FROM COMPLEX TO SIMPLE

As technology changes our vocabulary, it's also changing our devinition of progress.

by Bill Joy

When our vocabulary changes, we know something big is going on, something really fundamental – a change in the way we think about what we do. That's precisely what I see happening today. It's a trend that I'd like to see continue – and accelerate.

For 40 years, computers were all about the disk and what was on it. Now we talk about the network and the services it makes available. That's far more important to people than what's on their particular disk.

We used to worry about what hardware we had, what operating system. Those terms are becoming irrelevant. We now think in terms of platform independence – programs that run on any computer.

Instead of talking about computers, we're talking about devices. Whole systems on a single chip.

We used to talk about computer memory. Current thinking centers instead on distributed objects – small chunks of bug-free software that can be snapped together like Lego building blocks. And we have a new term, "agents," for bits of software that go where they're needed, when they're needed, across the network.

Things used to be "permanent" – a term whose literal definition has long since been replaced by a more relative meaning. Now things are becoming completely spontaneous. We used to manually configure networks in a certain way. Now we can simply plug devices in and they find each other on the Net. They basically introduce themselves and tell each other what their functions are.

We're going from what has been described as the cathedral model, where everything is developed by one place – say, Redmond, Wash. – to the bazaar model, where everybody in the world can contribute services and devices. From Microsoft to many. Many people innovating – not one company trying to do it all. From the tired, buggy, overly complex operating systems of the disk age - the technology of the 1970s taken too far - to simple, object-oriented systems where you just plug things in and they work.

The bottom line: Disk-centric computing is coming to an end. The future belongs to networks. Wired and wireless. Broadband and narrowband. As microprocessors are embedded in just about everything, just about everything will be connected to the Net.

We do forecasts of how many microprocessors you'd have in a typical car or a typical house. It looks like 50 microprocessors is a good number for a car, and maybe 150 or 200 microprocessors in a house. It's inconceivable to have 150 copies of a PC operating system running in your house. The thought of administering that is staggering. The number of disk drives and everything - it's just completely out of proportion to the scope of the things being done. Refrigerators that take inventory and order additional groceries from the corner market. Appliances that monitor themselves, predict failures, and call for service.

The whole way we've done computing for the past 40 years - with monolithic disk operating systems – is really inappropriate for this new environment. The term "unreliable" has to be removed from our vocabulary. We have to do away with systems where one failure brought everything down and move to the kinds of distributed, dependable systems people are going to come to expect. And the essential price of reliability is simplicity.

All this new terminology indicates that we have appropriate technology - appropriate for the age of the network rather than the disk. We have a platform-independent programming language, snap-together software building blocks, and "agents" that enable us to construct spontaneous networks. In short, we have the things we need to build simple solutions to our problems.

The organizing principle is very simple: Everything can be represented as an object. Every device, every service, every process, every piece of business logic - what we normally think of as an application – they're all objects. These objects exist in different places on the network and work together to provide value to the user. This principle applies to phones, pagers, PDAs, software you run on existing PCs, devices embedded in vehicles, things on the factory floor, in business enterprises, toys. In every case, we can think of them as objects – things with a set of properties. I don't care how those properties are implemented. All I have to know is that a printer can print. I don't have to know how. It's enough to know what. That's a big breakthrough.

In the new millennium, we're ready to redefine progress and make the biggest semantic leap of all – from complex to simple.

Bill Joy is founder and chief scientist of Sun Microsystems, Inc.

Executives	Service Providers
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Developers	System Admins
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