Linux for IBM @server pSeries

An Overview for Customers

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Abstract

This paper is intended to introduce IBM @server pSeries™ customers, IBM Business Partners, sales, marketing, and technical teams to Linux® for pSeries. IBM's plans as put forth in this document are subject to change without notice.

References and Prerequisite Reading

For an overall discussion of IBM's Linux strategy and positioning, the following background reading is recommended:

- The Linux for pSeries external Web site at http://www.ibm.com/servers/eserver/pseries/linux/.
- IBM's external Linux Web site at http://www.ibm./com/linux.
- IBM @server Linux Web site at http://www.ibm.com/servers/eserver/linux.
- IBM Linux Services Web site at http://www.ibm.com/linux/services.
- "*IBM and Linux*" brochure from the IBM Linux Marketing team. This tri-fold can be ordered as publication G325-5316-00.
- "*Linux at IBM*" booklet from the IBM Linux Marketing team. This can be ordered as publication G325-5315-00 or browsed at http://www.ibm.com/servers/eserver/linux/brochure.pdf.
- More on the history of Linux can be found at http://www.cnn.com/2000/TECH/computing/02/11/mini.linux.history.idg.
- Information on the *AIX Toolbox for Linux Applications* product can be found at http://www.ibm.com/AIX

Overview of Linux

Linux is an operating system that is based on a development approach that delivers innovation and portability. Linux is an open, reliable and efficient operating system that runs on virtually any platform from embedded systems to mainframes.

Linux is the creation of Linus Torvalds, a Finnish computer science student, who developed it while a student at the University of Helsinki in 1991. The architecture is similar to the UNIX® operating system. It provides a free, UNIX like solution across many computer architectures. After doing the initial development work, Torvalds made the source code available on the Internet for use, feedback and further development by others who were interested in helping to evolve Linux.

As an Open Source technology, Linux is not owned or controlled by any individual or company, but rather it is maintained by the Open Source community -- a dedicated group of independent developers collaborating to make it the most open operating system. Being Open

Source, the Linux operating system source code, like other Open Source technologies, can be acquired at no cost.

The GNU Project (http://www.gnu.org/gnu/the-gnu-project.html) was launched in 1984 to develop a complete UNIX-like operating system which is free software: the GNU system. (GNU is a recursive acronym for “GNU's Not UNIX” and is pronounced "guh-NEW".) Variants of the GNU operating environment which use the Linux kernel are now widely used; though these systems are often referred to as “Linux,” they are perhaps more accurately called GNU/Linux systems.

Customers are benefiting from the rapid innovation and enhancements made to Linux, enabled by the Open Source development approach. Linux is licensed under the terms of the GNU General Public License (http://www.fsf.org/copyleft/gpl.html) or GPL. The GPL requires, among other things, that the source code be made freely available to all who receive the program and that all modifications to the code be licensed using the GPL as well. This ensures that all changes and even derivative works remain Open Source. As a result, innovations are rapidly fed back into Linux for the benefit of all users.

The current version of the Linux kernel is 2.4. This version became generally available in early January 2001. It replaces version 2.2.x (odd numbered versions such as 2.3 are for development only and are not made generally available). This version features increased performance, scalability, and stability.

There is currently no published schedule for the next major release, which will be 2.6. Speculation is that, based on the time from 2.2 to 2.4, version 2.6 will be in the first half of 2003.

Linux and UNIX

While Linux is “UNIX like”, it is not the same as UNIX. The similarity begins and ends with the fact that Linux is based on the same design principles and standards as UNIX and it is derived from that heritage. The Linux source code is distinct from that of UNIX, and offers compatibility, portability, and horizontal scalability across all platforms.

Today, UNIX has split (or “forked”) into series of competing operating systems derived from the original code. Standards such as POSIX and UNIX 98 have been promulgated to specify many of the APIs and features of the various UNIX offerings. Linux is a single source operating system available to all. Linux is strictly guarded by the Open Source community and, through the GPL, developers must contribute their modifications back to the community.

IBM’s Role in the Linux Community

IBM has made an expansive commitment to support Linux as an open computing environment. IBM understands that the open computing business model requires customer flexibility and choice. Linux is the epitome of both, at least in terms of operating systems. As a recent Business 2.0 article suggests, "Linux provides the rock-bottom foundation for open computing platforms." Linux continues to scale and address larger computing tasks, and IBM is

doing its part to speed this process along, while optimizing IBM @server systems to offer customers the option of using Linux.

Through its Linux Technology Center (http://ltc.linux.ibm.com), IBM is working with the Open Source community on a variety of projects to enhance the value of Linux for customers. The LTC has over 200 people devoted to developing and improving Open Source. IBM is also a participant in several industry-led efforts, such as the Linux Standard Base (http://www.linuxbase.org), Free Standards Group (http://www.freestandards.org), the Open Source Development Network (http://www.osdn.com), and the Open Source Development Lab (http://www.osdlab.org).

IBM has taken on an active, leadership role in Linux for the PowerPC ®. IBM developers are working to enable more pSeries systems. This work is also used by the PowerPC processor-based IBM @server iSeries™ systems.

Linux Distributors

As Linux has gained popularity, a number of new companies have formed to distribute the Linux operating system along with a variety of additional value-added software packages and services. There are over 150 companies doing various nonprofit and for-profit distributions for a variety of hardware platforms. IBM has engaged Red Hat, SuSE, and Turbolinux as Linux Distribution Partners (LDPs) to deliver the appropriate Linux solutions that support IBM's various hardware and software platforms. IBM has no plans to become a Linux distributor.

In addition, IBM is working with regional Linux distributors such as Red Flag (China), Connectiva (Latin America), and MandrakeSoft (France). They are largely focused on x86 distributions. No commitments to support Linux for pSeries are in place with these regional distributors.

More information on Linux distributors who are providing products for the pSeries and RS/6000® are detailed in a later section.

Linux and AIX

The AIX® platform is, and will continue to be, the premier operating system from IBM for pSeries systems. In order to enhance the interoperability between Linux and AIX, IBM has ported a collection of Open Source and GNU software tools from the Linux world and bundled them into a toolbox for users of AIX. The AIX Toolbox for Linux Applications is the first step in IBM's efforts to provide AIX and Linux interoperability.

The toolbox works with AIX 4.3.3 and AIX 5L™. For customers of AIX, it opens up a range of Linux applications, development tools and utilities. Linux users running Intel-based machines will have the option to move up to more powerful systems. And for Linux developers, it introduces a way to expand the target for applications to AIX.

The toolbox contains a collection of Open Source and GNU software that works with both AIX 4.3.3 and AIX 5L. Some of those applications include recompiled versions of the

Gnome and KDE desktop environments and system utilities including Emacs, Samba, shells, GNU base utilities and application development tools such as compilers and software installers.

Once developed and compiled, the Linux-based applications are native AIX applications, meaning they can can take advantage of the same scalability and performance as any other AIX application. Note that these applications are AIX binaries. They cannot be run on Linux for pSeries without being recompiled on Linux for pSeries. Similarly, applications developed on Linux for pSeries do not run in binary form on AIX.

Linux and the pSeries

Linux for pSeries is a key element of the IBM @server Linux strategy. IBM's commitment to provide Linux for pSeries was announced as part of the IBM @server launch in October 2000. IBM intends to increase its growing server momentum by leveraging the power of Open Source in general and Linux in particular to offer new options and value to its customers. Linux is a major factor in the x86 space as companies to look for alternatives to Windows®. The References section contains pointers to other documents that more fully address IBM's overall Linux strategy.

Today, Linux is strong at the low end of the scalability range, while pSeries has carved out a leadership position in the mid and high end of the enterprise server space. As Linux becomes more mature in enterprise reliability, availability and scalability, Linux for pSeries will grow more compelling. As Linux scales over time, so too will the workloads for which it can be deployed. IBM is working closely with the Linux community to increase the performance on pSeries servers.

Linux for pSeries Distributions

A Linux port for the PowerPC architecture has been available for several years. As with the ports to many architectures, it was started by members of the Open Source community (http://linuxppc.org/). More background on this effort may be found at http://gate.crashing.org/doc/ppc/doc003.htm and the Linux PowerPC community Web page at http://penguinppc.org/. IBM became involved initially by contributing RS/6000 equipment and some technical expertise to the effort. The initial port supported only the PowerPC chips, not the POWER3™ and POWER4™ processors. Many of the PowerPC distributions such as SuSE and Yellow Dog work on Apple Power Macs as well as PowerPC systems from Motorola. There has also been a large effort around Linux on embedded PowerPC processors.

The following sections describe the Linux distributors that are working with IBM to provide and support Linux for pSeries. Each LDP is wholly responsible for the contents, availability, and pricing of their offering. IBM offers support for these distributions as described in a later section.

In order to run Linux on a pSeries system, a customer would first purchase their system from IBM or an IBM Business Partner. The system would either be preloaded with AIX or the customer could request not to have AIX preloaded. (In either case, the system price is the same

and comes with a license to run AIX.) The customer would then purchase a version of Linux for pSeries from one of the distributors and install it. The customer could also choose to download the code for free from the distributor's Web site if the customer does not want CD-ROMs, documentation, and installation support.

Red Hat 

Red Hat (http://www.redhat.com) is probably the best known of the Linux distributors. As part of the IBM @server initiative, Red Hat has agreed to supply a version of its distribution for the pSeries. Red Hat 7.1 was announced for pSeries in November 2001. It supports only the p640. Red Hat has not yet shipped this product and has not provided a date when it will be available.

SuSE 

SuSE (http://www.suse.com), pronounced "sooza", was the first of the IBM Tier 1 Linux Distributors to release for the RS/6000. SuSE Linux for PowerPC Version 6.4 was released in June 2000. It supported the RS/6000 B50, 150, and F50 systems. Version 6.4 was based on the 32-bit Linux 2.2.x kernel. It has been superseded by Versions 7.1 and 7.3 which are based on the 32-bit Linux 2.4 kernel. The distribution is available directly from SuSE at http://www.suse.com/us/products/suse_linux/ppc/index.html.

The next version of SuSE for POWER and PowerPC systems will be SuSE Linux Enterprise Server (SLES) Version 7. It will be available in 1Q02 and contains the 64-bit Linux kernel. It will support most of the pSeries systems. See the Hardware Availability Matrix below for details.

The SuSE distribution contains hundreds of Open Source applications, including the Apache Web server, MySQL and PostgresSQL relational database managers, and compilers and development tools for many languages. A complete list can be found at http://www.suse.com/en/products/suse_linux/ppc/packages/index.html.

Turbolinux 

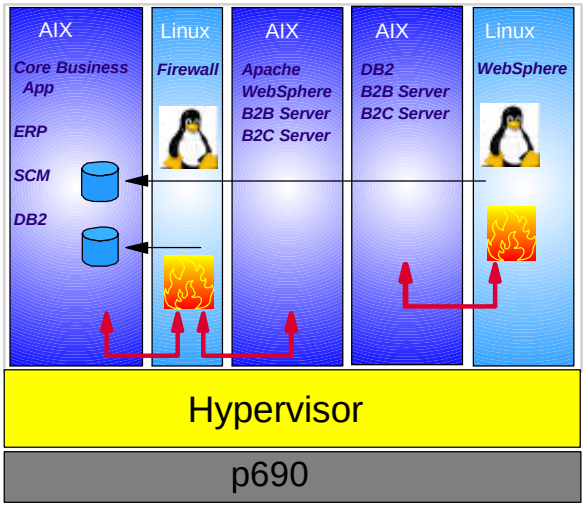
Turbolinux (http://www.turbolinux.com) is also providing a pSeries distribution. Turbolinux has a strong presence in the Asia Pacific countries. Turbolinux is currently shipping a supported distribution for the p640-B80. Details are available at http://www.turbolinux.com/products/pseries/index.html

Hardware Enablement Roadmap

Both 32-bit and 64-bit versions of Linux for pSeries are being provided in order to optimize customer choices and exploit pSeries hardware capabilities. Each distributor may, at its discretion, provide support for other pSeries and RS/6000 platforms using code developed by the Open Source community.

The RS/6000 B50 and 150 are 32-bit PowerPC systems supported by the Linux for pSeries 32-bit kernel and application environment. The pSeries and RS/6000 64-bit systems such as the p640-B80, RS/6000 170, RS/6000 260, and RS/6000 270 are also currently supported with a 32-bit Linux kernel. This limits the amount of memory that can be addressed. IBM is currently working with the Open Source community to provide the 64-bit technology for the PowerPC Linux kernel and support tools. This will result in a 64-bit environment that fully exploits the increased addressability and performance of the 64-bit processors. IBM's plan is to ensure that the p610, p620, p640, p660, p690, RS/6000 170, and RS/6000 270 systems will have full 64-bit Linux kernel support by 1Q2002 and 64-bit application support in late 2002.

Logical Partition Systems



Linux will be supported running in one or more logical partitions (LPARs) on the new p690 systems and future LPAR-capable systems. AIX and Linux will be able to run concurrently on a single LPAR system in any combination (i.e. zero or more Linux partitions along with zero or more AIX partitions). This will enable a customer to consolidate workloads from several separate servers onto a single system.

For example, consider a typical service provider or Web hosting environment. It is typically architected as a two or three tier model. In most installations, there are front-end systems (typically thin "appliance" servers) to handle caching, proxy, DNS, etc. There may then be a second tier of small systems to do Web application serving using WebSphere® or competing products in conjunction with an ERP or CRM product like SAP. The third tier of servers runs UNIX on a large SMP to provide the backoffice and DBMS functions that require high performance and scalability. In many cases, the first and possibly second tiers are running Linux or Windows NT®. This results in a proliferation of servers and the need for more staff and expensive software to manage multiple platforms.

Using the p690 with LPAR support, it is possible to consolidate the tiers on a single physical system. This could be done by allocating several Linux instances to single or dual processor partitions to handle the tasks of the first two tiers. The remaining capacity could then be devoted to a single (or dual redundant) instance(s) of AIX for the DBMS.

Hardware Availability Matrix

The following table shows the current and projected support of pSeries and RS/6000 platforms for 2001 and 2002.

pSeries or RS/6000 Model	Number of Supported Processors	32-bit or 64-bit	Distributions	Availability Date	Additional Comments
150	1	32	SuSE 7.1 SuSE 7.3	4/01 11/01	
B50	1	32	SuSE 7.1 SuSE 7.3	4/01 11/01	
170	1	32 64	SuSE 7.1 SLES 7	4/01 1Q02	
270	1-4	32 64	SuSE 7.1 SLES 7	4/01 1Q02	
F50					Not supported
F80					Not supported
H80					Not supported
M80					Not supported
S80					Not supported
p610-6CE/ p610-6E1	1-2	64	SLES 7	1Q02	
P620-6F0/ P620-6F1	1-4	64	SLES 7	1Q02	
p640-B80	1-4	32 64	SuSE 7.1 TL 6.5 SLES 7	4/01 8/01 1Q02	
p660-6H0 p660-6H1	1-4*	64	SLES 7	1Q02	
P660-6M1	1-4*	64	SLES 7	1Q02	
p680					Not supported
p690	1-4**	64	SLES 7	1Q02	LPAR only. Technology preview.***

* Indicates systems that may have more than four processors. However, Linux is only supported on 1-4 way versions of these systems.

** A maximum of four processors are supported in any Linux partition for the p690. There is no limit on the number of processors that can be assigned to a Linux partition.

*** Linux on the p690 is being initially distributed as a “technology preview.” A white paper is being prepared to assist customers in installing/configuring/servicing Linux in an LPAR.

Additional older RS/6000 models are supported by SuSE. For further information, see http://www.suse.com/us/products/suse_linux/ppc/system_requirements.html

With the availability of the 64-bit kernel in 1Q02, the 32-bit kernel will be put into maintenance mode by IBM. IBM will not be making enhancements or supporting this kernel on future PowerPC or POWER systems. All of the development focus will be on the 64-bit environment for pSeries platforms. Individual Linux distributors may elect to continue to enhance and support the 32-bit kernel for PowerPC systems.

I/O Device and Adapter Support and Availability

There are a large number of adapters and devices that can be attached to pSeries and RS/6000 systems running AIX. While some of the devices (e.g. PCI adapters) have Linux drivers for Intel as well as AIX drivers, these cannot be utilized directly in Linux for pSeries.

As part of the base enablement of Linux for pSeries, the following adapters are enabled in addition to the base device support (i.e. SCSI, Ethernet, etc.).

- 2104 Expandable Storage Plus
- 2624 CD-ROM 32x/40x
- 2830 2D Graphics (GXT130P)
- 2968 Ethernet 10/100
- 2969 Gigabit Ethernet (Fiber)
- 2975 Gigabit Ethernet (UTP)
- 4951 4-Port Ethernet 10/100
- 6158 Tape - 4mm Internal
- 6204 Ultra SCSI PCI Differential
- 6205 Ultra2 SCSI PCI LVD

Other adapters will obviously be required. IBM will work to help provide these as part of special bids to customers interested in testing/deploying Linux for pSeries. Note that Linux today does not support hot-swapping of disk drives.

Linux for pSeries Performance

To date, we do not have publishable performance benchmarks for Linux for pSeries. Initial performance measurements indicate very good performance for Java™ applications (using the IBM JVM) and Web serving (using Apache). IBM plans to port the IBM VisualAge® C, Fortran, and C++ compilers to Linux for pSeries. These optimized compilers will increase application performance over the standard GNU compilers.

Linux Scalability

Linux 2.4 has been found to scale well to four processors in an SMP system. This makes it a good match for RS/6000 systems such as the B50, 150, 270 and 1- to 4-way versions of pSeries systems p610, p620, p640, p660 (H and M), and a 1- to 4-way LPAR on the p690.

Tests run with Java applications have shown good scalability up to 8-way. Linux is expected to scale well to 8-way systems by the end of 2002.

Clustering and High Availability

Currently, none of the IBM software that has been announced for IBM's (Linux Intel) cluster product, IBM @server Cluster 1300, has been ported to Linux on pSeries. This work is ongoing, but schedules have not been finalized.

The Beowulf clustering technology and other Open Source and some commercial products (e.g. Myrinet™) can be used to cluster pSeries and RS/6000 systems running Linux to provide compute or high availability clusters. Myricom has the Myrinet switch available for Linux for pSeries. It can be used as a high-speed interconnect to cluster systems of pSeries machines running Linux. Gigabit or 10/100 Ethernet connections can also be used.

Internationalization

Each of the Linux distributions currently supports certain geographic regions and languages. This typically includes language translations and locale support. Linux as a whole is moving to adopt the Linux Internationalization Initiative approach to providing standard national language support. Details on language/locale support can be found on each distributor's Web site.

IBM Software Availability

Plans are being developed to support WebSphere Application Server and DB2® Universal Database™ on Linux for pSeries. A technology preview for these packages will be available in 1Q02. Interested customers should contact IBM for details. The IBM Java Virtual Machine version 1.3 is already available.

ISV Applications

A wide variety of Open Source applications and software packages are available on Linux for pSeries. Each Linux distributor provides hundreds of bundled applications with their product. These range from text editors to development environments to database managers to Web hosting utilities. This is being driven by the fact that many ISVs are quickly moving to support Linux; in fact, a large number of ISVs have made Linux their preferred development platform. Given that the availability of software under Linux is growing rapidly, one needs to recheck for the availability of software under Linux on a regular basis.

It is important to note that Linux applications that are recompiled and tested on Linux for pSeries should also work unmodified on Linux in a logical partition on an iSeries system. Similarly, Linux applications that have been migrated to work on Linux on an iSeries should also run on a pSeries system running Linux.

The following table lists some of the ISVs that have packages for Linux on pSeries. Up to date product information can be obtained on the vendor's Web site.

Vendor	Product	URL
Lutris	Enhydra Java/XML Application Server	www.lutris.com www.enhydra.org
Myricom	Myrinet scalable cluster interconnect	www.myri.com
Absoft	Pro FORTRAN for PowerPC/Linux	www.absoft.com/pro.linuxppc.html
Metrowerks	Code Warrior for Linux	www.metrowerks.com/products/linux

Software Service and Support

Linux support is readily available from many sources. It ranges from free support from the Open Source community at large, to fee based service contracts with service organizations and Linux distributors such as Turbolinux, Linuxcare, Red Hat, and SuSE. Details on these offerings are available at the respective distributor's Web site. Maintenance contracts for software upgrades can also be obtained from the distributors.

IBM Global Services has developed a comprehensive portfolio of Linux service, support, and education offerings. These offerings currently include:

- Consulting, planning and implementation services:
  - Open Source Consulting
  - Linux Server Consolidation Services
  - Migration Services for Linux
  - IBM Middleware Enablement Services for Linux
  - Linux Cluster Implementation Services
- Worldwide remote 24x7 technical support:
  - Support Line
  - Advanced Support
  - Account Advocate
- Classroom and Web-based Education and Training

Local IBM Global Services consultants are available to help customers evaluate their Linux requirements and to assist in implementing and optimizing their Linux solutions. For further details visit the IBM Global Services Web site at http://www.ibm.com/linux/services.

Hardware Service and Support Under Linux

Linux does not yet provide the same high level of reliability, availability, and serviceability for pSeries hardware as does AIX. Specifically, Linux does not contain many of the error logging, intermittent fault detection, and notification features that allow for failing component identification and replacement. Thus, running Linux for pSeries represents some challenges for customers and IBM service personnel.

If the machine fails to boot, then this problem can be diagnosed by field technicians. Also, the standalone hardware diagnostics can be used to pinpoint hard failures on systems with CD-ROM drives. IBM is still working through the service strategy and warranty issues when the

customer experiences intermittent failures while running Linux. This is a focus of both IBM's development team and IBM Linux Technology Center.

Frequently Asked Questions

Q: What are the license terms and conditions for Linux on pSeries?

A: License terms and conditions are provided by the Linux distributor, but all base Linux operating systems are licensed under the GPL. Distributors may offer additional programs under other licenses and may also set terms for service and support.

Q: How much does Linux on pSeries cost?

A: Each Linux distributor sets their own pricing for their distribution, service, and support. A customer can choose to download any of the distributions from an LDP's Web site. However, downloaded versions do not typically come with any service or support.

Q: Can Linux be ordered as a preload on pSeries systems?

A: No. Market demand has not materialized to the point where this is cost-effective.

Q: Does a customer get a system discount or a credit if they plan to run Linux and not AIX?

A: There is no option to order a pSeries system without AIX. All pSeries systems will still come with an entitlement to AIX whether the customer chooses to run it or not. Customers may choose to order a pSeries system without AIX preloaded but they still have an entitlement to use AIX.

Q: What testing and systems assurance is IBM providing to ensure a quality product?

A: IBM is doing a functional and regression test of the base enablement that is being developed for pSeries hardware. In addition, IBM receives each candidate release from the LDPs and runs a system test to verify that the package will install, boot, and operate correctly on the designated hardware. Quality assurance for the hundreds of Open Source applications that are packaged with a Linux distribution is provided by the Linux distributor.

Q: How do I get software support for Linux on pSeries?

A: Each of the Linux distributors has its own service offering which may be purchased from that distributor. There is typically 30 to 90 days of free installation support included with a retail purchase of a distribution. The service/support contract can be extended.

IBM Global Services provides SupportLine services for Linux for pSeries distributions. IBM Global Services can be engaged for any Linux services or support requirements. See http://www.ibm.com/linux/services for more details.

Customers who purchase a packaged distribution should rely on the initial support services offered by the distributor. If a customer downloads a free version of Linux, then neither the distributor nor IBM is responsible for support unless a fee service is purchased.

Q: When will older RS/6000 systems have Linux support?

A: IBM does not plan to provide support for RS/6000 systems beyond those already listed. It would be almost impossible to develop and test all of the devices required for those older models. The focus is on enabling pSeries platforms as they arrive. This approach is consistent with the other IBM @server platforms which are only enabling their latest models. Individual Linux distributors may decide to support other RS/6000 models.

Q: What about other Linux distributions for PowerPC or POWER-based systems?

A: Yellow Dog Linux from Terra Soft was one of the first commercial PowerPC distributions, covering not only the RS/6000 but systems from Apple and Motorola. Yellow Dog continues to make new versions of its PowerPC distribution available. However, there is no IBM service or support available to customers who choose to run Yellow Dog. Debian and MandrakeSoft are also providing PowerPC versions targeted at the Power Mac market. These distributions may or may not work on IBM pSeries and RS/6000 hardware.

Consult the respective Linux distributor's Web site for more information.

Q: How does Linux help AIX?

A: Linux is definitely gaining momentum. By allowing Linux applications to be easily compiled for AIX with the AIX Toolbox for Linux Applications package, IBM is expanding the available application portfolio. Additionally, AIX can now take advantage of the growing Linux skill base**.**

Q: Does Linux compete with AIX?

A: Linux and AIX are complementary operating systems. AIX is the strategic, proven, mission-critical operating system for the pSeries. Linux is a highly portable operating system which supports all of IBM's @server platforms. IBM expects to see many installations running Linux (on xSeries or pSeries hardware) as the front-end to mission-critical AIX systems running DB2 and other enterprise applications. One example of this is NHL.com, which uses Linux on xSeries Web appliances connected to a back-end pSeries/AIX infrastructure. See http://eltoday.com/article.php3?ltsn=2001-06-06-001-14-PS for more details.

Q: Is AIX going away?

A: No! AIX is the strategic operating system for the pSeries. It contains enterprise features such as scalability and RAS that will take years to materialize on Linux. It also has broad application support and industry acceptance. Customers have invested millions of dollars in AIX applications and skills. AIX is second only to Solaris in UNIX market share. IBM plans to enhance and support AIX for years to come.

Q: What's up with the penguin?

A: In the beginning, sometime in early 1996, several people were talking about a suitable logo/mascot for Linux. Of the many, many suggestions, many involved parodies of other

operating system logos - or were strong, noble beasts such as Sharks or Eagles. At some point Linus casually mentioned that he was rather fond of Penguins - which stopped the debate in its tracks. The Linux penguin is known as “Tux” and is ubiquitous in the Linux community. Further information can be found at http://tuxaqfh.sourceforge.net/doc/index.html.

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More details on IBM UNIX hardware, software and solutions may be found at: http://www.ibm.com/servers/eserver/pseries.

You can find notices, including applicable legal information, trademark attribution, and notes on benchmark and performance at ibm.com/rs6000/hardware/specnote.html

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