

## Maintaining the Internet

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The Maintainers: A Conference  
Stevens Institute of Technology  
April 7-9, 2016

Histories of the Internet thus far have been preoccupied with creation, invention, and innovation. The most prominent example is the subfield's foundational text, Janet Abbate's *Inventing the Internet*, but other leading books carry the same innovation bias. One recent example is Shane Greenstein's *How the Internet Became Commercial*, a book whose publisher distinguishes it from other Internet histories because it is a different *type* of innovation narrative, "a story of innovation from the edges."<sup>1</sup> And, of course, Walter Isaacson's *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*, evidently not an exercise in genre self-parody, inspired a sequence of events that has led to our present gathering.

In this brief paper/presentation/polemic, my goal is to continue a scholarly program that I have pursued for some years now, where I have advocated for the correction of a category error: we would do well to supplant discussions of *the* history of *the* Internet with broader discussions of histories of computer networking. Such a reinterpretation and recasting would encourage scholars to think more about computer (and communication) networks whose histories neither begin with nor converge upon the TCP/IP Internet; about "failed" networking technologies; and formative practices—such as the consensus mode of standards-setting—with origins in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries.<sup>2</sup>

The wrinkle I am playing with here, following the Edgertonian thrust of our conference, is to conceptualize computer networking histories around maintenance rather than invention and innovation.

As a result, I have more questions than answers. I have organized these questions into two categories.

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<sup>1</sup> Shane Greenstein, *How the Internet Became Commercial: Innovation, Privatization, and the Birth of a New Network* (Princeton University Press, 2015), publisher's description from <http://press.princeton.edu/titles/10574.html>.

<sup>2</sup> For a recent review of the literature, see Thomas Haigh, Andrew Russell, and William Dutton, "Histories of the Internet: Introducing the Special Issue of *Information & Culture*," *Information & Culture* 50 (2015): 143-159. See also Andrew L. Russell, *Open Standards and the Digital Age: History, Ideology, and Networks* (Cambridge University Press, 2014).

First, an empirical question: **who maintains the Internet?** To add some analytical value to such a general question, we might pursue conceptual and actual overlaps between the maintainers of the Internet on the one hand, and other forms of digital labor or information labor on the other. And, to add some historiographical value, we might also ask how the identity and jurisdiction (control over work) of these maintainers has changed over time and across space, and how it has varied across different types of computer networks.

Second, a methodological question: **how does the analytical focus on maintenance differ from an analytical focus on “materiality”?** I have developed strong feelings on this question, and will conclude my essay (and presentation at our conference) by arguing for the conceptual, political, and moral advantages of maintenance over materiality. To put the point a different way, and with advanced apologies for the pun, studies that feature “materiality” or “objects” strike me as missed opportunities to talk about things that actually matter.

Since the conference organizers mercifully requested only brief, blog-like position papers, I will not even attempt anything comprehensive. Instead, what follows will function more as an outline or promissory note for a revised paper, a roadmap for how to go forward, and a plea for the new materialists to change their course.

### **Who maintains the Internet?**

Alas, I have not been able to find a simple or direct answer to my simple question, “who maintains the Internet?” In lieu of such an answer, here are four possible avenues that might generate an answer.

First, one could turn to existing typologies of industries and jobs, such as the Standard Industrial Classification (SIC) codes. These codes, established in 1937, can be quite useful for classifying different types of industries (mining, construction, manufacturing, and communications, for example), for identifying different occupations within those industries, and for tracking change over time in the numbers of business and workers in different industrial sectors. Unfortunately, I don’t see anything in the SIC categories (and, more recently, the North American Industry Classification System (NAICS)) that could identify maintenance labor, particularly in the telecommunications or computing sectors, in any rigorous or specific way.

Second, one could explore the significant overlaps between Internet maintenance and other forms of digital labor or information labor that have attracted scholarly and popular scrutiny. Exemplary work here includes Lilly Irani’s essay “Justice for Data Janitors,” which is itself a review of two recent books on labor in an era of increasing business automation; Hector Postigo’s “Working in the Digital Age,” a brief essay that situates digital work such as user-generated content within the historiographical traditions of Harry Braverman and David F. Noble; and Greg Downey’s chapter on “Making Media Work,” which has the most extensive description and richest conceptualization of

different types of “information labor” in the recent literature I have encountered.<sup>3</sup> Although all of these essays discuss a broad range of work that we see in all walks of contemporary digital and information-centric living, none of them provide an exhaustive account or taxonomic approach that one could use to identify networking maintenance or the Internet’s maintainers with any precision.

A third avenue departs from the others, insofar as it contests the premise of the question. Rather than identifying specific maintainers or their work duties, we might ask instead: when we maintain the Internet, whose interests do we preserve? To put the point in a different way, we have good reason to conclude that maintenance work is fundamentally conservative—labor directed at simply protecting and extending the status quo. If this point is right, then some critical questions emerge: who benefits from the Internet status quo, and when have those beneficiaries changed? At this particular moment in time, some of the major beneficiaries of the status quo include Google, cisco, Facebook, and the NSA – but this constellation is unlikely to remain stable.<sup>4</sup>

A fourth avenue, and the one I most prefer, is rooted more solidly and conventionally in STS and the history of technology, namely, in the work of Bruno Latour and Greg Downey. Latour’s sociological and ethnographic approach is outlined in the subtitle of his 1987 classic *Science in Action: How to Follow Scientists and Engineers Through Society*. Downey summarized his approach with a set of questions—“who does what kind of information work, when and where and why?”<sup>5</sup> Taken together, their approaches provide a way to try and identify the Internet’s maintainers. With a thought experiment, we can follow Internet data traffic—say, an individual packet—from its source to its destination across the network. Doing so would help us get a first-hand view of the different elements that make up the Internet; in the process, we can also continuously pose Downey’s question, which we can abbreviate as “where is the labor?”

I can imagine two different ways to implement these questions by thinking through visual representations of the Internet. The first would follow the packets as they traverse the network—first with an eye on the devices and transmission media through which packets flow, but ultimately (and more importantly) with an eye on who *maintains* those things. We might summarize the resulting journey as movement from a process within a device

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<sup>3</sup> Lilly Irani, “Justice for ‘Data Janitors,’” *Public Books* (January 15, 2015), <http://www.publicbooks.org/nonfiction/justice-for-data-janitors>; Hector Postigo, “Working in the Digital Age: Why Information Technology May Be Re-Skilling the Labor Process,” *The American Historian* (February 2016), 38-43; Gregory J. Downey, “Making Media Work: Time, Space, Identity, and Labor in the Analysis of Information and Communication Infrastructures,” in Tarleton Gillespie, Pablo J. Boczkowski, and Kirsten A. Foot, eds., *Media Technologies: Essays on Communication, Materiality, and Society* (MIT Press, 2014).

<sup>4</sup> Proponents of “net neutrality,” despite prevailing rhetoric of “end to end innovation,” seem not to recognize or not be concerned that net neutrality would lock in existing power structures that have grown up through and around the Internet.

<sup>5</sup> Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Harvard UP, 1987); Downey, “Making Media Work,” 148.

to a router, to a local area network, to an ISP, and back through a similar path, ultimately landing at another process embedded in software in another device.

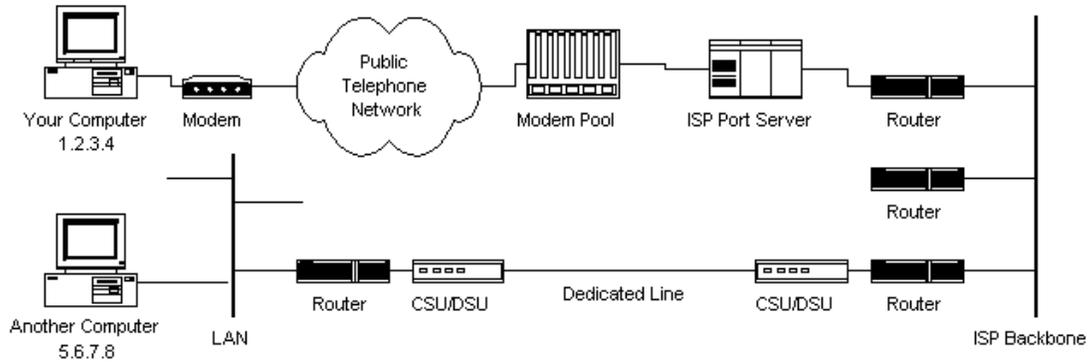


Figure 1 from Rus Shuler, *How Does the Internet Work?*  
<https://web.stanford.edu/class/msande91si/www-spr04/readings/week1/InternetWhitepaper.htm>

Alternatively, one could flip the diagram of the network on its side to examine the various hierarchical layers that packets traverse, and, accordingly, ask about maintenance labor within and across different layers.

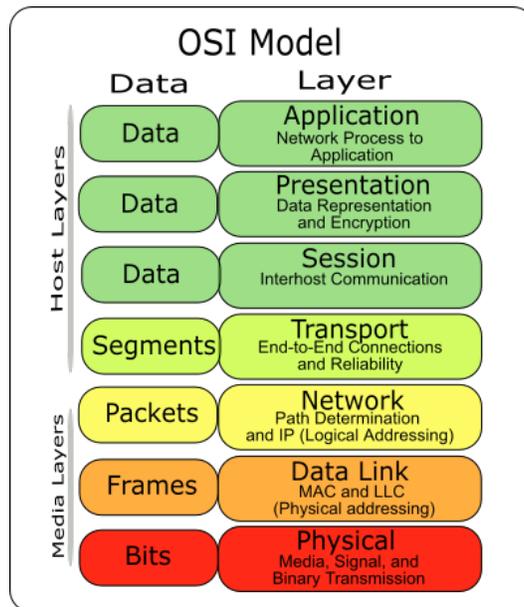


Figure 2 from Wikimedia Commons,  
<https://commons.wikimedia.org/wiki/File:Osi-model-jb.png>.

Either way, the method is inductive: follow the packets and seek out the places where maintainers work. Eventually, we should come up with a list of occupations whose labor is essential for the maintenance of the Internet.

## Maintenance vs materiality

The core assumption of the Maintainers conference is the urgent need to reassess how we think and speak about human engagements with technology. There are real opportunities in our various fields to break outside of the innovation/invention frame, and to think about technology in broader and more meaningful ways. For historians of technology, two formative texts here are Ruth Schwartz Cowan's *More Work for Mother* and David Edgerton's *The Shock of the Old*. Their suggestions are increasingly the stuff of conventional wisdom: infrastructures are important, we should pay close attention to technologies in use, mundane and "old" technologies become more important than emerging, so-called "high-tech" devices, new technologies often shift work and responsibilities to less powerful populations, and so on.<sup>6</sup>

While we're in this mode of conceptual reflection and renewal, I want to make a case *against* "materiality."

In recent decades we have seen an increasing scholarly emphasis (or re-emphasis) on materiality, in the form of what some have called a "new materialism." I don't have any thorough explanation for these trends, although I suspect the interplay of at least two distinct but interrelated sources. The first would seem to be a reaction against the cultural turn of the 1980s and 1990s in the humanities and critical theory. This reaction became manifest several fields, for example in scholarship around material culture (Danny Miller), thing theory (Bill Brown), and environmental history. One recent instance of this trend is the "Object Lessons" series, complete with slick, integrated branding and marketing of "short, beautiful books" published by Bloomsbury and "smart essays you can't write for anyone else, published online by *The Atlantic*."<sup>7</sup>

A second source of the "new materialism" is media studies and the history of technology and computing. The reaction here came in part against the naïve utopianism of early proclamations about the Internet, such as John Perry Barlow's 1996 declaration of the independence of cyberspace from "legal concepts of property, expression, identity, movement, and context [...] They are all based on matter, and there is no matter here."<sup>8</sup> Over time, scholars and artists have refuted Barlow's claims and endeavored to illustrate the "materiality of the Internet," to use the title phrase of Paul Ceruzzi's 2006 essay on the subject, and to debunk business slogans such as "the cloud" that suggest ethereality, weightlessness, and detachment from history and from, well, materiality.<sup>9</sup>

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<sup>6</sup> Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (Basic Books, 1985); David Edgerton, *The Shock of the Old: Technology and Global History Since 1900* (Profile Books, 2006).

<sup>7</sup> "Object Lessons," available from <http://objectsofobjects.com/>.

<sup>8</sup> John Perry Barlow, "Declaration of the Independence of Cyberspace," February 6, 1996, available from <https://www.eff.org/cyberspace-independence>.

<sup>9</sup> Paul Ceruzzi, "The Materiality of the Internet," *IEEE Annals of the History of Computing* 28 (2006): 96.

Perhaps because of its trendiness, the “new materialism” and related scholarship has, itself, provoked critics who worry about “the era of the fetish of everything.” For example, in his review of Bloomsbury’s “Object Lessons” series, the intellectual historian Russell Jacoby attributes the appeal of such studies to a “theory-fatigue” that has “struck the professorial class, especially English-department inhabitants” and a more general acquiescence with commodity fetishism and unapologetic consumerism in the 21<sup>st</sup> century. The political theorist David Chandler has framed some related concerns in the terms of a more traditional Marxist interpretation. For Chandler, if the “first modern political use of materialist critique – historical materialism – ended in tragedy,” then “the second, current wave of materialist critique – new materialism – is farce.” Its celebration of objects, regrettably, features “a diminished view of the human subject” and “seems peculiarly uninterested in conceptual clarity.”<sup>10</sup>

While I share some of the concerns that Jacoby and Chandler have raised, I would like to offer my own critique of object-based, new materialist work with a different, perhaps more constructive suggestion. If you’ve been paying attention, the substance of my constructive critique won’t be surprising at all. I don’t mind “going deep” into a particular object or thing, but let’s not forget to ask: where is the labor? When we talk about “things” or “objects” or “infrastructures,” let’s not be content simply with pointing at them and their materiality. Let’s keep asking Downey’s questions: who does what kind of work, when and where and why? Who maintains them? Who repairs them when they break? What political and economic structures support or hinder the labor necessary for maintenance and repair? What are the cultural forces that celebrate or denigrate those kinds of labor?

To provide a clear example of how Downey’s questions (and my related questions) can generate some useful and constructive results, I plan to spend the bulk of my time at the Maintainers conference in Hoboken on a commentary of a new materialist photo essay that recently appeared in the Atlantic, titled “Inside the Internet.”<sup>11</sup> The 15 photos there excel at showing some objects that feature in the Internet’s infrastructure, but, in their nicely stylized presentation of the inner workings of the Internet and “cloud,” ignore and almost suggest contempt for human labor. Because of this omission, the photos provide a starting point to illustrate the moral failings and missed opportunities of scholarly and artistic programs that are overly focused on objects and material things, and neglect to provide accounts of the work of the maintainers.

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<sup>10</sup> Russell Jacoby, “The Object as Subject,” *The Chronicle of Higher Education*, April 24, 2015, available from <http://chronicle.com/article/The-Object-as-Subject/229587/>; David Chandler, “New Materialism and Marxism as Critique: ‘Mattering’ Mind vs. ‘Minding’ Matter,” March 10, 2016, available from <http://www.davidchandler.org/wp-content/uploads/2014/11/New-Materialism-and-Marxism-.pdf>.

<sup>11</sup> Emily Anne Epstein and Peter Garritano, “Inside the Internet: Photographs of what “the cloud” actually looks like,” *The Atlantic*, available from <http://www.theatlantic.com/photo/slideshow/inside-the-internet/416622/>.