The Sticky Side of the Web

by Kenneth J. Klingenstein

Of the various inventions implemented over the last twenty years on the Internet infrastructure, none has had the impact that the World Wide Web has had. Begun as a tool to assist scientific researchers in sharing scholarly data, the Web arrived at the right moment, when the fusion of computing and digital communication was reaching fruition. The result has been breathtaking growth and the beginning of a remarkable societal transformation. The Web, in its ease and power, offers a profound new mechanism for information and communication. Among its many benefits, it promises economic opportunities, new efficiencies for government and social services, and significant environmental relief. But not all of its effects have been positive. In dimensions ranging from network impact to cultural preservation, from laws to mores, the Web presents difficult challenges in an urgent time frame.

From being a mote in network traffic two years ago, the Web is now over 50 percent of total Internet volume. Its ease of use, both for navigation and content presentation in multimedia and interactive formats, has brought legions of new users and new uses to the network. And in its propensity for complex graphics, the Web represents a massive number of bytes to convey. (A picture may be worth a thousand words, but most graphics contain an order of magnitude more bytes than a thousand words.) Multiply new users and uses by such a volume per usage, and the current severe network congestion is the result.

Moreover, all this traffic is carried by a somewhat inefficient protocol that is insensitive to network load. Most network applications employ a “slow-start” approach that transmits packets at a limited rate until the current carrying capacity of the network is determined. This “good citizenship” by applications helps deter the chronic death-spiral that congestion can create.

HTTP, the underlying Web transport protocol, does not employ slow-start, likely because its designers assumed that the typical Web user, flitting from host to host, would have such brief connections as not to justify implementing slow-start. Thus, the large, bursty transfers of Web data can cause, and exacerbate, network congestion.

If the Web is technically boorish, it is a social radical. Its power as the ultimate printing press means that it can push the limits of our societal bounds. For example, while it presents powerful opportunities for diverse populations to inform the rest of the world of their own lives, it represents a real threat to those in the community who are trying to preserve their cultures from contamination.

Many of these issues are illustrated at universities, where our traditional leadership in networking has brought us to the forefront of its associated problems. We are having to create new policies to deal with self-expression on the Web. When a student in a dorm room, operating on his or her own machine, posts offensive material on the Net, what authority does the institution have? Who determines if an image is libelous or harassing? Such issues were once largely academic, but given the reach of the Internet, these questions now have world-wide impact and implication. Indeed, the Net’s global scope complicates the matter by removing the context of local standards for policies.

The Web also poses significant threats to our personal security and privacy. In particular, while Web clients help users to glean information from the servers, the clients also can convey information, surreptitiously, from the client back to the server. Today the clients may report to the server the identity of the client’s owner; within months they will be able to report the contents of the user’s hard drive and convey files back to a server. While legal precedents have been established in other areas of privacy (for example, barring public disclosure of what books you have checked out of the library or what videotapes you have rented) there is no guidance on privacy in cyberspace. The temptations for businesses, or government, to know details of the people who visit their Web sites may lead to unforeseen abuses.

The Web, much like other transformational inventions, has consequence far beyond its first assessment. While we have, as institutions and as a society, already begun to reap the benefits of the Web, we have yet to deal with its sticky side.