




IBM @server pSeries Linux on pSeries Overview


May 19, 2004




Entry deskside




pSeries 615
Model 6E3



pSeries 630
Model 6E4



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® clients, IBM Business Partners, sales, marketing, and technical teams to Linux on 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 on pSeries external Web site at <http://www.ibm.com/eserver/pseries/linux/>
- The Linux on POWER™ external Web site at <http://www.ibm.com/linux/power>
- 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
- Information on the *AIX Toolbox for Linux Applications* product can be found at <http://www.ibm.com/servers/aix/products/aixos/linux/index.html>
- Information and download of the Linux on pSeries service aids toolkit can be found at https://techsupport.services.ibm.com/server/Linux_on_pSeries

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.

Clients 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 2.6. This version became available in October 2003 and is available as a download from www.kernel.org. The commercially available kernel from Red Hat, Inc. and SUSE LINUX is the 2.4 kernel which became available in January 2001. Odd numbered versions such as 2.5 are for development only and are not made generally available. The 2.4 version features increased performance, scalability, and stability over previous releases. The 2.6 kernel is being certified for pSeries by Red Hat Inc. and SUSE LINUX and is expected to ship in 2H2004. Certain modules of this release have been back-ported into the 2.4.21 kernel as released in SUSE LINUX Enterprise Server 8 and Red Hat Enterprise Linux AS 3.

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 client 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 clients 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 clients. The LTC has over 300 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 on the PowerPC Architecture™. This work is common to the PowerPC® processor-based IBM @server iSeries™, and POWER processor-based pSeries and IBM @server BladeCenter™ JS20 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 is working with Red Hat, Inc. and SUSE LINUX as Linux Distribution Companies (LDCs) to deliver the appropriate Linux solutions that support IBM's various hardware and software platforms including pSeries servers and JS20 blades.

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 Distribution Company.

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. However, binary distributions of the "enterprise" versions of most distributions must be purchased and include maintenance and support.

Linux and AIX

The AIX 5L™ platform is, and will continue to be, the premier operating system from IBM on pSeries systems. In order to enhance solution interoperability between Linux and AIX 5L, 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 5L. The AIX® Toolbox for Linux Applications is the one of IBM's efforts to provide AIX 5L and Linux interchangeability and interoperability.

For clients of AIX 5L, 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 5L.

The toolbox contains a collection of Open Source and GNU software that works with both AIX V4.3.3 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 5L applications, meaning they can take advantage of the same scalability and performance as any other AIX 5L application. Note that these applications that are compiled using the toolkit are AIX 5L binaries. They cannot be run on Linux on pSeries. Similarly, applications developed on Linux on pSeries do not run in binary form on AIX 5L.

Linux and the pSeries

Linux on pSeries is a key element of the IBM @server Linux strategy. IBM's commitment to provide Linux on 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 clients. The References section contains pointers to other documents that more fully address IBM's overall Linux strategy.

Today, with the Linux 2.4 kernel, Linux is able to support from the low end of the scalability range systems to the very high-end systems. Recently, a 16-way pSeries 690 set the performance record for SPECjbb workloads with Linux. In fact, it is also the only 16-way benchmark of Linux, demonstrating the high scalability of pSeries servers. These servers have carved out a leadership position in the enterprise targeted entry, mid-range and high-end servers. As Linux becomes even more mature with the 2.6 kernel in enterprise reliability, availability and scalability, Linux on pSeries grows more compelling with such features as large page support, improved scheduler, improved Virtual Memory support. As Linux scalability grows, so does the ability to support greater 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 POWER processor-based servers.

Linux on pSeries is especially compelling for solutions requiring a 64-bit highly scalable solution architecture or the high-performance floating-point capabilities of the POWER processor. The balanced systems design (where processor speed, memory access rates, cache access, I/O bus and adapters are tuned for mixed workloads as opposed to maximizing performance for a specific workload, such as floating-point operations) are unmatched in the Linux space today as compared to the Intel Itanium® processors (supported mainly by HP) and Sun systems which support Linux only for their IA-32-based systems (with announced plans for limited symmetric multiprocessing (SMP) Opteron servers) and not for SPARC processor-based servers.

In addition, the logical partitioning (LPAR) capabilities of the pSeries (discussed later) make it possible to run one or more instances of Linux with or without the presence of AIX 5L. This can provide a low-risk way to begin developing and deploying Linux operating system-ready applications while retaining the enterprise-ready capabilities of AIX 5L for mission-critical or highly-scalable workloads. Since Linux does not currently scale to consistently handle large SMP systems over 8-way, LPARs allow large pSeries systems to be partitioned to run multiple Linux workloads and efficiently utilize the scalability capabilities of the pSeries.

Linux ready Express Configurations

To make it easy to get started with Linux on pSeries, IBM has introduced a number of pSeries Linux ready Express Configurations. These include some of the most popular configurations of the p615, p630 and p650 systems. They are provided without an AIX 5L license and offer great cost savings with the ability to add additional features. Linux can be ordered through IBM at the time of initial purchase of these systems and a Linux distribution from SUSE LINUX or Red Hat, Inc. is available to support these configurations.

Check the Linux on 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 IBM 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 such as found in game boxes.

In order to implement Linux as the operating environment on a pSeries system, a client would need to have a pSeries system and a copy of Linux. For all pSeries systems including Linux ready Express Configurations, clients can order SUSE LINUX or Red Hat Linux with their initial pSeries system order, CUoD activation, or processor upgrade orders for installed systems. More details on this ordering process are found in the “Red Hat” or “SUSE LINUX” sections 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 distributors offer maintenance and support. IBM also has support offerings for these distributions as described in a later section.



Red Hat, Inc.

Red Hat, Inc. (<http://www.redhat.com>) is the best known of the Linux distributors. Red Hat Enterprise Linux AS 3 became generally available for pSeries in November 2003. This is a full 64-bit kernel (2.4.21) with 32- and 64-bit application support. (Note: the “ES” and “WS” packages of Red Hat Enterprise Linux 3 are not available for pSeries at this time.)

For the convenience of clients, IBM provides the ability to order a full retail distribution of RHEL AS 3 in conjunction with any new pSeries server purchase, with any new processor upgrade or with any activation of a CUoD processor. IBM will accept the client’s order and payment and arrange for the Red Hat distribution to arrive with the pSeries server at the client location. This feature (5639-RDH) is only available at the time of the initial pSeries server order, processor upgrade or CUoD activation. Clients always have the option of ordering directly from Red Hat, Inc. at any time from the Red Hat Web site or a Red Hat business partner.

Full information on this product, including pricing and support options, can be found at <http://www.redhat.com/software/rhel>.

Red Hat, Inc. also has a number of worldwide sales offices. The contact information is available at http://www.redhat.com/apps/webform.html?event_type=contact_sales&eid=1.

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SUSE LINUX

SUSE LINUX (<http://www.suse.com>), pronounced “sooza”, was the first of the IBM Linux Distribution Partners to release Linux for the pSeries and RS/6000. The latest version of SUSE LINUX for enterprise clients, SUSE LINUX Enterprise Server 8 (SLES 8.1) became available in August 2003 and contains the 64-bit Linux kernel (version 2.4.21) as well as both 32-bit and 64-bit application support. SUSE LINUX is now part of Novell.

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. SUSE LINUX also has a

number of worldwide sales offices. The contact information is available at <http://www.suse.com/us/company/suse/contact>.

For the convenience of clients, IBM provides the ability to order a full retail distribution of SLES 8 in conjunction with new pSeries server purchases, processor upgrades or Capacity Upgrade on Demand (CUoD) activation. IBM will take the client's order and payment and pass it through to SUSE LINUX, who will direct-ship SLES 8 to the client and provide maintenance and can, for an additional charge, provide support. This feature (5639-LNX) is only available at the time of the initial of new pSeries orders. Clients always have the option of ordering directly from SUSE LINUX at any time per the information above.

Logical Partitioning

Linux is supported running in one or more static logical partitions (LPARs) on all pSeries systems which support logical partitioning. AIX 5L 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 5L partitions). This enables a client 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 5L is never required to run Linux¹.

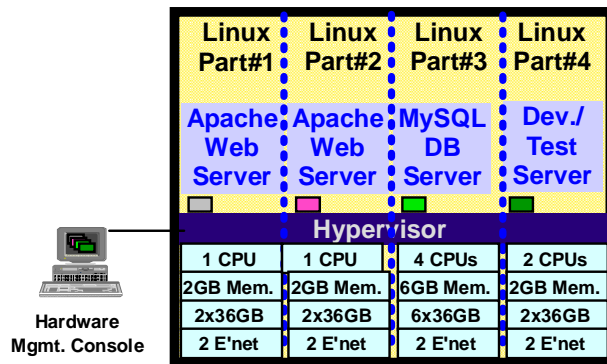
Dynamic LPAR is currently not supported by Linux. However, Linux partitions can be created on systems enabled for dynamic LPAR. The Linux partition will appear grayed out on the HMC and cannot be changed dynamically. To reconfigure Linux in an LPAR environment, Linux must first be stopped, the partition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

¹ The pSeries 655 requires that AIX 5L be present in the system or network, to extract diagnostic information for service support

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



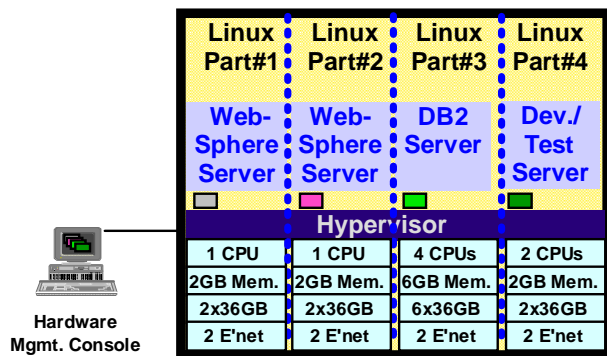
Open Source applications - simple Web workload

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 5L 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 Red Hat Enterprise Linux AS 3 have a 64-bit kernel with support for either 32- or 64-bit applications. In practice, this is a very good feature as no performance degradation will be encountered when running 32-bit application on the 64-bit kernel on POWER systems, unlike other system architectures. Additionally to exploit 64-bit, database managers and many high performance computing (HPC) applications tend to make use of 64-bit.

pSeries or RS/6000 Model or JS20	SUSE LINUX Enterprise Server 8	Red Hat Enterprise Linux AS 3
170 (7044-170) ⁶	Yes	No
270 (7044-270) ⁶	Yes	No
p610 (7028-6C1) p610 (7028-6E1)	Yes	No

pSeries or RS/6000 Model or JS20	SUSE LINUX Enterprise Server 8	Red Hat Enterprise Linux AS 3
p615 (7029-6C3) p615 (7029-6E3)	Yes ⁴	Yes
p620 (7025-6F0) ⁶ p620 (7025-6F1) ⁶	Yes	No
p630 (7028-6C4) p630 (7028-6E4)	Yes ^{1,4}	Yes ¹
p640 (7026-B80) ⁶	Yes	No
p650 (7038-6M2)	Yes ^{1,4}	Yes ¹
p655 (7039-651)	Yes ⁵	Yes ⁵
p660 (7026-6H0) ⁶ p660 (7026-6H1) ⁶	Yes	No
p660 (7026-6M1) ⁶	Yes	No
p670 (7040-671)	Yes ^{2,3}	Yes ^{2,3}
p690 (7040-681)	Yes ^{2,3}	Yes ^{2,3}
JS20 Blade	Yes	Yes

¹ 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.

² 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 applications currently do not consistently scale well beyond 4-way to 16-way SMP, Linux is only supported in an LPAR on these large systems.

³ 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 eight processors, typical application workloads will only effectively utilize the equivalent of four to eight processors.

⁴ These systems may be ordered as Linux ready Express Configurations at special prices.

⁵ The p655 requires that AIX 5L be available either in the system or on the network to extract diagnostic information. This is only required when diagnostics are to be extracted and does not require full time connection.

⁶ These systems are no longer marketed by IBM but are supported by the indicated distributions.

I/O Device and Adapter Support

There are a large number of adapters and devices that can be attached to pSeries systems running AIX 5L. While some of the devices (e.g. PCI adapters) have Linux drivers for Intel as well as AIX 5L drivers, these cannot be utilized directly in Linux on pSeries.

The supported adapters and storage devices are detailed in the *IBM @server pSeries Linux 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 certified. These will be included in future Linux for pSeries distributions and IBM will

work to help provide others as part of special bids to clients interested in testing/deploying Linux on pSeries.

Performance

IBM has ported the IBM VisualAge® C++ V6.0 and XL Fortran V8.1 compilers used on AIX 5L to Linux on 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 on pSeries for SLES 8, TLES 8, and Conectiva. 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 on pSeries on various systems are published in the *IBM @server pSeries and IBM RS/6000 Performance Report* which is downloadable from http://www.ibm.com/servers/eserver/pseries/hardware/system_perf.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 systems such as the p610, p615, p630, p640, p650, p655, 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 5L.

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 reporting to Service Focal Point
- Error log analysis
- 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

Many of these RAS deficiencies will be remedied with the debut of distributions based on the Linux 2.6 kernel.

To enable Linux to take advantage of the pSeries enhanced reliability support, a Service Aids Toolkit has been made available for download. This toolkit should greatly enhance Linux availability and serviceability when running on pSeries systems. The toolkit information and download is at the following URL:

- https://techsupport.services.ibm.com/server/Linux_on_pSeries

Clustering and High Availability

IBM has announced the availability of Cluster Systems Management (CSM) technology and other tools supporting Linux on 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.myri.com/>) has the Myrinet™ switch available for Linux on 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.

In the high availability arena, IBM is providing Tivoli® System Automation as one solution. This product is based on technology from IBM's mainframe z/OS® and AIX 5L high availability products. It is currently in beta. Other third-party solutions are also available today.

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 the availability and support of major components of the IBM software portfolio for Linux on pSeries including WebSphere Application Server, WebSphere Commerce Suite, DB2® Universal Database™, IBM Fortran and C/C++ compilers, and several Tivoli products. IBM's Software Group will work with interested clients to assess requirements and provide no charge copies for evaluation.

Many of IBM's premiere software products including DB2 UDB V8.1, WebSphere Application Server V5.0.2, WebSphere Commerce Suite, IBM C/C++ and Fortran compilers, IBM Directory, Tivoli Storage Manager and other Tivoli solutions are available for Linux on POWER.

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

ISV Applications

A wide variety of over 400 Open Source applications and software packages are available on Linux on pSeries and JS20. Each Linux distributor provides 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 on pSeries on a regular basis. The most up to date information on ISV availability can be found on the Linux on pSeries Web site.

It is important to note that applications that are ported/recompiled and tested on Linux on 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 on pSeries.

For a full list of the currently available applications, please visit <http://www.ibm.com/linux/power>

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, Inc. and SUSE LINUX. 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 IGS and IBM Technical Education Services has developed a comprehensive portfolio of Linux services, 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 clients 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, new pSeries server orders, processor upgrades or CUoD activations have the option of ordering SLES 8 or RHEL AS 3.

Q: What version of AIX 5L is required to run Linux in an LPAR?

A: AIX 5L is not required to run Linux, though it may be required to take advantage of certain diagnostic and support features on some pSeries systems. All LPAR functions are controlled by the Hardware Management Console for pSeries (HMC) and the firmware on LPAR-capable systems. Instances of AIX 5L and Linux run as peer operating systems in separate LPARs. Linux is installed, booted, and runs independent of any use of AIX 5L.

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 90 days to one year of free installation support and maintenance 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: The support of IBM systems is provided by the distributors and not IBM. However, IBM understands that the distributors do 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. Specific model support information should be obtained from the LDPs.

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 clients 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 5L?

A: Linux is rapidly gaining momentum, having become the fastest growing server operating environment. By allowing Linux applications to be easily compiled for AIX 5L with the AIX Toolbox for Linux Applications, IBM has expanded the available application portfolio. Additionally, AIX 5L can now take advantage of the growing Linux skill base.

Q: Does Linux compete with AIX 5L?

A: Linux and AIX 5L are complementary operating systems. AIX 5L 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 5L 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, client-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 pSeries 670 and pSeries 690. On November 12, 2002, the p630 and p650 were announced with dynamic LPAR support as well. AIX 5L 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 5L also has broad application support and industry acceptance. Clients have invested millions of dollars in AIX applications and skills. IBM plans to enhance and support AIX 5L for years to come. Keep in mind, Linux on pSeries is a response to client 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 clients have the low risk option to run AIX 5L and migrate to Linux in the future. IBM clients 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 clients 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 operating system platforms. Because of this unique flexibility between AIX 5L and Linux to coexist on the same server clients 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 5L, but not both. One pSeries server can support the broadest portfolio of UNIX and Linux applications, saving clients from purchasing separate servers to run Linux and UNIX applications.

Q: What are some of the advantages of Linux on pSeries with 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 client address with Linux and which workloads might benefit from a combination of both AIX 5L 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. Clients may choose Linux for availability of a specific application. Those clients who need to support database management/analysis and core business applications tend to prefer UNIX although Linux is rapidly gaining acceptance in DBMS environment. IBM is the only vendor that can provide both on a single server with UNIX and Linux partitions.

Q: Why are there some I/O devices not supported by Linux on pSeries at this time?

A: Although today most I/O devices and adapters are supported, the supported list is not as complete as the list for AIX 5L. Support for I/O devices and 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 *IBM @server pSeries Linux 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 5L and Linux. Source compiled using the AIX 5L 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 on pSeries.

Q: Can a Linux on pSeries binary be run on AIX 5L?

A: No. As per the previous question, the executable formats are different. A Linux application must be compiled on AIX 5L using the AIX Toolbox in order to run.

Q: Can a Linux on pSeries binary run on Linux on 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 on pSeries binaries compatible across different Linux on pSeries distributions? For example, can a program created using Red Hat Enterprise Linux AS 3 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 on 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 each 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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