

white paper

HP Linux Strategy

April 1999

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I. Executive Summary

Linux is the fastest growing operating system in the world and represents perhaps the hottest topic in the information technology industry. According to IDC, Linux market share surged 212% in 1998, and Linux represented 17.2% (see graphic) of all server operating system shipments. As the market adoption rate indicates, Linux is not "all hype." In HP's view, Linux has already emerged as an operating environment of choice in markets of vital strategic interest, including Internet Service Provider (ISP) servers and Electronic Commerce application development systems.

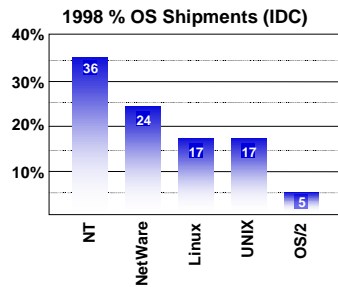
Hewlett-Packard is responding to this opportunity with the most comprehensive strategy for Linux support in the industry, covering its systems, software, services, and peripherals business units. HP's Linux systems strategy includes support for the HP NetServer family IA-32-based servers and PA-RISC support later this year. A project at HP Labs is well under

way to port Linux to IA-64, thereby providing a leadership growth path for both IA-32 and PA-RISC-based systems. More importantly, with Linux/IA-64 leadership, HP is positioning itself to be recognized as the key contributor of Linux kernel and optimization technologies for what is projected to be the highest volume UNIX[®]-like operating system for the next-generation volume computing architecture.

In terms of software applications, several key HP software divisions have announced or are providing Linux support today while others are actively evaluating Linux support and the open source distribution model. Moreover, HP is taking steps to ensure that applications developed on Linux can be easily deployed on HP-UX. On the services front, HP has announced several service offerings for Linux in the areas of technical support and training.

In March 1999, HP formed the Open Source Solutions Operation to coordinate HP's Linux strategy across systems, software, services and peripherals business units, as well as to provide a focal point for outbound communication of HP strategy and programs.

Topics Covered This paper explores current Linux market dynamics and HP's strategy for capitalizing on the Linux movement. It discusses HP's current and planned Linux offerings according to the three pillars of the HP strategy: systems, software, and services.



HP is preparing to ride the Linux wave!

II. Linux: A Closer Look

What Is Linux? Linux (pronounced *Linnucks*) is a POSIX-compliant operating system (OS) which was created in 1991 by Linus Torvalds, a 21-year-old Helsinki University student. Seeking peer review and input to help him refine and perfect his OS, Torvalds posted his work-in-progress on Internet newsgroups.

By 1996, Linux had attracted the input of more than a million developers worldwide and had evolved into a feature-rich, reliable operating system.

What is Open Source? Open source is an Internet engineering tradition in which source code is generally available for inspection, independent peer review, and rapid evolution. Most open source software is distributed under the GNU¹ General Public License (GPL); anyone can sell a version of what's copyrighted under GPL, but the source code and any changes to it must remain public.

Packaged Linux distributions are commercially available—from Red Hat, Caldera, SuSE, and others. These vendors add value by bundling documentation, installation procedures, useful tools and applications, and software support with the Linux source and executable code.

Linux Growth Drivers Linux is fast, cheap, and reliable:

- 1.5x performance over Windows NT[®]
- Ease of operation/maintenance
- Less complex, more stable (bug-free) than NT
- Hot fixes/patches in hours from extended Linux community
- Cheap, old Intel[®] machines can be recycled
- Kernel access for software development
- Only OS which runs on both Intel and RISC architectures with a single source code base²

Linux Growth Inhibitors Linux still has some maturing to do (although it should be noted that the new, more capable 2.2.0 kernel, approved by Linux in late January, will address some of Linux's core shortcomings):

- Lack of packaged applications and tools (changing rapidly: recent announcements from SAP, Oracle[®], CA, ...)
- Ease/speed of installation and configuration
- Hacker OS reputation, mistrust of "freeware" (i.e., if it's free, it can't be good)
- Lack of accountability for support and strategic direction; support model scalability; backward compatibility concerns
- Availability of training and documentation

¹ GNU is a self-referential acronym for "GNU's not UNIX." For more information, see www.gnu.org

² Platforms include: Intel, DEC Alpha, Sun SPARC, SGI MIPS, StrongARM, Motorola PowerPC, Apple Macintosh, and HP-PA (OSF Mach-based port)

- Scalability beyond 4 processors; HA clustering
- Understanding of legal/licensing issues

Linux Market Size Estimates of Linux's total installed base range from 7 million to 10 million. (For comparison, the Windows[®] environment has an estimated 200+ million installed base worldwide).

While Linux's volume growth has been explosive, the OS still brings distributors only modest revenues. According to IDC's December 1998 research, Linux is now neck-and-neck with all other UNIX server operating systems combined in terms of unit volume, surpassed only by Windows NT and NetWare (see chart on page 1). Meanwhile, UNIX vendors continue to generate far more revenue than any other server platform, bringing in nearly \$2.9 billion (58% of total revenues) versus Linux's \$33 million (.7% of total revenues) in 1998 (IDC, 12/98).

Where Is Linux Being Used? Looking at Linux from a broad IT perspective, Linux has vastly differing impact, usage, and business-critical roles depending on how it is being used. The two broad categories of Linux usage are as a server and as a desktop/workstation OS. While relatively small and medium-sized businesses and ISPs are the heaviest users of Linux servers, there is a growing interest in Linux among corporate users, especially as an intranet server and as a file and print server (Summit Strategies, 3/99). Until recently, Linux has often been invisible in the enterprise because early enterprise adopters were usually covert fans in corporate IT shops.

On the desktop side, Linux usage is continuing to grow, and the key limiter in this arena is the availability of desktop applications and tools. This is rapidly changing, however, as key desktop vendors join Corel[®] and Applix in supporting Linux.

<ul style="list-style-type: none">▪ Linux in ISPs 36% of ISP machines are "white box" Intel servers running Linux. 52% of web servers run on Apache (usually hosted on Linux)▪ Linux in the Enterprise Linux is in use at 14% of all business sites—GartnerGroup, 1998

III. HP's Linux Strategy

Target Markets Linux has emerged as a requirement to compete in markets of vital strategic interest, including ISPs where Linux is widely used as a web and e-mail server. The Linux development environment is also experiencing strong growth. HP's primary Linux

targets are, therefore, infrastructure servers for ISP deployment and development desktops particularly for electronic commerce within enterprises, ISPs, and ISVs.

Emerging market opportunities within the enterprise include workgroup servers positioned as a low-cost alternative to Windows NT, and distributed replicated site servers targeting retail and other service industries. Linux also has some vertical market strength in university, government, and technical/scientific computing environments.

Application Development and Deployment The core of HP's Linux strategy is to encourage the use of Linux as a preferred development environment and then provide the tools and facilities that enable developers to easily target HP-UX for deployment, when HP-UX data center capabilities are required. As a pervasive development environment, Linux levels the playing field against competitors whose development environment has captured the mindshare of ISVs and corporate developers, and allows HP-UX to compete on its superior deployment environment strengths (e.g., five nines, high-end performance/scalability, etc.).

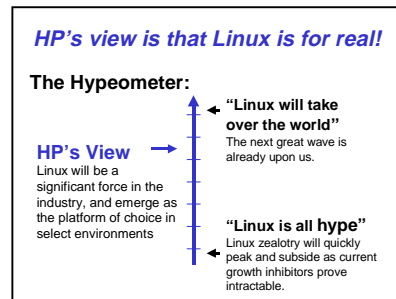
HP has taken two important steps to ensure that Linux application developers will view HP-UX as a preferred deployment target. First, HP has committed to ensuring that Linux APIs are supported on HP-UX (timeline under investigation). Second, HP has recently entered into a strategic alliance with Cygnus Solutions to port the Cygnus GNUPro tool chain to HP-UX. With common APIs and a common developer tool chain (e.g., common GUI, look, and feel), HP is delivering the key ingredients that allow applications to easily slide between development host and target deployment systems. HP's support for Linux as a development environment is consistent with the open development approach espoused by the HP FoundationWare/FoundationTools program. Linux will join NT as a strategic development environment that can be used to easily target HP-UX, NT, or Linux systems for deployment.

HP will also contribute technology into open source that will create goodwill among open source developers and brand preference for HP development and deployment systems. Candidate technologies are under evaluation.

OS Positioning HP-UX is HP's flagship operating system for mission-critical data center computing. Linux has some maturing to do before it gains acceptance by mainstream IT

organizations, especially for more mission-critical applications. For example, Linux currently is not tuned to run the workloads that high-end systems with four or more CPUs typically handle. In addition to scalability, some key features—such as HA/clustering—that ensure that a network of mission-critical systems stays up and running are not available on Linux today.

This is not to say that Linux is not “mission critical.” Many ISPs run their entire business on Linux. In certain application environments, Linux has demonstrated superior performance, reliability, and supportability. In fact, in 1998 *VAR Magazine* rated Linux as the #1 operating system in terms of support. Specifically, Linux is an excellent platform for dedicated or single-purpose application environments such as web serving or infrastructure (proxy/cache, firewall, directory, etc.) services. According to D.H. Brown, Linux has been “wildly successful when deployed in appliance-like capacities such as network routers, low-end web servers, file/print servers, and compute nodes in Beowulf³ technical clusters.” In the enterprise space, Linux is being used widely as an application development and testing system and is emerging in low-end deployment environments as workgroup replicated/remote site servers. Today, Linux is being evaluated by many early adopter enterprises as a potential low-cost alternative to NT.



The major challenge for Linux in terms of mainstream acceptance is that enterprises want to deal with solutions from suppliers that are accountable and can provide predictable levels of service and support. Since Linux is not really owned by anyone but its inventor and confidantes, and is distributed by relatively small companies, Linux will not really be trusted for mainstream enterprise use unless a large IT supplier with a global services and support infrastructure is willing to stand behind the

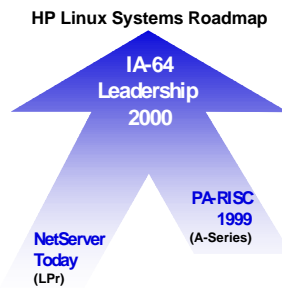
³ Information regarding the Beowulf project can be found at <http://beowulf.gsfc.nasa.gov/>

Linux operating system. HP is stepping up to this opportunity. As a “trusted advisor” to global enterprises, HP is well positioned to recommend the right solution for a customer’s specific environment.

Linux is not competing with HP-UX today. Rather, Linux will be a catalyst for HP-UX growth as HP’s strategy of seeding future HP-UX deployments by promoting Linux for development comes to fruition.

IV. HP’s Linux Offering and Plan

HP believes in providing customers with choice. Linux provides a preferred choice for select development and deployment environments today. HP is preparing for the continued Linux growth and is moving on all fronts to meet anticipated strong demand for HP Linux systems, software, and services.



(a) Systems

HP is the best choice for high-performance Linux systems, both today and in the future.

HP NetServers (NetServer Division) NSD announced in February 1999 that it is offering support and integration services in the U.S. for Linux on its NetServer family of IA-32-based servers. The division has formed an alliance with Red Hat, which will provide end-to-end service and support for HP customers.

The HP NetServer LPr is the first HP NetServer system to support Linux. Strengthening its commitment to provide customers with complete solutions, HP’s Global Installation and Integration Operation (GIIO) will offer installation and configuration services for Red Hat Linux 5.2 on the HP NetServer LPr system. GIIO will include the official Red Hat Linux distribution, as well as other support software.

NSD also announced a strategic alliance with Red Hat to offer integrated Internet solutions for the Linux platform through Covision program’s channel partners. www.hp.com/go/covision

NSD plans to offer worldwide Linux support across the HP NetServer product family by the end of summer 1999. In addition, HP intends to port Linux to its platforms based on the IA-64 architecture. www.hp.com/netserver

PA-RISC Platform (Puffin Group) HP is facilitating a project with the Puffin Group to create a *native* port of Linux to the PA-RISC family of processors, which will be merged into the mainstream Linux kernel tree (www.kernel.org) and into commercial distributions.

The PA-RISC/Linux project will initially target porting Linux to HP 9000 A-Class Enterprise servers. Availability of initial systems is targeted for the end of calendar year 1999. www.thepuffingroup.com

HP Kayak Workstations (Performance Desktop Computing Organization) HP Kayak PC Workstations have been optimized for the Linux operating system (announced 3/99). For current HP Kayak XA, XA-s, and XU PC Workstations, PDCO has:

- Developed the systems’ BIOS (interface between the OS and the hardware) so that it is compatible with and performs well running Linux.
- Provided all hardware address specifications for all subsystems. Specifically, HP has worked with a major customer—the European Laboratory for Particle Physics (CERN)—which has developed Linux drivers for much of the Kayak hardware. A list of these drivers is posted at <http://hp-linux.cern.ch/>.
- Provided complete installation instructions for Linux on HP Kayak PC Workstations, which are also available at the above web site.

At this time, PDCO has not announced formal technical system support for Linux on HP Kayak PC Workstations. www.hp.com/go/kayak

VISUALIZE Workstations (Workstation Systems Division) WSY is actively engaged in ensuring that Linux runs with 3D acceleration on VISUALIZE Personal Workstations (including the HP Kayak XW). This will include drivers for the X server and OpenGL, to be provided and supported by a third party. In the meantime, WSY will provide configuration and installation information for VISUALIZE Personal Workstations, identifying those configurations that have been found to work with Linux. At present, support for these configurations will need to be secured by the customer. WSY is also investigating the potential expansion of its Linux support offering, and the shipment of VISUALIZE Personal Workstations preconfigured with Linux. wsysystemsw.fc.hp.com

IA-64 Platform (HP Labs) HP is playing a leadership role in porting Linux to IA-64. In

February 1999, HP publicly revealed its Linux/IA-64 project, which has been under way for more than a year and has made good progress. HP expects to contribute core kernel and system optimization technologies to the Linux source tree.

As of now, there is a working toolchain, GNU assembler, GNU linker, disassembler, and Linux-enhanced simulator. Kernel development has started and is progressing well. The Linux/IA-64 team is targeting completion of an initial Linux port by the time product divisions are ready to ship IA-64-based products. linux.hpl.hp.com/ia-64

(b) Software

HP is mobilizing on all fronts to provide Linux software applications and tools from HP and partners:

— HP Software Technologies —

Firehunter (Communications Solutions Group)

The entire Firehunter product family of service-level management software—Firehunter/L, Firehunter, and Firehunter/Pro—now provides full support worldwide for the Linux operating system (Red Hat 5.2 distribution). www.firehunter.com

HP Eloquence (Global Sales Services Europe)

HP Eloquence, a development and runtime environment for commercial applications in small to medium-sized business environments, has been available for HP-UX platforms since 1990, and for Windows NT and Linux since 1997. Support for HP Eloquence on HP-UX and Windows NT is provided by HP, while HP Eloquence on Linux is supported through an external partner. Preferred Linux distributions are Red Hat for the U.S. and Canada and SuSE for Europe, but other distributions are also supported. www.hp-eloquence.com.

HP OpenMail (Communication Software Organization)

CSO has developed a messaging/collaboration prototype based on the OpenMail 6.0 technology, which provides the Linux community with a compelling alternative to “generic” e-mail servers. Product availability is expected in this calendar year. www.hp.com/go/openmail

HP OpenView (OpenView Business Unit)

HP OpenView Business Unit recognizes that Linux is quickly becoming a mainstream operating system, and OVBU is investigating its time frame for support of Linux across OpenView’s various enterprise management products. HP Network Node Manager will be the first OpenView product to be supported, although availability

has not yet been determined. Linux client support for HP OpenView OmniBack 3.1 and IT/Operations is targeted for availability for summer 1999. www.openview.hp.com

HP Web JetAdmin (Network Peripheral Solutions Division)

In February 1999, HP announced its Web JetAdmin 5.1, which gives Linux users the benefits of sophisticated peripheral management. HP Web JetAdmin supports more server platforms than any other web-based peripheral management solution, including Windows NT, HP-UX, Sun Solaris, and Red Hat’s Linux 5.0, 5.1, and 5.2. Linux support is currently offered in the U.S. and is English only. www.hp.com/go/webjetadmin

Web QoS (E-Services Division)

Web QoS is an Internet technology that ensures customer satisfaction through exceptional service quality by stabilizing performance under peak loads, optimizing resource usage, and prioritizing users or applications. ESRD has a two-prong strategy for bringing its Web QoS technology to the Linux marketplace. In summer 1999, ESRD will release peak usage management functionality for the Apache web server. Subsequently, by the end of 1999, Web QoS version 2.0, which includes peak usage management, user prioritization, and integration with network QoS, will be fully ported to Linux. www.hp.com/go/webqos

Apache on Linux (E-Services Division)

The E-Services Division’s Solutions Lab is currently testing/tuning Apache on Linux. For more information about this project, contact Alex Carlton at: alex_carlton@hp.com.

— HP Partner Software Programs —

GNUPro (Cygnus Solutions)

On March 8, 1999, HP and Cygnus Solutions announced a partnership to deliver Cygnus’ market-leading GNUPro Toolkit for all HP-supported platforms under HP’s FoundationTools program. Open source developers will have access to the industry’s first common set of commercial-quality tools that facilitate application development on Linux for easy deployment on Linux, HP-UX, or Windows NT systems.

HP and Cygnus also plan to enhance the popular open source GNU tool chain. HP will make its technology available for code generation and debugging on HP’s PA-RISC 64-bit processors and the HP-UX 11 operating system. Cygnus will provide value-added software components and developer support services. www.cygnus.com/linux

Solution Provider Program (Enterprise Accounts Organization)

HP Partnership Solution Provider

Program (SPP) will provide seamless Linux support to program members (more than one thousand ISVs, ISPs, etc.) needing technical assistance with Linux. SPP is currently offering program members a 30% rebate on Linux HP NetServers and will work on providing discounts for any future Linux-based servers or workstations. Equipment will be available in the qualification center for porting and migration.

The Linux services provided to SPP members will be complementary to other HP Linux programs, leveraging off of each program's resources and activities for the success of the ISVs.

For more information, contact Jovani Torres at jovani_torres@hp.com.

(c) Services

Support Anticipating installed-base customer needs and responding to accelerating market demand, HP's Software Services Division (SSD) is offering around-the-clock, worldwide support of Linux and Linux applications. HP Linux Software Support will be available May 3, 1999, and will include the following:

- Unlimited, toll-free phone-in software assistance with two-hour response-time commitment
- Electronic software call submittal
- Remote software support by HP support engineers
- 24x7 electronic access, via HP's Electronic Support Center, to a database of multivendor product and support information

Initially, SSD will provide 24x7 worldwide electronic and response center support for Linux on the Intel platform. In time, support services for Linux will be expanded to include higher service levels such as Personalized System Support (PSS) and other platforms such as PA-RISC and IA-64. SSD's service offering is targeted at major Linux releases such as Red Hat, Caldera, Pacific HiTech, and SuSE.

HP phone-in assistance for Linux will use the same HP System Support Solutions framework currently in place for HP-UX. mayweb2.mayfield.hp.com/linux (internal) and www.hp.com/go/4service (external)

Training HP Education in Mountain View, CA has announced a curriculum of Linux training courses that will be available June/July 1999 at worldwide HP Education centers. The core course is a three-day Linux Installation,

Configuration, and Administration class (H3548S).

Although the hands-on course content is based on Red Hat 5.2, other Linux distributions are compared and contrasted in the course. The course assumes administration experience of some operating system, preferably UNIX, and includes basic configuration details of the typical 'server' uses of Linux (e.g., web, mail, and file).

Other two-day follow-on courses covering Apache, Samba, and other open source software will follow shortly. For more details contact: Rob Adams (WW Education Program Manager - UNIX) at (650) 691-5891, or rob_adams@hp.com

V. Competition

HP has the most comprehensive Linux strategy and program in the industry and is viewed as a leader in the Linux marketplace. With Linux as HP's IA-32 UNIX platform of choice, HP has a clear message that differentiates it from key competitors: IBM = SCO; Sun = Solaris; Compaq = TRU64; HP = Linux.

Sun While Sun attempts to take the "moral high ground" with its public endorsements of Linux ("Anything that's bad for Microsoft is good for Sun" -Scott McNealy), Linux is a major threat to the Solaris developer community franchise and Solaris-on-Intel deployment sales. And, since the vast majority of Linux systems today are IA-32-based, Sun is unable to participate today in the Linux systems market growth. As a result, Sun is trying to compete with Linux by attempting to give Solaris away for non-commercial use and with its own licensing schemes for key software (e.g. Java™ "community license").

Sun is responding to its lack of IA-32 support by solidifying its SPARC support. Sun is helping distributors with an UltraSPARC port, and SPARC support is available today. While Sun's strength is its ties to the developer community through its Java program (Sun recently announced Linux support for the JDK) and strong support for the popular Linux/GNU development environment, Sun still promotes its own environment for all development and deployment.

IBM IBM's strong services and software focus enables them to aggressively push Linux and open source technologies in general (e.g., IBM is a major supporter of the Apache open source web server). IBM is providing Linux support for some of its key software technologies, including DB2 and MQ Series. However, while IBM's

corporate-level Linux message is likely to be strong, there are certain to be conflicts and contradictions at the division levels. For example, IBM's alliance with SCO to unify SCO UNIX and AIX is clearly competing directly with Linux for the low-end UNIX server and development seats.

Compaq Compaq is very box-focused and does not currently have the broad services and software support offering that HP is rolling out. Compaq has announced Linux support for its ProLiant family of "Intel inside" servers; many of the commercial distributions currently support Alpha systems.

VI. HP's Linux Vision

HP believes that instead of buying application software, computers, and operating systems, business and home consumers will ultimately buy streamlined e-services that will deliver information, commerce, and business outsourcing over the web in a more intelligent and intuitive manner than we are accustomed to today.

Using HP technology and know-how, the next generation of service providers will build the information utilities that will deliver these e-services to the customer. These information utilities will run on a small number of strategic operating systems, including HP-UX, NT, and Linux.

VII. Linux Resources

HP Resources

HP's Linux web site: www.hp.com/go/linux
HP Linux resource list: <http://linux.hpl.hp.com/>
HP Linux Advocacy Group Synchronization (HPLAGS)—subscribe to mailing list at: <http://nr.corp.hp.com/people/karthik/linux/>
HP Linux Support: mayweb2.mayfield.hp.com/linux/; www.hp.com/go/4service
HP NetServers: www.hp.com/netserver
HP Covision Program: www.hp.com/go/covision
HP Kayak PC Workstations: www.hp.com/go/kayak
HP Kayak/Linux drivers: <http://hp-linux.cern.ch/>
HP Visualize Workstations: wsystemsw.fc.hp.com
HP Firehunter: www.firehunter.com
HP Eloquence: www.hp-eloquence.com
HP OpenMail Software: www.hp.com/go/openmail
HP OpenView Software: www.openview.hp.com
HP Web JetAdmin: www.hp.com/go/webjetadmin
HP WebQoS: www.hp.com/go/webqos

HP Partner Resources

Cygnus Solutions: www.cygnus.com/linux
Puffin Group (PA-RISC): www.thepuffingroup.com
Red Hat: www.redhat.com

General Linux Resources

Linux International: www.li.org
HP is a sponsoring corporate member and holds a seat on the board of directors of Linux International
Linux Gazette: www.linuxgazette.com
Linux Journal: www.ssc.com/lj
Linux Online: www.linux.org
Linux Today: www.linuxtoday.com
Linux Weekly News: www.lwn.net
LinuxWorld *web magazine*: www.linuxworld.com
M-Tech Bus Apps: www.m-tech.ab.ca/linux-biz/
References to commercial sites that make use of Linux to support their day-to-day business functions
The Open Source Page: www.opensource.org
The GNU Project: www.gnu.org
The Linux Kernel Archives: www.kernel.org

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Feedback Please direct comments and questions, as well as new information regarding HP Linux activities, to Heidi Eisips, Linux Program manager, Open Source Solutions Operation, at heidi_eisips@hp.com.

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