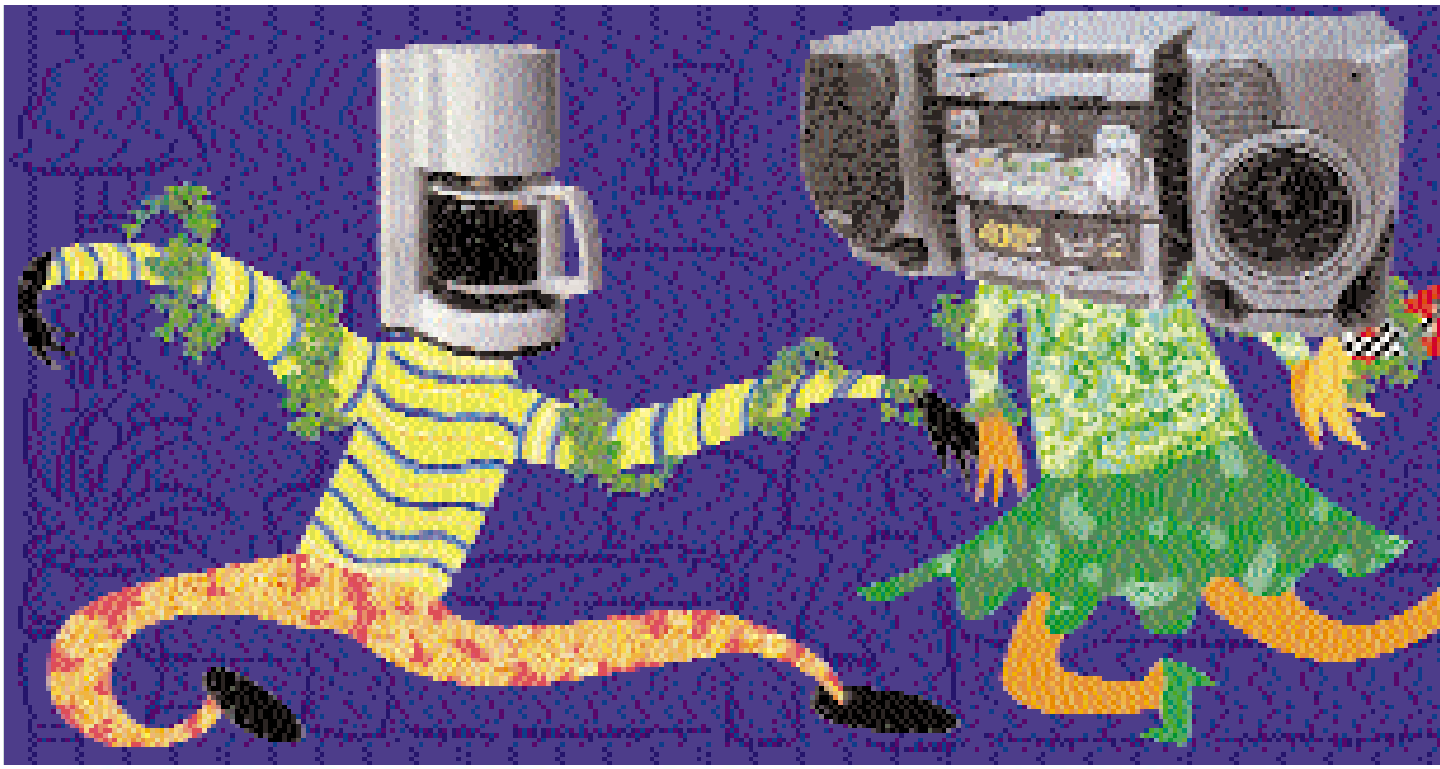

"JINI@YOUR

Thanks to Jini, the networked digital house of the future is today's reality—and you can

It is seven in the morning. Your networked alarm clock gives you a gentle reminder, and the window blinds roll up to let in the morning sun. The bath water is heated to just the right temperature, even as your fridge busies itself defrosting yesterday's leftover pizza for breakfast. The coffee-pot and microwave are waiting expectantly, ready to take over when their time comes.

Bath and breakfast done, you give one command, something like "Close All Sesame", and the windows and doors shut themselves.

Your house secured, you set off to work. Back home, the microwave discovers an electrical fault, all by itself. It contacts customer service and registers a complaint. The minor technical glitch is fixed at once by—take a breath—the computer at the other end. All automated, of course. Breathe out. Is this a scene from a sci-fi movie? Not quite.

Jini is Here

Jini, named after an Arabic word for magician or spirit, is the outcome of a four-year-long R&D project at Sun Microsystems. Created by Bill Joy (co-founder of Sun), Jini enables computers and digital devices to participate in networks: a federation of devices that simply 'plug and work'. Jini enables impromptu networking. It is like an entire community of electronic citizens living together without any elaborate planning, installation or human intervention.

Personal computers have been developed to perform increasingly complex tasks, many of which are not useful to the majority of PC users, who often run into 'illegal operation' and 'device not found' messages. In a Jini community, devices take care of themselves. They can self-configure, self-diagnose and self-install.

Another advantage is that Jini is 'light'. With only 35,000 lines (or about 48 KB) of Java-based code, Jini can reside in the simplest of devices such as wrist-watches and light switches.

Most offices today are networked—with shared printers and scanners. However, there is still the complexity of the network environment. Ask your system administrator. He will tell you (if he can find the time!) that each device has to be configured individually.

With Jini, devices will simply connect to the network when plugged. And you will get a Web tone similar to the dial tone in phone lines. Your system administrator may find himself out of work.

SERVICE"

be its Lord and system administrator

The Spirit of Jini

How does Jini work? When a new device wishes to join the network, it must use Jini technology to register the services it provides. This is done in two steps. The device first contacts the local network to locate a Jini technology lookup service. Then, it registers itself with the lookup service. These steps are called the 'discovery' and 'join' processes. For each service the device provides, it uploads a Java object to the lookup service that provides the interface for that service.

Jini is just Java software code. It can run on anything with a 'digital heartbeat'—cellular phones, digital cameras, personal digital assistants (PDAs) and even smart cards. Because Jini technology is based on the Java platform, it will run on any type of network that has at least one Java Virtual Machine (JVM), including networks using traditional operating environments such as Novell NetWare or Microsoft Windows.

By delegating some of the Java technology-specific functionality required by Jini software to a third party, a device does not need to have its own virtual machine, and can become part of a Jini technology network with little or no additional code. But some trade-off between functionality and device complexity may be inevitable.

Upgrading your existing digital devices to use Jini technology is simple. Just add Jini software. For example, your PC, once it has this software, can use the services of other devices and offer itself as a service.

Jini at Home

The CD player we use at home does not connect to the microwave oven; nor does the TV remote give us control over the refrigerator. However, new technologies such as HAVi (*See 'Other Emerging Network Technologies'*) will allow us to interconnect easily. The HAVi consortium has announced that it will use the Java programming language as its language of choice, making it even easier to integrate HAVi into networks using Jini.

A HAVi-Jini technology bridge will extend this concept by enabling remote access to the home network, regardless of

Your computers will be like your TV or your telephone pieces of plastic and metal that let you transcend time and space and the physical world.

OTHER EMERGING NETWORK TECHNOLOGIES

Bluetooth (Special Interest Group comprising Intel, IBM, Toshiba, Ericsson, Nokia, and others): Bluetooth is a technology specification for low-cost, short-range radio links among PDAs, laptops, mobile phones and other portable devices. Bluetooth devices can automatically detect and establish a network connection with similar devices in the vicinity. Thus, devices using Jini technology can communicate without being physically connected to each other.

JetSend (Hewlett-Packard): Introduced two years ago, this is a platform-independent protocol that allows devices to intelligently negotiate information exchange without the need for a server or a device driver or any user intervention. The protocol enables devices to identify a common data format and exchange data.

HAVi (Matsushita, Grundig AG, Hitachi, Sharp, Toshiba and others): Home Audio-Video interoperability (HAVi) is a specification for home networks of consumer electronic devices such as CD players, televisions, VCRs, digital cameras and set-top boxes. The network configuration is automatically updated as devices are plugged in or removed the operation of devices by the user is simplified.

T Spaces (IBM): Allows heterogeneous, Java-enabled devices to exchange data with little programming effort. T Spaces has a small footprint and because it implements Java, it complements Jini.

Universal Plug and Play (Microsoft): This technology will be based on open standards and will compete with Jini to allow intelligent appliances and computing devices to inter-operate, blurring the distinction between them.

the user's location. Add a cable modem, a set-top box with Jini software and a HAVi-to-Jini bridge, and you get video-on-demand, Web surfing, Web broadcasts and software upgrades from the Net. That's convenience for you! As a bonus, Jini offers you security too.

Here is a typical scenario: You are a career woman and a mother, and your adventurous kid is at home—alone. With your Jini-networked surveillance system in place, you can keep track of your child's movements. You can set the security system to notify you when a visitor rings the bell or a thief attempts a break-in. You can switch on your wireless TV to zoom into the scene at home and contact a neighbour (or the police, if necessary) for help. With Jini around, wonderful things 'simply' happen.

A Jini for Everyone

If you have a digital camera, should you also buy a PC, a printer, a storage device and a dozen applications? With Jini technology, you don't. Devices and applications 'announce' themselves and register with a lookup service (discovery) and upload their drivers or interfaces (join) it. The lookup service acts as a bulletin board with a list of all the services (devices and software) available on the network.

When you plug into the network—say, with your digital camera—and request a service such as print, the lookup service responds by providing you with a list of printers connected to the network. Once you make your choice, the chosen printer's interface and driver are downloaded into your camera and your images appear in print. All this, without any worries about compatibility issues.

In such a network, each service provides the code needed to interact with it. In the Jini world, everything is a mobile object. Services such as the printer (above) send their mobile code as 'agents' to the client, which absorbs the agent and interacts directly with it. The agent, in turn, takes care of the protocols involved in communicating across the network.

Jini relies on the Java technology architecture and other specifications for communication in such a distributed system. Java affords the very powerful feature of network mobility of code.

With Jini technology you could have access to a vast array of services, information and other devices from the dashboard of your car. The gates of your house or office will open even as you drive up. Smart cards will debit your bank account for your purchases, and no human intermediaries need be involved in the transaction. Smart devices will be part of daily life. Some companies have introduced such devices in the market already, and a variety of Jini-enabled devices are expected to be available later this year.

Simply Jini

The PC may not get any simpler to use in future but running a program or device definitely will—it probably won't even require a PC in the neighbourhood. By reducing the complexity of devices and by creating a way to simply connect them, we are at last beginning to see that advanced computer technology can simplify our lives. The idea of vanishing human intervention should appeal to all of us, unless you happen to be one of those nerds who thrive on complexity!

Jini is here, make your wish.

NAINTARA JAIN

The Network is the Computer

Coined in 1988, this favourite slogan of the engineers at Sun Microsystems translates to: It is not the box (PC) on your desk that will do the job for you, but the network you are connected to.

As computers become smaller, faster and cheaper, we find the mushrooming of tiny computers or microprocessors embedded in a wide range of consumer appliances from TVs and washing machines, to phones and cars, to ATMs and surveillance systems. Devices are being injected with smarts, so they can take care of themselves, be flexible, adapt and interact. The best technology is that which sinks below our view. The distributed nature of the network disperses the functionality of all software and hardware throughout the network, making the limitations imposed by geography irrelevant.