The Connected Home Powered by Java Embedded Server™ Software

White Paper

Sun
microsystems

Please
Recycle

Adobe PostScript™

Contents

Executive Summary

The pervasiveness of the Internet is enabling a *connected lifestyle*. The phone dial tone is giving way to the Internet *Webtone*, which will bring exciting new applications to consumers wherever they may be: at home, in cars, on cell phones, or in hotel rooms. In the home, the key to this connected lifestyle is the *home gateway*, a *black box* that connects devices and appliances in the home to each other and to the Internet. Broad opportunities exist for businesses—service developers, service providers, and device manufacturers—to deliver exciting new services to the networked home through the home gateway. Open standards, like the Open Services Gateway initiative (OSGi) for the network delivery of managed services, and industry alliances like the Internet Home Alliance, are critical for interoperability and consumer adoption of these technologies. Sun is building end-to-end solutions for this market, including Java Embedded Server™ software—an ideal solution for powering residential gateway devices to enable dynamic delivery of network services on demand.

Industry Overview

The Dot Com Home

The Internet is enabling the new connected lifestyle. Already, many of us communicate, shop, perform research, and do other business on the Internet, helping to create the new Internet economy. As the Internet extends its reach down to more and more devices in our homes and cars as well as our businesses, we can embrace this technology in a whole range of ways to make our lives easier and more productive. Powerful new services for communication, entertainment, home control, and information will enable us to stay connected no matter where we are.

Imagine a home in which all the different devices are connected. A consumer finds out about an early meeting for the following day. When scheduling the meeting into a calendar program at the office or a handheld PDA, they also reset their home alarm clock to wake them an hour early. Automatically, the alarm clock resets the furnace and the coffee maker to turn on 15 minutes before they need to get up. It sets the lights to come on as soon as the alarm goes off. It even resets the landscaping sprinklers so they don't come on while the person is in the shower and reduce the water pressure.

Expand the picture to include audiovisual equipment, security and health monitoring systems, kitchen appliances, pools and spas. Telephone services, entertainment and information access, and e-commerce services all come into play, and an optional wireless Web pad to access provides the services from anywhere in the house. The consumer can take advantage of these services at low incremental fees, in the same way that phone companies offer call waiting and conferencing services to enhance basic phone service.

Clients

Service Connections

Network Services

Network Infrastructure
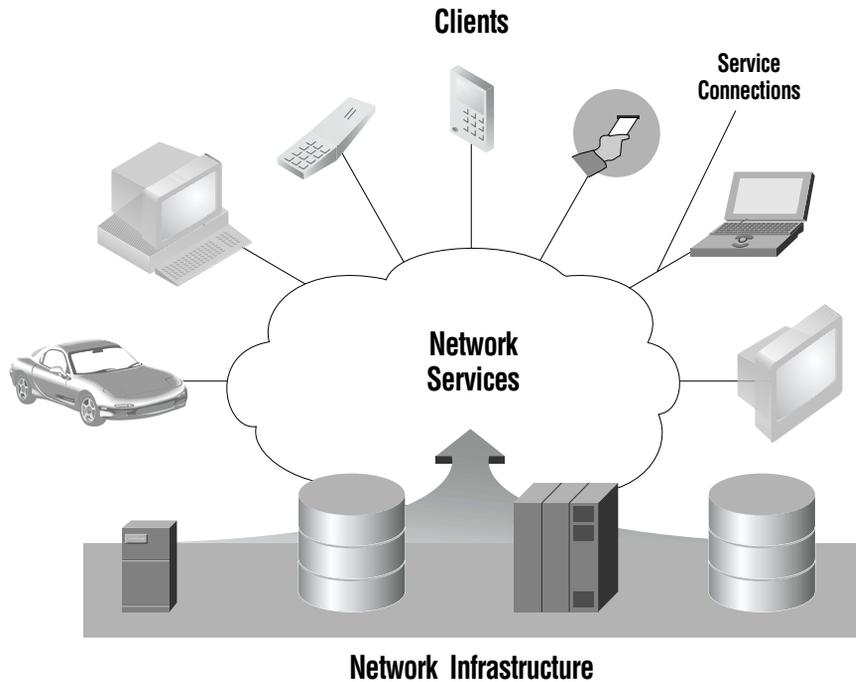
FIGURE 1   The Service Driven Network

The service driven network is enabling the Internet lifestyle, giving consumers access to a host of exciting new services and applications on any device, anywhere, anytime. The service driven network gives consumers the same degree of dial-tone reliability that traditional phone networks provide, while delivering new services that reside on the network. This new computing architecture has three primary components:

- *Access*—various network-enabled devices
- *Delivery*—personalized value-added delivery of Java™ services
- *Resources*—the back-end data center servers, storage, and software that act as the computing engine and warehouse of information

The *connected home* is a key market segment of the service driven network. Electricity, gas, phone service, cable TV—these utilities have been around for a while. The next utility is the Internet. Soon the Internet will be everywhere: in the car, on the cell phone, and in the home. In tomorrow's home—Sun's connected home—networked home appliances will be as commonplace as the telephone is today. Microprocessor-based consumer products are already common in our daily lives: alarm clocks, coffee machines, televisions, cars, air conditioners, and phones. Stereo systems, kitchen appliances, climate control systems, utility meters and security systems are just a few of the many devices that are now being connected to each other and the Internet, offering consumers powerful new ways to use technology to enhance their daily lives. Coupled with the broadband pipe to the home, the connected home enables service providers to deliver exciting new services such as audio/video on demand, dial-tone on demand, unified mail box for e-mail/voicemail/fax, home security, and energy management to the various networked devices in the home.

Sun offers end-to-end solutions to support the opportunities for an enhanced lifestyle that are being created through the pervasiveness of the Internet. Put another way, the Internet is a key driver to the connected home. This is a key market to drive these services, and Sun can bring reliable Webtone for these next generation services to the home.

Market Trends

Several important trends are converging today to create an environment in which the connected home is inevitable:

- *Rapid growth of broadband*
  - More than 12 million homes in the U.S. alone will have broadband access by 2002. (IDC/Dataquest)
  - 10 million homes will have broadband access by 2003. (Yankee Group)
  - U.S. broadband revenue will increase from $2.4 to $14.8 billion by 2005. (Forrester Research)
- *Emergence of network-enabled devices*
  - Worldwide information appliance shipments will grow from $11 million to $89 million annually by 2004. (IDC)
  - The home networking equipment and residential gateway market will grow from $600 million to $5.7 billion by 2004. (Cahner's In-Stat)
- *Emergence of local networks*
  - More than 20 million homes will have an in-home network by 2003. (Parks Associates)

- *A move to service-driven networks*
  - Broadcast television is moving toward pay-per-view, as well as dial tone on demand.
  - Activities such as using a mobile phone to remotely access home security or audiovisual systems, and using the smart card in the phone for storing personal information or to secure transactions, will soon be everyday occurrences.
- *Consumer acceptance*
  - 21 million U.S. households have an interest in the concept of the networked home.
  - 42% of households with PCs would consider using a network to enhance communication across their families.
  - About 12 million are likely to install such services over the next twelve months.
  - 39% would use such services to enable the viewing of downloaded video anywhere in the house.
  - 37% would use them to monitor and control the heating systems.
  - 33% would use them to listen to music anywhere.
  - 36% would use them to run household appliances.
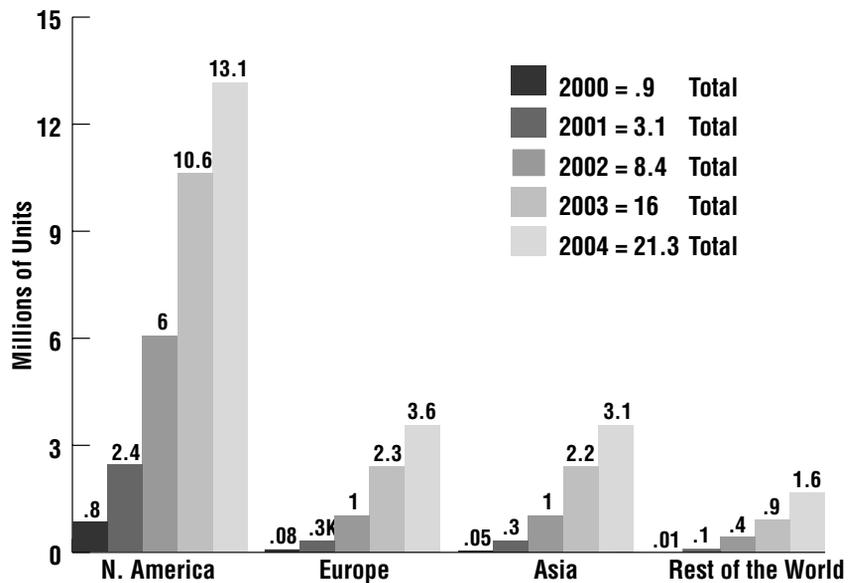
FIGURE 2   Home Gateway Market Size(Source: Honeywell Consumer Survey, 2000)
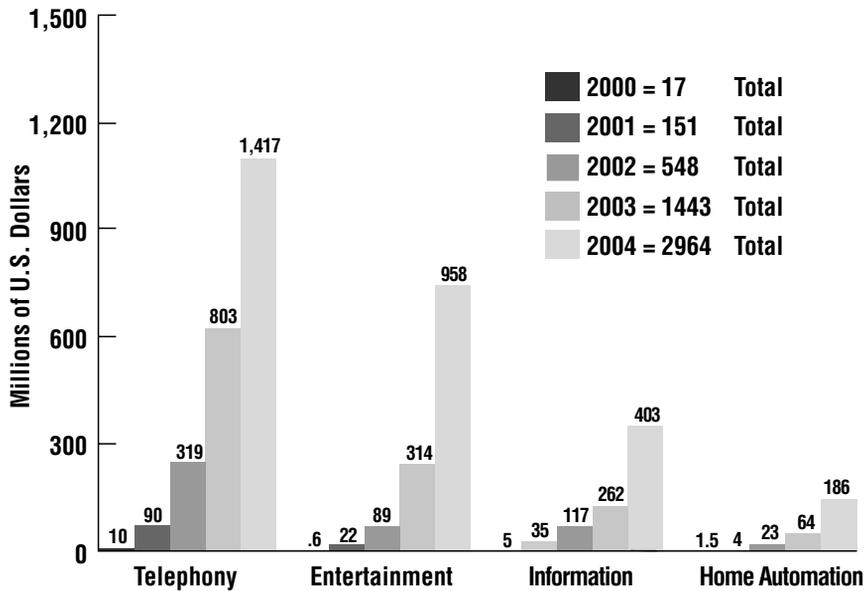
FIGURE 3   Home Services Revenue Projections (Source: Honeywell Consumer Survey, 2000)

Next-generation Internet Services

Deregulation of the telephone, cable, and utility industries has blurred the roles of these industries. Cable operators are moving to offer Internet access and phone services in addition to basic cable services. Phone companies are offering high-speed Internet access and eventually will offer video-on-demand services. Utilities are exploring energy management as well as the potential of becoming Internet service providers.

In this competitive environment, these service providers must not only protect existing revenue streams, but also generate new revenue. They are looking increasingly at the Internet to offer new value-added services to the networked home customers. Some of the new services in development for the networked home include communication, entertainment, home control, and information services.
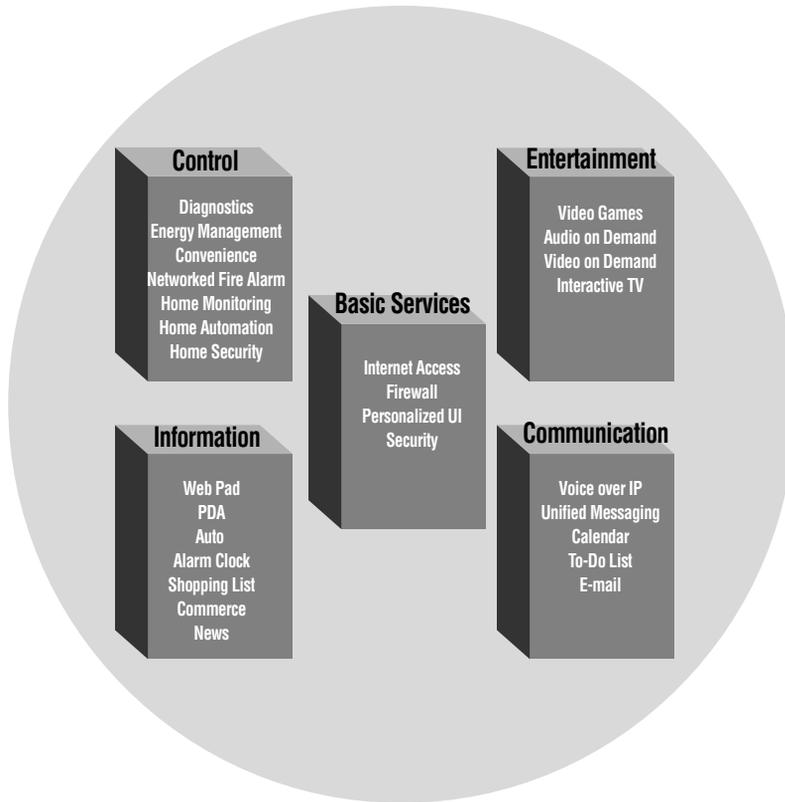
FIGURE 4   An Overview of Networked Home Services

■ *Communication Services*

Voiceover IP (VoIP) and *unified messaging services* are just a few of the myriad ways to bring telephony services to the home. VoIP supports directory service standards to help users locate other users, the use of touchtone signals for automatic call distribution and multiple phone lines on demand, individual mail boxes, conference calling, call transfer—all the services users already expect at the office are now available at home. Another major advantage of VoIP and Internet telephony is the avoidance of tolls charged by ordinary telephone service. Unified messaging services change the way users think about communicating, by letting the user receive any form of message in an *in-box* and collect it via any method: phone, voicemail, fax, e-mail, Web page, or answering service. Cell phones can act as transponders, allowing busy parents to track their children's whereabouts. The successors to today's popular chat rooms and instant messaging may be accessed via *wearable computers* or personal communicators.

- *Entertainment Services*

  Audio- and video-on-demand services and *digital video recorders* give the consumer access to a tremendous variety of specialized entertainment programming that can be started, stopped, and paused at will—all from the Web pad, without phoning or going anywhere. Consumers will have the ability to play movies from the DVD player in the den, or on demand from a service provider, to any television in the home.

- *Home Control Services*

  Home security, energy management, and home automation free consumers from worry and tedious routine tasks. *Device monitoring services* can run remote diagnostic tests to ensure that appliances and systems are operating properly. They can also receive alerts from devices indicating a functional problem. Many problems can be resolved remotely, or if needed, service agents can be automatically dispatched to the home to troubleshoot in person. *Device integration services* provide the means for appliances and other devices to communicate with each other to synchronize operations, such as the alarm clock telling the coffeemaker to turn on. *Home network management* supports multiple PCs and many other devices that share a broadband connection, and peripherals like printers. The consumer need not know anything about proxies, firewalls, and DHCP servers—the home networking service provider takes care of everything.

- *Information Services*

  Integrated and personalized e-commerce services will greatly enhance the consumer shopping experience. The consumer will scan product bar codes and add items to an online shopping list as stocks run low. The ingredients for a recipe shown on a TV cooking program can be added by simply clicking a button on the remote. The shopping list is transparently converted to an order with an online grocer and delivered to the doorstep. Manufacturers will be able to provide targeted promotions based on a specific consumer's consumption profile (if the consumer wishes to receive them), as opposed to barraging customers with spam and junk mail. In addition, these personal profiles will customize homes, cars, and even hotel rooms to specific consumer preferences when an individual enters them using a smart card, or automatically make airline, hotel, and car reservations (based on the defined preference) as soon as a new trip is entered on a online family calendar.

Several studies have shown that consumers are willing to accept more technology if it adds real value, is similar to existing approaches, and is relatively transparent to them (cell phones are examples), but they are not interested in having to learn and implement these new technologies themselves. Consumers won't want to buy a *device integration system*, but are likely to be attracted by a home entertainment or home security service that works via the Internet to seamlessly provide services they can access from anywhere—as long as the technology to make this happen comes along with the service.

The Home Gateway is Key

So what will make all this possible? Obviously, just putting a wired PC in the home is not the answer—the difficulties of maintaining it and the technical knowledge required to do so could outweigh the value of the services obtained. What will make these services attractive to the consumer is a dedicated, small device, connected to the rest of the house, that requires minimal or no upkeep on the part of the homeowner.

Thus, the real key to the connected home is the home gateway, the nerve center of the networked home.
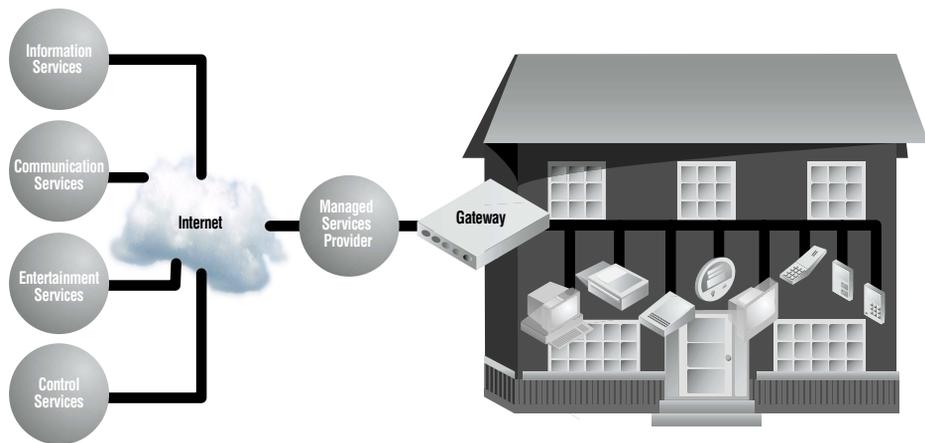
FIGURE 5   Home Gateway Usage Scenario

The connected home of tomorrow will connect all of the networks that already exist in the home—electrical, telephone, wireless—and then connect each one with any number of external networks via the Internet. The box that will network appliances within the home and connect them to the Internet is the home gateway. This type of network enables washing machines to download new washing programs dynamically, electronic toys to download updated game programs, and the consumer to turn off the oven, iron, or lights remotely after leaving for a trip. Most importantly to the consumer, all the services of the home gateway can be managed by external service providers. Just like the cable or phone service, home gateway services are just there for the consumer when they are needed—the consumer does not need to understand anything about how or why they work, just that they do. While home gateways are just one application of open services gateways (the software is expected to run in everything from gas pumps to soda machines to power substations), the home is an important and visible market for this new concept.

What It Is

What is a home gateway? It could be a:

- Cable modem
- Set top box
- DSL modem
- Web phone
- Dedicated residential gateway device

The specialized hardware and software required for a gateway can be built into a new, specialized device or embedded into an existing device. In effect, adding an embedded server—a special-purpose, low-memory, software server (not a Web server)—to any broadband termination device, transforms it into a home gateway.

The look and feel of the home gateway device will be influenced by the business model of the service provider who delivers it. A cable operator would embed this functionality in a cable modem or set-top box device. A telephone company might choose to include this functionality in a DSL modem or router, and a utility company could target the residential utility meter. To the consumer, the residential gateway will be a black box that is not even visible in the home, and that is managed by the service provider.

Why It Is Necessary

A home gateway links devices in local networks in the home to the Internet and external service providers—creating a focal point for enterprises and service providers to deliver services to client devices. The home gateway serves two primary roles:

- As a hub to connect and manage the intelligent appliances in the home
- As a communications gateway between the home and the outside world

Many types of devices can already communicate with each other. Why do we need another device to connect them? Even though a lot of important technology has already been developed to address many of these issues, all the infrastructure is not yet in place to make these connections seamless. Among the most important elements of this infrastructure is home wiring. New and existing houses need to be wired to receive external network services, with copper, coaxial cable, fiber, or some other alternative. Once the homes are connected to the outside world, the existing telephone or power lines, radio, wireless, infrared, or some other technology can be used to create secure internal networks. Current service providers must learn about this new technology and develop their own infrastructures to serve customers, and new providers must come into being to provide services that today may not even be imagined.

How It Works

The home gateway is an embedded server that is inserted into the network to connect the external Internet to internal clients. The gateway is inserted between the service provider's network and the home (or the remote branch office), LAN, and client devices. The gateway separates the topology into the external and internal networks. Services are delivered from trusted service providers on the external network to the gateway or internal clients. The gateway is typically a zero-administration device that is secure. It functions as a bridge between the internal and external components.
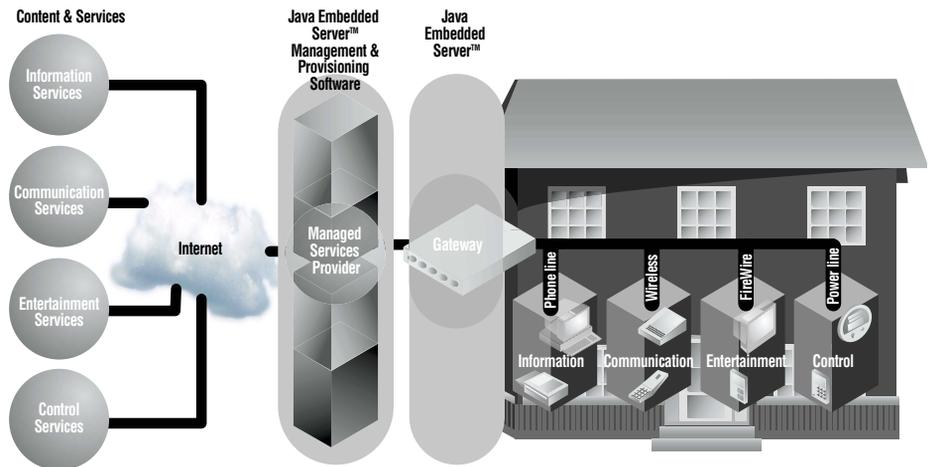
FIGURE 6   How a Home Gateway Works

Business Models

Now that we know what can happen, the question is how to make it happen. The current industry landscape is very fragmented, with many products, technologies, and standards. Sun is one of an increasing number of companies developing products and services for the connected home—and it is clear that no one company can create everything that is needed to enable the Internet lifestyle. Certainly one important driver for this development is the enhanced lifestyle it can bring to the consumers who will buy these products and services, and, in turn, the revenues it will mean for the creators and builders of these new technologies. But, another important reason is that both large and small companies are testing the boundaries of the corporate market that has been their lifeblood, and are finding that they need to expand into the consumer market.

> "It's a push market trying to create a pull market," said Michael Wolf, director of residential technologies at Cahners In-Stat Group, as quoted in *The Industry Standard* in October 2000. "You need infrastructure for these services, but there won't be demand for infrastructure until there are compelling services."

What are some of the roles that service and infrastructure providers can play in creating the Internet lifestyle?

Roles That Enable the Connected Home

Because of the vast new opportunities it offers, the potential of the home gateway is exciting not only to consumers but also for service providers, gateway operators, and vendors of hardware, software, and devices. Several roles are involved in the end-to-end deployment of a home gateway, and any individual company may perform one or many roles.

Service Provider

The *service provider* delivers a service or content that is of benefit to the consumer. The service is an application that is downloaded by the managed services provider into the gateway device. In the gateway model, service providers can focus on developing content, and outsource delivery and management. They rapidly deploy new services and generate service revenue streams. Providers may lower their costs by sharing a gateway with multiple providers and administering systems remotely. Service providers may choose to emulate the cellular phone model, in which the consumer gets the gateway device free—and revenue is obtained through monthly service payments.

Managed Services Provider

The *managed service provider* operates, manages, and maintains the gateway devices and their applications. The gateway offers new business and revenue opportunities for the provider, attracting new customers as well as increasing customer retention by adding services for existing customers. Gateway services can also increase network traffic and revenue. Costs can be lowered with gateways that are vendor-neutral, and the Write Once, Run Anywhere™ concept lets the provider choose from more platform options.

The managed services provider could be the telephone company, cable operator, ISP, or CLEC. The role of the managed services provider is to:

- Download, remove, start, and stop an application
- Control the resources of the gateway, check the operating cycle of the gateway, and manage application versions
- Define and control access rights between the gateway and service providers
- Secure the communications between the gateway and service providers
- Check the validity and the rights of any services that are dependent on other services

Network Access Provider or Service Aggregator

The *network access provider* provides and manages the network used to access the gateway. This provider could potentially be a telephone company, cable operator, or ISP.

Hardware, Software, and Device Vendors

For hardware, software, and device vendors, the home gateway offers access to a much larger market, increased revenues due to standardization, and the ability to create solutions on a vendor-neutral platform—which also reduces the risks inherent in proprietary solutions. The Write Once, Run Anywhere concept helps to reduce software development costs.

Gateway Retailer

If the gateway is not provided free of charge by a service provider or managed services provider, the *gateway retailer* offers it for purchase by the consumer at a retail outlet, an additional new line of revenue.

Consumer

Ultimately the consumer gains tremendous benefits from the home gateway. The consumer can obtain better availability of more services, at a lower cost because just one gateway delivers multiple services. One-stop service shopping offers unparalleled convenience for today's busy consumer, who can deal with several WANs or LANs at the same time, switch easily between service providers to get better services or a lower price, and securely access services through a *service aggregator*.

Technology Standards

A number of standards, alliances, and programming models have arisen to help bring some unity to the fragmented industry that is evolving the connected home.

Broadband Standards

■ *Digital Subscriber Line (DSL)*

DSL is a technology for bringing high-bandwidth information to homes and small businesses over ordinary copper telephone lines.

■ *Data Over Cable Systems Interface Specifications (DOCSIS)*

Now known as CableLabs Certified Cable Modems, DOCSIS is an interface standard for cable modems, the devices that handle incoming and outgoing data signals between a cable TV operator and a personal or business computer or television set.

■ *Wideband Code Division Multiple Access* (WCDMA)

WCDMA is a third-generation mobile wireless technology offering very high data speeds to mobile and portable wireless devices. WCDMA is an ITU standard derived from code-division multiple access (CDMA) that is officially known as IMT-2000 direct spread.

Home/Local Network Standards

■ *Phone Line*

 ■ *HomePNA* is an industry standard for interconnecting computers within a home using existing telephone lines and registered jacks in a transmission technology similar to traditional Ethernet. Using HomePNA, multiple computer users in a home can share a single Internet connection, open or copy files from different computers, share printers, and play multiuser computer games.

- *Wireless*
  - *Bluetooth* is a computing and telecommunications industry specification that describes how mobile phones, computers, and personal digital assistants (PDAs) can easily interconnect with each other and with home and business phones and computers using a short-range, wireless connection.
  - The *HomeRF* standards body has developed the Shared Wireless Access Protocol (SWAP) specification as a wireless LAN solution that operates in the 2.4 GHz band at a raw data rate of 1.6 Mbps.
  - *IEEE 802.11b*, also known as 802.11 High Rate (HR) and wireless Ethernet, is a high-speed, wireless Ethernet connectivity standard designed for both enterprise LAN environments and the home network. Operating in the 2.4 GHz band, 802.11b is fast, scalable, and has an impressive range: it operates at a raw data rate of 11 Mbps, can accommodate up to 128 nodes on a network, and has a range of up to 150 meters.
- *Power Line*
  - Echelon's *Lonworks* system is an open, networked automation and control solution for the building, industrial equipment, transportation, and home markets. Based on physical transceivers and application layer software, LonWorks nodes can be connected on multiple types of media; twisted pair and power lines are the most common.
  - *CeBus (Consumer Electronic Bus)* also known as EIA-600, is a standard for powerline networking using spread-spectrum technology. The CEBus Industry Council is merging the CEBus protocol and HomePnP into the SCP standard.
  - *Simple Control Protocol (SCP)* is a networking technology for devices with limited memory and processing power and networks with low bandwidth. Devices that would benefit from SCP include lights, home security devices, home automation devices, and other small appliances that are not able to support TCP/IP networking, or that connect to a home network through a low-speed powerline medium.
  - *The HomePlug Powerline Alliance*, formed in April 2000, has announced a powerline technology for home networking that will support a raw data rate of 14 Mbps. The first version of the HomePlug specification is expected next year.

Service Delivery Standards

Open Services Gateway Initiative (OSGi)

To fully develop the market for residential gateways of a broadly embraced open standard is critical. The Open Services Gateway Initiative (OSGI), is an open industry effort founded in March 1999 by fifteen technology companies, with the objective of providing a forum for developing open specifications to deliver multiple services over wide area networks to local networks and devices, and accelerating the demand for products and services based on those specifications worldwide through the sponsorship of market and user education programs. Today, more than eighty companies have committed to support the full incorporation and charter of the organization. Sun is a founding member of OSGi and a major contributor to its technical foundation.

The four major OSGI premises are:

- The networked home is the next frontier.
- The Internet and new technologies enable new services, value chains, and business models.
- Standards are required for the market to take off.
- Consumers need an end-to-end solution, which requires Internet connectivity for home equipment. This connectivity is provided by a gateway.

The OSG specification is the *missing link* in the networked delivery of managed services from broadband network to local networks in the home. Java™ technology provides the flexibility to support the wide range of phone line, powerline, and wireless network standards.

The specification is an layer framework application based on Java technology. It gives service providers, network operators, device makers, and appliance manufacturers the vendor-neutral application and device layer APIs and functions they need. These APIs define a set of core and optional APIs that together define an OSG compliant gateway. The OSGI specification includes APIs for service cradle-to-grave lifecycle management, interservice dependencies, data management, device management, client access, resource management, and security. Using these APIs, clients load network-based services on demand from the service provider, and the gateway manages the installation, versioning, and configuration of these services. In addition to the APIs, the OSG specification defines a number of required or optional services, such as Web server, alarms, logging, data management, and more. For additional information, see www.osgi.org.

Industry Alliances

Internet Home Alliance

The Internet Home Alliance was formed in 2000 by twelve founding member companies, with a vision of enabling and accelerating the development of the Internet lifestyle. Sun is a founding member of the Internet Home Alliance, along with 3COM, Best Buy, Cisco, General Motors, Honeywell, Invensys, Motorola, New Power Company, Panasonic, and Sears. The Internet Home Alliance seeks to enable a world of ubiquitous products and services that are as commonly accepted as the telephone and television are today.

The Internet Home Alliance is a facilitator for development of the Internet home market. The organization acts as an influencer to manufacturers and service providers, channel partners, and customers. The organization should be a source of stability and a builder of primary demand within the consumer community.

The Internet Home Alliance was conceived to accomplish two key goals:

- Market Development
  - Reduce customer confusion through simple and affordable solutions
  - Educate customers on the value and availability of Internet Lifestyle solutions
  - Help customers make choices with confidence
- Market Collaboration
  - Facilitate market collaboration aimed at rapid industry growth
  - Leverage collective expertise to establish industry building blocks
  - Deliver trust in bringing solutions forward

No single company can accomplish these goals, so the Internet Home Alliance was formed to combine critical skills, resources, and relationships from many companies that will enable the Internet home market to flourish. Additional members will be recruited to provide the right talent mix, including solutions partners, home integrators, service providers, and support organizations. For more information or to join the Internet Home Alliance, visit www.internethomealliance.com.

Sun Products and Technologies for the Connected Home

Java Embedded Server™ Software In the Home Gateway

Sun's Java Embedded Server™ software is an ideal solution for powering residential gateway devices to enable dynamic delivery of network services on demand. The Java Embedded Server product is a small-footprint application server that can be embedded in a networked device—like a home gateway—and provides lifecycle management of services deployed to the device over the network. It allows development, deployment, and installation of applications and services to embedded devices on a just-in-time basis. Using Java Embedded Server software, companies can quickly respond to changing market requirements by installing and managing new software and services on the devices over the network—dynamically and securely.

Java Embedded Server software is written to the Java™ platform, so it runs on a wide variety of devices. The software has two primary components:

- *Framework.* The Java Embedded Server framework is small enough to fit within the footprint of nearly any target device, and is composed of APIs for lifecycle management of plug-n-play services and applications. This modular model provides installation, versioning, content management, monitoring, service discovery, and more.

- *Services.* Plugging into the framework are servlet-like objects called *services*, which represent the modular services that can be deployed over the Internet, including HTTP, logging, thread management, remote administration, and servlet support. To provide and manage services for consumer devices around the home, optional Services can be loaded into the framework on demand. These optional bundles could handle everything from phone dial tone on demand to home security services to live pay-per-day sports scores or other services.

The product's small size, architecture, use of Java technology, and extensibility are targeted primarily at developers and manufacturers of residential gateway products.
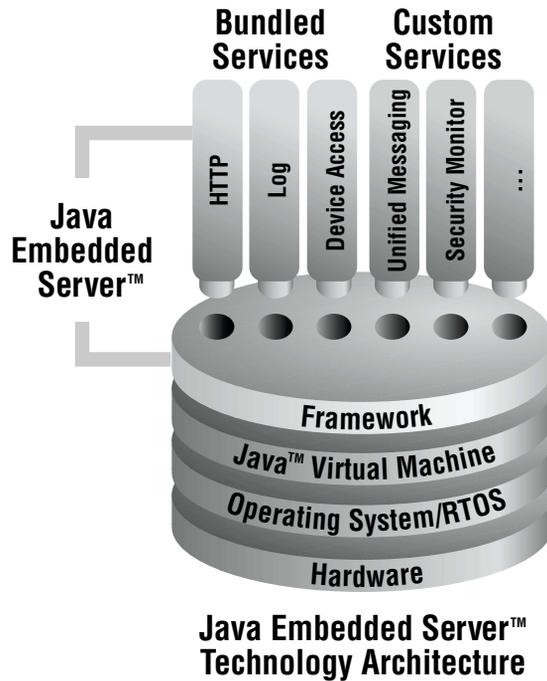

Java Embedded Server™ Technology Architecture

The features of Java Embedded Server 2.0 include:

- Thin-server framework for dynamic delivery of network services
- Designed to be fully compliant with the OSGi 1.0 specification (HTTP, log, and device access services)
- Comprehensive Developer Tool kit, including centralized tools portal with plug-in for Forte™ for Java™ Community Edition software to expedite development of OSGi-compliant applications and services
- User Portal service to automatically provide a user interface on a graphical device (like a Web pad) for interaction with services running on the gateway device
- HTML-based administration console for gateway management
- Support for PersonalJava™ 3.0.2 software on VxWorks™

For more information on Java Embedded Server software, visit www.sun.com/software/embeddedserver.

Middleware: the Java Embedded Server Management and Provisioning Pack

The Management and Provisioning Pack is a Web-based solution for managing and provisioning residential gateways running Java Embedded Server software. It requires a Web server that supports Java Servlets and JavaServer Pages™ software, such as Apache Tomcat, and an LDAP directory server, such as the iPlanet™ Directory Server.

The Pack gives the managed services provider a centralized management and provisioning capability, including:

- A management console for managing a multitude of residential gateways
- Efficient and scalable monitoring of gateways using datagram-based polling and trapping
- Ability to drill down into each gateway and configure services
- A service bundle repository
- Optionally automated download of new or updated service bundles from service providers Web sites into the repository
- Optionally automated download of updated service bundles into gateways
- Ability for a service bundle to initiate provisioning—for example, when a new device is discovered on the home network
- High-level security policies
- Customer portal where customers can subscribe to and unsubscribe from services
- Managed services provider portal that supports provisioning administration functions
- Provisioning and management APIs that support customization and extensibility in the Java programming language

Sun Hardware that Powers the Internet

From the workgroup to the data center, Sun provides dependable solutions for maximum uptime, unmatched scalability, terabytes of capacity, and seamless connectivity. With a solution-focused approach and uncompromising commitment to quality and service, Sun has earned a position among the top UNIX® server vendors. As the world quickly becomes a dot-com community, Sun offers the vision and key components to ensure that businesses thrive in the Net economy. Sun Enterprise™ Servers are key components of integrated, tuned, and tested business solutions, developed with top-tier application providers.

Opening the Door to the Connected Home

Sun's home gateway software bridges all of the devices on the home's network with external networks and their services. It provides a focal point for service providers to deliver value-added services to the networked devices in the home.

Scott McNealy, CEO of Sun Microsystems, recently remarked:

> *"Sun won't get into the business of creating the connected home, but we'll certainly provide much of the technology, the same technology that also powers the Net. After all, if you look at the connected home, you'll realize that it uses the same backbone—open Internet standards and cross-platform technologies—used to connect the Net to cars, offices, governments, and just about anything else. This is an important point, because the connected home must speak the same language as the rest of the Net."*

Sun's consumer and embedded technologies are being adopted in a variety of exciting markets. In addition to the home gateway market, these markets include wireless communications, digital interactive TV, and automotive. Each of these markets is characterized by a movement towards providing value-added services over a network—and Java Embedded Server technology, as well as Sun's other consumer and embedded technologies, play a key role in making this happen. Opportunities also abound for manufacturers of devices needing lifecycle management which are capable of hosting Java technology; examples include small business servers, printers, copiers and point-of-sale (POS) devices such as vending machines, gas pumps, kiosks, and cash registers. Through partnerships with service providers, device manufacturers, content providers, and system integrators, Sun is committed to providing end-to-end solutions based on open standards that will make consumers' lives more productive and enjoyable.

For More Information

- Learn more about Sun's connected home and Java Embedded Server software by visiting www.sun.com/software/embeddedserver.

- Learn more about the Open Services Gateway initiative by visiting www.osgi.org.

- Learn more about the Internet Home Alliance by visiting www.internethomealliance.com.

Sun microsystems

Sun Microsystems, Inc.
901 San Antonio Road
Palo Alto, CA 94303

1 (800) 786.7638
1.512.434.1511

http://www.sun.com

December 2000