OpenPOWER™

OpenPOWER Performance

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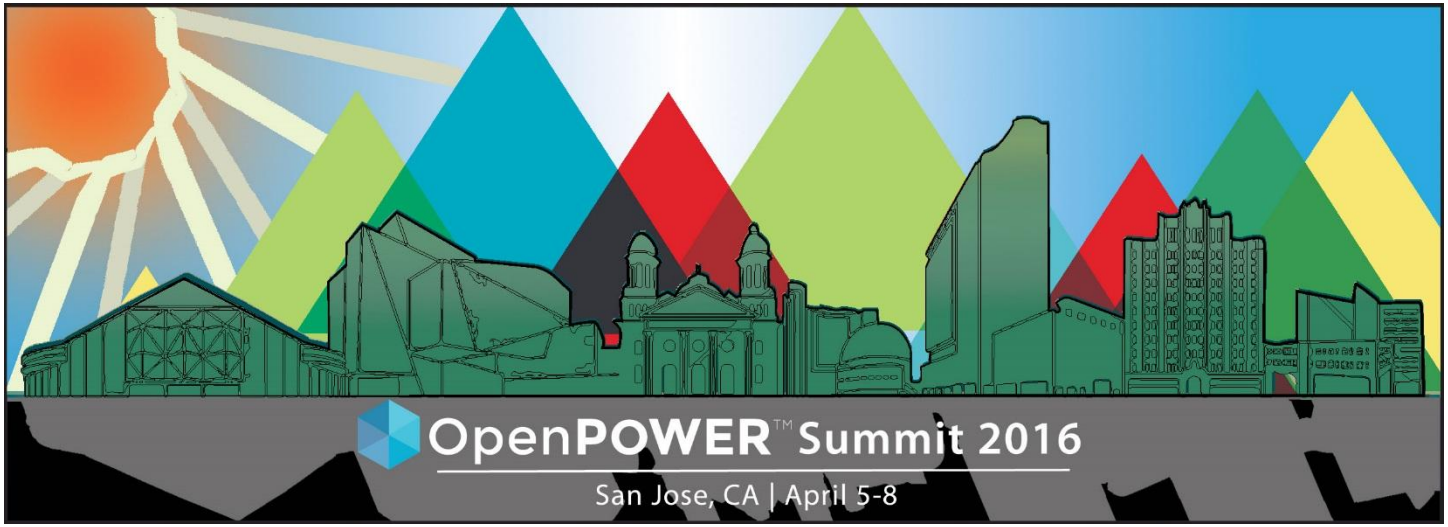
Revolutionizing the Datacenter



Join the Conversation #OpenPOWERSummit

Delivering the Linux ecosystem for Power

SOLUTIONS	OpenPOWER	IBM SOFTWARE	LINUX ECOSYSTEM	OPEN SOURCE
Solutions with full stack innovation for Big Data and Analytics, Cloud and ISVs	Google, nVIDIA, Tyan, Mellanox, Micron, Samsung, Canonical, POWERCORE	WebSphere, DB2, Cognos, Watson, Tivoli, Rational, Platform…	Red Hat, SUSE and Ubuntu distributions	Docker, OpenStack, KVM, OpenCompute, NoSQL Databases
30+ reference configurations for solutions	**180+** members	**200+** applications	**2350+** Linux ISVs developing on Power	**100,000+** open source packages

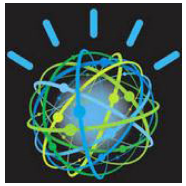
Resources and Support for Linux Developers

IBM PartnerWorldTechnical Support
- IBM Innovation Centers
- Free access to Power Hardware
- Free porting assistance
- Free Eclipse-based development environment

www.ibm.com/partnerworld/wps/servlet/ContentHandler/pw_com_pwp_partnerworld-program

IBM Migration Factory
Premier migration services for large applications
www.ibm.com/systems/power/migratetoibm/index.html

IBM Watson Developer's Cloud
Access to IBM Watson for developing cognitive computing applications
www.ibm.com/smarterplanet/us/en/ibmwatson/developers.html



IBM Power Development Cloud
Provide free access to Power hardware to ISVs for Porting
www.ibm.com/partnerworld/wps/servlet/ContentHandler/stg_com_sys_power-development-platform

IBM DeveloperWorks
Technical resources, community, blogs, toolkits, How to articles, beta code
www.ibm.com/developerworks/linux/

Regional Ecosystem Initiative – Recruiting Key Solutions
Greater China, North America, Europe
Middleware and Industry Solutions

IBM Innovation Centers
- All 50+ centers worldwide now support Linux on Power
- One-stop for ISVs, developers
- HW access, technical support, demos, toolkits, Hands-on labs

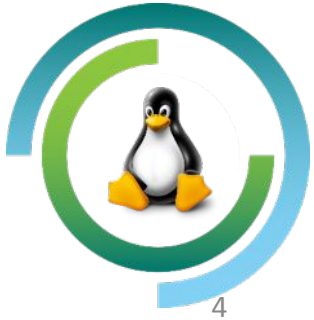
www.ibm.com/systems/power/software/linux/centers

Site Ox
On-demand cloud-based development platform using Linux on POWER8
www.siteox.com

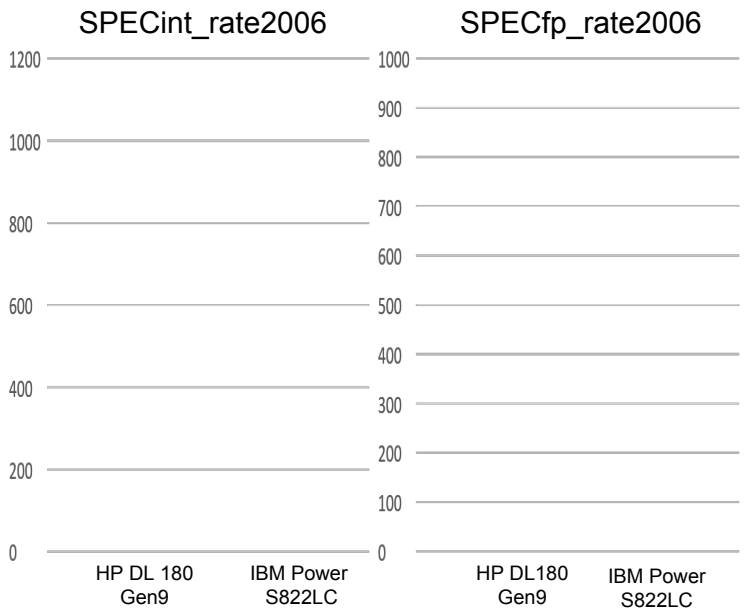
Performance resources for Linux on Power

- Advanced Toolchain
  - Power Optimized GCC
  - Power Optimized runtime libra
- Power SDK
  - Programming Framework
  - Performance profiler
  - Performance guidance
- IBM XL Compilers
  - High Performance C/C++ and Fortran Compilers
- IBM Java
  - High Performance Java

IBM Tools	IBM Research Tools	Open Source Tools	Eclipse IDE
Advance Toolchain	Feedback-Directed Program Restructuring (FDPR)	Eclipse LinuxTools	IBM Eclipse SDK (IES)
Migration Advisor	Source Code Advisor (SCA)	Eclipse CDT	
CPI Breakdown	Trace Analyzer (TA)	Eclipse PTP	
Qemu	System Grokking Technology (SGT)		
Power 8 Functional Simulator			



IBM Power S822LC delivers up to 1.30x the integer and floating point performance on SPECcpu2006



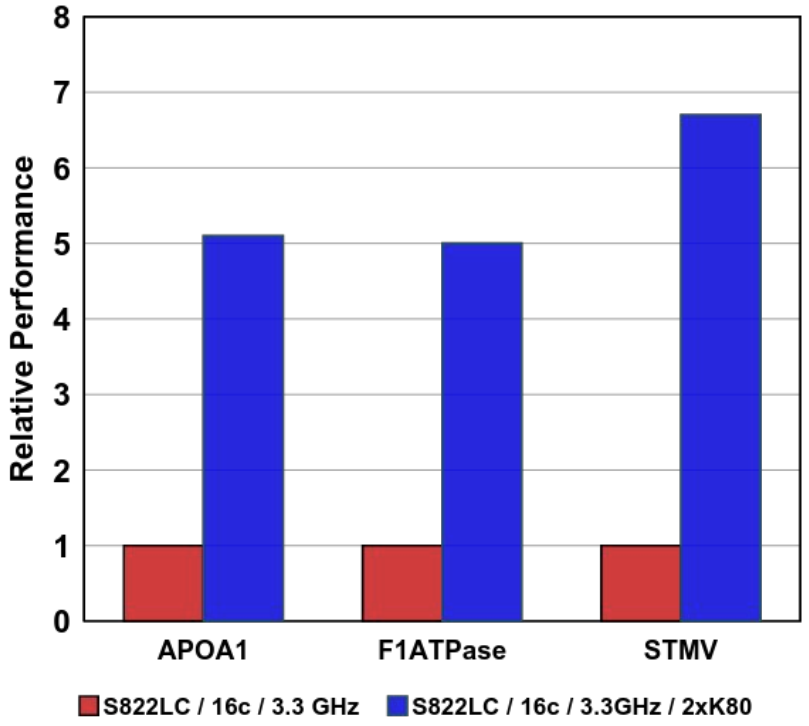
Published	Power S822LC/Ubuntu			HP DL 180 Gen9			Speed up
Benchmarks	**Config-uration**	**Freq**	**Result**	**Config-uration**	**Freq**	**Result**	**Ratio**
SPECint_rate	20c, 256GB	2.92 GHz	1,100	20c, 256GB	2.30 GHz	859	1.28x
SPECfp_rate	20c, 256GB	2.92 GHz	888	20c, 256GB	2.30 GHz	685	1.30x

- IBM Power S822LC SPECint_rate2006 results based upon published results at http://spec.org/cpu2006/results/res2015q4/cpu2006-20151002-37621.html
- IBM Power S822LC SPECfp_rate2006 results based upon published results at http://spec.org/cpu2006/results/res2015q4/cpu2006-20151002-37620.html
- HP DL 180 Gen9 SPECint_rate2006 results based upon published results at http://spec.org/cpu2006/results/res2014q4/cpu2006-20141006-32106.html
- HP DL 180 Gen9 SPECfp_rate2006 results based upon published results at http://spec.org/cpu2006/results/res2014q4/cpu2006-20141006-32118.html

Adding 2 NVIDIA Tesla K80 GPUs to IBM Power S822LC delivers up to ***6.7X better performance*** on **NAMD** code

Faster time to insight and reduced operating costs with fewer systems

- Accelerate performance and reduce operating costs in biomolecular research
- Running NAMD code with NVIDIA Tesla K80 GPUs delivers
  - Up to 6.7X better performance
  - Up to 2.6X better price-performance

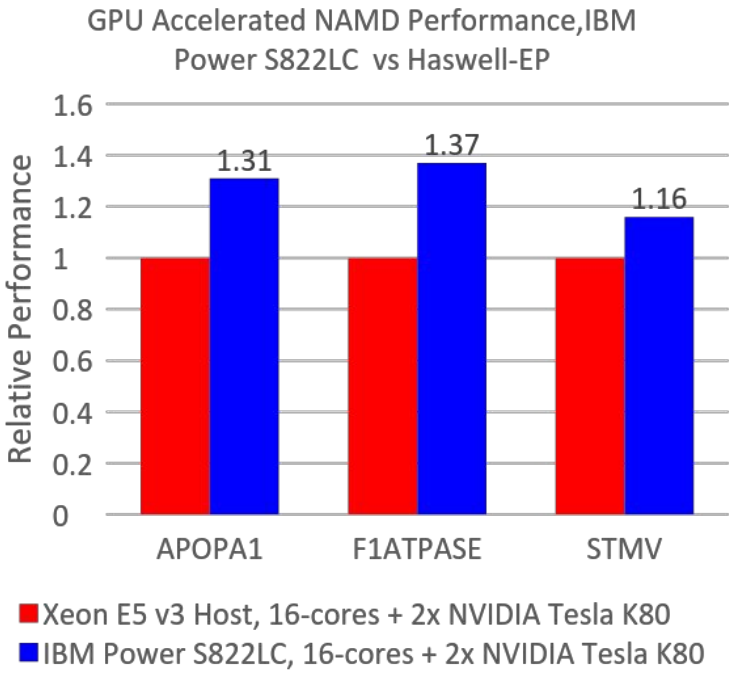


- Results are based on IBM internal testing of systems running NAMD version 2.10 APOA1, F1ATPASE, STMV code benchmarked on POWER8 systems installed each with 2 NVIDIA Tesla K80 GPUs.. Individual results will vary depending on individual workloads, configurations and conditions.
- IBM Power System S822LC; 16 cores / 128 threads, POWER8; 3.3GHz, 128 GB memory
- IBM Power System S822LC; 16 cores / 128 threads, POWER8; 3.3GHz, 128 GB memory, 2 NVIDIA K80 GPUsC

IBM Power S822LC with NVIDIA Tesla K80s outperforms Xeon E5-2600 v3 with NVIDIA Tesla K80s for **NAMD** by up to 37%

IBM Power S822LC delivers superior results for NAMD

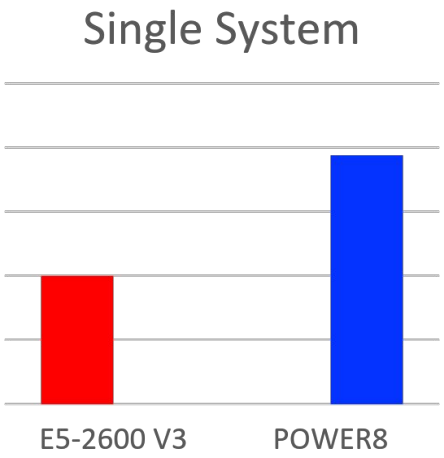
IBM Power S822LC is a superb platform for users of NAMD molecular dynamics package

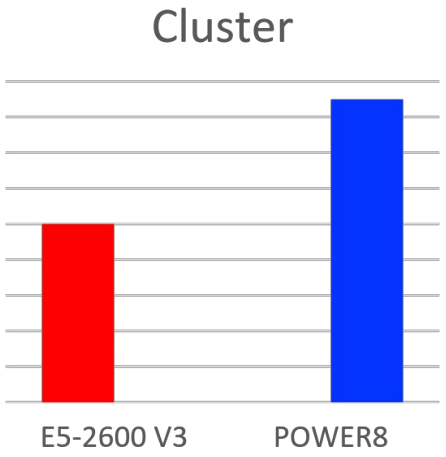


- Results are based on IBM & NVIDIA internal testing of systems running NAMD version 2.10 APOA1, F1ATPASE, STMV code; Compilation: CUDA 7.0.28, ICC 15.1.133, MKL 11.2.1 Individual results will vary depending on individual workloads, configurations and conditions.
- Supermicro 2028GR-TRT, 16 cores, x86, 2.3GHz, 128GB memory, 2 NVIDIA K80 GPUs
- IBM Power System S822LC, 16 cores / 128 threads, POWER8, 3.3GHz, 128GB memory, 2 NVIDIA K80 GPUs

SparkBench on Power Systems S812LC

- S812LC delivers optimized Spark price-performance based on 10 SparkBench benchmarks
  - 94% more Spark workloads on a single system space versus Intel Xeon E5-2690 v3 systems
    - **1.94X BETTER performance per system (10 core S812LC vs 24 core DL380)**
  - 70% more Spark workloads on a similar sized cluster versus Intel Xeon E5-2620 V3 systems
    - **1.7X BETTER performance per cluster (10 core S812LC vs 2028-TR)**





- All results are based on IBM Internal Testing of 10 SparkBench benchmarks consisting of SQL RDD Relation, Twitter, Pageview Streaming, PageRank, Logistic Regression, SVD++, TriangleCount, SVM, MF, SQL Hive
- IBM Power System S812LC 10 cores / 80 threads, POWER8; 2.9GHz, 256 GB memory, Ubuntu 15.04, Spark 1.4, OpenJDK 1.8
- IBM Power System S812LC (Cluster) 10 cores / 80 threads, POWER8; 2.9GHz, 256 GB memory, RHEL 7.2, Spark 1.4, OpenJDK 1.8
- Intel Xeon HP DL380; 24 cores / 48 threads, E5-2690 v3; 2.3GHz , 256 GB memory. Ubuntu 15.04, Spark 1.4, OpenJDK 1.8
- Intel Xeon SuperMicro 2028-TR: (cluster) 12 cores/ 24 threads, E5-2620 V3, 2.4 GHz, 512GB memory, RHEL 7.1, OpenJDK 1.8

Want to learn more?

- Attend Spark Performance Session
  - Expo Theater
- Attend OpenPOWER Ready Plug-Fest
  - Friday 8AM – 11AM / Hilton - San Carlos room
- Stop by IBM Booth
  - Expo Pavillion