LEVELS AND BOUNDARIES: ANOTHER LOOK AT INTERNET CONTENT
by Kevin Werbach

Today’s Internet is like a teenage boy’s room: It’s very hard to find anything, but you can be sure there’s pornography in there somewhere.

In other words, the real problem with the Internet is not the type or volume of content; it’s the limitations of existing navigational and search tools. Grown-ups have difficulty preventing children from viewing pornography and other inappropriate materials for the same reason search engines often don’t point you to the right site: They can’t locate it. One reason Yahoo! has a $5 billion market capitalization is that the Web is simply unusable without tools to find what you’re looking for.

There is a better way. The Net is fragmenting, both vertically (into multiple levels of meaning) and horizontally (into bounded online communities). Content labeling is part of this process. Labels first gained prominence as tools to enable filtering of material deemed inappropriate for children, but they can serve many other functions. In this issue, we examine the emergence of labeling and filtering systems, and what they mean for the future of the Internet.

There is significant overlap between the debates over privacy protection and content controls on the Internet (and we have previously linked them; see Release 1.0, 12-96 and 2-97). The two issues pose a common problem — absence of sufficient self-regulation to keep governments at bay — and common solutions — labeling and local choice. For privacy, labeling means disclosure of privacy policies, negotiation with users and use of trustmarks such as the TRUSTe system. For content, labeling means rating sites so that users can filter out the ones they consider inappropriate for themselves or for children.

The good news is that concerns about Internet content have fostered development of labeling infrastructures with benefits in many other areas. At least 35 companies have stepped

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into the breach to offer content controls to parents, schools and companies. Labeling can address concerns about protecting children on the one hand, and government-imposed censorship on the other.

But we're not quite there yet. Despite industry efforts, legislators continue to propose restrictions on certain types of content. Filtering companies have rated hundreds of thousands of sites, but out of an estimated 10 million separate information sources on the Web. Users have few choices of label sets catering to specific values or interests; the recent deal between Cyber Patrol and the Anti-Defamation League to create a rating service for hate speech is a welcome development. We're also missing truly easy-to-use tools for creating customized labels. Labeling and filtering won't take off until users can rate sites with one or two clicks (in content-creation tools, bookmark-management applications and elsewhere).

We're optimistic these limitations can be overcome. Filtering began as a way for parents to keep pornography away from their kids, but significant new demand is coming from companies and schools eager to control what goes over their networks. The Extensible Markup Language (XML) and related technical specifications will make it easier to label content in multiple ways, and to distribute those labels. Better search and navigational tools will require information about the information on the Web, assigned explicitly or generated on the fly from aggregate usage patterns. People will continue to filter themselves into bounded online communities that track their interests.

Before exploring the many roads to content labeling, we begin with the latest developments in the policy realm. The threat of government action has long driven technology in this area. Despite much progress, many of those who first put Internet content controls on the map are not satisfied with private solutions.

UPDATE FROM THE POLICY FRONT

Son of CDA

When the Communications Decency Act (CDA) was proposed in 1995, it galvanized the online community both politically and technically. A federal court declared the CDA unconstitutional shortly after it was passed in February 1996, and in June 1997 the US Supreme Court affirmed that decision in Reno v. ACLU. Most of the Net community breathed a sigh of relief. The court decision did not, however, eliminate the concerns that fostered the legislation in the first place. Efforts to legislate controls on online speech have continued, both in the United States and elsewhere.

Senator Dan Coats (R-IN), one of the CDA's sponsors, has introduced a new more narrowly written bill, limited to commercial Websites, that would prohibit them from allowing children to access material that is "harmful to minors." Constitutional or not, the Coats bill uses the same basic approach as the CDA: Criminalizing a category of content. Several of the organizations that fought the CDA, such as the Center for Democracy and Technology (CDT) and the American Civil Liberties Union (ACLU), have announced their opposition to the Coats bill. The full Senate could consider the bill as early as this month.
Several states have also adopted legislation to restrict online content. New Mexico, for example, recently passed a law that bans the dissemination of material deemed “harmful to minors” on the Internet. The ACLU, joined by the Electronic Frontier Foundation (EFF), has filed suit to declare this law unconstitutional. The ACLU’s Cyber-Liberties Web site lists 13 states that have passed laws to regulate Internet speech, with legislation pending in an additional 10. The argument for the futility of the CDA — that one country could not effectively prohibit speech on an inherently global network — applies with additional force to individual state laws.

No filter, no $$

Senator John McCain (R-AZ), Chairman of the Senate Commerce Committee, has introduced the “Internet School Filtering Act” which would require schools and libraries to install filtering software in order to receive the new Universal Service Fund’s benefits. This program allows schools and libraries receive discounts on telecommunications and information services, including Internet access. Vice President Gore has endorsed an alternative to the McCain bill that would require schools and libraries to implement acceptable use policies, without necessarily requiring the use of filtering software.

Filtering is particularly controversial in libraries, which straddle the boundary between government-operated public forums and educational environments for children. The American Library Association has voted to oppose library filtering. Many individual librarians and city governments, however, strongly support the use of filtering software, especially on computers in children’s sections of libraries. Last month, a federal judge in Virginia refused to dismiss a suit brought by ACLU and People for the American Way challenging mandatory library filtering in Loudon County.

Let’s talk about this

The computer and communications industries have responded to these initiatives in several ways, including supporting groups such as the EFF, ACLU and CDT; working through the World Wide Web Consortium (W3C) to develop labeling technologies (see PICS, page 7); labeling many popular Web sites and educating policy-makers.

Perhaps the most visible activities have been conferences to bring together industry and government representatives. The most significant was the Internet Online Summit, held December 1 to 3 last year in Washington, DC. The summit featured speeches by Vice President Al Gore, Attorney General Janet Reno and Commerce Secretary William Daley, and participation from most of the players in the filtering and Internet content arenas. The Organization for Economic Coordination and Development held a similar, if lower-level, event in Paris on March 25.

These events show that industry players are willing to address concerns about inappropriate materials on the Internet. Several organizations announced initiatives at the Internet Online Summit, including netparents.org (a resource for parents to learn about content-control technologies) and the American Library Association (which unveiled a collection of over 700 organized and annotated links to “great sites” for kids).

On June 11 to 12, the Clinton Administration and the Annenberg Center for Communication at the University of Southern California will host a White
House Internet Summit to discuss digital content for children and teenagers. This event is billed as third in a series, following the December online summit and a February conference on Internet access for rural and low-income communities. The June conference will examine ways to make online content for children more widely available and easier to find. (In the long run, children’s experiences with the Internet will depend more on educational and entertaining content than on what we don’t want them to see.)

Outside the United States

Content issues also attract government attention outside the US. What counts as “inappropriate” varies from country to country. In the US, political material is the paradigm of speech that should be protectible under the First Amendment. In China, criticism of the government may land you in jail for subversion. Some countries, such as Singapore, are in effect constructing national intranets, using proxy servers to filter all international communications into and out of the country.

The transnational nature of the Internet may limit the effectiveness of such systems, especially as the number of international connection paths increases. Still, governments that really want to limit speech can do so. The best response will be to convince them that such actions will hamper their ability to engage in electronic commerce, and that voluntary alternatives (such as end-user filtering software) are available. This is the approach Ira Magaziner and the Clinton Administration have taken with their Framework for Global Electronic Commerce.

The policy debate about content in the US has generally centered on the role of content creators. By contrast, many European countries have emphasized a different side of the equation, the Internet service providers (ISPs). “Codes of conduct” for ISPs have been developed in several countries by ISP trade associations, often at government “urging.” In these codes, ISPs typically commit to prohibit or remove materials from their sites that violate specified standards of decency.

Martin Bangemann, the member of the European Commission (EC) responsible for telecommunications and information technology, has suggested a “global charter” for the Internet. Bangemann’s idea is that the governments of the world would negotiate baseline rules for a variety of Internet policy questions, including content regulation. The EC formally endorsed the idea in February, and the United States has expressed qualified support for such an approach. A more detailed proposal is expected later this year. The EC has also allocated 10 million ecu for the INCORE (Internet Content Rating for Europe) initiative to develop a European rating system. These efforts may be valuable, but in their current forms they tend towards government-mandated systems rather than user choice.
NEW ADVENTURES IN FILTERING

We have previously covered many of the major players in the filtering business and their products, including Microsystems, Inc. 1 (Cyber Patrol), Net Nanny, Net Shepherd, PlanetWeb, SafeSurf, RSACi, Solid Oak (CYBERsitter) and SurfWatch (see Release 1.0, 12-96). The table on page 6 compares these and other leading products in the filtering space.

(Note: The numbers are not entirely reliable, because companies use different methodologies to calculate them. Larger numbers do not necessarily mean that a product is more comprehensive.)

Since we first compared filtering products 17 months ago, the user numbers have shown the typical Internet growth curve. The number of rated sites has also increased dramatically. The claims are impossible to evaluate, especially because virtually no company (except Net Nanny) lets users see its full list of blocked items. If as Steve Lawrence and Lee Giles of the NEC Research Institute recently estimated there are 320 million documents on the Web today, these products still have a way to go. On the other hand, the primary goal of most filtering products is to find sites that are inappropriate for children, a much smaller number.

How widely are these products actually used? A study late last year sponsored by FamilyPC magazine found that only 26 percent of parents surveyed used some form of parental control software (including the built-in features available through Microsoft Internet Explorer, AOL and elsewhere), and only 4 percent employed a standalone filtering product. These numbers don't necessarily prove that labeling isn't working. Parents may make conscious choices not to filter what their children view; the same survey found that 78 percent of parents monitor their children as they surf. AOL reports that 45 percent of families with children enable some form of its parental controls (see page 13), which suggests that many parents will take advantage of tools that are simple and readily available. FamilyPC editor-in-chief Robin Raskin believes one of the biggest hurdles for filtering software is that parents feel too much work is required to install and configure the standalone products.

The next application of content labeling will be integration of filtering with search engines. Net Shepherd began offering a filtered version of Digital's Alta Vista search engine last fall, and in February N2H2 announced an agreement to provide a filtered version of the Inktomi search service (see page 11). These services prevent users not only from visiting sites on the blocking list, but also from seeing information about them in search results. With search engines becoming increasingly central "portals" to the Internet, the option of a filtered search (so long as it is only an option) is highly valuable. Using these tools, children engaging in research for school will be less likely to stumble across the wrong kind of information.

1Now a subsidiary of The Learning Company.

Release 1.0  21 May 1998
### Major Filtering Products

<table>
<thead>
<tr>
<th>Company (Product)</th>
<th>Number of Users</th>
<th>Sites rated</th>
<th>Source of Ratings</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content Advisor</strong></td>
<td>Launching 6/98</td>
<td>1,500,000³</td>
<td>employees</td>
<td>server</td>
</tr>
<tr>
<td><strong>Kansmen</strong> (Little Brother)</td>
<td>500,000 desktops</td>
<td>300,000</td>
<td>employees</td>
<td>server</td>
</tr>
<tr>
<td><strong>Learning Company</strong> (Cyber Patrol)</td>
<td>2,000,000+</td>
<td>60,000 NO employees, 50,000 YES teachers/parents</td>
<td>client, server</td>
<td></td>
</tr>
<tr>
<td><strong>N2H2</strong> (Bess)</td>
<td>4,000 schools, 120 ISPs</td>
<td>400,000</td>
<td>employees</td>
<td>server</td>
</tr>
<tr>
<td><strong>Net Nanny</strong></td>
<td>1,000,000 copies installed</td>
<td>100,000³</td>
<td>employees</td>
<td>client, server</td>
</tr>
<tr>
<td><strong>Net Partners</strong> (WebSENSE)</td>
<td>2,000,000</td>
<td>200,000</td>
<td>employees</td>
<td>server</td>
</tr>
<tr>
<td><strong>Net Shepherd</strong></td>
<td>NA</td>
<td>500,000+⁴</td>
<td>volunteers, bureaus</td>
<td>client, label bureau⁵</td>
</tr>
<tr>
<td><strong>Planet Web</strong></td>
<td>NA</td>
<td>50,000+⁶</td>
<td>employees, students</td>
<td>server</td>
</tr>
<tr>
<td><strong>RSACi</strong></td>
<td>NA</td>
<td>70,000+</td>
<td>self-rating</td>
<td>label bureau</td>
</tr>
<tr>
<td><strong>SafeSurf</strong></td>
<td>NA⁷</td>
<td>100,000+</td>
<td>self-rating, volunteers</td>
<td>label bureau</td>
</tr>
<tr>
<td><strong>Secure Computing</strong> (SmartFilter)</td>
<td>NA</td>
<td>250,000</td>
<td>employees</td>
<td>server</td>
</tr>
<tr>
<td><strong>Solid Oak</strong> (CyberSITTER)</td>
<td>1,500,000 licensed copies</td>
<td>100,000⁸</td>
<td>employees, self-rating</td>
<td>client, server</td>
</tr>
<tr>
<td><strong>SurfWatch</strong></td>
<td>8,000,000 copies installed</td>
<td>100,000⁹</td>
<td>employees, contractors</td>
<td>client, server, bureau</td>
</tr>
</tbody>
</table>

* Indicates ratings that are PICS-compatible.

²Total database entries; sites can have multiple entries. The number of separate sites is much smaller, but the company will not estimate it.
³Includes sites on words and phrases lists; 20,000 sites labeled.
⁴2,000,000 total URLs; over 500,000 represent the main page of a site.
⁵Distributes labels that can be used with other companies’ software.
⁶61,400 database records covering 50,000 complete sites.
⁷Previously offered Internet Filtering Solution.
⁸Estimated blocked sites. Works primarily through phrase filtering.
⁹Number of rates sites in database; ratings provided by others.
The Platform for Internet Content Selection (PICS) provides a standardized technical format for labeling Internet content and for distributing those labels (see Release 1.0, 12-96). Designed as a less-intrusive alternative to the CDA, PICS is a standard for labels, not for content. By making it easier to create new labeling systems, PICS facilitates a diversity of labels. Although the CDA is just a memory, work on PICS has continued under the auspices of the W3C.

Most filtering products on the market today can read labels in PICS format, and Microsoft Internet Explorer versions 3.0 and up include a “content advisor” feature that accepts PICS-compatible labels with RSACi as the default. Netscape will support PICS and RSACi in a new version of Communicator to be released later this year. On the other hand, we are disappointed that many filtering products, especially the server-based services, still are not compatible with PICS. PICS reduces the cost of creating new rating systems, giving consumers a broader range of choices. The ability to mix and match different sets of labels will be important if filtering is to achieve critical mass. In the long run, insistence on proprietary approaches will reduce user acceptance and hurt the filtering industry.

A controversial PICS development is PICSRules, a standard for filtering profiles. A profile is, in essence, a further abstraction built on top of the PICS labeling architecture. Labels tell you about content, while profiles tell you what to do with content based on certain labels. Such profiles are important: A certain level of violence may be perfectly acceptable for a 15-year-old but excessive for a 5-year-old. Similarly, individual parents will have different views about whether sites discussing homosexuality are appropriate for their children. (Remember the fight over broadcast TV ratings?) PICSRules allows parents and others to set their own criteria for ratings.

Filtering software already allows users to set preferences for the types of content they wish to block. These profiles are limited, however, as are labeling systems not compatible with PICS. Without a public standard, profiles cannot easily be shared across multiple applications or users. PICSRules also makes it far easier for organizations to distribute filtering profiles. Groups ranging from People for the Ethical Treatment of Animals (PETA) to the local PTA can generate profiles and make them available to their members. Parents can simply load a profile developed by an organization they trust, without going through a time-consuming process of setting preferences. There is the usual tradeoff here between ease-of-use and individual control.

But is it censorship?

Civil liberties organizations including the ACLU and the Electronic Privacy Information Center have questioned the benefits of PICSRules, and PICS itself. EFF has expressed concerns that PICSRules makes it easier to block entire domains and that the accuracy of filtering tools is being oversold. Beyond such legitimate issues, however, PICS critics often argue that the technology enables censorship. Such arguments confuse private decisions to
filter or block Internet content with government mandates. There is a vast difference between giving individuals more information about the content they view and tools to select it, on the one hand, and governments acting to restrict choice on the other.

A recent press release from Watchsoft nicely illustrates the confusion about filtering. Watchsoft’s Disk Tracy monitors Internet usage and allows parents to review the sites their children visit to determine whether they are accessing inappropriate material. Watchsoft claims this approach is superior to filtering because filters are “First Amendment challenged” and “may be unconstitutional.”

But the First Amendment, and the very word censorship, apply only to government action. It may be unconstitutional to require filtering at public libraries, because they are government-run institutions, but that is entirely different from a parent installing filtering software on her child’s PC. And if we’re talking about a public environment such as a library, monitoring software is hardly a superior alternative. If people object to filters that prevent them from accessing certain sites, they will probably feel even more concerned about software that allows someone to keep track of all the sites they visited. The concern about both filtering and monitoring technology is fundamentally about who uses it, and for whom.

To be sure, there are more nuanced critiques of filtering (see page 23). We’re not trying here to resolve all the policy issues or to belittle First Amendment concerns. Our point is that the genie isn’t going back in the bottle; let’s try to understand the tradeoffs inherent in choices we make.

A truism in First Amendment law is that the answer to objectionable speech is more speech. Well, we think the answer to concerns about labeling is more labeling. The more different labeling systems that exist, the more physical governments will become just more one source of ratings among many on the Internet.

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Sign of the times

There are important links between PICS and identity management (see Release 1.0, 2-98). If you subscribe to a labeling service, how do you know you’re really getting what you think? A functioning labeling infrastructure requires trust in the identity of those who create and distribute labels. W3C has formed a Digital Signature Working Group to develop a standard, DSig, for digitally signing PICS labels. DSig will allow label distributors to confirm the validity of labels they distribute, thus enhancing the integrity of the process.
E-mail filtering

Content controls are about more than pornography. For example, corporations generally prefer that their employees not spend their days ordering bestsellers from Amazon.com, even though there is nothing inherently “undesirable” about the content of that site.

In other situations, the problem is not what is available, but how it is distributed. Take, for example, spam (unsolicited commercial e-mail). Some spam involves adult content or invitations to illegal pyramid schemes. Much of it, however, would be innocuous if not sent in huge quantities to people who did not request it. The problem is the conflict between producers and consumers of information. The content originator derives some benefit from sending out millions of unsolicited advertisements. The marginal cost is effectively zero. Recipients, however, bear a cost they don’t control.

Ultimately, there are only two technological solutions: Change the economics, or change the architecture of the network. Both are being explored. Services that award people for receiving commercial e-mail or viewing advertisements (such as Juno) seek to shift the economic incentives for both senders and receivers. Some of the leading spammers have created a “spam-friendly” Internet backbone under the name Global Technology Marketing, Inc., based on the idea of paying ISPs for accepting unsolicited commercial e-mail.

We expect more experiments along these lines, until viable business models emerge (see Esther Dyson’s book Release 2.0, pages 116-121). The trouble is that it takes only a few rogue spammers convinced they can make money to generate a huge volume of traffic. For this reason, economic incentives must be combined with structural changes.

E-mail client and server software are being upgraded with new anti-spam features. At the same time, e-mail is evolving from an ISP-provided service to one that is increasingly available on a standalone basis via the Web (through services such as Hotmail, Rocketmail, and Yahoo Mail). This trend will initially make it easier for spammers to obtain “disposable” e-mail accounts from which to launch their messages. In the long run, though, the evolution of e-mail architecture may be the most effective way to prevent spam.

A company called Critical Path shows one way how. Critical Path is building a business around e-mail outsourcing, offering a customizable Web-based front-end combined with a high-performance back-end servers. It promises scalable performance and value-added functionality to ISPs, Web hosting providers and companies. As part of its service, Critical Path offers sophisticated spam blocking. Critical Path uses both a list of spammer addresses and algorithms that identify large volumes of identical e-mail not associated with legitimate mailing lists. The beauty of this approach is that it enjoys increasing returns — the more customers Critical Path signs up, the larger and more diverse a sample it has from which to identify spam.
FILTERING ON THE SERVER SIDE

Content can be filtered either at an individual PC or on the server level, using either self-labeling or third-party services. Most of the original filtering companies, such as SurfWatch, Net Nanny and Microsystems began by distributing software that users could install on their PCs. There is, however, a significant market for server-based filtering. Schools that have deployed local area networks are obvious customers. Companies also employ content controls to prevent their employees from downloading inappropriate materials or conducting personal activities on company time. Finally, dial-up ISPs can integrate filtering products into their networks (for example, by reselling the Bess service described below), and offer them as value-added services to their clients.

As a technical matter, server-based filtering is particularly appropriate for companies or schools that connect to the Internet through a firewall or proxy server. These organizations already route all of their incoming Internet traffic through a gateway, so filtering software deployed in one place can control access for all users on the network. Like any server-based application, these tools can be managed centrally without the need to administer individual users’ computers (although they do leave less room for individual variation). The server is always connected to the Internet, so the filtering software provider can update the ratings database automatically. Filtering can also be combined with other functions, such as network security and caching.

Most of the client-side filtering software providers, including The Learning Company, Net Nanny, Solid Oak and SurfWatch, now offer server-based versions of their products. We describe below three very different companies that concentrate on server-side filtering. We then look at the parental controls that AOL, the largest ISP, makes available to its users.

Bess

N2H2, Inc., is a private Seattle-based Internet filtering and caching company founded in 1995 by the husband-and-wife team of Peter Nickerson and Holly Hill. The couple named their server-side filtering service Bess after their pet dog, a retriever, and the friendly pooch is depicted prominently on the Bess home page.

Nickerson is a former economics professor who wanted to keep his kids away from adult sites on the Internet. He found that children could easily evade client-based filtering products, so he began the company to develop a server-based filtering service. Bess uses a proxy server to block sites based on a database of hundreds of thousands of URLs. N2H2’s employees review every site considered for blocking; less than half of the sites they examine wind up being blocked. In addition to filtering, Bess provides a colorful Web site with links to several dozen kid-friendly sites and Web-based e-mail.

The company initially focused on the consumer market, but today the bulk of N2H2’s business is turnkey filtering services for over 4000 schools. N2H2 installs a proxy server in the school network and then sends updates to the database of blocked sites into each proxy server on a daily basis. N2H2 also provides technical support for the equipment. Pricing varies based on the size of the customer, from $60 per month for a small school to several
thousand dollars a month for larger institutions. A similar service is available to businesses and libraries.

N2H2 also sells to approximately 120 ISPs, allowing them to offer filtered access to their customers for an additional monthly fee. The ISP partnership program includes the proxy server as well as sales and marketing materials; once Bess is installed at the ISP, it as a reseller and can provide the service to individual customers for an additional fee. Finally, users in Western Washington State can get filtered dial-up Internet access directly from N2H2 for $24.95 per month. (N2H2 also operates an unfiltered ISP, Rainier.net.)

The N2H2 proxy server also offers caching to improve network performance (N2H2 claims 30 to 50 percent of files can be retrieved locally from its caches). Caching and filtering are usually thought of as separate product categories, but as Bess demonstrates they can easily be combined. Nickerson argues that caching is especially valuable in educational settings, because schools tend to have limited bandwidth and teachers can pre-load sites covered in their lesson plans. One could just as easily imagine a company (such as Mirror Image, Inktomi or Skycache) using filtering as a throw-in to enhance their caching services.

Integration with caching products may also address the potential performance degradation when all queries must go through a filtering proxy server. Caching and related technologies are designed to improve network performance, so filtering built on top of caching servers should prove to be more scalable than standalone alternatives.

At the National Educational Computing Conference for K-12 and university educators in late June, N2H2 will unveil an advertising-supported filtered search service built on the Inktomi search engine. Nickerson says that schools are increasingly taking for granted the need for filtering mechanisms as they recognize the type of material available online. Eventually, however, he believes the market for filtering in corporate settings may exceed the educational opportunities.

SmartFilter

Secure Computing is a 350-employee Honeywell spinoff that went public in November 1995 and generated $48 million in revenue last year. The company began as a developer of security systems for government agencies such as the National Security Agency, but more recently has moved into the enterprise security space. As part of that transition, Secure Computing acquired Webster Network Technologies, one of the first server-based filtering companies, in May 1996. Secure Computing offers a content-filtering proxy server called SmartFilter based on the technology acquired with Webster.

SmartFilter integrates with numerous different products, including Secure Computing's own products and the Microsoft and Netscape proxy servers. The software is also available as a standalone proxy server for Windows NT and all the major flavors of UNIX. All of these implementations use SmartFilter's control list of some 250,000 entries, which include both individual pages and complete file directories. Testing against unfiltered proxy logs from potential customers, Secure Computing typically finds that 40 percent of the addresses users request are on its control list.
To build its list, Secure Computing first uses automated systems to scan documents and assign recommended categories. Employees then review and confirm the classification of every site before updating the control list. The company is funding academic research into more sophisticated pattern recognition algorithms, using neural nets to learn from previously categorized sites.

Secure Computing focuses primarily on the corporate market; schools represent one third of customers but a smaller share of revenues. Consequently, the control list is broad, allowing administrators to select from 27 categories ranging from the obvious ("sex," "drugs," "extreme or obscene," "criminal skills," ) to the seemingly mundane ("investing," "humor," "sports") to the abstract ("worthless," "non-essential"). Through partnerships with Siemens and ViRT, the company offers localized versions of SmartFilter in German and Japanese.

The latest version of SmartFilter for Secure Computing's Firewall for NT 3.0 can also use the control list to manage bandwidth rather than block sites. Network administrators can assign lower priority to sites falling into "non-business" categories, so that they take longer to download. Secure Computing's Richard Viets says that early adopters of filtering technology generally wanted to block inappropriate sites, but many new customers find "kinder, gentler" approaches more consistent with their corporate culture.

Content Advisor

Content Advisor branched off from Coffeehaus Networks, a Somerville, MA, developer of database and other technology for Internet service providers. The company developed the underlying software technology to implement the RSACi labels available through the Content Advisor feature in Microsoft Internet Explorer (hence the name). Founder Steve Shannon concluded that the RSACi system required too many arbitrary decisions about the level of sex or violence on a site, and relied too much on site creators to self-label. He decided to build a third-party ratings database as an alternative. Content Advisor's first end-user product will launch in June.

Shannon sees technology as Content Advisor's secret weapon. Content Advisor uses a patent-pending distributed Web spider technology to scour the Web for new sites to rate. Its database currently holds about 4 to 7 million URLs, of which 1.5 million have been rated so far. Content Advisor's staff of 6 to 7 editors are able to classify 250,000 URLs per month into 30 different subject categories. The goal is eventually to categorize everything on the Web. The company will accept "reasonable requests" from Webmasters to find out how a site is classified, but does not provide direct access to its database.

Content Advisor has nonexclusive partnerships with proxy server and firewall companies such as Checkpoint to incorporate filtering as a plug-in feature. The company is focused entirely on the corporate market; users can block any subject area they consider unnecessary or inappropriate for normal business uses.

The software is designed to harmonize with the way companies manage their existing firewalls. Administrators can set different blocking preferences for different parts of a company or time of day (so employees can visit sports or travel sites on their lunch hour), and can specify sites to al-
ways or never block. The product will be priced at $1,800 per year for 250 users to start, and pro-rated above that.

In the future, Content Advisor plans to develop subject-specific search engines based on its massive database. For example, someone looking for sports-related information would be able to search a database limited to sites classified in that category. This will significantly reduce the number of irrelevant hits generated when searching through the entire Web.

AOL Parental Controls

As the largest online service and the one with the highest percentage of new users, America Online (AOL) has a big role (wanted or not) in protecting children from inappropriate material. AOL is a well-known bounded community (see page 22). That is, users can reach public Internet sites through AOL, but AOL offers a significant amount of proprietary content even if access to the public Internet is turned off. Equally important, AOL has contractual relationships with all its users and content providers. These contracts define what is "appropriate" for the AOL service, and give AOL the authority to remove material that violates its contract terms, concerning propriety among other things. (Although as the Matt Drudge experience demonstrates, this process doesn’t always work smoothly).

AOL offers proprietary parental controls for its own content, and partners with The Learning Company (makers of Cyber Patrol) to offer filtered access to outside Websites. The simplest controls are algorithms and live forum monitors to prevent restricted words in areas such as chat rooms. More sophisticated tools can be configured through the parental controls area, which in AOL version 4.0 is always available from the main screen. As noted, nearly half of families with children use these controls.

Parents can assign password-protected screen names to each of their children. Four default levels are available. “18+” provides full access to AOL features and outside Internet sites. “Mature teen” limits access to Web sites deemed appropriate for the 16-17 age group, restricts access to newsgroups that allow file attachments and does not allow access to premium services (which involve additional fees). “Young teen” restricts newsgroup and premium service access, limits Web sites to those deemed appropriate for the 13-15 age group and also prohibits access to member-created or private chat rooms. Finally, “Kids Only,” as the name implies, restricts users to AOL’s Kids Only channel, and also disables instant messages, chat rooms and file attachments to e-mail. All of these settings can be customized. Many parents, however, prefer the simplicity of the default settings.

AOL enhances its parental controls as it adds new functionality. For example, parents can prevent their children from receiving instant messages, except from an approved list of users.
Filtering and consumer access devices

Internet access is increasingly available through devices other than personal computers. These include dedicated Internet clients such as WebTV, cable set-top boxes, Sega Saturn video game machines, DVD players and screen phones (not to mention the Pentium II-enabled refrigerator announced last month by V Sync Technology of Japan). With PCs in only 45 percent of US homes (and even lower penetration rates elsewhere), there is a huge market for such low-cost Internet appliances.

Families with children are a target market, so inappropriate content can be a particular concern. Server-based filtering is usually the best approach here, due to the limited processing power and storage in the appliances themselves.

PlanetWeb, which makes Internet software for a variety of embedded processor devices, offers an integrated parental control service that limits access using a database of 50,000 sites considered acceptable for children (see Release 1.0, 12-96).

PlanetWeb's new CEO, Jan Gullett, came from Broderbund Software, so he is familiar with the ratings process used in the computer gaming world. According to Gullett, there are significant economic challenges to operating an effective parental control system. The only way to ensure that inappropriate sites are blocked is to block unrated sites, but reviewing sites for inclusion in the "white list" of acceptable sites is a time-intensive and costly process.

Gullett also sees the absence of an industry-backed third-party labeling bureau as a significant limitation. The most prevalent independent labeling standard, RSACi, relies on self-labeling, which Gullett believes does not provide sufficient assurance of the accuracy and consistency of labels.

From our perspective, the more label bureaus the merrier. RSACi fills a niche and so would a similar organization based on third-party labels. On the other hand, de facto "official" ratings would come close to a government-mandated system. Gullett's idea only makes sense if users have options and understand what those options mean.
METADATA — THE INFRASTRUCTURE FOR LABELING

What does the future hold for Internet content controls? The next step beyond PICS and the current crop of filtering tools is a generalized metadata architecture. Metadata (information about information) is important, and not only because it facilitates effective parental controls.

The Internet is a network of machines, but Internet content is generally not in a format that machines can understand. Confronted with an electronic copy of the Bible, a computer may be able to tell you the title, the number of words and, using algorithms, something about the content. But the computer probably couldn’t tell you that much of the world considers it a sacred text, and it might have a hard time deciding whether it was appropriate for children (there’s an awful lot of sex and violence in there).

The solution is to provide more information about content in the form of labels, which describe human-readable content in machine-readable form. A computer doesn’t need to read the Bible to decide whether to block it; the computer need only read the associated label and apply a pre-defined set of rules. Moreover, once a labeling infrastructure is in place, it can be used for many other functions. Bar codes increase the speed and functionality of everything from package shipping to grocery shopping, because they put data about objects into machine-readable form. Done right, labeling can bring the same benefits to Internet content.

Labels are a form of metadata. Movie reviews are metadata, as are the ToolTips that appear whenever you hold your mouse above a toolbar icon in most Microsoft applications. Metadata is most useful when there are well-defined standards for its expression, association with underlying data, distribution and interpretation.

The World Wide Web Consortium (W3C), recognizing the recurrence of metadata across several of its activities, began a coordinated metadata project in June 1997.

PICS is a metadata framework optimized for a specific domain — rating Internet content to allow filtering of inappropriate material. The same kind of architecture, however, could make content easier to search, or could provide ownership information or license terms for intellectual property purposes. Communities of interest have done significant work to build domain-specific architectures, but a standard framework for building metadata would be much more powerful.

As W3C Director Tim Berners-Lee puts it, “metadata is data.” In other words, we can have metadata about metadata, and on and on forever. Many applications will require only one descriptive layer on top of the content itself, but in other cases it will be beneficial to build more complex structures. With metadata, the Net is no longer flat, but becomes a flexible, multi-dimensional hierarchy of abstractions built upon abstractions, linked together in an infinite number of ways. Oh, and it gets easier to label Web pages.

XML

Sophisticated metadata requires a metalanguage. Different user communities will want different information about documents, but the means of encoding
these linkages must be standardized. The Extensible Markup Language (XML) serves this function. XML, which became a W3C recommendation in February, is a framework for creating specialized markup languages for pages and objects on the Web. Stated more concretely, it allows content creators to employ an unlimited number of tags, rather than being limited to those in the Hypertext Markup Language (HTML) specification. Among other things, these tags can provide information about content (aka metadata) in a standard way.

Most of the advantages and disadvantages of the Web as a content distribution medium stem from HTML. Tim Berners-Lee developed HTML based on the International Standards Organization's Standard Generalized Markup Language (SGML). We have discussed SGML, and its relationship to HTML, at some length in the past (see Release 1.0, 6-91, 9-94). One of the significant benefits of SGML, and to a lesser extent HTML, is that it allows metadata to be associated with documents. The following line in a Web page:

\<title\>Lakers Win 1998 NBA Championship</title>  

tells any browser that the information between the two bracketed tags is the title of the page.

The problem is that different applications call for different forms of metadata. A scientist coming upon a scholarly paper might want to know the author, the title and the section headings. Such labels, however, don't register violence or porn. SGML allows many different types of markup, because every document must be associated with a document type definition (DTD). A DTD for Department of Defense procurement documents looks very different from a DTD for molecular biology research. The downside is that creating DTDs can be cumbersome, especially for non-technical applications.

HTML does not require separate DTDs, and sharply limits the available markup elements. This simplicity has facilitated the explosive growth of the Web. On the other hand, the small number of elements constrains the possible applications. Metadata systems based on HTML, such as PICS, cannot adapt to new requirements without revisions to the standard, and to client software based on the standard. Thus, for example, PICS expresses labels numerically...
to facilitate internationalization, and as a result a PICS label cannot eas-
ily contain the title of a book.

Effective Web metadata requires an alternative to HTML that provides the
flexibility of SGML without the complexity. XML is designed to do just
that. XML has already become something of this year's Java, a poorly-under-
stood technology over-hyped as the Next Great Thing. As with Java, the
reality is more complicated.

XML frees Web developers from using the limited set of tags available from
HTML (or proprietary "extensions" to HTML that Netscape and Microsoft seem
to introduce with each new browser version). Every XML document can have
its own DTD, which defines the available set of tags. Because XML is a
subset of SGML, existing SGML DTDs will work under XML.

An XML document looks very much like an HTML document; the primary differ-
ence is the broader range of tags. XML is not fully backward compatible
with HTML, because HTML allows a certain degree of sloppiness in coding that
can choke XML parsers. However, it's relatively easy to turn HTML documents
into well-formed XML documents, and browsers can easily be designed to read
both formats.
The Resource Description Framework (RDF) is another component of the W3C metadata activity. RDF is a framework, based on XML, designed specifically for metadata. RDF was heavily influenced by PICS, but it can be used for any type of metadata. The RDF specifications are currently in working draft form (under the direction of W3C’s Ralph Swick). Some details may change, but overall the standard works as follows.

Conceptually, RDF defines descriptions as triplets. For example, we would indicate that Bill Gates is the CEO of Microsoft as follows:

[Microsoft] —CEO → "Bill Gates"

The first item describes the specific resource to which the metadata applies. The second item is a property of that resource, and the final item is the value of that property. Properties are defined by schemas, which adapt the general structure of RDF to specific subject areas.

If we want to make it easier to search the Web, we might use a schema such as Dublin Core, which the Online Computer Library Center and others developed for that very purpose. Or we could use a schema for labeling inappropriate content for children, otherwise known as PICS.

[http://www.genericpornosite.com] —PICS Label → "RSACi s3"

In other words, the site has a PICS label of s3 ("frontal nudity") under the RSACi standard. RSACi is, in effect, a subset of PICS, but PICS can be used independently of RSACi. The RDF schema specification will make it possible to define hierarchies of schemas, and constraints on the values possible under any of those schemas.

A powerful feature of RDF is that it is recursive (as noted, metadata is data). A description can also be a resource subject to assertions:

[PICSLabel] —Statement By → "Kevin Werbach"

In other words, Kevin Werbach stated that a certain PICS label should be associated with a page.

The current version 1.1 implementation of PICS doesn’t use RDF, because it was developed before RDF and XML were created. However, W3C plans to migrate PICS to RDF in version 2.0.
In practice, RDF metadata will be encoded in XML. XML documents will reference schemas using the XML namespace facility, which is still under development. Such documents will begin with pointers to the RDF specification and to whatever schemas the document employs. A schema can be written as a DTD, but an XML document can also reference multiple schemas and combine elements from all of them.

RDF metadata can be embedded in a document (e.g., in HTML), supplied by the transfer mechanism (e.g., the HTTP server), or transported as a separate resource. The last method is particularly significant for content filtering tools — independent metadata “service bureaus” (what PICS calls label bureaus) can assign labels to documents and serve them to users. PICS supports third-party labeling today, but RDF will expand the functionality of such structures. RDF-based service bureaus can distribute not only content ratings, also but privacy information under the P3P standard (see Release 1.0, 4-98), intellectual property information, keywords for search engines and other types of labels.

As with any assertion about content, labels require trust on the part of users. RDF therefore allows labels to be signed. “Signatures” can be as simple as a statement that the label applies as of a certain date. On the other end of the spectrum, RDF labels can employ full-blown digital signatures using public key cryptography (see page 7 and Release 1.0, 2-98).

RDF seems likely to catch on because it is so flexible. Browser vendors and other companies can incorporate one standard, which can interoperate across different platforms and different substantive domains. The demand from many different communities can be combined to help the protocol reach critical mass.

One way this might happen is as follows. Everyone wants better Internet search engines. If all major sites were labeled with the 15 “card catalog” elements of Dublin Core, searching would be much more efficient. Therefore, the search engine companies, ISPs, browser companies and others should want content creators to label their sites in a standardized way. RDF could help make that possible.

Once RDF is broadly implemented and labeling becomes a standard part of creating sites, it gets much easier to envision widespread labeling of inappropriate content. Perhaps the leading vendors of Website-creation tools could make labeling a default step in creating a page? This would all be voluntary, of course, but any step that reduces the transaction costs of labeling will make a difference.
Alexa Internet

PICS, XML and RDF are the plumbing for an effective metadata infrastructure. But we also need user interfaces. The broad consumer and corporate market will require horizontal, user-friendly tools, and not just for filtering software. PICS and RDF mean application developers can incorporate one piece of code to enable a vast range of labeling systems.

A good example is Alexa (see Release 1.0, 12-97). Alexa Internet was founded in April 1996 by Brewster Kahle and Bruce Gilliat. Kahle was the developer of the Wide Area Information Server (WAIS), an Internet search technology for the Connection Machine that predated the Web. Before that, he spent six years as the lead engineer for massively parallel computer vendor Thinking Machines.

Alexa grew out of a project of Kahle’s called the Internet Archive. The Internet Archive maintains snapshots of almost the entire Web at different points in time, beginning in early 1996. Currently, the archive comprises 10 terabytes worth of data. The Internet Archive is a non-profit organization designed to make the Web accessible for historians and researchers, although copyrighted material is protected. Alexa is a for-profit enterprise to make use of the data in the archive.

The Alexa software places a small floating toolbar at the edge of a user’s browser window. From the toolbar, users can get information about the site they are visiting, see suggested links to other sites, access pages from the archive that are no longer available or use reference tools provided by Encyclopaedia Britannica. Alexa’s suggested-link feature tracks the paths that its users follow through the Internet, and aggregates that information using collaborative filtering technology. Based on this information, combined with data mining from its huge archive, Alexa suggests sites related to the current one.

Alexa provides several forms of “explicit” metadata about sites, including contact information about the owner (drawn from the InterNIC registration information); a tally of ratings from other Alexa users; the relative speed of the server; the presence of a TRUSTe trustmark; and, last but not least, RSACI labels. Alexa doesn’t prevent users from accessing any sites; it simply indicates whether a site has been labeled with RSACI, and how it has been labeled.

Alexa also renders “implicit metadata” about sites explicit, a process Kahle describes as “global peer review.” Kahle believes that as the Web grows such navigation aids will be essential. Explicit self-labeling, although useful for many purposes, will never be universal. By analyzing usage tracks, Alexa can gain information about sites without conscious labeling. As with any collaborative filtering application (see Release 1.0, 11-96), the accuracy of Alexa’s link suggestions improves as the num

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11 The archive doesn’t include everything on the Web - there is simply too much stuff, distributed across too many servers, to locate and store it all. Some web content changes too frequently, and some sites hide from navigational services (such as Alexa).

12 Etoile, which owns the Encyclopaedia Britannica, is also an investor in Alexa Internet.
ber of participants increases; Alexa claims over 100,000 users since its September 1997 launch.13

There is no technical reason Alexa couldn't be extended to block sites with certain ratings. Alexa (the company) sees its role as providing more information to users, rather than limiting choices, and therefore has no plans to incorporate such functionality. On the other hand, Alexa does filter out pornographic sites when suggesting links from non-pornographic sites, to prevent users from inadvertently stumbling into such material.

An Alexa-like application with built-in filtering would have several advantages. It could be available for free, as Alexa is today, because revenues are derived from context-sensitive advertisements on the toolbar. That would help address some of the distribution concerns about existing, stand-alone filtering software. Because Alexa can download updates automatically, additional labeling bureaus could be used on the fly.

Finally, labeling could be combined with collaborative filtering. In addition to voting on whether they like a site, users could assign content ratings to sites they visit. Hundreds of thousands of users should be able to label more sites than the dozens of college students that filtering software companies employ. Ratings would become more reliable over time as the number of raters increased. Users could also divide themselves into subgroups to label sites based on a tailored rating system. Net Shepherd has done something similar with a "rating community" of several thousand people (see Release 1.0, 12-96). Alexa plans to explore other means for users to annotate or rate sites, but only for informational purposes.

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**Metadata in Mozilla**

Unlike Microsoft Internet Explorer, Netscape Navigator and Communicator do not currently support PICS as a built-in feature. But because Netscape has made the source code for Navigator freely available as Mozilla (the original, pre-release name for the product; see Release 1.0, 3-98), programmers outside Netscape can now integrate new features into the browser. One such group, led by Netscape's Ramanathan Guha, Robert Churchill and John Giannandrea, is implementing XML and RDF in Mozilla.

RDF in Mozilla will serve several functions. In particular, RDF will underlie Aurora/NavCenter, a unifying interface for managing bookmarks, search results, file systems, ftp sites and more. Even if the team implementing XML and RDF has no particular interest in enabling content filtering, Netscape's open-source approach will make it simple for someone else to build that functionality into Mozilla.

13Alexa is a good citizen when it comes to privacy. The service aggregates user paths but does not store information about individual users. Alexa also supports TRUSTe (see Release 1.0, 4-98) and makes its privacy policy readily available.
FEEDBACK LOOPS

Architecture influences policy, and policy shapes architecture. It's all about feedback loops. In this section, we take a few steps back to get some perspective on the future of Internet content controls.

Bounded spaces

Mutually-reinforcing pressures are leading to more boundaries and more centralization on the Internet. Boundaries combat free-rider problems and the tragedy of the commons: Open space often becomes over-used or monopolized by a small number of individuals. (For an extended discussion of what this means for law, see Release 1.0, 2-96.) Bounded online spaces are not limited by geography and can therefore overlap. Companies, however, have incentives to make the boundaries around their communities less permeable. They can capture more revenue, directly or indirectly, if they keep users in their own space rather than let them jump around. Amazon.com, for example, offers one-click ordering to make life simpler for its customers, but also to make it relatively easier for an existing customer to order via Amazon.com than Barnesandnoble.com.

What does all this have to do with Internet content controls? The answer is that content can be controlled much more easily in bounded spaces than in unbounded spaces. There is simply too much material to rate everything on the open Internet, and new sites are added too quickly for any rating process to keep up. Moreover, not everyone will agree on how to rate a site or what to do with a given rating. Labeling systems can never be perfect: They must employ rule-like precision to avoid inconsistency, but flexible standards to capture the nuances of individual sites. (See Jonathan Weinberg's 1997 Hastings Communications/Entertainment Law Journal article, Rating the Net, for a good analysis of this point).

The best way to address this conundrum is to change the setting. The limitations of labeling are diminished in a bounded community, where people volunteer to join and can keep others out. In effect, communities themselves are filters. Users can choose communities that reflect their own values and those communities can tailor content to their user base (just as US law defines obscenity based on the prevailing standards of the local community). As Danny Weitzner of the Center for Democracy and Technology puts it: "Your view of the Web will be based more on who you trust than what you stumble into." Parents who are worried about pornography may choose a community that blocks all unrated material. Others will be comfortable knowing that an unrated site might be inappropriate, because they want to allow their children to explore a wider variety of sites.

The distribution challenge

The problem is getting from here to there. Users may not even realize which online communities they have joined. Labels and content control tools must be widely available, but that requires the right incentives. Distribution is relatively easy in institutional settings, such as schools, libraries and corporations. In those cases, a local central authority can deploy a filtering system, especially one that is server-based, and content controls will be available for all users in the organization. Some of these settings (libraries in particular) raise difficult policy questions that go beyond the scope of this issue. We are focusing here not on whether communities should
Distribution becomes a bigger barrier for home Internet users. Millions of copies of filtering software have been installed, but tens of millions of Internet users still do not have such software. The answer comes back to boundaries and communities. A dial-up Internet user is not just an individual node connected to an amorphous cloud called "the Internet." Many points in the infrastructure can serve as bottlenecks, for better or worse, where content control technologies can be inserted. ISPs can play this role, but so can browser vendors, search engines, online communities, operating systems, PC vendors and others. Every Internet user should have filtering as an installed option, whether or not he or she chooses to use it.

Distributing the labels may be the biggest challenge. PICS, XML and RDF will address the technical questions, but these standards alone do not create incentives to label. Companies such as N2H2, Secure Computing and Content Advisor want to rate as many sites as possible, but none of them make their ratings databases publicly available for use in other products. RSACi relies on sites to self-rate, and many site creators see no need to do so. There is a place for both these models, but others are needed. In particular, we would like to see more universal support for PICS among filtering products, so that users can decide which ratings they prefer.

Ratings will become much more prevalent if broader metadata initiatives succeed. There will be many opportunities for companies to add value on top of labels. These applications, beginning with more powerful search engines, will create more pressure for content creators and third parties to rate sites. Such feedback loops are not yet fully developed. Companies including zNet Shepherd, N2H2 and Content Advisor are moving from filtering into searching. Organizations concerned about effective searching, such as the Online Computer Library Center, are turning to labeling. We hope that before long they meet in a broad middle.

The devil we know

Finally, a cautionary note. Lawrence Lessig of Harvard Law School (better known as the erstwhile and pending special master on the Microsoft antitrust case) has articulated an interesting challenge to PICS. Lessig argues that PICS, by standardizing the infrastructure for filtering, facilitates censorship. In fact, he claims that PICS is actually more intrusive than the CDA.14 Lessig's basic point is that PICS changes the Web from a "non-discriminating" medium (accessible to all) into one capable of restricting access. PICS, he points out, enables "zoning" not only to keep pornography away from kids, but to achieve any other goal, including restricting "subversive" material. Moreover, PICS enables invisible filtering anywhere in the network. While legislation such as the CDA may restrict the provision of certain types of speech to children, it stops there. Lessig's pithy summary is that "PICS is the devil."

In essence, Lessig's argument is about transaction costs. PICS is dangerous because it makes it easier for governments to censor. Lessig thinks governments are likely to mandate labeling and filtering, because voluntary approaches will never be completely effective. Not all sites will be labeled, and some people will deliberately mis-label their sites. Govern-

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14 In First Amendment law, the general rule is that government can restrict indecent speech so long as there is no less burdensome means to do so.
ments, Lessig believes, will see mandated labeling and filtering, combined with prohibitions against false labeling, as the only effective solution.

Lessig's conclusion is that there must be a more thorough debate about the consequences of technologies such as PICS. We agree. Intelligent efforts to understand, balance and most importantly disclose the tradeoffs of different technologies are essential to effective self-governance. This does not mean, however, that we should avoid the whole enterprise. Virtually all technologies make repression possible. As Mike Godwin of EFF has noted, computer databases make it much easier to track and repress political dissidents, but few would argue against their development. We should condemn the repressive things that governments do with technology, not the technologies themselves. Precluding the development of technologies that enable censorship can itself be seen as a form of repression, because it means telling software developers what kind of code they can write.

Furthermore, Lessig's "discriminating media" are in essence what we have called "bounded communities." Boundaries are by nature exclusionary. As discrete communities increasingly define people's online experiences, the Internet will serve as less of a global public park. Something will be lost in the process; but other things will be gained. In any event, the growth of bounded communities is an inevitable consequence of the scaling of the Internet.

Content controls are here to stay. As a result, the Internet may become richer and more complex, but only if companies and users seize the new opportunities that these technologies present.

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**COMING SOON**

- ISP pricing and quality of service.
- Audience behavior measurement.
- Home-based local area networks.
- And much more... (If you know of any good examples of the categories listed above, please let us know.)
RESOURCES & PHONE NUMBERS

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Except as noted otherwise, all companies’ Websites are at the likely address, http://www.domain_name.com.

For further reading:


1998
**Release 1.0 Calendar**

1998

May 26-29 
*Harvard Conference on the Internet and Society - Cambridge, MA. A wide-ranging look at the social implications of cyber space. Call Beverly Freeman, (617) 432-1638; cybercon@sph.harvard.edu.

June 3-6 
International Design Conference in Aspen (the 48th annual) - Aspen, CO. Organized by IDCA. The annual design conference, cutting across all design disciplines. Call (970) 925-2257; fax, (970) 925-8495; idca@csn.net; www.idca.org.

June 8 
EPIC Cryptography and Privacy Conference - Washington, DC. Sponsored by the Electronic Privacy Information Center, the Harvard Information Infrastructure Project and the London School of Economics. Conference agenda and registration information are available at www.epic.org/events/crypto98.

June 20-25 
Ed-Media/Ed-Telecom '98 - Freiburg, Germany. Organized by Association for the Advancement of Computing in Education. Focus on educational multimedia, hypermedia and telecom. Call (804) 973-3987; fax, (804) 978-7449; aace@virginia.edu.

June 23-24 
Digital Kids '98 - San Francisco, CA. Sponsored by Jupiter Communications. Explores the online migration of child-and family-oriented software, games, and educational content. Call (800) 488-4345 Fax (212) 780-6075 Hema@up.com.

June 24-26 

July 19-21 
Spotlight '98 - Laguna Niguel, CA. Sponsored by IDG. Michael Schrage hosts discussions on new business models for media and technology. With Barry Diller, Joe Nacchio and David Dorman. Call (800) 633-4312; fax, (650) 286-2750; conference_registrar@idg.com.

July 19-22 
ISA Summit '98 - Los Angeles. Sponsored by Interactive Services Association. Call (301) 495-4955; fax, (301) 495-4959; isa@isa.net.

July 20-24 
INET '98 - Geneva. Sponsored by the Internet Society. Over 3000 expected. Call Mark Measday, 41 (22) 344-64-64; fax 41 (22) 345-92-58; measday@osmarian.ch.

July 26-30 
Fifteenth National Conference on Artificial Intelligence - Madison, WI. Sponsored by AAAI. Also the tenth annual Innovative Applications in AI program. Write Charles Rich, rich@emerl.com.

Oct 11-13 
EDventure's High-Tech Forum - Copenhagen, Denmark. Sponsored by EDventure Holdings. Call Daphne Kis, (212) 924-8800; fax, (212) 924-0240; daphne@edventure.com; www.edventure.com.
November 4-6 **Human Resource Technology Conference and Exposition** - Philadelphia, PA. Latest on knowledge management and corporate intranets. Sponsored by L.R.P. Call (800) 727-1227; fax, (703) 739-0489; lrpconf@lrp.com/ More information at www.lrp.com/Conferences/conferences.htm.

November 16-20 **COMDEX/Fall ’98** - Las Vegas, NV. Over 2,000 exhibitors, over 10,000 new products, and 200,000 attendees from over 100 countries. Registration information available at www.comdex.com.

November 19-21 **Annual Conference on Technology & Society**: Washington, D.C. vs. Silicon Valley - San Jose, CA. Cosponsored by the CATO Institute and Forbes ASAP. Featuring Eric Schmidt, Scott Cook, and others. Contact Bethany Blue, (202) 789-5203; fax (202) 371-0841, bblue@cato.org.

* Events Esther plans to attend.
@ Events Jerry plans to attend.

Lack of a symbol is no indication of lack of merit.
The full, current calendar is available on our Website (www.edventure.com).
Please let us know about other events we should include. — Mari Katsunuma
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