Why Jini Now?

THE NETWORK IS THE COMPUTER™

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Why Jini Now?

We've all seen the picture: A computer room circa 1963 with its raised floor, a dozen tall skinny boxes representing the mainframe, a Teletype terminal, a bulky line printer or two, and the pièce de résistance—a cleancut gentleman loading a mag tape onto one of the 3 or 4 tape drives. He looks out of the picture toward you, smiling.

The picture seems quaint to us now—how unlike contemporary computing.

But in the intervening 35 years, what has changed in the picture? Not much—just the scale. The speed of computation has increased by a perhaps factor of 3000, the size of feasible computations has also increased dramatically by a factor of perhaps 1000, and the size of the computer has decreased dramatically: The contemporary computer—the one that's 1000–3000 times more powerful than the one in the picture—sits on a desk and is used routinely in the office and at home. But a block diagram of the major components, their roles, and how they work together hasn't changed at all. We've merely shrunk the computer and sped it up, but we haven't advanced it as a tool. This is significant.

Other significant things have changed as well—the smiling cleancut gentleman has disappeared, sort of. That man was the *system administrator* (*sys admin*) who was responsible for making sure that the gargantuan computer worked properly, that programs it needed to operate were kept up to date and in good working order, and that the programs you wanted to run were loaded and executed as you specified. The problem is that he hasn't disappeared entirely: If you work in a small office, have a home office or a moderately sophisticated home computer system, or if you work in a department with limited resources, most of his duties have fallen on your shoulders. You make sure the computer is working properly; you keep the programs you use loaded and up to date; and you make sure that all the components are in working order, and communicating properly with each other. In larger organizations, the smiling man is still called a *sys admin*, but his job (or her job) is to install your computer when it first arrives and to fix it or arrange to have it fixed when it breaks down—and you share him or her with 20 or more other people.

What else has changed? Computers have become ubiquitous, and they have disappeared. They've disappeared by donning coats of automobile hide, telephone skin, stereo fur, and microwave scales. Quite a few of the things we use have a computer in it, and all of these computers are easy to use, while the only thing we think of as a computer is hardest to use of all. There is nothing magical or paradoxical about this: Throughout history the best technology has always sunk below our view within tools and toys that do something we need or something we want.

By disappearing they dominate our lives. But also their ubiquity is quite visible on the Internet and the Web. With Web browsers we visit computers all over the world—sometimes in peoples' dens and bedrooms, sometimes in corporate halls the other side of sunset. When we work the Web, aren't we operating under the model that there is exactly *one* computer in the world?

And when we connect to a site with wonderful animated graphics, we've actually installed and successfully run a program that a Swede or an Aussie but someone far away has put together in her or his spare time. It's a simple piece of code written in Java, but what we've done was once considered remarkable. And even today, the simplest program we can buy from the best professional software developer can take many minutes or hours of devoted attention to install and run.

These three facts (you are the new sys admin, computers are nowhere, the one computer is everywhere) should combine to improve the world of using computers as computers— by making the boundaries of computers disappear, by making the computer be everywhere, and by making the details of working with the computer as simple as plugging a DVD machine into your stereo system.

What is Jini?

Jini is a new system architecture that tries to make the improvements these observations suggest: Jini brings to the network the facilities of distributed computing, network-based services, seamless expansion, reliable smart devices, and ease of administration.

Here's the Jini vision: When you walk up to an interaction device that is part of a Jini system, all of the *services* on the Jini system are as available to you as if they were on your own computer—and services include not only software but hardware devices as well, including disk drives, DVD players, VCRs, printers, scanners, digital cameras, and almost anything else you could imagine that passes "information" (digital streams) in and out. Adding a new device to a Jini system is simply plugging it in.

We use the term *system* for a couple of reasons. First, we say Jini is a system because Jini really isn't a computer nor is it a network of computers. Not only does it accept other sorts of devices (entertainment devices, MIDI devices, etc.) than we normally expect on a computer or computer network, but there is no single computer that is the computer. The system appears as a set of services that are available—some are software implemented and others hardware, but the interfaces (user and programmatic) always presents simply and uniformly the services available regardless of how they are implemented or where they are.

The second reason we say Jini is a system is because Jini itself is not simply a set of point technologies but a new architecture for computing, sort of like a new block diagram for what a computer could be.

And we use the term *service* because there is nothing inherently interesting about computers to people who want to use them, just as there is nothing inherently interesting about stereo components except what they do, what services they provide. A CD player, an amplifier, some speakers, and a CD make music—that's all we care about once it's all working. What most people care about from their computing systems is what they can do with them: read and compose e-mail, prepare papers and presentations, do financial work, find information on the Web, or be entertained. Each of these things is a service, and we care about them, not about the types of CPUs, the number of registers, the speeds of the buses, or the word size.

In other words, Jini is a system architecture (hardware, software, and network) that supports the notion that a computing environment is a network-connected set of computing, storage, display, entertainment, and IO devices. In Jini, devices can be added or subtracted, and doing so may alter some of the capabilities of the system, but it will not alter its identity or basic usability.

Putting together Jini requires a few things:

- an infrastructure which operates as a dynamically distributed system
- a common language and implementation that enables low-overhead communication between distributed objects
- a lookup service (which identifies objects that supply those services)
- add-in and subtract-out protocols which are implemented on each device—we call this the *discovery* protocol

Jini Software Details

The first realization of Jini ties together machines on which Java objects are running, perhaps in different virtual machines. Jini enables such objects to work together as though they were on a single, very powerful computer. Jini enables such objects to

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