UNCATEGORIZED

The State of the Global Telecosm

The most notorious promoter of the 1990s telecom boom has been proved right.

By Mark Williams Pontin

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This past February, with the Southern California days already warm and the sunlight reflecting off the bay and the high-rises along the waterfront, 12,000-odd members of what is perhaps the most important technology industry on the planet converged on San Diego's convention center for their annual conference.

This big!: George Gilder was a promoter of telecommunications during the boom of the 1990s.

Since 2005 this event has been called the Optical Fiber Communication Conference and Exposition and the National Fiber Optic Engineers Conference. It's a mind-numbingly dull name with an unpronounceable acronym (OFC/NFOEC). But the nearly one terameter (1,000 million kilometers) of fiber-optic cable encircling the earth effectively makes up our global civilization's central nervous system, since it carries Internet traffic and all international telecommunications–including voice calls, which nowadays are transmitted as packets of digital data. The world's data traffic, moreover, is doubling in volume every two years. Industry critic Robert X. Cringely claims that the only reason video didn't overwhelm U.S. Internet services in 2007 was that broadband ISPs capped bandwidth and closed switches to control traffic, while pretending that they were taking no such measures. People have been predicting that the

Internet would crash as long as it's existed, of course. Still, it's worth considering that if, for instance, all of YouTube's users were to upload their videos in high definition, it would nearly double U.S. Internet traffic.

I went to San Diego because I wanted a better picture of the state of the global telecosm in 2008. What's a telecosm? As I entered the convention center on the conference's third morning, I ran into an older gentleman dressed in a blue blazer and beige chinos, trying irritably to get into the main hall. Recognizing him, I said, "You're George Gilder." Tetchily, the bespectacled gentleman acknowledged that he was. "This is most annoying," he told me. "It's this way," I said, pointing, and left him. It was a poignant moment: a few short years before, the convention's officials would likely have sent a limousine and had someone waiting to usher Gilder to his seat. Back then, he'd been a wealthy, honored prophet of technology. In 2000–the year communications carriers and technology suppliers saw their stock begin to collapse–he'd published a book called Telecosm (whose original subtitle was *How Infinite Bandwidth Will Revolutionize Our World*). In those days, any company endorsed by Gilder's monthly newsletter–which by the late 1990s mainly endorsed companies involved in the global build-out of optical networks–immediately experienced the "Gilder effect": its stock value surged.

Unlike most technology promoters of that era, Gilder was an interesting fellow with a history. He'd begun in the 1960s as a speechwriter whose clients included Richard Nixon; in the 1970s he'd penned an antifeminist screed, called *Sexual Suicide*, that prompted *Time* magazine to name him "the nation's leading male-chauvinist-pig author." After a period promoting supply-side economics in the Reagan era, Gilder established himself as a technology pundit: he published *Microcosm*, which assessed the microchip revolution, in 1989 and *Life after Television*, which predicted that "teleputers" connected by fiber-optic cable would make broadcast television obsolete, in 1990. Gilder hadn't just hit on the coming thing in exquisitely timely fashion, it turned out; he learned so much about the actual technologies that the experts took him seriously.

Gilder argued that just as the microprocessor had introduced previously unimaginable processing power, so the fiber-optic construction boom would usher in a world of instantaneous communication and infinite bandwidth: the telecosm. He predicted that it would make "the CPU … peripheral, the network central," and that it would enable anyone to launch a product, company, or political movement. But every boom must go bust, and the crash of the telecommunications industry, when it came, proved worse than the bursting of the dot-com bubble. More than $500 billion was lost in just a few years. Between 2001 and 2004, 216 telecommunications companies went bankrupt–most notably Worldcom ($104 billion in assets), whose CEO, Bernie Ebbers, received a 25-year jail sentence for what remains the largest accounting fraud in U.S. history. Meanwhile, hitherto stable industry giants like AT&T staggered. Unfortunately for Gilder, he had loved his tech companies not wisely but too well,

investing his own money as he had advised others to do.

"I'm a fan of George Gilder, the bubble bursting notwithstanding," Ethernet coinventor Bob Metcalfe (a member of *Technology Review*'s board of directors) told me after his San Diego keynote speech, "Toward Terabit Ethernet." Metcalfe had told his audience not only that optical networks would soon deliver 40- and 100-gigabit-per-second Ethernet–standards bodies are now hammering out the technical specifications–but also that 1,000-gigabyte-per-second Ethernet, which Metcalfe dubbed "terabit Ethernet," would emerge around 2015. Why, I asked, did Metcalfe believe this? "Last night, Gilder spoke to 300 of us at an executive forum about his 'Exaflood' paper, in which he predicts a zettabyte of U.S. Internet traffic by the year 2015," Metcalfe said. "Since I admire Gilder, I extrapolated from his prediction."

Fiber Aglow

An exabyte is 10^{18} bytes of data; a zettabyte is 10^{21} bytes. Metcalfe pointed to video, new mobile, and embedded systems as the factors driving this rising data flood: "Video is becoming the Internet's dominant traffic, and that's before high definition comes fully online. Mobile Internet just passed a billion new cell phones per year. Then totally new sources of traffic exist, like the 10 billion embedded microcontrollers now shipped annually." Did Metcalfe believe that the existing infrastructure–built in the boom years, when great excesses of fiber-optic cable were laid down–could support terabit Ethernet? "That dark fiber laid down then is being lit up, and some routes are now full," he said. "That's the principal pressure to go to 40 and 100 gigabits per second. It seems we can reach those speeds with basically the same fibers, lasers, photodetectors, and 1,500-nanometer wavelengths we have, mostly by means of modulation improvement. But it's doubtful we'll wring another factor of 10 beyond that." Thus, the backbone networks would need to be overhauled and new technologies implemented.

The speaker after Metcalfe, Herwig Kogelnik, described both the field's progress and the technologies that would support not just 10- and 40-gigabyte-per-second but also terabit speeds. Kogelnik–who in more than four decades at Bell Labs has headed several research divisions investigating lasers, holography, and optical guided-wave devices, collecting too many academic and industry honors to list in less than a page–explained that current research had, for example, advanced WDM (wavelength division multiplexing) technology to a point where economical transmission of 10 channels, each carrying 100-gigabyte-per-second traffic, was now feasible. Likewise, on the trade-show floor, it was apparent that the component technologies of the telecosm Gilder envisioned a decade ago–a global network with infinite bandwidth and instantaneous transmission–were becoming available in 2008. Companies exhibited products that made use of silicon photonics: Lightwire, for instance, offered a lightweight transceiver designed to greatly improve upon the SFP+ modules currently used to connect servers and network equipment. Since photons move much faster and scatter much less heat than electrons, it promises to reduce power dissipation by more than half.

Nevertheless, many of the conference's attendees and exhibitors seemed ambivalent. Sure, they felt, all this was exciting. Simultaneously, however, they told each other in muted tones that the economy was sinking and the industry needed to undergo consolidation. And who, they asked, would pay the up-front costs for these next-generation networks?

"Nobody wants to pay," Jag Bolaria, a Linley Group analyst and former director with Intel's Ethernet division, told me. "That's why British Telecom is asking the U.K. government for subsidies to install DSL bandwidth. It's the same in France and Italy, and it'll happen here." Bolaria was particularly critical of U.S. carriers. "Test what you get through your broadband connection, and you'll find a one- or two-meg link is what you end up with," he said. "In Europe and even parts of Asia, they're getting significantly more–maybe 10 megs. But in America, carriers own the pipes, and we don't really see much competition. If they don't want to give you much bandwidth–and AT&T and other carriers are selling T1 lines and charging seriously for them–you don't get much bandwidth. Furthermore, the carriers want to control content and charge for that." If the U.S. government gave American telecoms taxpayers' money, Bolaria said, the companies should be strictly prevented from pushing tiered services or content restrictions onto consumers.

He was guardedly optimistic about the future. "We're slowly moving toward more than 25 megs of bandwidth in a fiber-optic pipe into your house," he said. "I think as you start getting two- to five-meg uplinks, then you'll reach the point where users can put their own content in high definition." That, he speculated, might change Hollywood as radically as the Internet had already changed newspapers. "Overall," he said, "I'm looking forward to the time when you can truly choose or create your own content, as opposed to 'This is what you get and how much you pay for it.'"

Altogether, the telecosm in 2008 is much as Gilder predicted at the beginning of the century.

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