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Linux workloads on Power Systems increase business and IT efficiencies

IBM **IT Economics Consulting & Research**

Why Linux® workloads on Power Systems reduce IT costs

Who could have predicted the success that the Linux operating system would achieve when Linus Torvalds introduced its first release back in 1991. Indeed, it could be argued that Linux has become the most popular operating system on the planet given that it runs on virtually every compute platform in use today. Its ubiquitous and portable nature enables small and large businesses everywhere to leverage open standards and open source community collaboration while exploiting architecture specific attributes. Increasingly, companies are choosing IBM Power Systems™ over x86 to run their Linux workloads to gain dramatic IT cost savings.

Performance per core – doing more with fewer cores

Both IBM POWER® and x86 based servers have made performance improvements over time. Data from multiple sources however shows that while x86 servers may have increased in overall size, capacity, and system performance, the per core performance of x86multi-core CPU offerings has remained relatively flat.[1] In contrast, IBM POWER has increased its per core performance on average by 35% with each new generation or technology release.[1]

For many Linux based software packages, subscription and support, licensing is determined per core or socket. Reducing the number of required cores to run those packages can significantly decrease software costs. In a total cost of ownership (TCO) assessment for a large European telecommunications company comparing Linux web application and database workloads on x86 Skylake blades and Linux on a Power E980 server (see chart 1), analysis found that for every IBM POWER9™ core, the x86 solution required ten x86 Skylake cores.[2] This core differential for the Power E980 solution would save the company an estimated $7 million over five years with 74% of those savings based on software reductions in core-based licensing, subscription and support costs for the systems, web applications and database software.

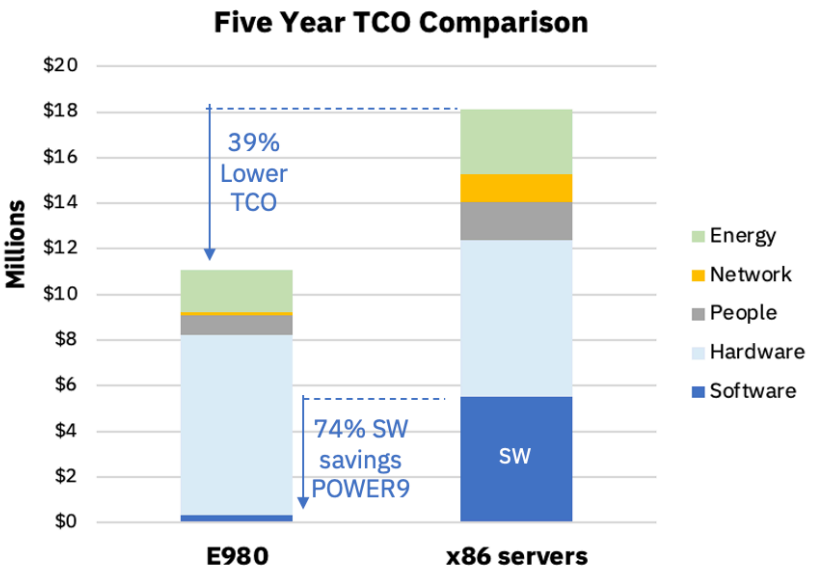

Chart 1: 5-Year POWER9 versus x86 TCO for European telecommunications company

[1] Refer to benchmark sites indicating per core values such as IDC/QPI https://www.idc.com/about/qpi and IBM rPerf https://www.ibm.com/downloads/cas/K90RQOW8. Space calculation assumes annual cost of $260 per square foot and a standard 42U rack occupying nine square feet. Electrical load calculation assumes $0.15 cents per kWHr and Power usage effectiveness (PUE) of 2.0.

[2] An IBM IT Economics model was used to examine one time charge and maintenance costs over five years for hardware, software, energy, labor and networking costs for commercial Linux web application servers and database workloads running on 238 40-core 2.4GHz Skylake Lake x86 servers with a total of 9,520 cores versus 12 80-core 3.0GHz POWER9 E980 servers a total of 960 cores. Power Systems pricing, where applicable, is based on U.S. prices as of 07/01/2020 from our website and x86 hardware pricing is based on IBM analysis of U.S. prices as of 07/01/2020 from IDC. Software, energy, networking and labor costs are based on data from IBM IT Economics assessments for clients. For additional information on the model, contact the IBM IT Economics Team at IT.Economics@us.ibm.com

Floor space and electricity savings

Another advantage of Linux on Power Systems' ability to do more work with fewer resources is observed when examining space and electrical costs. Chart 2 illustrates how a large genomics research facility was able to reduce its physical footprint from eighty-nine Linux on x86 servers to four Linux on POWER9 AC922 NVLink enabled GPU systems. Floor space savings was estimated to be 1,586 square feet or approximately 340 rack units, while annual electrical consumption could be reduced by 558,000 kilowatt-hours, equating to an annual cost savings of $500,000, or 92% lower data center costs with POWER9.[3]

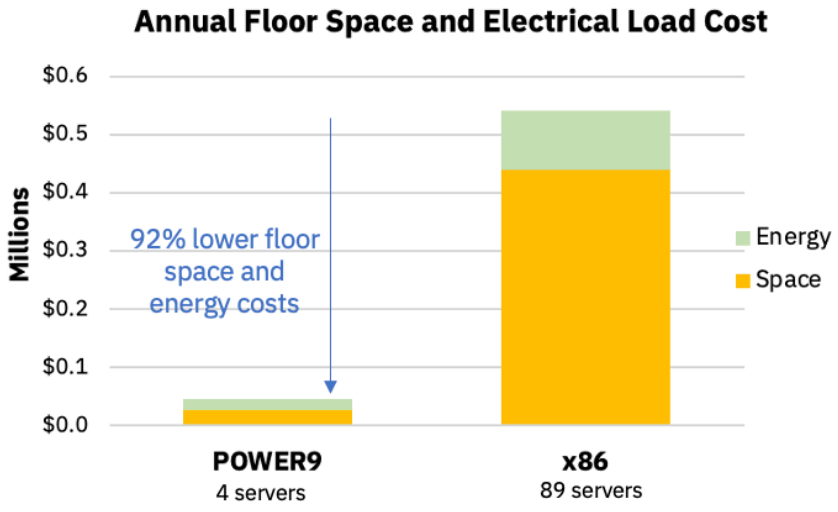

Chart 2: Annual floor space and energy savings for geonomics research center

Technology durability – longer lifecycles, fewer refreshes

Power Systems' unique architecture and superior performance provide lifecycle longevity. Assessments performed by the IBM IT Economics team find that most POWER users refresh their servers once every four to five years while their customary refresh cycle for x86 servers is once every three to four years. Over a ten-year period that translates to a 30% lower refresh cycle for Linux on POWER than for Linux on x86,[4] resulting in decreased business disruptions and technology change-out costs such as planned outages, systems administration/labor, temporary parallel operations, and large step increases in software and hardware maintenance. In ITIC's 2020 ITIC Global Reliability Survey,[5] 88% of survey respondents indicated that a single hour of downtime now exceeds $300,000 (or $4,998 per server/per minute). For an IT department refreshing just ten servers within 60 minutes, the cost of replacement for those servers could be $2.9 million. A 30% longer refresh cycle could save an IT organizations $0.8 million dollars or more in refresh costs if using Power Systems in place of x86 servers.

[3] An IBM IT Economics model was used to examine one time charge and maintenance costs over five years for hardware, floor space, energy, labor and networking costs for Linux AI deep learning workloads running on 89 24-core 2.6 GHz Haswell x86 servers with a total of 2,136 cores versus four Power AC922 NVLink enabled GPU 40-core 3.0 GHz servers with a total of 160 cores and 16 Volta V100 GPUs. Power Systems pricing, where applicable, is based on U.S. prices as of 05/01/2020 from our website and x86 hardware pricing is based on IBM analysis of U.S. prices as of 05/01/2020 from IDC. Software, energy, networking and labor costs are based on data from IBM IT Economics assessments for clients. For additional information on the model, contact the IBM IT Economics Team at IT.Economics@us.ibm.com

[4] Client data from 22 IBM IT Economics assessments examining workloads on Power Systems and x86 servers was collected from a range of industries and geographies from 2015 to 2020. Initial purchase costs, hardware maintenance and technology refresh data, software and data center costs were provided by clients to quantify the cost of servers for workload consolidation and/or new technology adoption TCO analysis. Each client engaged the IT Economics team to evaluate their current IT environment and assess the proposed environment for workload placement on POWER technology. Client data showed that POWER servers were refreshed once every four to six years with an average of 5.14 years and x86 servers were refreshed once every three to four years with an average of 3.69 years. For additional information on TCO analysis contact the IBM IT Economics team, IT.Economics@us.ibm.com.

[5] ITIC 2020 Global Server Hardware, Server OS Reliability Survey, https://itic-corp.com/blog/2020/

Reliability and Recoverability

Linux for IBM POWER9 leverages unique underlying hardware and virtualization capabilities to provide a more secure, reliable, and recoverable environment than x86. Linux workloads on POWER can take advantage of Power Systems Enterprise Pools, Capacity-on-Demand (CoD), and Live Partition Mobility (LPM) to deliver 24x7 availability. These POWER specific features enable compute resources to be efficiently managed and re-routed based on changing business needs without incurring the cost or overheard of x86 disaster recovery implementations that require dedicated, yet often idle compute resources.

All systems are at risk of security threats and implementation vulnerabilities. IBM POWER minimizes these threats by using the same security design principles for Linux on POWER as with Linux on IBM Z.[6] POWER9 also uses accelerated encryption built into the chip so that data is protected in motion and at rest.[7]

PowerVM™, the underlying, firmware-based virtualization layer that is standard with POWER9 systems, has had just one reported security vulnerability in twenty years according to the U.S. government's National Vulnerability Database (NVD).[8] In contrast, VMware, a common hypervisor for Linux on x86, has had over 1,200 exposures reported in the NVD database over the same time frame.

According to ITIC in 2020, Linux on POWER users experienced 1.54 minutes of unplanned downtime per server per year, or essentially 99.999% uptime.[9] Linux on x86 users experienced anywhere from 1.64 to 53 minutes of unplanned downtime per server per year within the same timeframe. This can equate to as much as a 34 times operational cost advantage for Linux on POWER in terms of unplanned downtime, or $264,000 savings per server per year.[10]

Ready your mission critical workloads for Hybrid Cloud

For cloud computing users IBM Linux on POWER is leading the way for mission critical applications on hybrid and multi-cloud environments with the Red Hat OpenShift. Red Hat supercharges IBM's Linux on POWER capabilities with a hybrid cloud, enterprise Kubernetes platform that provides container software development and management tools. Red Hat cloud technology and extensive contributions to open source communities has enabled POWER to provide integrated POWER based cloud offerings and IBM Cloud Paks™[11] that simplify and expedite delivery to market with notable cost savings.

An example is IBM's SAP HANA on IBM Power Systems virtualized in the IBM Cloud®. This Linux on POWER cloud solution provides the benefits of running mission critical SAP HANA on POWER while tapping into the flexibility, reliability, security, and performance advantages of POWER to reduce IT costs.

[6] IBM EAL 5+ Common Criteria Evaluation Service Level 5+ https://www.ibm.com/downloads/cas/ZJWELX1M
[7] https://www.ibm.com/downloads/cas/EPNDE9D0
[8] https://nvd.nist.gov/vuln/search/results?form_type=Basic&results_type=overview&query=powervm&search_type=all Zero reported Common Vulnerabilities and Exposures (CVE) for IBM PowerVM https://nvd.nist.gov/
[9] Server downtime minutes and cost based in ITIC 2020 report, https://www.ibm.com/it-infrastructure/us-en/resources/power/five-nines-power9
[10] Based on 2020 ITIC survey amount of $4,998 per minute per server
[11] IBM Cloud Paks https://www.ibm.com/cloud/paks/

An IBM IT Economics cost analysis for a large managed IT service provider in Latin America found a cumulative five-year TCO cost savings of $0.48 million by running SAP HANA on Linux on POWER versus Linux on x86, representing a 47% decrease in total costs.[12] For this provider, the largest savings are due to significantly lower costs for networking, storage, and compute hardware.

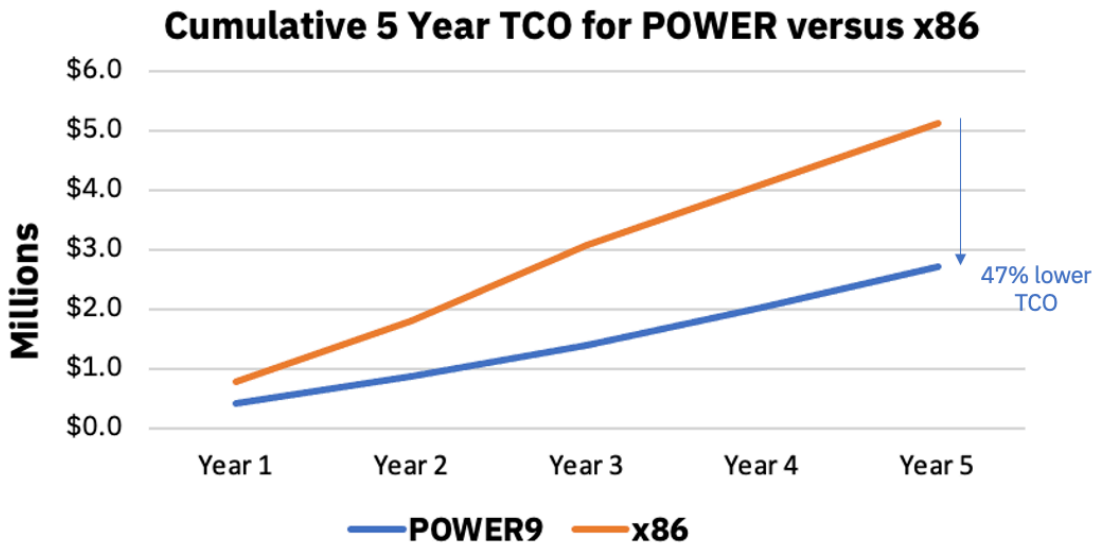

Chart 3: Cumulative five-year total cost of ownership model for SAP HANA workloads on POWER9 versus x86 for managed IT service provider

In separate analysis, and customer interviews, performed by Forrester Consulting, SAP HANA on Power Systems was found to increase system administrator productivity by 60% and to decrease planned and unplanned downtime compared to their previous systems.[13] Additionally, SAP HANA on Power Systems provided lower architecture acquisition costs, reduced the cost of managing and maintaining infrastructure and reduced the cost of power and cooling.[14]

When making a platform selection to host Linux workloads, examine the technical and financial benefits of Power Systems. For many companies Linux on POWER is the top contender for the job! If your organization is looking savings with Linux workloads, contact the IBM IT Economics Team at IT.Economics@us.ibm.com for a no-charge assessment to identify cost savings and infrastructure efficiencies with Power Systems.

[12] An IBM IT Economics model was used to examine one time charge and maintenance costs over five years for hardware, software, floor space, energy, labor and networking costs for SAP HANA workloads running on 18 54-core 2.1 GHz Haswell x86 servers with a total of 972 cores versus two Power E980 systems, one 80-core 3.7 GHz server and one 108-core 3.9 GHz server for a total of 188 cores. Power Systems pricing, where applicable, is based on U.S. prices as of 09/01/2020 from our website and x86 hardware pricing is based on IBM analysis of U.S. prices as of 09/01/2020 from IDC. Software, energy, networking and labor costs are based on data from IBM IT Economics assessments for clients. For additional information on the model, contact the IBM IT Economics Team at IT.Economics@us.ibm.com.

[13] The Total Economics Impact of IBM Power Systems for SAP HANA, https://www.ibm.com/downloads/cas/QEWGOWRN

[14] Cost Savings And Business Benefits Enabled By IBM Power Systems For SAP HANA, https://www.ibm.com/downloads/cas/LGAELZWD

Authors

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