

## *What is "Push Technology"?*

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*Push technology is a relatively new means for automating the delivery of news and information to computer "desktops" on the Internet and on internal organizational intranets. Push methods differ from e-mail in their immediacy--real-time data delivery versus a typically delayed "store and forward" methodology used for e-mail--and in their capacity to provide complex graphics, sound, hyperlinks, and scrolling data that e-mail is not designed to accommodate.*

*The push approach may have applications for State government as both user and provider of information. Among the innovative possibilities, California's Resources Agency is investigating how push methods could serve as an alternative to the Emergency Broadcast System and CalTrans is considering "pushing" near-real-time traffic updates and advisories.*

*Push methods also raise concerns about excessive bandwidth use, selection of appropriate applications and information (both for delivery and for receipt by government agencies and personnel), selection of standards for use of the technology, and the prominence of advertising in commercial push products such as PointCast. Bandwidth demands of push systems have led to the banning of push-media subscriptions both in some private industry settings and in at least one State data center.*

### **Push vs. Pull: Different Ways to Use the Web**

In recent years, the Internet has become important in business, education, and government. The most publicized and fastest growing aspect of the Internet is the Worldwide Web. The Web features enhanced typography, photos, sound, and even video images. Users can navigate easily from one Web page to another by clicking on highlighted "hyperlinks."<sup>1</sup> The Web is increasingly important as a source of commercial information, news, government data, and educational resources. If current trends continue it might become the predominant medium in all these areas.<sup>2</sup>

Typically the Web user "pulls" information by requesting specific pages, where a "page" is a file formatted for display on a Web browser such as Netscape Navigator. A new approach instead depends on an information provider "pushing" news, announcements,

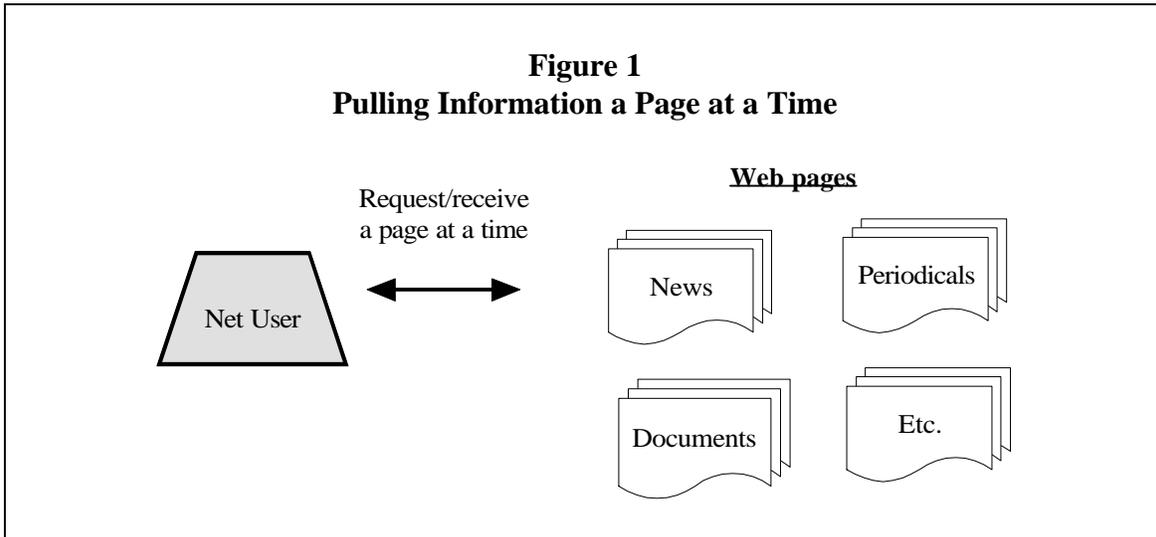
and so on to the user without a specific request for each item, after the user has registered with the provider and indicated the types of information desired for future delivery.

Some observers have questioned whether push methods are actually like e-mail (electronic mail), not really something new. After all, methods such as “listservs” exist to automate the distribution of e-mail messages to large groups of subscribers, essentially creating an ongoing electronic discussion group and forwarding information without a specific user-initiated request for each item. While the fundamental principle of the listserv is similar to that behind push, *push technology permits the distribution of far more complex information and graphics than e-mail can accommodate, and on a real-time basis for which e-mail, a “store and forward” system, is not designed.*

The basic idea of “push” vs. “pull” can be illustrated with a few non-Internet examples (Table 1), as the basic idea is much broader than the Internet technology context.

These are simple examples, but they illustrate the point: “pull” is selection of information at the requester’s initiative; “push” is an automated process delivering something under the vendor’s control, ordinarily under prior general arrangements. The last of the four examples (broadcast or cable TV) is the model after which commercial Internet push vendors seems to be modeling their products, implicitly if not explicitly.<sup>3</sup> The term “webcasting” has been used to suggest the equivalent of broadcasting on the Internet. The names of a number of major vendors and products in the field are plays on this idea.

<b>Table 1</b> <b>Pulling and Pushing Information</b>	
<b>Pulled</b>	<b>Pushed</b>
Books individually selected from the shelves of a library or bookstore.	Books delivered by subscription--such as Library of America--selected by the publisher and sent to the reader.
Magazine or newspaper browsed at the newsstand.	Magazines and newspapers delivered on a regular schedule by subscription.
Audio tape or CD (music or spoken-word recording of a book) selected and played by purchaser.	Radio broadcast--the listener tunes in a station and listens to what is broadcast.
Video rented or purchased by viewer--the viewer makes a choice from what is available on the shelves and watches at his or her convenience.	Movie or other content delivered over broadcast or cable television--viewer selects a channel and receives what the vendor chooses to show (possibly taping for later viewing).

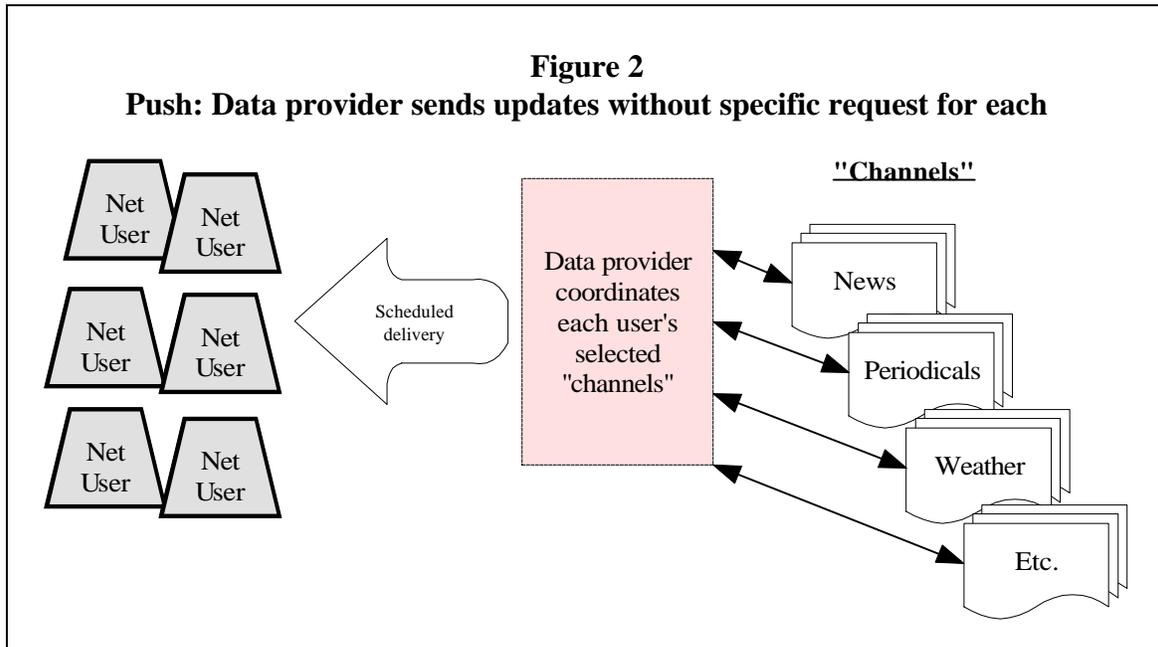


Once the Web user has requested a page, for example a report posted by the Department of Education or a news summary from CNN, the computer receiving the request sends it over the Internet to the user's PC. The process is sketched in Figure 1. The page is then stored on the user's local hard drive and displayed on the monitor.

Any type of digital data may be delivered by means of push as well as by means of pull methods. A Web page, whether designed for pull or push delivery, may include much more than a literal page of information--not only extensive text and graphics, but even sound or video clips. Hypertext links included in the Web page--whether the user receives it automatically via push or by deliberate selection (pull)--may enable the user to retrieve related or referenced pages through a simple click of the mouse.

In contrast to the "pull" model, push technology (loosely diagrammed in Figure 2) sends out information to the user, ordinarily after the user has registered with a data provider and specified what he or she wants to receive. The user need not ask for each separate Web page. In this case, the data sources are termed "channels."

Push methods may be used by organizations to distribute information on their own "intranets" as well as by individual users who have placed the appropriate software on their own PCs in order to have information pushed from the Internet. That is, the technology may be used in diverse settings and in varying ways.



### How Push Technology Works

This note uses PointCast to illustrate push technology. PointCast is a company that provides push software and that sends news and other information to its users. However, the basic principles of push technology are reflected in several products and may be adapted to strikingly different purposes, some of which could be important to California government. It is important to note that the use of push technology is not limited to commercial enterprises. A government agency could distribute information through the same sort of technology, as some examples in a later section will illustrate.

Push requires appropriate software at the user's end (client software) and at the vendor's end (server software).<sup>4</sup> The client software and server software cooperate with one another. The end user has a program on his or her machine that "knows" how to request information, receive it, store it, and display it.<sup>5</sup> The vendor supplying the information has a program that understands and stores the requests it receives from clients, keeps track of clients that have requested particular channels, and sends out ("webcasts") information over the Internet to the client machines.<sup>6</sup>

For example, the PointCast screen (Figure 3) includes menu areas for selecting "channels" (such as CNN, Health, and ZDNet) and the specific file to be viewed (such as the report titled "Will China squash Hong Kong's Net freedoms"), the area for viewing the selected file, an advertisement area (the content of which changes periodically), an information banner identifying update day and time, and various navigation and control buttons and bars.

**Figure 3**  
**An Example of the PointCast Screen**

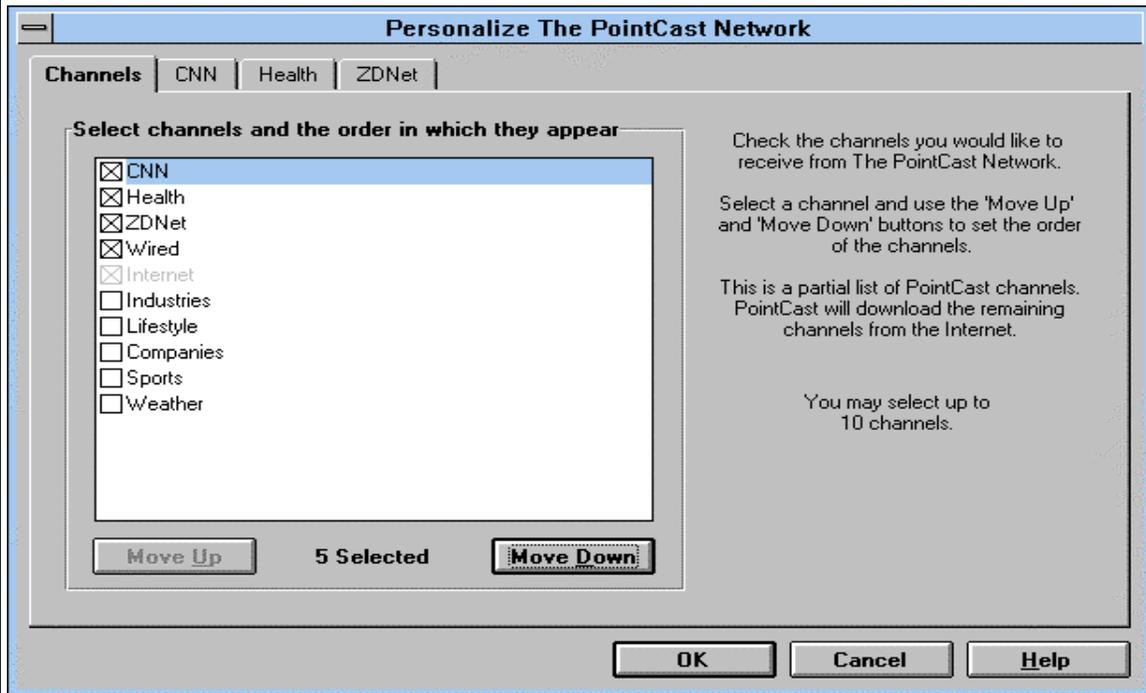


Source: screen print

The PointCast personalization screen (see Figure 4) allows the user to select what “channels” will be downloaded for display. Remember that a channel is for all practical purposes just a Web page that has the necessary coding to work with the push programs at the client and server ends. The user may select subtopics within each channel, for example only getting the front page and editorials from a specific newspaper’s channel.

Push works best--is faster, less obtrusive, and requires less user action--when operating through a direct connection to the Internet, such as large businesses or government agencies might provide for their employees. The direct connection does not go through the telephone network to access the Internet and may typically be left open (that is, connected for sending and receiving of packets) continuously. In that way, whenever the push vendor initiates delivery of information, the user’s connection is open and the machine is ready to receive it in the background. Where urgent “pushed” communications are concerned, such as flood warnings or other emergency notices, the difference between the two types of connection is critical.

**Figure 4**  
**The PointCast Personalization Screen**



Source: screen print

Push is *not* best used with a dial-up connection of the type that many Internet users have,<sup>7</sup> because a user with a dial-up connection must either:

- specifically initiate each update, or
- specify a schedule by which the client software initiates the connection and downloads the specified channels.

A user who has to initiate each update might receive updates late or not at all--the user might neglect to request updates for days or weeks.<sup>8</sup> For a user who must specifically, actively initiate updates to his or her selected channels, push is actually comparable to pull. The difference is that a single update request may trigger a series of downloads in a single session, in accordance with the user's previously specified choices. The user then can browse all of the results off-line.

## Competition in Push Technology

Standards on the Internet evolve from proposals posted by researchers and vendors as “Requests for Comment” (RFCs), testing, user experience, and market power of vendors.<sup>9</sup> The push approach is still new, even in the context of the fast-moving world of the Internet, but already many companies, including those summarized below, are seeking to establish a role, gain market share, and test push technology concepts and techniques.<sup>10</sup> Several companies are pursuing the intranet market rather than seeking a major Internet presence. It is likely that a few (possibly compatible) techniques for push technology will eventually be generally adopted, but it is too early to know which ones or how soon.

Some of the significant firms in the push technology field are:<sup>11</sup>

- **PointCast.** The first of the widely available push products, PointCast functions as a “screen saver,” popping up after the PC has been idle for a while, and displaying the user’s selected channels as windows, boxes, and scrolling messages. PointCast has a long list of available channels—the *Los Angeles Times*, CNN Interactive, TechWeb, and Lifestyles, to name a few.<sup>12</sup>
- **BackWeb.** This company offers a product that is generally similar to PointCast, and also provides software for intranets and “extranets.”<sup>13</sup> The product may be used to distribute software updates online.
- **Marimba.** This company’s product is Castanet (yet another play on the terms “broadcasting” and “network”). This product can also be used for software distribution.
- **Netscape.** This company’s well known Web browser is being updated to include Marimba’s Castanet technology.<sup>14</sup>
- **Microsoft.** This leading software company is adding push features to new generations of its operating systems products and “Internet Explorer” browser,<sup>15</sup> and has proposed a standard for push technology, called Channel Definition Format (CDF), that has not (yet, at least) been widely accepted.<sup>16</sup> In short, CDF defines a specific set of instructions to be included on Web pages in order to turn them into “channels” for receipt and display by compatible client software (that is, client software that understands CDF).<sup>17</sup>
- **Intel.** This major producer of computer chips, including the central processing units (80486, Pentium, and so on) of numerous personal computers, is leading a push-related effort called “InterCast.” InterCast combines Web pages with television

broadcasts, so that Web pages pertinent to a broadcast are sent to the user's hard disk, for retrieval when the user chooses.<sup>18</sup>

### **Possible Directions**

Push *could* turn out to be the Pet Rock of the Internet--a fad that disappears from the market once the novelty wears off.<sup>19</sup> However, it appears much more likely that push technology will become part of a varied set of techniques for using the Internet and intranets--a useful (but not exclusive) set of tools for distributing information. That may take some time while competing and complementary methods, standards, and applications are sorted out and tested and as other technical developments<sup>20</sup> affect the growth and use of the Internet and of intranets.

Push technology could be the vehicle by which the Web begins to look like newspapers, magazines, and journals: a subscription system funded by fees plus advertising, with a trade-off between the two (that is, higher price in exchange for fewer or no advertisements). In this case, one might expect there to be highly segmented audiences. Some channels (like general-interest periodicals) would be for a general audience and others for each of many different specialized interests.

Push technology might also succeed in making the Internet more like television and radio: a relatively passive medium delivering information and entertainment interspersed with advertising but able to provide urgent information quickly and widely.

### **“Customized Pull” as an Alternative to Push**

An alternative to push techniques is what might be called “customized pull.” That alternative would have the user establish a profile with the data provider, specifying specific topics or sub-topics to be included in responses to the user's queries. That is, the user would fill out a form indicating which type of item he or she wishes to receive when making subsequent data requests. This would be a bit like placing a standing order at a restaurant, so that when you walk in the door, the kitchen immediately serves up (say) the soup of the day, the featured salad (whatever it might be that day), and the daily fish entree, but no bread, no beverage, and no dessert. The waiter would never bring you steak, a sandwich, a pasta selection, or a vegetarian entree. Every time you show up at the door, the kitchen fixes the same type of meal for you--the one you already specified as your preference (your lunch profile, so to speak)--until you fill out a form for a new standing order. But the restaurant is not delivering. You have to go there.

Customized pull might help to serve the purpose of push methods (automating much of the process) while avoiding the problem, described by technology consultant Cheryl Currid, that “all too often, people end up with too much pushed information.”<sup>21</sup>

Some search engines (online services that find information on the Web on request) provide this sort of service, allowing the user to specify topics of interest and have new information on those topics ready in advance of the next visit to the search engine's site.<sup>22</sup>

### **Potential Applications for Government**

There are three general roles in which government might use push technology: as consumer of information from the Internet, as provider of information over the Internet, and as user of push technology on (internal) government networks. To at least some extent, these roles could overlap.

**As consumer of pushed information over the Internet**, government users would be like any other Internet user, establishing a relationship with vendors so that selected channels are delivered to their desktops. The possible uses are very broad. These might include meeting public affairs personnel's need for information on agency policy areas, researchers' need for newly released technical documents, and school classrooms' need for curriculum-related information.

**As provider of pushed information over the Internet**, government agencies would make information available in push format compatible with PointCast, Castanet, or some other standard. Reporters, organizations, businesses, and individuals using the Internet could then receive updates on selected topics automatically along with other push channels to which they have subscribed. Information made available by this means could be as diverse as legislative schedules (and even live audio and video of hearings), highway information, notices of new laws or regulations, announcements regarding public parks and recreational facilities, and dates for hunting and fishing seasons. Few such initiatives appear to be far along at this time, but the California Department of Transportation (CalTrans) is considering offering near-real-time traffic updates and advisories--possibly including video of significant roadways--via push methods.

Essentially any type of frequently updated document or information that is now distributed by mail or that is regularly requested by interested parties might be delivered efficiently and cost-effectively over intranet(s), the Internet, or both. Some of these (not all of which are necessarily feasible for push techniques at this time) might include those outlined in Table 2.

"Customized pull" might make more sense for some types of information. Under that system, users would specify their topics (ranges of SAM sections, for example), but would request updates when they chose to pull them, at that time receiving updates to all of their previously specified topics. The updates would not be automatically pushed their way. The choice of methods is a matter for analysis by data managers in consultation with users

of the information, in order to determine the most effective and efficient alternative for handling each type of information, from perspectives of data providers/managers *and* data users.

<b>Table 2</b>	
<b>Examples of Topics and Audiences for Pushed Information</b>	
<b>These topics (channels) . . .</b>	<b>Might be distributed to . . .</b>
Updates to the State Administrative Manual (SAM)	Personnel across State government who must keep up with the manual
Revisions to personnel regulations	Agency and department personnel offices
Civil service examination notices and announcements of state job openings	Departments within government; colleges and universities; and members of the public
Training, management information, schedules	State agencies, employees
Notices of environmental documents, such as draft Environmental Impact Reports	State and local agencies and the public
Procurement documents, requests for proposals, and notices of contracts going out to bid	Prospective suppliers and contractors
Press releases and public notices of all types	Press and public
Emergency notifications	Public safety agencies, press, and general public
Legislative schedules	The press and interested public
Audio and video of hearings and legislative sessions	Educational institutions, the press, interested public

*As user of push technologies on government networks* (intranets) for internal purposes, government agencies would adapt push methods on their own networks to serve the needs of government agencies and employees for internal dissemination of management information, training, schedules, and so on (including some of the types of information outlined above). In this way, agencies could assure that a uniform set of information is provided to all employees.

One innovative potential use of push technology is under evaluation within the California Resources Agency. The potential use would be as a supplement to the Emergency Broadcast System, which is well known through its occasional test tones on the radio and the announcement, “*If this had been an actual emergency . . .*” The system would push emergency information (flood warnings, highway hazards, approaching storms, and so on) onto computer desktops via the Internet. The system could permit messages to be sent

across the system by news media, law enforcement officials, environmental agencies, and so on, to users who had subscribed to the emergency warning channel. A source-verification system would authenticate the sender and enable source information to be included with the pushed advisory. For example, a scrolling message might advise, *“National Weather Service advises severe thunderstorm approaching Sacramento from northeast as of 5:00 p.m., with potential flash flooding.”* The system could operate almost in real time, with a 15 to 20 minute delay.<sup>23</sup>

A system of this type would require continuous Internet connections, as such information cannot wait for users to log on and request an update. The more direct Internet connections (or equivalent) there are, the more effective such a system could be as a means of immediately notifying the public in the case of an emergency. Suitable connections might include radio receivers connected to PCs and tuned to an emergency channel that broadcasts Internet data, in addition to standard types of direct Internet connections.

### Public Policy Issues

- **Bandwidth.** Push technologies can be very heavy users of network bandwidth (capacity to carry data), especially if many users are updating their subscribed channels at the same time. This is a potential resource allocation issue that can be of concern to government agencies, businesses, and other large organizations with many push users, as system capacity may be inadequate for the higher peak loads generated by mass updates. For this reason, California’s Teale Data Center has banned the use of PointCast.<sup>24</sup> Bandwidth costs money. If bandwidth requirements rise sharply at peak periods to accommodate receipt of push channels, then more bandwidth (higher capacity connections) may be needed so that employees can do their work without delays or interruptions caused by clogging of the network.
- **Appropriate use.** Pushed channels may include an enormous array of information with little or no connection with the needs of the employers or with the job responsibilities of the employee. This information, such as inconsequential news reports, sports scores, stock market data--and accompanying advertising and graphics--might take up employees’ time and put an extra load on computer data storage capacity. Further, updates to push channels can interrupt employees’ work by splashing banners and notices on the screen or simply stalling other processes while the download proceeds. For these reasons, government agencies may need standards of appropriate use specifically to address the use of push technology on the Internet.
- **Selection of standards.** Different standards for push technology have been proposed or are in current use. Government agencies that choose to make use of push technology, whether via the Internet or via internal networks, must evaluate the

alternatives and choose which to adopt--or whether to wait for clear standards to be established. The selection of standard(s) to adopt may be a complex question, reflecting both technical comparisons and market penetration and acceptance.

- **Charging for government information.** If government agencies get into the business of offering pushed information, the question may arise as to whether they should establish subscription fees. This may simply be impractical or considered inappropriate, given the ease and speed with which documents are redistributed on the Internet and the fact that most information provided by government is in the public domain, but a case-by-case analysis might be needed.
- **Purchase of online information.** Government agencies may need subscriptions to pushed sites that offer information needed by employees, such as periodicals, research reports, and so on. A mechanism may be needed for reviewing, approving, and funding such expenses, especially where they do not fall into agencies' established categories for purchases. It may also be appropriate to bundle subscriptions under site licenses or equivalent, in preference to numerous individual purchases, to minimize total costs.
- **Advertising.** Commercial push vendors depend on advertising, pushed along with the content. Government information distributed through push commercial push media companies presumably will be accompanied by the same sorts of advertising that the vendor sends along with the user's other selected channels. This may raise issues of appropriateness. It may also raise the question of whether government agencies that provide such information should receive a portion of advertising receipts or otherwise be paid for content. On the other hand, such advertising may be seen as inconsequential, comparable to advertising in newspapers and magazines that report on government actions or make use of government press releases and public affairs information.

Advertising alongside pushed content received by schools may be viewed with the same reservations that have surrounded the advertising-supported Channel One satellite TV system to which some schools subscribe. Here, too, though, such advertising may be seen as unimportant, essentially like the advertising in *Newsweek*, *The Los Angeles Times*, or other periodicals that a school library or classroom might use.

## Selected Policy Options

The following are options for consideration, not recommendations.

- California could examine whether push technology methods (and customized pull) should be explicitly included in long-term planning for State computer systems. Potential uses could include provision of training, dissemination of notices at department, agency, and state-government-wide levels, and distribution of information tailored to job needs of specific employees or units. Such an examination could be conducted through hearings or through a request to the Department of Information Technology.
- The Legislature could consider whether legislative hearings and floor sessions should be made available over the Internet through push techniques, and if so, under what conditions or limitations.
- The Department of Information Technology could be asked to review the need for guidelines regarding state employee use of push technology products such as PointCast and BackWeb, considering bandwidth demands, appropriate use issues, and potential benefits for job performance.
- California could formally examine the potential costs and benefits of a push-technology-based method of emergency notification to supplement the Emergency Broadcast System, and consider potential funding mechanisms if such a method is found to be desirable and cannot be accommodated within existing allocations.
- California could examine the potential costs and benefits of push methods for distribution of state documents within government and to the public. Can use of this technology make document distribution more efficient or less costly? Should limited experimentation be authorized in order to test this approach and to examine other alternatives?
- The Legislature could request an examination and report on the potential uses of push technology in the delivery of educational resources to K-12 education and the issues that the technology might raise.

### **Selected Sources and Further Reading**

*I have drawn from newspaper and magazine articles (most posted online), from vendor information posted on the Worldwide Web,<sup>25</sup> and from the personal testing of PointCast via a dial-up connection.<sup>26</sup> As with everything else having to do with the Internet, information on push technology is voluminous and constantly changing. The items listed below are a few of those I consulted, but not necessarily a representative sample of the resources available.*

Aragon, Lawrence. "When Shove Comes to Push." *PC Week Online*, February 10, 1997 (posted at <http://www8.zdnet.com/pcweek/business/0210/10push.html>).

Cortese, Amy. "A Way out of the Web Maze." *Business Week*, February 24, 1997 (as posted online).

Currid, Cheryl. "Push, But Don't Shove." *Information Week*, July 14, 1997, p. 140.

Dunn, Ashley. "Technologies that Push Chaos Onto Your Desktop." *New York Times*, January 1, 1997 (posted at <http://www.nytimes.com/library/cyber/surf/010197surf.html>).

Gleick, James. "Push Me, Pull You." *New York Times Magazine*, March 23, 1997 (posted at <http://www.around.com/push.html>).

Haskin, David. "Getting the Online Scoop." *ZD Internet Magazine*, April 1997.

Kramer, Art. "Web Sites Becoming Pushy." *The Atlanta Journal and Constitution*, June 8, 1997 (as posted online).

Markoff, John. "Microsoft to Unveil Explorer 4.0 and Media Alliances," *New York Times* (online edition) July 15, 1997 (<http://www.nytimes.com/library/cyber/week/071597microsoft.html>).

Rothstein, Edward. "'Push' Technology Makes the Internet Come to You." *New York Times*, January 20, 1997 (posted at <http://www.nytimes.com/library/cyber/techcol/012097techcol.html>).

Schiesel, Seth. "Push Technology: Digging In Despite Criticism." *New York Times*, June 2, 1997 (posted at <http://www.nytimes.com/library/cyber/digicom/060297digicom.html>).

Shenk, David. *Data Smog: Surviving the Information Glut*. New York: HarperCollins, 1997.

Sweet, Lisa. "Pushing it to the Limit." *ZD Internet Magazine*, April 1997.

Thompson, Clive. "Push Comes to Shove on the New Internet." *Newsday*, June 15, 1997 (as posted online).

Umbach, Kenneth W. *The Internet: A California Policy Perspective*. Sacramento: California Research Bureau, 1997. This document is unofficially posted in several formats at the author's Web site, <http://www.unlimited.net/~kumbach>.

Williamson, Miryam. "The Pull of Push," *WebMaster Magazine*, July 1997. Posted at [http://www.cio.com/WebMaster/070197\\_push\\_content.html](http://www.cio.com/WebMaster/070197_push_content.html).

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## Endnotes

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<sup>1</sup> For background on the Internet, see Kenneth W. Umbach, *The Internet: A California Policy Perspective* (Sacramento: California Research Bureau, 1997). I have not attempted to repeat here the background, definitions, and explanations of Internet-related terminology provided in that paper. The present note covers a topic that was not addressed in the earlier paper, as it was still very new when that paper was being researched.

<sup>2</sup> Some view the growth in data traffic with concern. David Shenk, for one, points out the problems caused by the excessive information that he calls "data smog." See his *Data Smog* (N.Y.: HarperCollins, 1997). In a nutshell: "The information tools that yesterday's techno-utopians dreamed about have arrived, but the machines are not the cultural panaceas they had prophesied." (P. 65.)

<sup>3</sup> For an acerbic take on this point, see James Gleick, "Push Me, Pull You," posted at <http://www.around.com/push.html>, and originally published in the *New York Times Magazine*, March 25, 1997. In a nutshell, Gleick's view is that "Push is the silliest piece of puffery to waft along in several seasons . . . nothing more than a thinly disguised return to ideas of information delivery that the Internet has made obsolete."

<sup>4</sup> Web pages that are to be pushed require certain formatting adjustments or additional information, compared to a normal Web page, although the details vary from one push technology vendor to another. Examination of formatting requirements or of details of the technology is beyond the scope of this note. For information on the formatting requirements of one vendor, see the Marimba Castanet documentation posted at <http://www.marimba.com/doc>. Also see "Netscape Netcaster Unveiled: Step-by-Step Guide to Converting Web Sites to Channels," <http://webreview.com/97/05/16/addict/index2.html>. For information on BackWeb, see <http://www.backweb.com>. Technical procedures for push technology are within the bailiwick of appropriately trained computer geeks and nerds, although it is possible that the procedures will become automated and simpler to implement as the technology develops.

<sup>5</sup> In the case of PointCast, the user downloads the client software from [www.PointCast.com](http://www.PointCast.com). In the case of BackWeb, a similar provider, the user downloads the client software from [www.backweb.com](http://www.backweb.com). Microsoft and Netscape are including push features in the new versions of their browsers.

<sup>6</sup> If the client-server system is on an intranet--an internal network that works in a manner similar to the Internet, but for a specific organization--then the information is traveling over that network, not over the Internet, but the basic idea is the same.

<sup>7</sup> See Umbach, *The Internet: A California Policy Perspective*, p. 11.

<sup>8</sup> Some reports suggest that many PointCast users, after a while, neglect to request updates forever, and uninstall the software.

<sup>9</sup> See Umbach, *The Internet: A California Policy Perspective*, pp. 14-16, and sources cited therein.

<sup>10</sup> PointCast issued a test version of its client software in February of 1996, and the product has been through several revisions since, as competitors have entered the market. By comparison, the Web became part of Internet services in 1991, a date of almost Paleolithic appearance in the Internet universe; Web browser Mosaic appeared in mid-1993--and has long since been eclipsed by Netscape Navigator and Microsoft Internet Explorer.

<sup>11</sup> These are only a few of the companies in the field. The "Web Broadcasting '97" conference site lists 21 "push technology providers" (<http://www.thunderlizard.com/wb-links.html>). Neither Microsoft nor Netscape was among those listed, but both have entered the field (in Netscape's case, in cooperation with Marimba). The Web Broadcasting '97 page also provides links to a series of articles on push technology, streaming media, and agents.

<sup>12</sup> Each “channel” has its own selection of topics. The following are summaries of four “channels” posted at <http://www.pointcast.com>:

Sections of the Los Angeles Times channel include Daily Photo, Front Page, Nation & World, State & Local, Sports, Business & Technology, Life & Style, Calendar and Commentary.

The CNN Interactive channel covers a wide range of news topics around the clock. From World and US events, to Politics and Business news. Timely coverage on Health, ShowBiz, Earth, Style and Technology. News Quiz and Almanac add fun to your daily reading.

[T]he TechWeb channel broadcasts dozens of stories daily and breaking news on the high-tech industry, latest product news on hardware and software, networking and the Internet.

The Lifestyles Channel provides a quick update of the latest film, TV, and entertainment news and information from Reuters. In addition, daily horoscopes from AccuWeather, and daily lottery results for all states, courtesy of LottoNet New Media Services, are broadcast directly to viewers' desktops.

<sup>13</sup> “An extranet is a collaborative network that uses Internet technology to link businesses with their suppliers, customers, or other businesses that share common goals. The term has been used by Jim Barksdale and Mark Andreessen of Netscape Communications to describe software that facilitates intercompany relationships.” Definition posted by Whatis.com, Inc., at <http://whatis.com/extranet.htm>.

<sup>14</sup> According to a Marimba press release, “Castanet technology will be integrated and bundled with Netscape® Communicator, which will be released later this year . . . Any of the hundreds of existing Castanet channels can be seamlessly viewed inside of Netscape Communicator.” Posted at <http://www.marimba.com/press/netcaster-apr15.html>, dated April 15, 1997.

<sup>15</sup> According to a report in the *New York Times* (online edition), July 15, 1997: “Companies or media organizations that will deliver World Wide Web pages in the form of channels that can be directly embedded into the Windows 95 desktop -- or control screen -- include Warner Bros., Disney Online, CBS, Sportsline, the Discovery Channel, ESPN Sports Zone, MTV, National Geographic, The New York Times and The Wall Street Journal.” John Markoff, “Microsoft to Unveil Explorer 4.0 and Media Alliances” (<http://www.nytimes.com/library/cyber/week/071597microsoft.html>).

<sup>16</sup> The official documentation for Channel Definition Format (CDF) includes the following summary (posted at <http://www.w3.org/TR/NOTE-CDFsubmit.html#Introduction>):

The Channel Definition Format is an open specification that permits a web publisher to offer frequently updated collections of information, or channels, from any web server for automatic delivery to compatible receiver programs on PCs or other information appliances.

Automatic means that the user need only choose the channel once, and thereafter, scheduled deliveries of information to the client will occur without further user intervention.

Standard web server means that any web server that uses the HTTP 1.0 or later protocol can broadcast channels.

Compatible means any program that implements processing and retrieving content as specified by the Channel Definition Format described below.

When downloaded to a client, CDFs act as a local index to its channel's available content. For example, a receiver program can present the implicit hierarchy in a CDF within a channel selector.

<sup>17</sup> For comparison, imagine the situation if your television set could receive broadcasts only from specific stations--that is, that your TV set had to be compatible with particular television channels in order to receive and display their broadcasts.

<sup>18</sup> See <http://connectedpc.com/iaweb/intercast/> for descriptive information.

<sup>19</sup> See, for example, David Bank, "New Web Browsers Play Down TV-Channel Approach," *Wall Street Journal*, September 30, 1997, p. B1. Bank suggests that Microsoft, for example, is "distancing" itself from its previous enthusiasm for the technology.

<sup>20</sup> These might include faster Internet connections, integration of Internet access into television sets, easier to use browser software, and better indexing of Web sites.

<sup>21</sup> Cheryl Currid, "Push, But Don't Shove," *Information Week*, July 14, 1997, p. 140.

<sup>22</sup> Currid, "Push, But Don't Shove."

<sup>23</sup> Gary Darling, California Resources Agency, personal communication, July 7, 1997.

<sup>24</sup> Sue Rodger, of the Teale Data Center, advised me of this policy, but noted that it has not been possible to fully enforce it. The push-bandwidth issue may also have broader implications for the viability of the Internet. That is, heavy use of push methods could add to the capacity problems that are increasingly evident on the Internet.

<sup>25</sup> Including documents from Netscape (<http://www.netscape.com>) and Marimba (vendor of Castanet) (<http://www.marimba.com>).

<sup>26</sup> PointCast software may be downloaded from <http://www.PointCast.com>.