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ONE HUGE COMPUTER

THE NET MADE it possible. Java made it doable. Jini might just make it happen. An on-the-fly, plug-and-work, global nervous system that connects his cam to her RAM to your PDA. **Also:** A conversation with Sun's founding spirit Bill Joy.

The Irresistible Dream: Ever since Marshall McLuhan, a central dream of the digital culture has been to create one huge computer. Not a towering superbrain tended by white-coated priests, but a vast constellation of interacting machines - processors, memory modules, disk drives, and a million other devices, all networked into a vast planetary system. A means of thinking, creating, and communicating that is everywhere at once, but nowhere in particular. A computer that is always on. Such a system would continuously spread itself and thicken, expanding by its own internal logic. It would be supremely adaptable, and hard to break. It would have myriad access points, but no CPU, no single point of failure. The global village, to coin a phrase, made real.

Engineers have long had a word for systems whose powers are widely dispersed: distributed. Banking, telephones, the electric power grid - the bigger something is, the more likely that it will be distributed. The Internet is arguably the biggest distributed system ever built, and the most complex. But all these are specialized, essentially one-dimensional undertakings - processing money, electricity, or communications bits. They pale against the ambitions of a system that aspires to be everything - to everyone.



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For the biggest of thinkers, that sets up an irresistible dream: to build the network that makes all networks one, a global nervous system. The napkin sketch is simple: Take all the intelligent machines in the world - from giant mainframes to the tiniest embedded chip - and hook them together in a single intelligent network. A system open to novelty, new members, and features. A system that can tolerate what engineers ruefully call faults. A system with no limits on how large it can get, nor how small its smallest part can be.

Add a few more stipulations. To have any chance of working, the global network's structure will need to unfold from simple principles, rather than from ever more complex planning and central control. And, like another well-known distributed-computing device - the human brain - it will need to be able endlessly to reconfigure itself, to solve unanticipated problems and address unforeseeable new needs.

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The key pieces for such a system - millions and billions of microprocessors - are already here, or coming. So, too, are the riotously expanding networks. Indeed, to start building that one great computer, only a single essential ingredient is missing: an architecture, a universal language, a

set of superprotocols, something - and very possibly today's lexicon can't name it - to hold it all together and let the magic work. A constitution, if you like, a digital equivalent of the genetic code that all living things share.

Or, just maybe, this: a crash effort cooked up by some of the most ambitious minds ever to flee the corporate confines of Silicon Valley - a secret project spearheaded by Bill Joy, the software luminary who put the Internet on Unix and Java on close to 100 million desktops and whose fondest wish now is to give the world, to use a favorite Joy phrase, one more good "technological dislocation." He's sure he's found one. And appropriately, it's called Jini, loosely from the Arabic for magician.

__ General magic

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In a windowless second-floor room in a deliberately obscure Sun Microsystems outpost in Sunnyvale, California, half a dozen anonymous chunks of expensive-looking hardware sit on long folding tables. Some barely rate a first look: a not particularly recent printer, what look like a pair of flat-screen monitors, a video camera, a couple of keyboards. Others are clearly prototypes: overdesigned purple computer-somethings with curved sides and stylized vents. Any Demo, Silicon Valley, USA.

Turn any of the devices around, however, and only two wires are visible: electric power and an RJ-45 Ethernet connection. Each box - even the display screens and the little handheld camera - is a fully independent network citizen, able to hold its own on the system, unencumbered by specialized cables, software drivers, or the rest of the usual array of digital life support.

Say you want to use the camera. Plug it in, and poof - a second later, an icon appears on your display screen. All the configuration chores are done automatically by one of those purple boxes - a low-end server called a lookup device - and by a 25K communication program in the camera. What's in the viewfinder? Bring the camera image up on a monitor - any one you like. Store a clip? The 10-gig storage device - a slightly smartened-up disk drive - is waiting. Edit? There's another of those purple

boxes, the computing device, with full workstation power. Pull some video-edit software out of the storage module, and you're off.

That's one possibility. Or maybe you'd rather batch print some letters from your laptop. Done. Or get that old laser printer online. A pocket-sized adapter does it. Or add another 10 gigs of storage - no need to call a sysadmin, just grab a drive off the shelf, and plug it in.

On one level, the demo is the ultimate in plug-and-play technology - "plug-and-work," its Sun-shirted minders note with a smile. No mean feat. Not surprisingly, some of the Jini demo's most interested visitors have been from hardware companies that would dearly love to find a way for us all to snap a few billion more microprocessors, disk drives, and other smart devices into our personal networks.

But Jini aims much higher. What Joy and the two dozen programmers working with him aspire to do is nothing less than dynamite the whole creaky logjam of computing, as it has evolved from giant mainframes through the first clunky PCs to today's cobbled-together Internet and Windows Everywhere. If they succeed, Jini code will provide connections that will make today's information "superhighways" look as confining as 19th-century railways. And that, Jini thinking goes, will be the foundation for truly networked, global computing - organic and ever changing, and keyed to a hurtling future instead of being shackled to the platforms and conventions of the past. "When the foundations are so far off," reads an internal Sun document written to support the project last year, "it makes sense to do a reset."

Coming from almost anywhere else, that declaration would be laughable. But Sun and Bill Joy have come close once already to pushing computing's reset button, with its still-expanding programming language Java, the most important development in computing since the explosion of the Internet. What Java aims to do for software - be a lingua franca - Jini hopes to do for the machines that run it: provide an overarching, universal platform - a distributed operating system, in effect, on which devices of every description can meet. "Jini is the next chapter in the Java story," reads

another project mantra.

And Jini is no clunky hack, strung together in a lab with glue and wire to impress the boss and calm investors. Most of the demo devices are modified versions of existing hardware - one of the project's driving ideas is to not have to throw existing systems away. Jini software has been in limited-release beta since June, with testing under way by some of the biggest names in computers and consumer electronics - NEC, Toshiba, Quantum, Ericsson, Siemens, Computer Associates, and a dozen others. By the end of the year, Sun hopes to release a full package, from a network infrastructure to the little 25K program that can put your front-door light switch onto the network. The release name is still being debated, but the marketing plan is not: It will reprise the same strategy that fueled the explosive take-offs of both the World Wide Web and Java - essentially, give it away. "There's one thing we've all learned from watching Java and the Net," says Mike Clary, Joy's key colleague in Aspen and Jini's overall project manager. "This can only be a ubiquity play."

Jini's prelaunch team shares a building with what remains of another audacious attempt at networking heroics, General Magic - a reminder of the casualty rate of would-be technological revolutionaries. A Jini victory would mean the creation of a loosely connected federation of computers freed from today's OS tyrannies - one reason not to expect a friendly Microsoft embrace. Neither Bill - Gates or Joy - needs reminding that it was the modest little PC's universal appeal, not the US Justice Department, that ultimately humbled IBM's mighty mainframes. And if lightning strikes again, those anonymous boxes in the windowless demo room could someday end up in a technology museum: cell zero of the global computer. Not to mention giant slayers.

If ...

__Up from Java

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Bill Joy doesn't like the word "exile," but he's made a second career out of keeping most of the Rocky Mountains between himself and Silicon Valley. A founder of Sun Microsystems and still officially

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