THE PRINCE

OF THE ENTERPRISE

& HISTORIC CLIMB INTO THE FUTURE

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I hope that you enjoy my article and get a sense for why so many clients are utilizing IBM Power today. The latest IBM Power10 servers have been one of the most successful in the entire history of the brand. No wonder clients who deploy Power see it as a competitive advantage. Don't hesitate to reach out to me to find out more about IBM Power Systems and how you can benefit from them.

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Q-SEC

The Lay of the Land

The Minions, represented by the prolific sprawl of x86-base servers in the Data Center, bow down to the almighty King & Queen, IBM's Z and LinuxONE, the quintessential cornerstone of mission critical computing. The component most overlooked, yet ever growing in popularity, is the Prince of the Data Center, the beloved IBM Power.

This flexible yet powerful middle ground, both inherits directly from its royal lineage as it does bring to light its own unique characteristics.

If you are unaware of the heroics of the Prince, you should open your realm to its advantages and keep pace with the industry leaders. For those who are familiar, take a seat and enjoy a retelling and future look into its adventures.

The Future awaits ...

Unique Characteristics

IBM Power's unique in that it was designed from the ground up for multiuser high-performance UNIX with its own Reduced Instruction Set Computer (RISC) architecture. Unexpected was its bi-endianness, its ability to be either Big-Endian or Little-Endian. Unlike IBM Z, LinuxONE, AIX, and IBM i, Linux and Windows are Little-Endian. This ability to run either or both endianness at the same time on the same systems is a key aspect to its capability to consolidate workloads.

Inherited Features

On the other hand, IBM Power inherited many essential features from its lineage. IBM was determined to not just bring UNIX to the market but to make it enterprise grade with consideration for Reliability, Availability, and Serviceability (RAS). It became a mandate that the RAS be improved every generation of chip architecture going forward. As we stand on Power10 today, we are at five nines (99.999%) of availability. Other key features:

Ease of use: Right out of the gate, IBM wanted to reduce the learning curve and make their UNIX system easier to manage. What was introduced was the Systems Management Interface Tool (SMIT) or what has since been referred to as SMITTY, its TTY Terminal (text) version as appose to the less used Graphical Interface. Very similar in fact to the TTY Terminal interface for Linux today.

IBM's UNIX, AIX, was the third and last major player to enter this market with the other two quickly follow suit with the System Administration Manager (SAM) and Solaris Management Console (known as just the Console).

IBM Power has evolved significantly from the days of SMITTY with Hardware Management Consoles (HMCs), IBM Power Virtualization Center (PowerVC), the Cloud Management Console (CMC), and many open-source systems management tools.

Hypervisor: A defining moment in the history of IBM Power Systems was the combined development efforts by the POWER team and Mainframe Team to provide hardware-based virtualization to this UNIX infrastructure. What started out as Mainframe virtualization in 1967 became an updated implementation for IBM Power in 2004. With this technology, it would rise from third in the UNIX market to #1. This was a pivotal point in the evolution of IBM Power

Systems bringing 37 years of hypervisor technology to the UNIX market.

Lifecycle: With both the Hardware and Software technologies bestowed upon it, Power had such excellent reliability that it extended the lifespan and thus lifecycle to twice that of an x86-based server.

Keeping the same infrastructure supported and up to date for 8 to 10 years provides a huge cost savings and advantage over the 3 to 4 year lifespan for a typical x86-based deployment.

Also of note, is that a typical deployment of Power requires very few if any servicing due to failed components. Definitely not a weekly backlog of disk drives to be replaced like you typically have in other deployments.

Evolutionary Milestones

Hypervisor: Although inherited, as noted, it also marked a significant milestone on the evolution of IBM Power Systems, elevating IBM Power into the UNIX market leadership position.

Deep Blue [1]: It was **1997** when a cluster of then RS/6000 SP Nodes would take on a human with a six-game re-match of chess and win. And not just any human, it was the world-renowned Russian chess grandmaster, and former World Chess Champion (1985–2000), Garry Kasparov.

The system had finite storage with a catalog of chess moves including a database of all the moves that grandmasters like, Garry Kasparov, had used in the past.

At the time, there was no other computer system that could take on a grandmaster or even challenge Deep Blue itself.

This was a first of its kind, and a pivotal moment for Man vs Machine. It wasn't until 2015 and

2016 that another cluster, AlphaGo, utilizing AI software and GPUs was able to defeat world professional Go players.

Open Source [2]: Since the inception of open source, IBM has been on board contributing, promoting, and protecting its evolution. This has led to IBM Power possibly being one of the most open platforms available on the market today.

In the late **1990's** IBM started contributing to Linux with a $1 million pledge, helped to establish the Linux Foundation in **2000**, is a founding member of the Apache Software Foundation (ASF) which started in **1999**, and led the Eclipse Foundation in **2004.**

IBM was instrumental in shaping the JAVA language from the start and its eventually open-source project, OpenJDK.

Contributing to AI platforms for years, IBM partnered with Open Neural Network eXchange (ONNX) to develop open formats of Machine Learning (ML) and donating the Egeria Project, allowing for the easy exchange of metadata between tools and platforms in a vendor-agnostic manner, to the ODPi consortium in **2018**.

In **2019** IBM became a member of LF AI, an umbrella foundation of the Linux Foundation that supports open-source innovation in artificial intelligence (AI), in order to focus on building trust in AI and later became a premier member in **2023**.

In **2020**, IBM donated three key open source technologies for AI to the Linux Foundation: AI Fairness 360 Toolkit, AI Explainability 360 Toolkit, and the Adversarial Robustness Toolbox.

In the larger ML community, IBM employees are actively engaged in Kubeflow, KServe, CodeFlare, PyTorch, and many other important projects, serving as committers and contributors.

The move to cloud-based deployment models in

the past decade was sped along by several high-priority open-source cloud projects. IBM's contributions in this area included work with OpenStack beginning in 2012, Cloud Foundry starting in 2010, and OpenWhisk since 2016.

Promoting the adoption of containers in the enterprise starting with Docker in 2013 and encouraging Docker towards open governance which led to the establishment of the Open Container Initiative (OCI) in 2015 with IBM as a founding member.

Around the same time that IBM helped launch the Cloud Native Computing Foundation (CNCF) to provide an open governance model for Kubernetes, an open-source container orchestration system.

This all culminated in the Istio Project, where IBM and Google joined forces with Lyft to collaborate on a merger of IBM's Amalgam8, Lyft's Envoy, and Google's Service Control. The result was a first-class abstraction for routing and policy management for cloud native microservices.

IBM has been involved in the Node.js project since 2012 and bringing it under open governance via the Node.js Foundation in 2014, ultimately bringing the Node.js and JavaScript communities together under the OpenJS Foundation, that was founded in 2019.

Linux [2]: Linux became a de facto operating system offering on IBM Power since 2001, and IBM has continued to contribute to the Linux kernel with hundreds of engineering resources and participation in more than 80 collaborative projects. IBM, even before the acquisition of Red Hat, was arguably a top 3 contributor to the Linux kernel.

Both Linux and IBM Power benefited from this effort. The Linux kernel, and thus Linux Distros were then able to take advantage of many of the enhanced functions offered by IBM Power. This included dynamic memory allocation, and memory fencing to name a few. IBM contributes strongly in the areas of scalability, robustness, and security. Arguably, Linux Distros like RHEL, SUSE, and Ubuntu run better on IBM power as a result.

Watson [3][4]: IBM would return to Man vs Machine in 2011 with Watson, IBM's AI entry on

the TV show Jeopardy!. Deployed on IBM Power7 running Red Hat, Watson would take the world by storm in its victory over reigning champions Ken Jennings and Brad Rutter.

Watson would not only analyze and understand the "answer", but it formulated multiple possible "questions" in response and scored them based on confidence of being correct.

"The more of its algorithms that independently arrived at the same answer, the higher Watson's confidence level. If the confidence level was high enough, Watson was programmed to buzz in during a game of Jeopardy!. If not, Watson wouldn't buzz. Watson performed all of these calculations in about three seconds."

This was both pivotal and groundbreaking. Arguably, this was ground zero for both Natural Large Processing (NLP) and AI as we know it today.

Again, what is amazing, is that no one, no other technology company, ever stepped forward to challenge IBM's Watson at the game of Jeopardy!. I was expecting to see a future Machine vs Machine backoff, and perhaps one day we will.

Watson would undergo further development until in 2023, it would morph into a more robust commercial product and be renamed watsonx. IBM announced the watsonx, which allowed partners to train, tune and distribute models with generative AI and machine learning capabilities. IBM designed watsonx to manage the life cycle of foundation models that are the basis of generative AI capabilities and for creating and tuning machine learning models.

OpenPOWER [5]: Founded in 2013, the OpenPOWER Foundation provides open development at a scale that enables

OpenPOWER™

unprecedented customization across applications, operating systems and firmware, driving hundreds of innovations across artificial intelligence, supercomputing, hyperscale and more.

With open hardware as a key component of this foundation, IBM Power is arguably the most open computer system available.

Virtualization [6]: In addition to IBM's powerful hardware-based hypervisor, PowerVM, IBM introduced their own version of Kernel-based Virtual Machine (KVM), PowerKVM, in **2014** to run on top of its hypervisor. This was a steppingstone to eventually supporting the open source KVM on IBM Power. Full KVM support was announced in **2024** allowing for KVM Guests to run on IBM Power, further expanding the capabilities of this platform and its ecosystem.

Red Hat: IBM acquired Red Hat in **2019** and rather than the typical blue wash of the company, IBM is running Red Hat as a standalone business further protecting the independence of this open-source Linux distro. There are however synergies to running Red Hat on IBM Power, in addition to the benefits of IBM's contributions to the open-source communities and the Linux kernel itself, with both being part of the same company.

OpenShift [7][8]: "We are pleased to announce that OpenShift is available on IBM Power Systems" (**2020**), further expanding the platform and its ecosystem.

"Developers and IT operations teams require flexibility and agility in order to develop and deploy applications across multiple infrastructures, from on-premise to the public cloud. Red Hat® OpenShift on IBM Power empowers organizations to accelerate digital transformation with scalability and added security across the hybrid cloud through a secure and resilient foundation for cloud-native development on IBM Power." – Red Hat

IBM has even packaged and marketed its vast array of software products in OpenShift consumable offerings with IBM's Cloud Paks.

Summit [9]: In **2021**, IBM and the Department of Energy's Oak Ridge National Laboratory revealed Summit, the world's "most powerful and smartest scientific supercomputer".

Summit was capable of processing 200 quadrillion calculations per second (200 petaflops). Built upon compute nodes, each a 22-core IBM Power9 with 6 Nvidia Tesla V100 GPUs, and running Red Hat, this system had a combined total of 10 petabytes of system memory.

When the US Department of Energy selected to build the words largest and most power Linux cluster, they chose IBM Power.

In conclusion, IBM Power embraces open-source, is the leading defender of open-source, is a top contributor to the Linux kernel, owns one of the leading Enterprise Linux Distros, provides enhanced scalability, performance, security, and availability to Linux deployments, and is arguably one of the most open hardware platforms.

The Future of Power [10]

With Power11 just around the corner, IBM is already hard at work on the design of its Power Future, or what we will boldly refer to here as Power12.
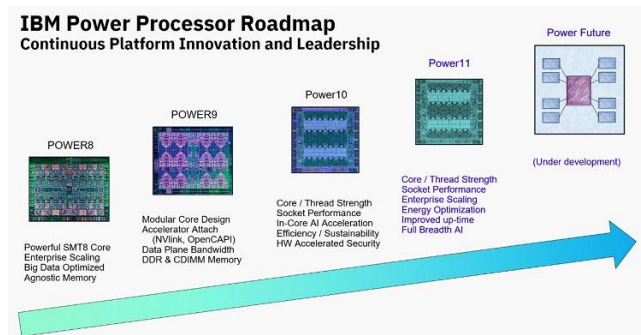
Bill Starke, distinguished engineer at Power Systems and the chief architect of the Power10 and Power11 processors, suggests, or hinted at,

the fact that IBM is likely to skip 5nm and go directly to 3nm chip for Power12. Power11 was intended to be 5nm but with insufficient gains, it should remain 7nm for now.

But here is where the design gets interesting. Bill goes on to talk about two things; chiplet architecture and dual-chip modules (DCM).

IBM has been implementing chiplet architecture since Power5+ in 2005. DCMs is a way of putting two processor chips in a single socket, but those two processor chips are in no way interconnected.

The concept here, rather than a DCM, is to simply "[break] the socket into independent compute, memory, and I/O elements and then [use] them in different ratios to meet different needs".

This level of dynamic utilization should be revolutionary.

For those of you who have IBM Power today, please review your implementations and make sure that you are utilizing all that there is to offer. Clients are often either running IBM i, AIX, or one of the Linux Distros. Why not utilize your infrastructure and combine operating systems onto a single platform. Have a Linux client to your AIX application server, developing a Linux application, or migrating from AIX to Linux? These can all be deployed with the resources you already have.

If you don't have an IBM Power System today, you should really take the time to check it out. Maybe you have not even heard of it. This system offers a competitive advantage that should not be overlooked. It offers higher availability and industry leading security and unparalleled flexibility. All that and with 2 to 3X the per-core performance, with an additional 2X the processor utilization, and 2x the lifecycle, who could pass this up. The big savings is in the software licensing, the soft savings are in lifecycle, maintenance, and management.

Independent Software Vendors (ISVs), if you are not certifying your software on IBM Power then you need to start working on a roadmap to do so. IBM Power is a cornerstone in the future of enterprise Linux.

Q-SEC is here to help. We consult, sell, implement, manage, and support enterprise infrastructure.

[1] Deep Blue: ibm.com/history/deep-blue
[2] Open Source @ IBM; A strong history and commitment to open source: ibm.com/opensource/story/
[3] Watson, 'Jeopardy!' champion: ibm.com/history/watson-jeopardy
[4] IBM Watson to watsonx: ibm.com/Watson
[5] OpenPOWER Foundation: openpowerfoundation.org/
[6] KVM in a PowerVM LPAR: ibm.com/docs/en/linux-on-systems?topic=servers-kvm-in-powervm-lpar
[7] Red Hat OpenShift for IBM Power: redhat.com/en/resources/openshift-ibm-power-systems-datasheet
[8] IBM Cloud Paks: ibm.com/cloud-paks
[9] digitaltrends; IBM and the Department of Energy show off the world's fastest supercomputer: digitaltrends.com/computing/ibm-summit-supercomputer/
[10] ITJungle; The Four Hundred; IBM Raises The Curtain A Little On Future Power Processors: itjungle.com/2024/11/13/ibm-raises-the-curtain-a-little-on-future-power-processors/