

Linux on Power in 2016

May 2016 | by [Jaqui Lynch](#)

IBM is serious about Linux on POWER. Linux now runs on every POWER8 server, with specialized offerings for Linux. These include the new LC (Linux only, PowerKVM only) servers, the L model (Linux only) servers, Linux IFLs, EasyScale for MSP offerings, and SAP Hana on POWER. Additionally, significant work has been done to encourage ISVs to increase their offerings on Linux on POWER, resulting in a flourishing ecosystem that wasn't available on POWER five years ago.

Power systems are designed for big data and optimized for performance and scalability. They provide great I/O and memory bandwidth with significant reliability and other availability features not available anywhere else except the mainframe. With full support for various levels of RHEL (Redhat Enterprise Linux), SLES (SuSE Linux Enterprise Server) and Ubuntu, it's a great time to consider migrating to Linux on Power. Here are some decisions to make:

1. Do you want to run Linux alongside other workloads like AIX or IBM i
2. Do you want to run a Linux only server
3. Do you want to use an HMC or virtual HMC to control the server (won't work with PowerKVM)
4. Do you want to use PowerKVM or PowerVM for virtualization
5. Do you have some dark cores and memory that you would like to run Linux on at a reduced rate
6. Do you have x86 workload running on Linux that you would like to migrate
7. Do you want to reduce costs for IBM software (PVU based licensing)

Reducing costs

Software can be expensive, especially middleware. IBM prices their middleware using PVUs (processor value units) which are set based on the server. The S814, S822, S824 are all 70 PVUs per core, the E850 is 100 PVUs per core and the E870 and E880 are 120 PVUs per core. However, if you run Linux on a server or in an IFL all the cores running Linux are charged at 70 PVUs per core, regardless of the server. This can lead to significant savings and is another reason many people consider Linux on Power.

Endian-ness

The decisions above will determine some options moving forward. I have broken down some of those points. But before that, we need to look at why BE and LE are important. IBM POWER servers have been bi-endian for a long time. However, AIX and PowerVM have always been BE (big endian) only. Linux on Power was also big endian but Linux on x86 was little endian. This made migrating applications and data challenging. So what do we mean by endian-ness? It's about how we store the values or bytes in memory. If we look at how 90AB12CD in hexadecimal would be stored on both options we see that each hex digit is 4 bits so we need 8 hex digits to represent this 32 bit value. Here's a table showing how those bits would be stored:

Value to store: 90AB12CD

	BIG ENDIAN	LITTLE ENDIAN
Address	Value	Value
1000	90	CD

1001	AB	12
1002	12	AB
1003	CD	90

Endian-ness is normally only a problem when migrating very old code with platform specific dependencies. These include code that was written to take advantage of specific x86 hardware or written as device drivers or similar functions. More recent code, especially code written in C/C++, perl, python, php or Java is not impacted by endian-ness as they are portable although the C/C++ would need a recompile.

The good news is that PowerVM is now bi-endian and can support both big endian and little endian LPARs on the same server. RHEL and SLES offer both big and little endian options and Ubuntu offers a little endian option; it's now possible to run the appropriate Linux version that allows for the best migration options.

Linux with Friends

Linux runs on all of the POWER8 servers and many of the previous POWER levels too. If you already run PowerVM with AIX and/or IBM i then adding Linux on Power is easy. Basically, you create an LPAR definition and install Linux into the LPAR. You'll have to mull some configuration items (Linux does not play well with large_receive) but it's easy to deal with that. Linux will run alongside other systems on all the POWER8 servers that do not end with LC or L—those are Linux only. On those servers (S822, S814, S824, E850, E870, E880) virtualization is done with PowerVM—PowerKVM is only available on Linux only servers.

Additionally, on the E850, E870 and E880 IBM has an IFL (Integrated facility for Linux) offering. This is also available on the POWER7 770, 780 and 795. It consists of a package of activations and licensing for Linux only workloads. Each package consists of 4 processor core activations, 32GB of memory activations, 4 PowerVM for PowerLinux licenses, 4 PowerVM for PowerLinux SWMA licenses and the Linux Subscription and support at a significant discount. If you have dark cores and memory on one of the supported servers then this is a great way to bring Linux into the fold.

Linux Only with PowerVM

In addition to the S and E class servers mentioned above there are also some Linux only S class servers—these consist of the S812I, S822I and the S824I. These servers can use either PowerVM for PowerLinux or PowerKVM for virtualization and support RHEL 6.6 and 7.1 BE (big endian), RHEL 7.2 BE and LE (little endian), SLES 11 BE, and SLES 12 LE and Ubuntu 14.04 LE. What makes these attractive to users over the LC models below is that they support PowerVM and can therefore be connected to an HMC console, which allows you to see all your servers from the console and provides for a central control point. However, if you come from a Linux on x86 background then you may prefer to use PowerKVM, the other option.

Linux Only with PowerKVM

The new LC servers were announced on October 15, 2015 and illustrate IBM's continued commitment to Linux on POWER. Two of these servers can be virtualized using PowerKVM and they support the same Linux options as the Linux only servers above. This provides for multiple options for those wanting to get into Linux on Power. All 3 servers provide significant I/O and memory bandwidth in a 2U profile making them very attractive as Intel replacements.

PowerVM vs. PowerKVM

With so many options, it's clear that one key deciding point is how you want to virtualize and support your servers. If you want to use the HMC, then you will need to use PowerVM. If not, then PowerKVM may be the best option. Let's break down of some of their features.

Features in PowerVM that are not in PowerKVM

Compute

- Dedicated processors, shared processor pools, shared dedicated processors
- Guaranteed minimum entitlement
- Hard capping of VMs
- Capacity on demand
- IFLs

I/O

- NPIV (Planned for PowerKVM)
- SR-IOV (Planned for PowerKVM)
- Dedicated I/O devices (Planned for PowerKVM)
- Redundant I/O virtualization (dual VIOS)

Configuration

- DLPAR (Dynamic LPAR) (Planned for PowerKVM)
- Support for AIX and IBM i
- System pools
- Hot plug memory, cpu, I/O

Features in PowerKVM not in PowerVM

- No need for HMC
- POWER8 micro-threading
- NFS storage support
- iSCSI storage support
- Runs on LC and L series servers only

Linux Distributions

Official support for Linux on POWER8 is provided for RHEL, SLES and Ubuntu. However, there are other distributions that will run on POWER8. These include Debian, Fedora and openSUSE. The Debian community now supports Power as of the Sid release. For the three IBM supported versions of Linux (RHEL, SLES and Ubuntu) you have the choice of getting support from the vendor or from IBM. My recommendation is that you price it both ways as there can be significant savings getting the support from one over the other. All three also have slightly different licensing options for cores and LPARs so you need to look closely at these as well.

Summary

With Linux on Power, you have multiple server and virtualization options. You have a great deal of flexibility in putting together environments. If you are looking at cloud, clusters and big data analytics or you have IBM middleware installed then look at Linux on Power as an option.

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