

‘The Seams that Hold Us Back’

Bill Gates on Hardware, Software, and the Next Step in Computing

In a keynote address at the COMDEX trade show on November 16, 2003, Microsoft founder Bill Gates discussed the recent history of computing and the “seams and boundaries” that impede the flow of information.

The successes of the 1980s and 1990s were pretty phenomenal, but those only brought us, I would say, halfway to the dream of what software and hardware could do. Certainly, we achieved the title of the most empowering device that’s ever been created, the best device for communications, the best device for letting you express your ideas, finding other people of similar interests. We are there on every one of those things. But in so many ways in terms of simplicity, and even power, we’re not there.

I think this decade is a very special

decade in terms of what we’ll be able to get done. I’ve referred to it many times as the Digital Decade, meaning that at the start of the decade the number of people who used computers for their regular activities both in their work and at home was quite modest. Creating documents [and using] e-mail were really the only things ... used by hundreds of millions of people. By the end of the decade, we’ll have over a half-billion people who have so many things that they do—whether it’s scheduling, photos, music, organizing meetings, planning forecasts—all those things will be driven by software assists. And so there’s more productivity to be gained in the advances that will come in the rest of this decade than the industry has delivered in our entire history up to this date. It’s

because we're building on the work that we've done before. And yet, the power is getting to such a high level that we can move even faster than ever before....

[T]he constraints that we have to get rid of now, the seams that hold us back, are of a different nature than ... in the previous two decades. The constraints now are much more about pure software challenges. In the 1980s, we were still held back by hardware. Moore's Law was necessary to get us a machine that could do graphical user interface. When we first put Windows up on a 286 machine, it was only sort of fast enough. It really took the 386, and some would say the 486, before graphics interface was clearly superior to what had come before that.

We needed hardware advances to let you run multiple applications and move data back and forth between them. So there was software invention, but we were constrained by hardware. In the 1990s, we talked about the wonderful things that would happen when these machines got connected together. And so at the start of the decade, the explosion of Ethernet started to fulfill that ... [T]oday we take it for granted.... [I]n the early 1990s, if you'd said to somebody that you could sit at your computer and go get information from thousands and thousands of miles away and not even have it measured ... that would

have seemed very strange. The mindset was that communications was going to be very expensive. And yet the model that succeeded was not even to measure the amount of network capacity that we're using, to just let you browse for a fixed amount. And that really revolutionized things. So, connecting all the hardware together, both locally and around the globe, that was the constraint we got rid of that let us do something very new and different.

Now, people thought that was it, that that alone was the last boundary, the last thing that had to be solved. In fact, that was wrong. When people talked about e-commerce, they didn't realize that representing the information of the buyers and sellers, and understanding the rich workflow that takes place in commerce, that a platform and a set of standards for that would have to be built, and that connectivity alone of the hardware was not enough. And so now, in this decade, we're engaged in delivering the final level of infrastructure, which is a software connecting infrastructure that connects all your different information together, that lets you work in a very natural way, connects you up to your speech, and your ink, and your photos, all those natural things. And so we talk about this as Seamless Computing—the idea that we, through advanced software, will be able to eliminate those things.