

The Triumph of Ethernet: Technological Communities and the Battle for the LAN Standard. *By Urs von Burg*. Stanford, Calif.: Stanford University Press, 2001. xx + 300 pp. Tables, figures, appendix, bibliography, notes, index. Cloth, \$55.00; paper, \$24.95. ISBN: cloth 0-8047-4094-1; paper 0-8047-4095-X.

Reviewed by Greg Downey

Urs von Burg's well-written book, *The Triumph of Ethernet*, describes the two decades long search for a reliable, cost-effective standard for linking microcomputers into local area networks (LANs). Such in-house computer networks are today taken for granted in large organizations, and since the early 1990s such LANs have represented a key access point to the evolving world of cyberspace (especially Internet e-mail and the World Wide Web) for growing numbers of "information laborers" (whether at work or at school) across the globe. With many of today's cyberspace battles focusing on both applications standards (such as the interoperability of Web browsers and the myriad extra "plug-in" software programs needed to render proprietary text, image, sound, video, and animation content) and operating-systems standards (especially open-source Linux versus proprietary Windows), the story of how the LAN "protocol builders" finally settled upon a useful standard for the rest of us is a timely and important one.

However, as von Burg describes it, the historical path from the invention of Ethernet by Robert Metcalfe at Xerox PARC in the early 1970s, through its acceptance as one of several official standards of the Institute of Electronic and Electrical Engineers (IEEE) in the early 1980s, to its acknowledged dominance in the "office computing" markets of the early 1990s, was anything but predictable. Another strong contender for the standard, the Token Ring system developed by David Farber at the University of California at Irvine, dogged Ethernet both at the 1980 IEEE standardization meetings and in the mid-1980s' corporate marketplace for IBM PC-compatible network products.

Both systems were designed to enable decentralized data exchange between computers—build-as-you-go networking without the need for an expensive, dedicated routing server. But each system took a different philosophical approach to this problem. Farber's Token Ring continually passed a logical "token" around the network from

computer to computer; at any given time, only the computer with the token could talk. Metcalfe's Ethernet, on the other hand, allowed random, "first-come, first-served" access to the network by including special algorithms to detect and handle "collisions" when two or more computers tried to talk at once.

In explaining Ethernet's success, von Burg develops the idea of an "open technological community." Ethernet, he explains, was conceived as an "open standard" by not one but three core firms: DEC, Intel, and Xerox (the so-called DIX alliance), while Token Ring was sponsored solely by IBM as a proprietary standard. This essential difference encouraged a community of small start-up suppliers to emerge around Ethernet, serving as an outsourcing army for the development and sale of countless hardware and software components that the Ethernet standard demanded—more components than the three larger members of the DIX alliance were willing to risk manufacturing. But, in filling this market niche, the community of Ethernet suppliers also participated in rigorous testing, development, and knowledge sharing, which fed right back into the Ethernet standard itself, steadily improving the technology and bringing both the cost and the size down to competitive levels. This was an innovative interactional dynamic, von Burg argues, which IBM's closed (and less committed) group of Token Ring suppliers simply could not match.

Through this thesis, von Burg reinvents a more mechanistic "economic standardization theory," which might have predicted, for example, that the standard to achieve "first-mover advantage" in the marketplace (even if it was a functionally inferior technology) would eventually "tip" the marketplace in its favor because of the positive-feedback "network effect" of new consumers wanting to minimize their own risk by investing in the leading market technology of the moment. While this pattern might appear to hold true in a macrolevel view of LAN history, von Burg shows that, at a more detailed level of analysis, the Ethernet community had to fight IBM's Token Ring standard every step of the way, despite Ethernet's entry into the market years earlier.

The story von Burg tells is well documented through some fifty interviews and a thorough historical review of relevant technical reports and trade publications. He effectively extends standard theories of technological systems (Thomas Hughes) and organizational management (Alfred Chandler) through his "open technological

community” framework. I wonder, however, whether this model really applies more to the “virtual” standards of Ethernet’s complex algorithms than to the physical standards of its cabling, circuit boards, and upkeep. As von Burg frequently points out, the debate over the logical merits of Ethernet versus Token Ring was often secondary to questions of adapter size (early Ethernet boards simply could not fit into the popular Apple II microcomputer), cabling costs (Ethernet’s original “thick” coaxial cable was expensive to install), and maintenance costs (Ethernet’s original wiring pattern, a “bus” topology which linked computers together in series, made the process of identifying and fixing faulty cables extremely time-consuming). After all, both Ethernet and Token Ring paradoxically received the IEEE’s blessing as “standards” in the early 1980s. It was only in the physical marketplace that one cyberspace standard was able to triumph over the other.

Thus, although *The Triumph of Ethernet* complements other histories of cyberspace, such as Janet Abbate’s *Inventing the Internet* (1999), I wish von Burg had been able to analyze the demand side of his “technological community” in the way that Abbate did with hers. “Users” in von Burg’s analysis are reduced to “the market,” undifferentiated “office” consumers of PCs. But all offices are not alike: Management Information Systems users desiring a LAN in order to share a single-site-licensed software application might have very different performance needs and hardware infrastructures than, say, graphics design users desiring a LAN in order to move bigger-than-floppy-sized files to high-density printing equipment, or even than university researchers desiring a LAN in order to telnet in real time to remote mainframe systems.

Although von Burg argues that “standardization is ultimately a very social process [and that] users as well as manufacturers must agree on a commonly shared technology” (p. 21), the users disappear from his account. Part of this problem is admittedly the methodological difficulty in “finding original material on users’ experiences and locating individuals who can be interviewed” (p. 28). But without such material, von Burg cannot simply claim that “the users granted the manufacturers much leeway in shaping the technology and simply adopted their eventual offering” (p. 29). Especially if von Burg is right that the labor requirements in managing troubleshooting and connectivity were Ethernet’s principal drawbacks, then the sophistication of the user community—and its

historical ties to different vendors, different hardware/software systems, and different forms of technical support—becomes even more important to his analysis.

Despite the lack of information on (or theories about) the very important (and presumably diverse) LAN user community, von Burg's contribution to the study of the historical actors that Paul Edwards called "protocol builders" (*History & Technology*, 1998) is timely and useful, and not just to business historians. Analyzing the interplay between the material possibility of technological innovation and the social community available to generate such innovation will become all the more important as the world of cyberspace—a virtual realm resting on socially negotiated and historically contingent standards—continues to grow.

Greg Downey is assistant professor in the School of Journalism and Mass Communication and the School of Library and Information Studies at the University of Wisconsin–Madison. He is the author of Telegraph Messenger Boys: Labor, Technology, and Geography, 1850–1950 (2002).