




# Linux for IBM @server pSeries An Overview for Customers


May 27, 2003




**Entry deskside**




pSeries 615  
Model 6E3




pSeries 630  
Model 6E4



pSeries 640  
Model B80



pSeries 615  
Model 6C3



pSeries 630  
Model 6C4

**Entry rack-mount**

**Mid-range**



pSeries 650



pSeries 655



pSeries 670

**High-end**



pSeries 690

## 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 overview of Linux and a discussion of IBM's Linux strategy and products, the following background reading is recommended:

- The Linux for pSeries external Web site at <http://www.ibm.com/eserver/pseries/linux/>
- The IBM external Linux Web site at <http://www.ibm.com/linux>
- The IBM Linux Services Web site at <http://www.ibm.com/linux/services>
- “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/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>
- An excellent set of background articles on Linux from the March 3, 2003 edition of *BusinessWeek* can be found at [http://www.businessweek.com/magazine/toc/03\\_09/B382203linux.htm](http://www.businessweek.com/magazine/toc/03_09/B382203linux.htm)
- Information on the *AIX Toolbox for Linux Applications* product can be found at <http://www.ibm.com/servers/aix/products/aixos/linux/index.html>

## 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 operating system-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 clone of the UNIX 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 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 ready in mid-2003 and available from Linux distributors in 1H 2004.

## **Linux and UNIX**

While Linux is “UNIX operating system-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 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. 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. 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>), and the Open Source Development Lab (<http://www.osdlab.org>).

IBM has taken on an active, leadership role in Linux for the PowerPC Architecture™. This work is common to the PowerPC® processor-based IBM @server iSeries™ and pSeries systems.

## **Linux Distributors**

As Linux gained popularity, a number of companies formed to distribute the Linux operating system along with a variety of additional value-added software packages and services. There are now over 100 companies doing various not-for-profit 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.

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

More information on Linux distributors who are providing products for the pSeries are detailed in a later section. IBM is not and has no plans to become a Linux distributor.

Linux is freely available and the GPL license does not allow a distributor to charge for Linux per se. However, the distributors can and do charge for the media, documentation, packaging, shipping, and bundled maintenance and support of their distributions. Source code to all distributions is available free of charge.

## **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.

For customers of AIX, it opens up a range of Linux applications, development tools and utilities. Linux users running Intel® architecture 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 original Linux source applications become native AIX applications, meaning they 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. 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. 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-range and high-end of the enterprise server space. As Linux becomes more mature in enterprise reliability, availability and scalability, Linux for pSeries grows more compelling. As Linux scalability grows, so do the workloads for which it can be deployed. IBM is working closely with the Linux community to increase performance, scalability, reliability, and serviceability to match the strengths of pSeries servers.

Linux for pSeries is especially compelling for solutions requiring a 64-bit architecture or the high-performance floating-point capabilities of the POWER processor. These capabilities are unmatched in the Linux space today, as the Intel Itanium® processor (supported mainly by HP) is still ramping up and Sun is advocating Linux only for their x86-based systems and not for SPARC.

In addition, the logical partitioning (LPAR) capabilities of the pSeries (discussed later) make it possible to run one or more instances of Linux along with AIX. This can provide a low-risk way to begin developing and deploying Linux operating system-ready applications as desired while retaining the enterprise-ready capabilities of AIX for mission-critical or highly-scalable workloads. Since Linux does not currently scale to efficiently handle large SMP systems, LPAR also allows large pSeries systems to be partitioned to run Linux workloads.

### ***Linux ready Express Configurations***

To make it easy to get started with Linux for pSeries, IBM has introduced a number of pSeries Linux ready Express Configurations. These systems represent some of the most popular configurations of the p630 and p650 systems. They are provided without an AIX license and offer great savings with the ability to add additional features. Linux can be ordered through IBM at the time of initial purchase of these systems.

Check the Linux for pSeries Web site (<http://www.ibm.com/servers/eserver/pseries/hardware/express.html>) for current configurations and pricing.

### **Linux for pSeries Distributions**

A Linux port for the PowerPC Architecture has been available for several years. As with the ports to other architectures, it was started by members of the Open Source community. More background on this effort may be found at the Linux PowerPC community Web pages at <http://penguinppc.org/> and <http://www.penguinppc64.org>.

IBM became involved in Linux on PowerPC 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 and IBM. There has also been a large effort around Linux on embedded PowerPC processors.

In order to run Linux on a pSeries system, a customer would first purchase their system from IBM or an IBM Business Partner. The customer would then purchase a version of Linux for pSeries from one of the distributors and install it (IBM Global Services and IBM Business Partners also provide installation services). For the Linux ready Express Configurations discussed above, customers can order Linux through IBM and have the order fulfilled by the Linux distributor. More details on this offering are in the “SuSE” section below.

The following sections describe the Linux distributors that are working with IBM to provide and support Linux for pSeries. Each distributor is wholly responsible for the contents, availability, and pricing of their offering. Regardless of how a Linux distribution is ordered, the distributor is

responsible for maintenance and support. IBM also has support offerings for these distributions as described in a later section.



### ***Red Hat***

Red Hat (<http://www.redhat.com>) is the best known of the Linux distributors. Red Hat 7.1 was announced for pSeries in November 2001 and made generally available in March 2002. An update supporting more pSeries systems became generally available in December 2002 and is designated as “Red Hat Linux 7.1 for pSeries (64 bit)”. It is a 64-bit kernel and supports 32-bit applications. Details on the offering, including pricing, can be found at <http://www.redhat.com/software/eserver/pseries>.

IBM has recently signed an agreement with Red Hat which aims to bring the Red Hat Enterprise Linux Advanced Server product to pSeries in 3Q2003. This will be a full 64-bit kernel with 32- and 64-bit application support.



### ***SuSE***

SuSE (<http://www.suse.com>), pronounced “sooza”, was the first of the IBM Linux Distribution Partners to release Linux for the pSeries and 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 was superseded by Version 7.x which is based on the 32-bit Linux 2.4 kernel.

The latest version of SuSE for enterprise customers, SuSE Linux Enterprise Server 8 (SLES 8) is now available for pSeries. It became available in December 2002 and contains the 64-bit Linux kernel (version 2.4.19) as well as both 32-bit and 64-bit application support. SLES 8 is the first distribution to be branded as “Powered by UnitedLinux V1.0” (details on UnitedLinux are provided below).

Full details on SLES 8 for pSeries are available directly from SuSE at [http://www.suse.com/us/business/products/server/sles/i\\_pseries.html](http://www.suse.com/us/business/products/server/sles/i_pseries.html). SuSE also has a number of worldwide sales offices. The contact information is available at <http://www.suse.com/us/company/suse/contact>.

Pricing for full retail and evaluation copies of SLES 8 is available by contacting SuSE at:

- [enterprise-presales@suse.com](mailto:enterprise-presales@suse.com) (US and Canada)
- [presales@suse.co.uk](mailto:presales@suse.co.uk) (UK, Ireland, Scandinavia, Benelux, South Africa and Middle East)
- [enterprise-presales@suse.de](mailto:enterprise-presales@suse.de) (all other countries).

Evaluation copies of SLES 8 are approximately \$300 (300 Euro).

For the convenience of customers, IBM provides the ability to order a full retail distribution of SLES 8 in conjunction with any Linux ready Express Configurations purchase. IBM will pass the order and payment through to SuSE Linux AG, who will then direct-ship SLES 8 to the customer. This feature (5639-LNX) is only available at the time of the initial Linux ready Express Configurations order. Customers always have the option of ordering directly from SuSE at any time per the information above.



## ***Turbolinux***

Turbolinux (<http://www.turbolinux.com>) has a strong presence in the Asia Pacific market. Turbolinux Enterprise Server 8 for pSeries (<http://www.turbolinux.co.jp>) is currently available in Japan and, like SLES 8, contains the 64-bit Linux kernel (version 2.4.19) as well as both 32-bit and 64-bit application support. Turbolinux intends to extend distribution to Korea, China, and Taiwan.

This version of Turbolinux is certified as UnitedLinux V1.0 and is binary compatible with SuSE SLES 8. Turbolinux can be reached at [sales@turbolinux.com](mailto:sales@turbolinux.com).



## ***UnitedLinux***

In June 2002, four of the Linux distributors formed the UnitedLinux (<http://www.unitedlinux.com>) organization. The UnitedLinux companies are Conectiva S.A., SuSE Linux AG, and Turbolinux, Inc (The SCO Group has suspended shipping Linux). They have pooled their development resources to create and distribute a common, standards-based server distribution of Linux focused on the business customer. The distribution supports Intel processor-based systems and each distributor decides on which other platforms, including IBM @server, to support.

While the development organization is common, each member will sell and service its own distribution at whatever price it chooses. More information can be found at their Web site.

SuSE Linux Enterprise Server 8 for iSeries and pSeries and Turbolinux Enterprise Server 8 for iSeries and pSeries carry the “Powered by UnitedLinux V1.0” brand. Since the UnitedLinux brand is intended to ensure that the distributions are common across all UnitedLinux branded offerings, SLES 8 and TLES 8 are API and binary compatible. Applications do not need to be recertified on each UL distribution for a particular architecture.

## **Logical Partitioning**

Linux is supported running in one or more static logical partitions (LPARs) on all pSeries systems which support logical partitioning. AIX and Linux can run concurrently in separate partitions on an LPAR-enabled system in any combination (i.e. zero or more Linux partitions along with zero or more AIX partitions). This enables a customer to consolidate workloads from several separate servers onto a single system. Since the partitioning is controlled by the hypervisor firmware and the Hardware Management Console for pSeries (HMC), AIX is never required to run Linux<sup>1</sup>.

Dynamic LPAR is currently not supported by Linux; however, Linux partitions can be created on systems enabled for dynamic LPAR. The Linux partition will appear grayed out on the HMC and cannot be changed dynamically. To reconfigure Linux in an LPAR environment, Linux must first be stopped, the partition reconfigured, and then Linux restarted.

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

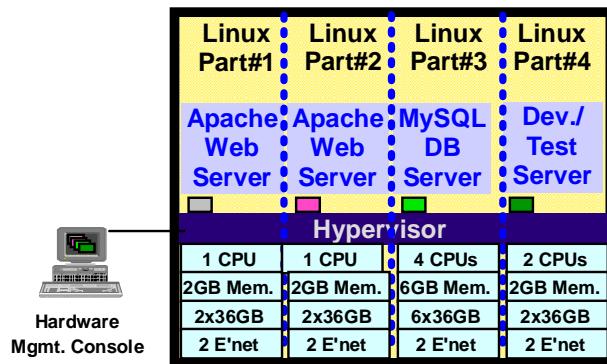
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<sup>1</sup> Currently, the p655 requires that AIX be run in one partition to provide serviceability of the system. This restriction will be removed in 3Q2003.

products in conjunction with an ERP or CRM product. The third tier of servers runs UNIX on a large SMP to provide the backoffice and database management (DBMS) functions that require high performance and scalability. In many cases, the first and possibly second tiers are running Linux or Microsoft® Windows®. This results in a proliferation of servers and the need for more staff and expensive software to manage multiple platforms.

The pictures below illustrate some possible Linux for pSeries LPAR configurations. The first scenario shows all Open Source applications being used to consolidate what would normally be separate servers into multiple logical partitions.

**pSeries 670 8-way**  
**12GB memory, 12x36GB DASD, 8 E'net**



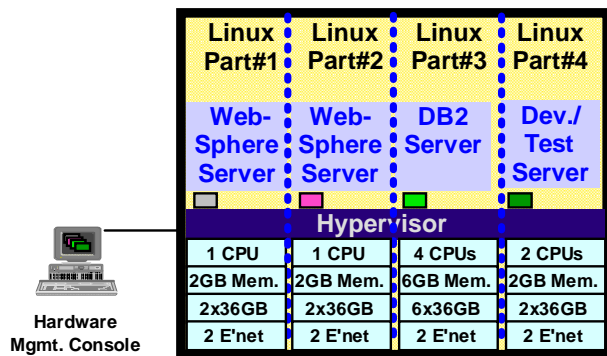
**Open Source applications - simple Web workload**

**Alternatives**

- ▶ One partition with two CPUs, 4GB memory, 2x36GB disk for Apache Web Server
- ▶ Sun, HP Migration Services offering

The second configuration shows a similar Web serving consolidation using IBM software. Note that higher DBMS scalability could be achieved by using AIX instead of Linux for Partition #3.

**pSeries 670 8-way**  
**12GB memory, 12x36GB DASD, 8 E'net**



**IBM SWG applications - complex Web workload**

**Alternatives**

- ▶ AIX for DB2 Server partition
- ▶ One partition with two CPUs, 4GB memory, 2x36GB disk for WebSphere Server
- ▶ Sun, HP Migration Services offering



## Supported pSeries Systems

The table below details the Linux distribution support for pSeries 64-bit systems. SuSE Linux Enterprise Server 8 and Turbolinux Enterprise Server 8 have a 64-bit kernel with support for either 32- or 64-bit applications. Red Hat Linux 7.1 for pSeries (64 bit) provides a 64-bit kernel but the tools and libraries support only 32-bit applications. In practice, this is not a major limitation as the majority of today's Linux applications are 32-bit. Database managers and many high performance computing applications tend to make use of 64-bit.

<b>pSeries or RS/6000 Model</b>	<b>SuSE Linux Enterprise Server 8 / Turbolinux Enterprise Server 8 (UnitedLinux V1.0)</b>	<b>Red Hat Linux 7.1 for pSeries (64 bit)</b>
170 (7044-170)	Yes	No
270 (7044-270)	Yes	No
p610 (7028-6C1) p610 (7028-6E1)	Yes	No
p615 (7029-6C3) p615 (7029-6E3)	Yes	No
p620 (7025-6F0) p620 (7025-6F1)	Yes	Yes
p630 (7028-6C4) p630 (7028-6E4)	Yes <sup>1,4</sup>	No
p640 (7026-B80)	Yes	Yes
p650 (7038-6M2)	Yes <sup>1,4</sup>	No
p655 (7039-651)	LPAR w/AIX only <sup>5</sup>	No
p660 (7026-6H0) p660 (7026-6H1)	Yes	Yes
p660 (7026-6M1)	Yes	Yes
p670 (7040-671)	Yes <sup>2,3</sup>	No
p690 (7040-681)	Yes <sup>2,3</sup>	No

<sup>1</sup> These LPAR-capable systems are supported either with or without the use of LPAR. Only statically-configured LPARs are supported, meaning that Linux must be stopped and restarted in order to change the partition configuration.

<sup>2</sup> These LPAR-capable systems are supported only in LPAR mode. Only statically-configured LPARs are supported, meaning that Linux must be stopped and restarted in order to change the partition configuration. Because Linux currently does not scale well beyond 6- to 8-way SMP, Linux is only supported in an LPAR on these large systems.

<sup>3</sup> A maximum of eight processors is recommended for each Linux LPAR on these systems. While Linux can be run successfully on systems/LPARs with more than 8 processors, typical application workloads will only effectively utilize the equivalent of 4 to 8 processors.

<sup>4</sup> These systems may be ordered as Linux ready Express Configurations at special prices. Orders for SLES 8 may be placed through IBM at the time of purchase for Linux ready Express Configurations.

<sup>5</sup> Currently, the p655 requires that AIX be run in one partition to provide serviceability of the system. This restriction will be removed in 3Q2003.

## **I/O Device and Adapter Support**

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, adapters are enabled in addition to the base device support (i.e. SCSI, Ethernet, etc.). The supported adapters are detailed in the *Linux for IBM @server pSeries Facts and Features* document available at <http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html>.

Other adapters not currently supported will obviously be required and some are already ported but not yet tested. These will be included in future Linux for pSeries distributions and work to help provide others as part of special bids to customers interested in testing/deploying Linux for pSeries.

## **Performance**

IBM has ported the IBM VisualAge® C++ V6.0 and XL Fortran V8.1 compilers used on AIX to Linux for pSeries. These optimized compilers increase performance over the standard GNU compilers, especially for floating-point intensive applications. The compilers are generally available and more information on downloads and purchases can be found at <http://www.ibm.com/software/awdtools/vacpp/features/vacpp-linux.html> and <http://www.ibm.com/software/awdtools/fortran/xlfortran/features/xlf-linux.html>.

The IBM Developer Kit for Linux, Java™ 2 Technology Edition is a development kit and runtime environment that contains IBM's just-in-time compiler and an enhanced Java 2 virtual machine. This high performance Java environment is available on Linux for pSeries for both SLES 8 and Red Hat 7.1 (64 bit). The kit is packaged with these distributions or can be downloaded from IBM's developerWorks site at (<http://www.ibm.com/developerworks/java/jdk/linux140>).

The available benchmark data for Linux for pSeries on various systems are published in the *Linux for IBM @server pSeries Facts and Features* document available at <http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html>.

## **Scalability**

Linux 2.4 has been found to scale well from four to eight processors in an SMP system depending on the workload. This makes it a good match for RS/6000 systems such as the 170, 270, pSeries systems such as the p610, p620, p630, p640, p650, p660, and 1- to 8-way LPARs on the p670 and p690. Scalability will be further enhanced in the Linux 2.6 kernel in 2004.

## **Reliability, Availability, and Serviceability (RAS)**

A key attribute of the pSeries is mission-critical RAS features. Drawing from IBM's autonomic computing efforts, pSeries continues to enhance the scope of its RAS capabilities. However, while Linux RAS capabilities continue to mature, many pSeries RAS features are only fully realized when running AIX.

The following pSeries RAS features are supported when running Linux:

- Chipkill™ and ECC memory
- Disk mirroring (software)
- Journalled file system (several available under Linux)
- PCI Extended Error detection
- Redundant, hot-plug power and cooling (where available)
- Error logging
- Boot-time processor and memory deallocation
- First Failure Data Capture (except for I/O)
- Service Processor

Some of the pSeries RAS features that are not currently supported in Linux include:

- Hot-swapping of disk drives
- Hot-plug PCI
- Dynamic Processor Deallocation
- PCI Extended Error recovery
- Error reporting to Service Focal Point
- Error log analysis
- High Availability Cluster Multiprocessing (HACMP). Alternative third party and Open Source solutions may be available.

## **Clustering and High Availability**

Currently, none of the IBM software that has been announced for IBM's cluster products, the IBM @server Cluster 1350 and Cluster 1600, has been ported to Linux on pSeries. IBM has an announced Statement of Direction to port its Cluster Systems Management (CSM) technology and other tools to Linux for pSeries.

The Beowulf clustering technology (<http://www.beowulf.org>) and other Open Source and some commercial products can be used to cluster pSeries systems running Linux to provide compute or high-availability clusters. Myricom (<http://www.myricom.com/>) 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 Open Internationalization Initiative (<http://www.openi18n.org/>) approach to providing standard national language support. Details on language/locale support can be found on each distributor's Web site.

## **IBM Software Availability**

IBM has announced a Statement of Direction to support major pieces of its software portfolio on Linux for pSeries including WebSphere, DB2 Universal Database™, and several Tivoli® products. IBM's Software Group will work with interested customers to assess requirements and provide early copies for evaluation.

DB2 UDB V8.1 is already in beta for Linux for pSeries on SLES 8. A full GA package will be orderable by mid-2003.

The IBM Developer Kit for Linux, Java 2 Technology Edition and IBM's Journaling File System (JFS) are already certified on the SLES 8 and Red Hat 7.1 (64 bit) distributions. DB2 and other IBM applications for Linux for pSeries can be found at the "Speed-start your Linux app 2003" site at <http://www.ibm.com/developerworks/offers/linux-speed-start/download-p.html>.

## **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.

Many ISVs are quickly moving to support Linux; in fact, a number of ISVs such as Oracle and SAP have made Linux their reference development platform. Given that the availability of software under Linux is growing rapidly, one needs to recheck for the availability of software on Linux for pSeries on a regular basis. The most up to date information on ISV availability can be found on the Linux for pSeries Web site

It is important to note that applications that are ported/recompiled and tested on Linux for pSeries will work unmodified on Linux on an IBM @server iSeries system unless there is some extremely low-level hardware interaction required. Similarly, Linux applications that have been migrated to work on Linux on iSeries will also run unmodified on Linux for pSeries.

## **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 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. Initial installation and maintenance is usually bundled into a Linux distributor's product.

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>.

# 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. This means that source code must be made available free of charge. Distributor pricing for Linux includes media, packaging/shipping and documentation costs, and they may offer additional programs under other licenses as well as bundled 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. Please consult the distributor's Web site for information.

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

A: Not at this time. However, IBM has stated its intention to allow customers to be able place an order for a supported Linux distribution at the time of their system order. The actual Linux software would be supplied by the Linux distributor.

**Q: What version of AIX is required to run Linux in an LPAR?**

A: AIX is *never* required to run Linux. All LPAR functions are controlled by the Hardware Management Console for pSeries (HMC) and the firmware on LPAR-capable systems. Instances of AIX and Linux run as peer operating systems in separate LPARs. Linux is installed, booted, and run independent of any use of AIX.

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

A: Any warranty and support for the Linux operating system is provided by the Linux distributor. The Linux distributor is primarily responsible for testing and systems assurance. In addition, IBM is doing functional and regression testing of supported Linux distributions on designated pSeries hardware. IBM receives candidate releases from the supported Linux distributors and runs a system test to verify that the package will install, boot, and operate correctly on the designated hardware. Also, other IBM server and software organizations provide extensive testing of Linux capabilities.

Quality assurance for the hundreds of Open Source applications that are packaged with a Linux distribution is provided by the Linux distributor and the Open Source community.

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

A: Each of the Linux distributors has its own service offerings 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.

**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 new pSeries platforms as they are announced. 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 systems?**

A: Terra Soft produces Yellow Dog Linux (<http://www.yellowdoglinux.com/>) which 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 (<http://www.debian.org>) and MandrakeSoft (<http://www.mandrakesoft.com>) are also providing PowerPC versions targeted at the Power Mac market. These distributions may or may not work on pSeries and RS/6000 hardware and are not supported by IBM. 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 IBM @server platforms. IBM expects to see many installations running Linux (on IBM @server xSeries™ or pSeries hardware) as the front-end to mission-critical AIX systems running DB2 and other enterprise applications.

**Q: Will IBM continue its commitment to AIX 5L while integrating Linux into the pSeries offerings?**

A: Absolutely yes! The AIX 5L product roadmap is loaded with rich, customer-validated enhancements far into the future. The October 8, 2002 announcement of AIX 5L v5.2, for example, brings new dynamic LPAR and keyed Capacity Upgrade on Demand capabilities to the IBM pSeries 670 and pSeries 690. On November 12, 2002, the p630 and p650 were announced with dynamic LPAR support as well. AIX will continue as IBM's premier, enterprise-class UNIX, but it will also continue to be more closely aligned with Linux than any other UNIX operating system (OS) in the industry. AIX also has broad application support and industry acceptance. Customers have invested millions of dollars in AIX applications and skills. IBM plans to enhance and support AIX for years to come. Keep in mind, Linux on pSeries is a response to customer requirements for more flexibility to address particular workload demands within an overall infrastructure.

**Q: How does the pSeries AIX 5L and Linux flexibility play in terms of risk and cost?**

A: The overall flexibility of pSeries with AIX 5L and Linux means customers have the low risk option to run AIX 5L and migrate to Linux in the future. IBM customers can buy very specific computing power to match workloads requirements. Depending on existing infrastructure, training and applications, administrators may choose a system with AIX 5L, Linux, or some combination of the two. IBM allows customers to make that decision at the time of purchase or any time thereafter, providing excellent investment protection. IBM @server pSeries offers the least amount of risk of all the UNIX OS platforms. Because of this unique flexibility between AIX and Linux to coexist on the same server customers get the best of both worlds - investment protection now and in the future.

**Q: What is the advantage of running AIX 5L and Linux concurrently?**

A: The ability to run both Linux and AIX 5L at the same time offers several advantages over a two system approach. Administrators running test and production applications may wish to run both within a single server rather than operating two separate systems with possible performance variances. A single common server is very useful during operating system and application migrations as it removes one less variable.

Selected pSeries systems can be partitioned into smaller virtual servers with logical partitioning (LPAR). Consolidating many AIX 5L and Linux systems within one server using LPAR greatly simplifies systems management, saves on space, increases flexibility and contributes to lower TCO since overall system resources are utilized more efficiently. This flexibility also lowers TCO as many applications currently run on Linux or AIX, but not both. One pSeries server can support the broadest portfolio of UNIX and Linux applications, saving customers from purchasing separate servers to run Linux and UNIX applications.

**Q: Are there additional software enhancements planned to complement the new pSeries servers running AIX or Linux?**

A: Yes, the ability to configure and interoperate systems running Linux and UNIX will be enhanced by new clustering software that greatly simplifies the management of clustered systems running both Linux and AIX 5L.

**Q: What are some of the advantages of Linux on the POWER processors?**

A: The IBM @server pSeries is an ideal platform for 64-bit Linux applications. The pSeries products offer a proven environment with industry leading performance, scalability, reliability and autonomic computing manageability features. Linux on pSeries leverages the competitive advantages of pSeries hardware while allowing administrators to utilize Linux applications.

**Q: What type of workload will a UNIX customer address with Linux and which workloads might benefit from a combination of both AIX and Linux?**

A: Typically e-infrastructure workloads like Web/Java application serving, file and print serving, as well as HPC environments are best for Linux. Customers may choose Linux for availability of a specific application. Those customers who need to support database management/analysis and core business applications tend to prefer UNIX. IBM is the only vendor that can provide both on a single server with UNIX and Linux partitions.

**Q: Why is there only a subset of I/O devices available for the pSeries when I am using Linux?**

A: Support for I/O adapters on pSeries servers running Linux is determined by many factors, including the availability of Open Source drivers and IBM's testing and certification efforts with available Linux distributions. The first priority is to support I/O adapters integrated on system planars and key devices such as SCSI and LAN adapters. Over time, the set of supported I/O devices will be enhanced as additional device drivers become available and as testing can be performed. Additional information is available in the *Linux for IBM @server pSeries Facts and Features* document at <http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html>.

**Q: Will an AIX binary or a binary produced using the AIX Toolbox run on Linux on pSeries?**

A: No. The executable formats are different between AIX and Linux. Source compiled using the AIX compilers or AIX Toolbox creates an AIX binary which is not compatible with the format Linux uses. The source code for the program must be recompiled on Linux for pSeries.

**Q: Can a Linux for pSeries binary be run on AIX?**

A: No. As per the previous question, the executable formats are different. A Linux application must be compiled on AIX using the AIX Toolbox in order to run.

**Q: Can a Linux for pSeries binary run on Linux for iSeries?**

A: Yes! The binary formats for Linux on these POWER/PowerPC systems are identical. An application compiled on one will work unmodified on the other series.

**Q: Are Linux for pSeries binaries compatible across different Linux for pSeries distributions? For example, can a program created using Red Hat 7.1 run on a pSeries system using SLES 8?**

A: While it may be possible in many instances to run a binary built using one Linux distribution on a system running another, this is not recommended. Differences in compiler and library levels as well as kernels may pose problems. In general, the source should be recompiled for each distribution.

**Q: Can a Linux binary created on an Intel system be run on Linux for pSeries?**

A: No. Linux binaries are not supported across hardware architectures. Since a compiled Linux program is actually machine-level instructions (rather than hardware-independent codes like a Java program), the Linux source code must be recompiled for every target architecture. Linux binaries created for either iSeries or pSeries can be run on the other platform (with the same level of Linux distribution) since they are both PowerPC systems.





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