The Wall Street Journal Interactive Edition uses BackWeb Technologies' tools to deliver filtered information to customers' desktops.



proprietary database.

A manager seeing the story can call the customer and make a sale or at least cement a relationship.

Push technology has applications in all types of nets: Internet for public free or for-fee services, intranet for organization applications, and Extranet for new types of for-fee services yet to bubble from the cauldron of innovation total networks engender.

Like most Internet-fed developments, dozens of technologies lurk behind the colorful, lively facade of products. Each has a way of displaying information in real-time (if the user is connected to the Internet) or from a local cache (if the persistent connection is broken).

"Filtering" is essential to the process. Specify a word, phrase, value range, ticker symbol, or even a complete sentence and the terms are added to a look-up list. When the resulting "list" is matched against information in a newsfeed or other source, the articles where matches occur are routed to the user. In the Before Web (BW) days, when push was selective dissemination of information (SDI), these functions required more expertise than point-and-click. The popular view of push technology is an example of disintermediation. The experts who set up profiles with commercial hosts have been replaced with software. Whether the human or the software is "better" than the other is a topic open to debate. Even "cheaper" can be a contentious issue because the costs of push technology are more difficult to evaluate than an information professional's salary and the online fees from Knight-Ridder Information Services.

CHANNEL MODEL OF INFORMATION

Push technology has kidnapped the concept of "channels" of information, making a \$2,000 computer work like a \$100 television set. The user runs software and selects from a pre-designed set of continuously updated information. The consumer connotation of "channel" is intentional. One can argue that a computer owner and user is somewhat different from a consumer who buys Nikes or flower arrangements with disposable income. Nevertheless, the Holy Grail of online has been a large consumer market, not the niche-filled mini-markets of opinionated professionals or smart-but-poor students.

PUSH TECHNOLOGY HAS APPLICATIONS IN ALL TYPES OF NETS: INTERNET FOR PUBLIC FREE OR FOR-FEE SERVICES, INTRANET FOR ORGANIZATION APPLICATIONS, AND EXTRANET FOR NEW TYPES OF FOR-FEE SERVICES...

The "consumer" of channels of information is yet to be trapped in a virtual supermarket shopping for shampoo or reclining on a sofa punching bets into his Web TV. There will be value attached to pushing information into this market, but the number of people is likely to be considerably smaller than for a more traditional consumer market for Monday Night Football or the Academy Awards Show. Marketers may have to make do with clusters of Internet consumers that number in the millions, not tens of millions, at least until the Baby Boomers give way to the increasingly computer literate cohorts behind them.

George Gilder has observed in his many articles in Forbes ASAP that the Internet is closer to a book culture than a broadcast culture. So far he seems to be correct in his assessment.

PUSH DOES NOT SIMPLY EXTEND SDI

Today's push technology, unlike the SDI's of the distant past on DIALOG/DataStar or the more recent past on Desktop Data, is more visually appealing. The presentation, if not the substance, is flashier, more eye-candy than fundamental change in what is offered for low or no cost. Most public push technology services are advertising supported. The idea is that the channel is able to attract a large number of

click-throughs or eyeballs. Clicks and eyeballs can be sold to advertisers who are allegedly hungry to tap into the demographics of the push technology information consumer. Push technology promises to supplement the Internet's passiveness with a far more active functionality. Maybe that is why Microsoft has an "active desktop" and promotes "ActiveX" as a programming language. Like it or not, push is here to stay. It has pushed itself to the front of the line.

THE POINTCAST REVOLUTION

Push technology received the capstone of its recently erected arch of hyperbole when the *WIRED* cover in March 1997 advised, "Kiss Your Browser Good-bye." The tagline predicted, "The Web browser itself is about to croak. And good riddance." [1] This was only 13 months after the debut of PointCast Network (Cupertino, California). Almost a year to the day after PointCast pushed itself into the Internet, *Business Week* opined that the Web has too much "noise and congestion." [2]

When PointCast shoehorned its software onto FTP sites, another Internet "revolution" was born. PointCast had a very, very clever idea. First, any Internet user could download its software to

CASE STUDY IN PUSH TECHNOLOGY

For a real application of push technology, consider the problem that confronted General Motors. The automobile manufacturer has thousands of dealers, geographically dispersed. Each must maintain an up-to-date directory of various pieces of information. Automobile parts, repair procedures, prices, labor data are all in a state of flux. GM makes use of a push technology that allows the company to update manuals using technology from StarBurst in Cambridge, Massachusetts. This type of application can be considered as a substantial business benefit. Costly printing and shipping of paper documents are reduced. The time delay between corporate's decision to change prices or implement a repair procedure is slashed from days or weeks to a matter of minutes or hours.



get access to free news, sports results, and stock quotes-and advertisements as it turned out. Second, using the PointCast interface, a user could define an interest profile or "filter." Third, the software would install a screen saver routine. When the machine was connected to the Internet, a persistent connection was established between the client (user's PC) and the PointCast server. Along this "channel" information was pushed. When the PC was disconnected, the screen saver would display downloaded information from the PC's cache. The effect was visually pleasing and the impression of being wired to the world was strong.

Wall Street, users, and software developers from the "me too" school of innovation loved PointCast. Network administrators were somewhat less enthusiastic. The persistent connection means that the client's PC or server is connected to PointCast. Information flows continuously. Network administrators not yet wise to the bandwidth and storage hogging persistent connections watched their networks slow to a crawl and hard drives fill to capacity. Users at home wondered why their

arrival of electronic mail, a gentle push triggers the beep. Similarly, password changes on an IBM SNA network, security permission modifications on a Novell network, or electronic mail from Mozilla welcoming a new user to Netscape illustrate push at work. Firefly Networks (www.firefly.com) has adapted the technology to alert music lovers when something likely to be of interest to them has happened. Two of the tastiest from an information professional's point of view are electronic mail and Usenet discussion groups. Clever programmers years ago wrote scripts to collect information, do a bit of housekeeping, and automatically mail it to people on a mailing list.

More advanced push technology has long been available for those with the bandwidth and technical know-how. Internet Protocol Multicasting takes the garden variety push technology and puts it on steroids. In greatly simplified terms, IP Multicasting allows data to be routed to specific computers on the network. Data are then sent directly to those places where they are needed or wanted. Perhaps the highest visibility IP Multicasting events are rock concerts. The lowest visibility IP

- Pre-selected channels. Users take no action to get the breaking news.
- Always available. When the PC is idle, the PointCast software works like a screen saver. When the PC is being used, PointCast recedes gracefully into the background.

These benefits are magnetic in their appeal. But to a person with some Internet experience, PointCast is a variation on established UNIX and TCP/IP functionality. In fact, "pushing" email messages or the contents of subscribed listservs has been part of the Internet environment for years.

Internet users who cut their teeth on the UNIX command line, pooh-pooh the push revolution. Push technology triggered some lively discussion on Usenet. Robert Alpert, a UNIX expert with deep Internet expertise, summed up the BW viewpoint, "Push' technology is just another buzzword for annoying people with unwanted commercial crap." [3] Dave Barr, Penn State University, compared PointCast to a news-reader: "I don't see how PointCast is any different from a Usenet news reader. I click on 'update' and it pulls down news articles. In the same way I

WHAT'S NEW ABOUT PUSH TECHNOLOGY DEPENDS UPON WHAT ONE KNOWS.

once zippy PCs were struggling through mundane tasks like opening a file.

PointCast responded, to their credit, with reasonable quickness. The PointCast server priced at about \$1,000 was more respectful of the cost of wide area networks and the need to husband certain customer resources more efficiently. At one firm in Pittsburgh, a handful of PointCast users brought a financial services firm's local area network to a stop. Each of those client PCs was doing its best to maintain a persistent connection to the PointCast server in order to get the flow of new information "pushed" to the desktops.

IS THE TECHNOLOGY NEW?

What is interesting is that push technology has been used in one form or another for more than a quarter century. When the annoying "downloading images" flash on a CompuServe or America Online user's screen, push technology is at work. When a mail package chimes a tune to signal the

Multicasting events are the ones that move scientific videoconferences from one laboratory to another.

What's new about push technology depends upon what one knows. While push technology generated miles of breathless prose in trade and consumer magazines, technically-savvy companies like TIBCO Inc. developed multicasting software that forms a digital bridge between two or more other pieces of software.

In the world of the Internet, "new" depends upon one's experience with electronic information in general and the BW Internet. To Net novices, the push technology of PointCast is an amazing innovation. It promises benefits:

- Set it and forget it. The choices the user makes will automatically filter the information.
- Easy to use. When changes are necessary, the point-and-click interface gives the user control over the content.

type 'trn' and it pulls down news articles. The only difference is the location and the transport protocols." [3a] A contrary voice spoke, "The push technology will last because it will allow me to say, 'Give me the weird things that no editor will feel is good enough to publish.'" [4]

PUSHING HARDER

The companies listed in the accompanying table offer a combination of software tools and services. With technology like Marimba's Castanet, for example, other applications of push technology can be built. To cite another example, BackWeb allows an organization to use its toolset to distribute software updates directly to users' machines. McAfee Associates (Santa Clara, California), the anti-virus experts in Silicon Valley, is developing an application using BackWeb's push technology to keep customers' anti-virus programs current. Customers can subscribe to the software updates, have them update the database of

Dozens of companies provide push technology. The table below provides a snapshot of a number of push purveyors:

Company	URL	Comment
Affinicast	http://www.affinicast.com	Personalized information retrieval service
Astound	http://www.astound.com	Their WebCast product lets developers create their own multimedia broadcast channels from existing Web sites.
BackWeb	http://www.backweb.com	Users can pick from many channels to receive news, multimedia, cartoon, audio announcements, etc., which download onto the computer desktop unobtrusively during idle times.
Caravelle	http://www.caravelle.com	They develop advanced network monitoring and Internet intranet publishing tools, including a nonproprietary tool that allows businesses to deliver timely content to consumers and end-users.
Cognisoft	http://www.cognisoft.com	Their Intelliserv is a server-based intranet application that integrates, monitors and tags information from disparate internal and external data sources, and orchestrates the delivery of this information to users based on their needs and preferences. Users can receive information via a customized start page, email, pager, or alert.
DataChannel	http://www.datachannel.com	They create intranet administration tools that allow IS managers to manage external Web channels and internal information sources on their employees' desktops.
Diffusion	http://www.diffusion.com	Their IntraExpress is targeted at business-to-business communications, allowing desktop-generated information (spreadsheets, price lists, etc.) to be distributed in one step to the appropriate recipients in their preferred media (email, fax, etc.) and formats (Windows and Macintosh).
First Floor	http://www.firstfloor.com	Using specified agents, their Web-enabling product allows documents to be interactively monitored and distributed. Well-received in the trade press.
Ifusion	http://www.ifusion.com	First high-profile push company to fail in a puff of dollar bills—\$18 million of them, in fact.
Wayfarer	http://www.wayfarer.com	Their INCISA is an easy-to-use Webcasting solution with a variety of data delivery methods, allows administrators to restrict content delivered to users' desktops. One of few push deliverers that comes equipped with encryption support. Offers Reuters, PR Newswire, and PCQuote \$5,000 per 100 users.
InCommon	http://www.incommon.com	Their Downtown product lets users download many different content channels to their desktop, making use of integrated accelerated Web browsing, automatic content delivery, and information customization.
Intercast	http://www.intercast.com	A technology being developed by Intel that allows for the transmission of data, specifically Web pages, along with a television broadcast, and reception of that data by PCs equipped to do so. (Listed as a push technology, but I wouldn't include it. I'm just putting it here to make you aware of it.)
Intermind	http://www.intermind.com	Can access or publish channels via its products; Web site has listing of more than 200 Intermind channels.
Lanacom	http://www.headliner.com	Developer of Headliner, which delivers news and information to Windows 95 and NT desktops. Claims to support 500 channels with headlines delivered advertisement-free.
Marimba	http://www.marimba.com	Their Castanet is a technology for distribution of channels over the Internet/Intranet. Each channel can be a stand-alone Java application, a Java applet, or a Web site, with each channel stored locally. Company likes to promote its platform independence.

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Company	URL	Comment
Mercury Mail	http://www.merc.com	User-selected content is delivered via email, so this only fits under the broadest usage of what people today view as push technology. Not much different than the Inbox-Direct stuff Netscape started, except that this is only email being delivered via email, not html being delivered via email.
NetDelivery	http://Nwww.netdelivery.com	"Pioneering the concept of 'Community Marketing'-linking people with common interests and shared attitudes to organizations that offer valuable information, products and services via the Internet." They selected CyberSeniors as the first community they will serve.
PointCast	http://Nwww.pointcast.com	For network use, the cost is about \$1,000 for 500 users for Iserver individual packages sell in most retail computer stores. Marketing angle: "But we're PointCast."
Tierra Communications	http://www.tierra.com	Their Tierra Highlights product is an Inter/Intranet news gathering tool that detects, retrieves, and presents new information from sites, highlighting important changes and letting the user filter in or out words and phrases.

virus patterns, make the killer algorithm current, and depart with nary a system glitch or whimper. Garden variety software users can purchase Oil Change, a push technology, to update a user's system automatically. Java applets running on network computers will get their updates in the same fashion. Microsoft envisions channels of information and entertainment flowing automatically to users of MSNBC. The list of commercial applications can be extended indefinitely, and it is still the early days for this "new" technology.

WHAT HAS CHANGED?

The previous discussion implies that push technology is merely repackaging older technological concepts. But some things have changed, such as an understanding of how to move certain types of data from one place to another via a network. Specialized tools, ranging from UNIX's mail to network administration utilities built into commercial network operating systems permit files, permissions, and executables to be updated from a central console. The proliferation of easy-to-use tools to handle remote administration of dispersed workstations allows engineers to move more types of data in more complex network architectures. With the supernova of popular interest in the Internet, a transport protocol that permits routing or the moving of data from a server to clients located anywhere a low-cost

telephone connection reached gave the digital farmers a fertile new field.

What is truly new is the use of the Web browser interface, the screen saver hook, and the use of paid advertisements to put high-value information in front of a certain segment of the Internet user community. Those eyeballs and the associated advertising revenue helped propel the push revolution from the FTP sites to the national media scene.

Not surprisingly, push technology has bloomed. But like a poorly managed field of wheat, abundance can choke the field. Critics of push technology point to the flooding of the network with large amounts of redundant data. The earliest "mass market" push technologies were relatively unsophisticated. When a client was registered as live on the network, the push server dumped data. The results:

- Network traffic, particularly on expensive connections associated with wide area networks, often overwhelmed capacity.
- Users, unaware of the persistent connection and constant updating, found their machines slowing down and running out of disk space.

Push technology has blurred some distinctions that existed with the older, command driven technologies of listservs and notification that electronic mail has arrived. For example:

- Data transfer from server to client has become more finely g-rained. Users who did not know an alternative to "pull" or online queries for information now understand a distinction.

- Pull data is almost entirely defined by the user's actions; that is, what query to launch, where to look, what database to access. Push data can be defined by the user, or by the server operator who decides what to send down the line. The advertisements in PointCast are an example. Users get them whether they want them or not.

- Content once perceived as static (as in a magazine or commercial database updated one a month) is now seen as fluid. Push allows the most recent information to be sent along in real-time. Two years ago, real-time and fluid data were concepts reserved for specialists.

- Push data are filtered. Pull data require the user take an action. Users now understand that profiles can be defined by themselves, by an organization, or not at all. Different types of push information services are therefore possible and desirable.

DATACHANNEL AND TIBCO: A PEEK INTO THE FUTURE

In early 1997, DataChannel, a company focusing on the emerging area of "Webcasting" or using network technology to move data in the traditional radio broadcasting model, announced



its intranet product. An intranet is a network that binds the various units of a single organization together. So "intranet Webcasting" provides services to send specific information to employees' desktops.

Unlike the text Webcasting services of Individual, Inc. or Desktop Data, DataChannel provides a far greater degree of control. DataChannel's software allows an administrator to control who gets what information, the type of information Webcast to a particular desktop or workstation, and the blending of information that resides on the company's proprietary database and information from external sources.

The TIBCO tools give DataChannel the "under the hood" controls necessary to filter, route, extract, blend, and coordinate the different processes needed to enable the DataChannel application. TIBCO works at the network level, handling the routing and filtering of the message packets. DataChannel's software works at the application level. The software uses database-driven objects to control the flow of content, the presentation style, and user-group administration.

The DataChannel-TIBCO approach allows the organization to make use of the PointCast-style format, the MSNBC format, or any other viewing style that the organization prefers. The software integrates TIBCO's real-time push technology to provide support of the Microsoft Active Platform, real-time notification, authentication, and certified delivery. The access to databases is handled with a Java application suite to ensure cross-platform compatibility.

TIBCO's multicasting protocol, TIB, has emerged as one of the staples in the financial services business sector. The TIBCO software is scaleable so that network growth does not degrade the effectiveness of the routing and filtering functions.

In early 1997, DataChannel and TIBCO were virtually the only firms able to combine this suite of content management, routing, filtering, and security services in a cross-platform environment. The Webcasting model as implemented by DataChannel and TIBCO is independent of a thin or thick client architecture (network computer, dumb terminal, or workstation).

The servers are location independent so that employees can retrieve their information environment and information from any location. The architecture does not flood a network with broadcast packets. The one-to-many model delivers content notifications and updates as scheduled by the administrator or when a client establishes a connection.

The key to this approach to push technology is the "information bus" developed by TIBCO. The software provides developers with tools to build multi-tier architectures between a TCP/IP network and applications. Diverse applications can share information across local area networks, wide area networks, and the Internet. Programs on different platforms can communicate with self-describing data messages and subject-based addressing.

THE ROLE OF A DATABASE

The effectiveness of push technology depends upon programmed actions. Data and information are useful if they are on point and on time. Brute force filtering of raw newsfeeds and dumping megabytes of information to a user's personal computer causes immediate, severe actions. At best, the data are ignored, a common fate of many popular push products. In the worst case scenario, the push product is removed and the data deleted.

Redundant consumption of network bandwidth, storage, and processor cycles are very real concerns, regardless of network type. Push technology can make database access more seamless for certain types of applications, for example:

- Notification of "deltas" in certain critical information areas like prices, product availability, certain factual developments, etc.
- Delivery of information objects that meet specific criteria in a standard format; for instance, news stories with unnecessary header information removed, electronic mail messages with redundant address data normalized, or images in a standard file format.
- Distribution of specific information from a range of data warehouses; such as updated Excel spreadsheets, delimited text files containing reports from sales people, and other active database applications.

These types of push applications are what might be termed "set and forget" services. Once they are defined by a system administrator, the user, or another person in the organization, automation (scripts) makes them function. When a change is required in a script parameter, modifications can be made easily, usually without programming. The flow of information becomes part of the standard work process.

PUSH BYPASSES PROGRAMMING

The ease with which push tools from D2K, Inc. and their Tapestry product or TIBCO (a Reuters company) are used determines their ultimate success. Programming has been the bottleneck in many organizational information applications. The cost of implementing and maintaining a service has a direct relationship on the speed and enthusiasm with which an information technology staff undertakes a specific project.

The tools needed to create finely-tuned, flexible push applications are immature. The rapid pace of innovation in this market sector indicates that no single company has a widely embraced solution to automating certain extracting, filtering, formatting, and delivering operations.

The database aspect of push technology raises a number of technological, administrative, and financial issues. Entrepreneurs and organizations eager to implement push technology are likely to find themselves saddled with a costly, difficult to support system unless some of the hyperbole is separated from the flowing data packets.

Consider the technological issues. For an Internet or public network application, the push entrepreneur must have something to move. Content from established or "branded" information sources is a logical first choice for many companies. However, content providers are becoming increasingly pragmatic about the fees, reuse, and branding of their information products. Some, like Reuters, want to win mindshare by flooding the market. Others like the *Wall Street Journal*, *New York Times*, and others want more exclusive deals. When a deal is struck, the push operator must:

- Obtain content
- Parse it
- Filter it
- Route it

These seem to be trivial tasks, and they are when one is dealing with a handful of customers or modest amounts of information. They become difficult when the scale of customers and information objects rises.

Within an organization, the issue of managing pushed content has two additional aspects. First, the blending of external information with internal information is a challenging undertaking. Most organizations have different types of databases for different applications. In most organizations, these different data repositories are not happy neighbors. Getting normalized data from different data sets is a high priority, difficult, and costly. Software from companies as diverse as giants like Microsoft and IBM or smaller firms like Intersolve, Inc. (Rockville, Maryland) are making the job somewhat easier. The flexible, seamless datawarehousing of the trade journals is less a reality than outsiders would like to believe. Commercial, structured data is better than unstructured, free form data from crawlers.

Second, the network infrastructure within organizations is often not able to keep up with the applications that managers, system administrators, staff, and consultants would like. No one in particular is at fault. Push technology requires resources that must be budgeted, selected, installed, debugged, and implemented. The catchy "Where do you want to go today?" implies that the gulf between a new application and a snazzy Windows interface does not exist. Well, there are Grand Canyons out there, and they will not be turned into launch pads for pushing and Webizing corporate information overnight.

DATABASE TECHNOLOGY KEY TO PUSH

Despite the concern about network infrastructure and the immaturity of the tools, the key to push technology for Internet and intranet applications will be database technology. Little can be done about the redundant information pushed to the user. Handcrafting of push solutions for individual managers

is out of the question. Without programming tools, agent technology, and seamless retrieval of information, the whole process is too expensive to build, operate, and maintain.

Users must make some of their own decisions about what to receive. They need to be able to interact with systems and services directly without programming or system support, including information intermediaries, being required.

The content stream must be normalized. Users can process information more rapidly if it is presented in a familiar, legible, consistent format. A heterogeneous mishmash of information, with no determination of what is important, turns the frustration knob up a notch or two.

Database technology, enhanced with effective scripts coded directly in SQL (structured query language) or a higher level tool like Cold Fusion from Allaire, Inc. (Cambridge, Massachusetts), can bring order to the information objects. Enhanced filtering tools from companies like Manning & Napier Information Services, Inc. (Rochester, New York), IsoQuest, Inc. (Fairfax, Virginia),

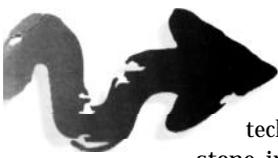
Open Text Corporation (Waterloo, Ontario), and many others can play an important role.

The objective is to have a way to assemble information into usable chunks of information for the user. These "answers" or "reports" can be pushed to the particular person or persons who need the information. Users who later discover a need for the information can then retrieve a particular report or an updated version of the report using less exotic retrieval technology.

On the back end, database technology becomes the enabling structure for the information objects. On the front end, database technology becomes the management environment that gives the system coherence, purpose, and focus. In the middle, database technology must be supplemented with toolsets that permit staff, both end-users and systems professionals, to build information delivery services that are truly useful and used.

From this point of view, the revolution in push technology is a logical extension of existing database and information management tools. Push





technology is a milestone in marketing. For the first time, end-users and people with jejune computing expertise can understand the usefulness of filtering, packaging, and delivering answers to the desktop.

Traditional database experts may not like the loss of the command line in UNIX, but they surely are pleased with the opportunity to build next-generation information delivery services with exciting new tools.

The caveat to this exciting innovation in network and database technology is that we are still in the early days. Expectations are rising faster than the services can deliver. Poorly implemented push services can cripple a network in a matter of hours. Challenges like eliminating duplicate or redundant information, ensuring that push data have appropriate security and priority flags, and perform reliably without disrupting other network processes remain to be met consistently.

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In the interim, a new range of products can be produced using tools developed by companies participating in the push revolution. Examples include:

- A service for teachers that delivers updated information on particular topics directly to the students' electronic mailbox or via facsimile to the teacher
- Blending information about a particular customer from an in-house database into a newsfeed story about that customer, formatting a report, and delivering it to the appropriate individuals in an organization
- Assembling non-text information into an information report that can be viewed by an executive outside of the organization's physical office, say, on a Web TV in a hotel exercise room
- Extracting information from a day's flow of textual and numeric information, analyzing the content for particular concepts and preparing a summary of the content into a flash report. On the back end, the system maintains links to pertinent information within the organization's proprietary databases.

PUSH IN THE NETWORK ENVIRONMENT

Are push services likely to be a fixture of the network environment? The answer is, "Yes." The impact of push will be felt in publicly available services. The "channel" model is likely to appeal to a significant percentage of the "market," whatever it becomes. These services are likely to be rich, varied, and use standard television, radio, and interactive games as their foundations. The applications will be diverse and give rise to fresh, often festive, information events or "edutainments."

On the more serious side, financial service, consulting, and keenly competitive organizations will use push technology to speed the flow of certain types of information in certain circumstances. The goal will be less cost cutting and more flexibility and responsiveness. Software, not people, will have to help with the filtering. Software, not people, will have to get logical clusters of closely related information

into manageable chunks and structures. Then people, not software, will have to figure out what it all means.

Push technology is not an intrusive or unpleasant technology. Quite the contrary, push technology is an enabling tool that will lead to increased information utility, particularly where dynamic information can be converted to intelligence.

AND TRADITIONAL DATABASE COMPANIES?

At the time of this writing, the traditional database companies have not been as aggressive as start ups in the use of push technology. The advanced technology staffs at Reed Elsevier and Thomson have experimented with push tools. Commercial applications should appear within the next 6 to 12 months. Online companies and traditional database companies are becoming active information providers to new intermediaries who deliver information to the desktop. Information Access Co., for example, has a number of licensing deals in place, and that firm's content is flowing

via the push model in several high-visibility services.

In these early days of push technology, the traditional database companies seem content to bide their time and make money via licensing deals or at least believe they will make money with these arrangements with Microsoft Network (MSNBC), Desktop Data, Individual, Inc., and others.

The outlook for aggregators is mixed. Without a strong brand identity, the traditional database companies run the risk of disappearing as a brand identity. However, the apparent strong interest in push technology applied to intranets suggests that a new source of revenue is gaining momentum. Primary publishers are likely to want a piece of the push action themselves.

In short, push technology is creating opportunities for organizations that can think outside of traditional boundaries. New intermediaries are emerging. Traditional database companies do not appear to have a strong hand on the wheel. Keeping their organizations on course and out of harm's way is likely to be a difficult task for many of these firms' managers. These companies are likely to be "pushed" around by some tough, disrespectful start ups. Unless they shove back, traditional database companies and database administrators who like the old pull model of information delivery are going to take some hard knocks.

Despite the turmoil, a mix of push and pull technology will characterize the information datascape for the foreseeable future.

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