Transformation For Growth

2014 Consultants & System Integrators Interchange

Compete in the Era of SMART.

Linux on Power Systems
Trends and Directions

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Agenda

1. Linux on Power Overview

2. Scale-out computing on Power

3. Future of Linux scale-out computing on Power

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Linux momentum is growing on Power Systems

OpenPOWER

An open ecosystem, using the POWER Architecture, to **share expertise, investments, and server-class intellectual property** to serve customers' evolving needs.

Linux Centers. Offering access to hardware technical support, porting assistance, demos, toolkits, hands-on labs

Beijing | Austin | New York | Montpellier | Tokyo

500+
ISVs enabled to run on Linux on Power

Global Linux ISV Development
NEW. Power Development Cloud gives Linux developers who want to prototype applications access to Power
NEW. **50,000 new developers** from Ubuntu development community
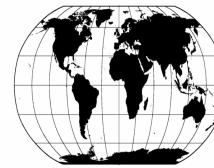
Regional Ecosystem Initiative

Recruiting key solutions:
+ Open Source Tools
+ Middleware
+ Industry Solutions

$1B

in new Linux and open source technologies for IBM Power Systems.

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Linux is Linux is Linux

Linux on Power Runs the Same Commands as Linux on x86

- **Supports Red Hat and SUSE Enterprise Linux versions consistent with x86_64**
  - POWER support available simultaneously with other platforms
  - List of packages nearly identical (except minor differences like bootloader)
  - Packages at same version/level – including kernel and device drivers
- **Leverage same open source system tools**
  - SDK: Same Free Eclipse-based development environment
    http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/sdklop.html
  - Advance Toolchain: Same Open Source tools (GNU), IBM tested and supported on Power
- **New Little Endian platform architecture same as x86**
  - Canonical Ubuntu Linux on Power
  - SUSE SLES

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Designed for Big Data

CAPITechnology

Superior Cloud Economics

POWER8

Open Innovation Platform

OpenPOWER™

Announcing a new generation of Power Systems

- **A new generation of POWER8 systems: The best Scale-out systems in the industry**
- **System Software: An intelligent IT infrastructure for Cloud**
  - Opening up the world of Linux
- **Optimized Solutions: Cloud, Big Data & Analytics, Mobile, Java and Linux applications**
  - Expanded portfolio of applications and faster time to value
- **Enterprise Pools: Transforming Enterprise IT for the Cloud**
  - POWER7+ Enterprise Pools with investment protection to POWER8

Bringing Power to Scale-out Computing

	Sandy Bridge EP	Ivy Bridge EP E5-26xx v2	Ivy Bridge EX E7-88xx v2	POWER 7+ Systems	POWER8
Clock rates	1.8–3.6GHz	1.7-3.7GHz	1.9-3.4 GHz	3.1–4.4 GHz	3.0–3.9 GHz
SMT options	1,2*	1, 2*	1, 2*	1, 2, 4	1, 2, 4, 8
Max Threads / sock	16	24	30	32	96
Max L1 Data Cache	0	32KB*	32KB*	32KB	64KB
Max L2 Cache	256 KB	256 KB	256 KB	256 KB	512 KB
Max L3 Cache	20 MB	30 MB	37.5 MB	80 MB	96 MB
Max L4 Cache	0	0	0	0	128 MB
Memory Bandwidth	31.4-51.2 GB/s	42.6-59.7 GB/s	68-85** GB/s	100 – 180 GB/sec	230 - 410 GB/sec

* Intel calls this Hyper-Threading Technology (No HT and with HT)
*32KB running in "Non-RAS mode" Only 16KB in RAS mode
**85GB running in "Non-RAS mode" = dual-device error NOT supported

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POWER8 Scale-out Systems

IBM Scale-out Power Systems
- POWER8 roll-out is leading with scale-out (1-2S) systems
- Expanded Linux focus: Ubuntu, KVM, and Open Stack
- Scale-up POWER8 (>2S) systems will be rolled out over time
- PCI Gen3 right out of POWER8 processor
- OpenPOWER Innovations

Power Systems S812L

- 1-socket, 2U
- POWER8 processor
- Linux only
- CAPI support (1)
- 2H14

Power Systems S822L

- 2-socket, 2U
- POWER8 processor
- Up to 24 cores
- 1 TB memory
- 9 PCI Gen3 slot
- Linux only
- CAPI support (2)
- PowerVM & PowerKVM

Power Systems S822

- 2-socket, 2U
- Up to 20 cores
- 1 TB memory
- 9 PCIe Gen 3
- AIX & Linux
- CAPI support (2)
- PowerVM

Power Systems S814

- 1-socket, 4U
- Up to 8 cores
- 512 GB memory
- 7 PCIe Gen 3
- AIX, IBM i, Linux
- CAPI support (1)
- PowerVM

Power Systems S824L

- 2-socket, 4U
- Up to 24 cores
- Linux
- NVIDIA GPU
- 2H14

Power Systems S824

- 2-socket, 4U
- Up to 24 cores
- 1 TB memory
- 11 PCIe Gen 3
- AIX, IBM i, Linux
- CAPI support (2)
- PowerVM

1 & 2 Sockets

AIX

Power**SC**

Power**HA**

Linux

Power**VC**

Power**VP**

Linux

openstack CLOUD SOFTWARE

Power**KVM**

ubuntu
Supported by Canonical

SUSE

redhat

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PowerKV System for Cloud
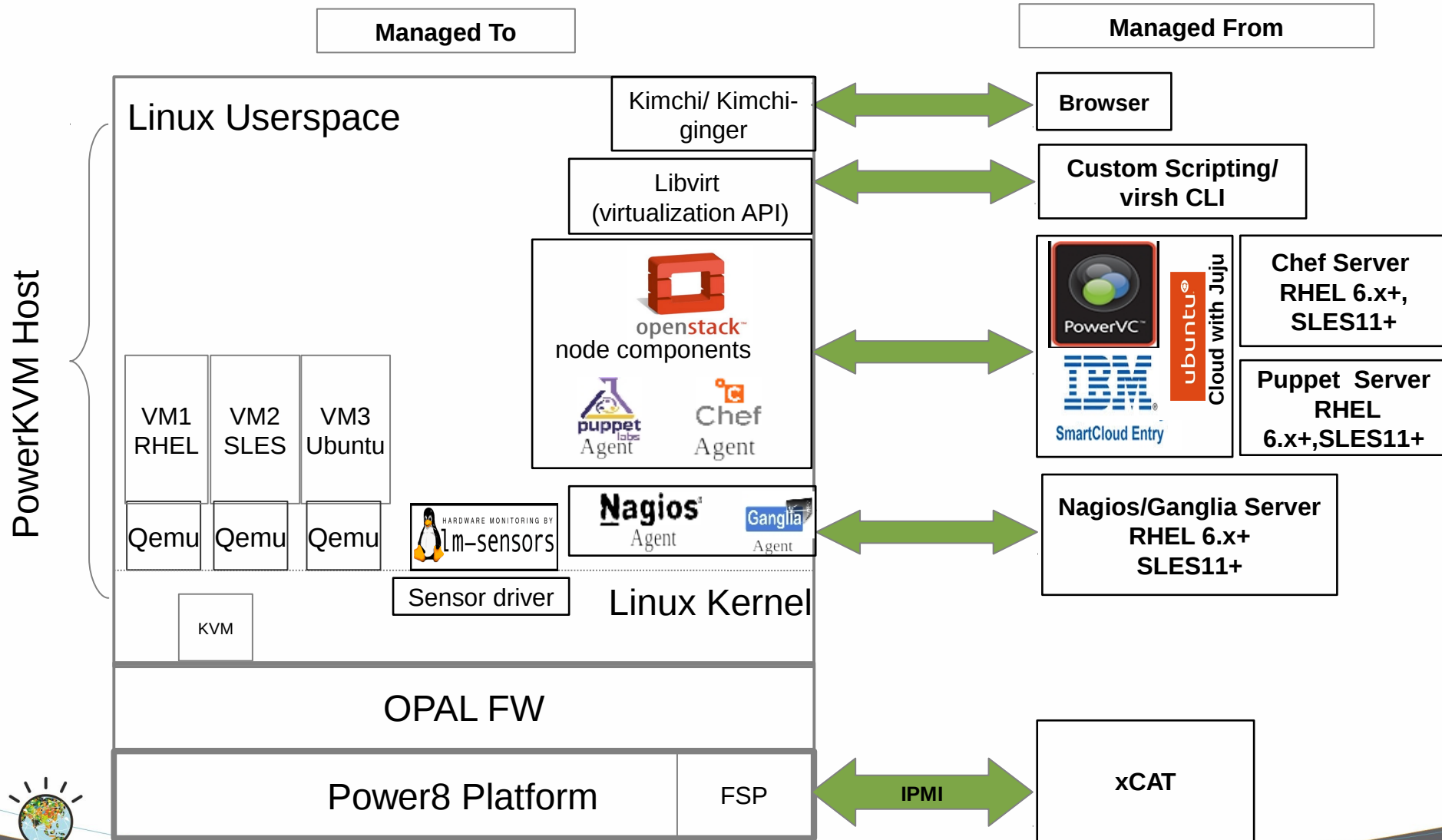
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Open Platform: Ecosystem Leadership
Providing Client Choice & Flexibility

OpenPOWER Foundation	Open Applications and Tools	Open Management
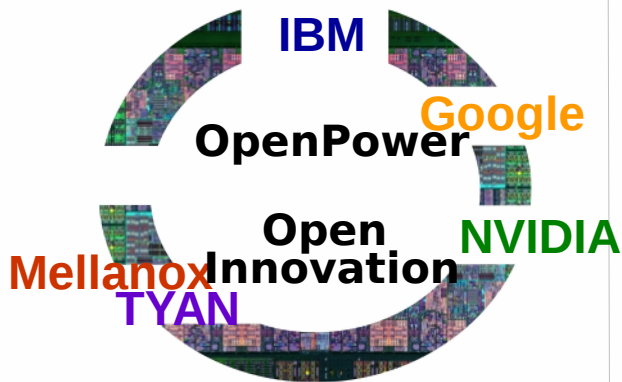
- Collaborative innovation for highly advanced systems
- Produce open hardware, software, firmware and tools
- Expand industry skills and investment for Power ecosystem
- Provide alternative architectures

- Access to industry innovation from a broad community
- Optimize scripting languages & development tools
- Contribute innovation to Linux, KVM and OpenStack
- Lift and shift java apps with LE Canonical Ubuntu & SUSE Linux

- Simplified, consistent management
- Deployment on premise or via cloud
- Seamless upgrades
- Software Defined Environments

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OpenPOWER™

OpenPOWER will enable data centers to rethink their approach to technology. Member companies may use POWER for custom open servers and components for Linux based cloud data centers. OpenPOWER ecosystem partners can optimize the interactions of server building blocks – microprocessors, networking, I/O & other components – to tune performance.

Buy
Build
Innovate

Platinum Members

How will the OpenPOWER Foundation benefit clients?
- OpenPOWER technology creates greater choice for customers
- Open and collaborative development model on the Power platform will create more opportunity for innovation
- New innovators will broaden the capability and value of the Power platform

What does this mean to the industry?
- **Game changer** on the competitive landscape of the server industry
- Will enable and drive innovation in the industry
- Provide more choice in the industry

ALTERA Google IBM Mellanox NVIDIA SAMSUNG Suzhou PowerCore Technology TYAN

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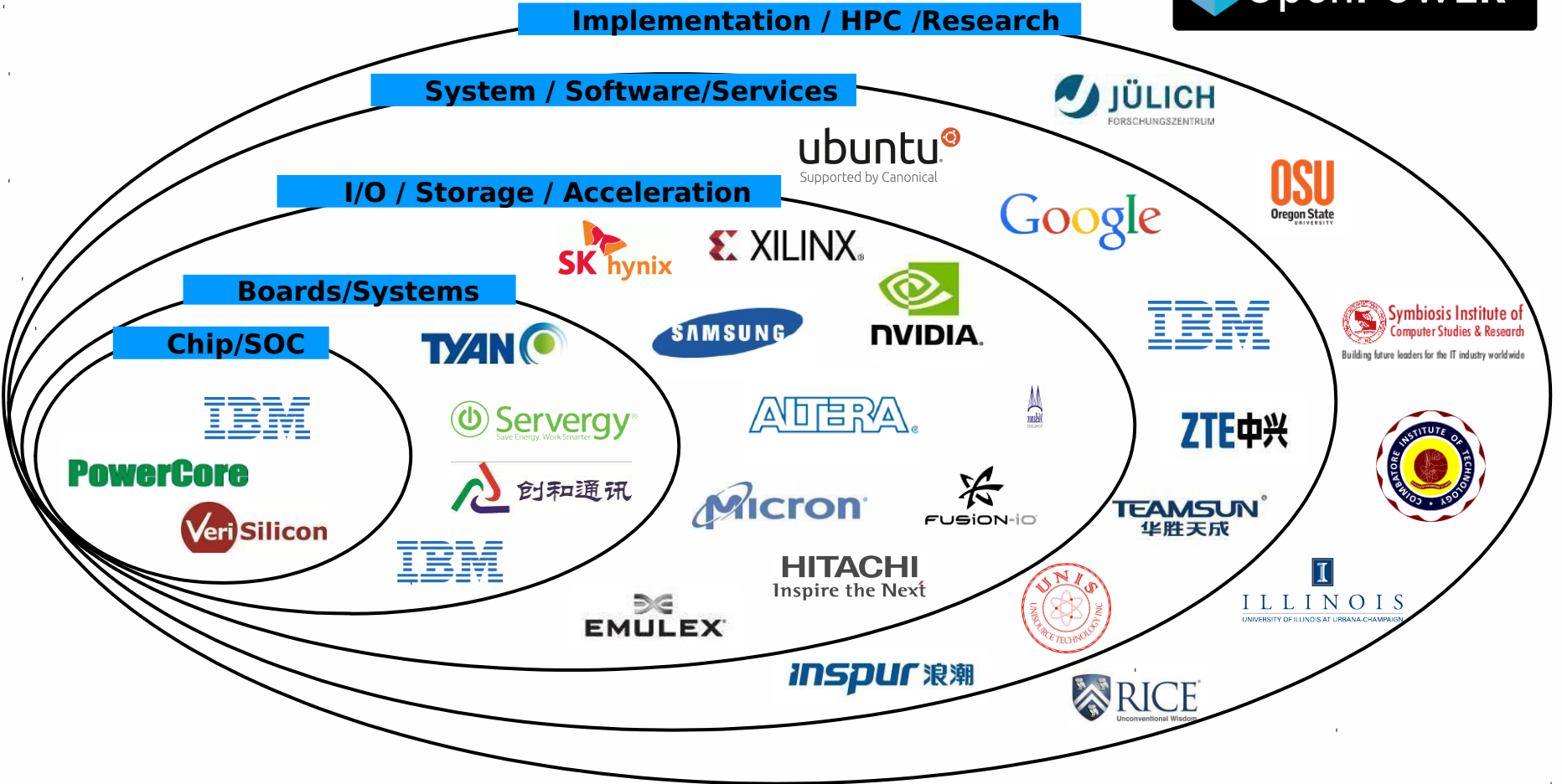
OpenPower Hardware & Software
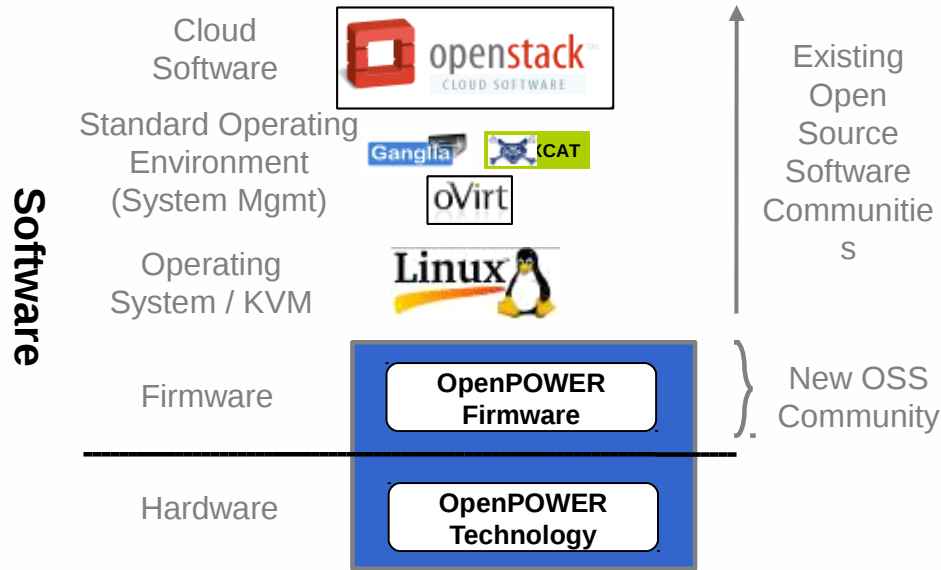
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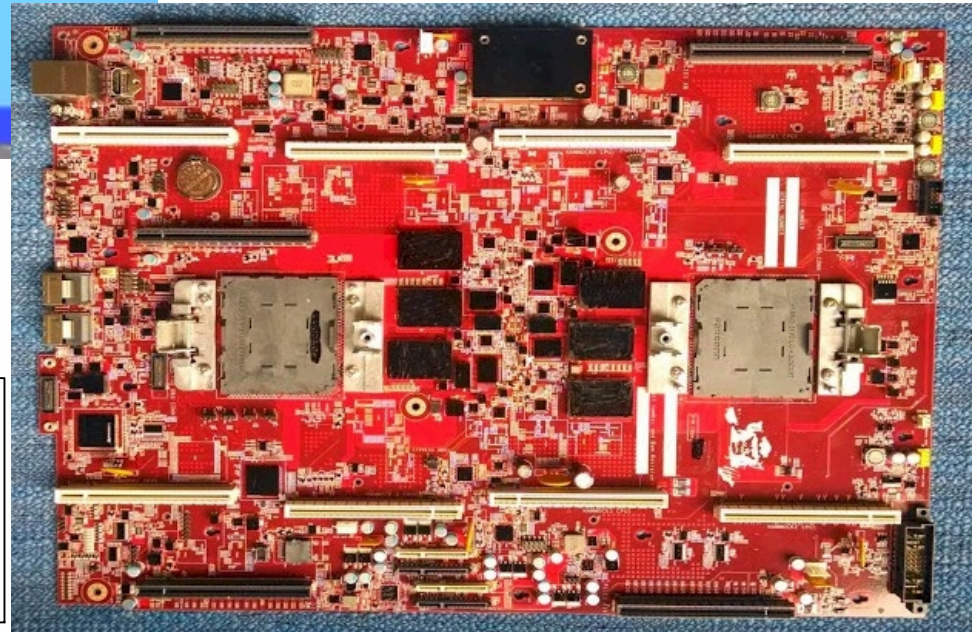
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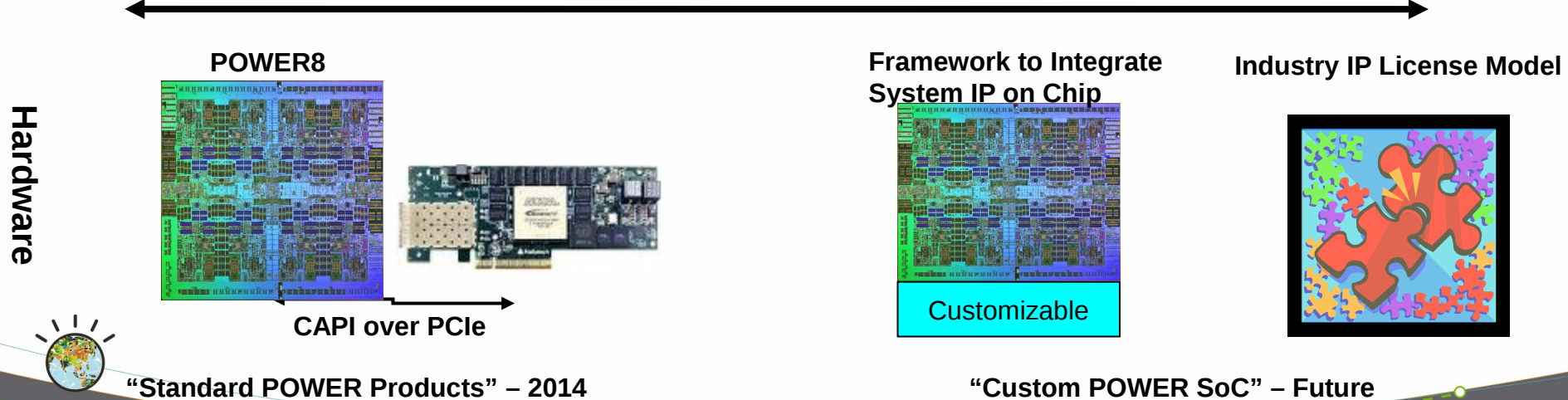
Non-IBM POWER8 products

The Tyan reference (ATX) board, SP010, measures 12" by 9.6"
- one single-chip module (SCM)
- four DDR3 memory slots
- four 6 Gb/sec SATA peripheral connectors
- two USB 3.0 ports
- two Gigabit Ethernet network interfaces
- keyboard and video
- intended for developers

The Google reference board
- two single-chip module (SCM)
- four modified SATA ports
- Google use only

http://www.enterprisetech.com/2014/04/28/inside-google-tyan-power8-server-boards/

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IBM Contribution to Linux

Top 20 contributor affiliations (since 2006)	#changes	% of total
Red Hat	31,261	11.9%
SUSE	16,738	6.4%
Intel	16,219	6.2%
IBM	16,073	6.1%
Consultant	7,986	3.0%
Oracle	5,542	2.1%
Academia	3,421	1.3%
Nokia	3,272	1.2%
Fujitsu	3,156	1.2%
Texas Instruments	2,982	1.1%
Broadcom	2,916	1.1%
Linux Foundation	2,890	1.1%
Google	2,620	1.0%
Analog Devices	2,595	1.0%
SGI	2,578	1.0%
AMD	2,510	1.0%
Parallels	2,419	0.9%
Freescale	2,265	0.9%
Cisco	2,259	0.9%
HP	2,158	0.8%

Source: "Linux Kernel Development" report from Linux Foundation, March 2012

http://www.linuxfoundation.org/publications/linux-foundation

"None" or "Unknown" affiliations are not included.

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Linux support for POWER

- ➢ Built from the same source as x86
- ➢ Delivered on the same schedule as x86
- ➢ Supported at the same time as x86
- ➢ Close development relationship with IBM

- **RHEL 7**
  - Aavailable for existing RHEL customers
  - POWER8 (native mode) and POWER 7/7+ at GA
  - LE / baremetal host support in future
- **RHEL 6**
  - POWER8 supported with U5 (P7-compatibility mode)
  - Full support of POWER6 and POWER7
  - (native mode)
- **Fedora**
  - Fedora supports POWER, actively devellpped
  - Fedora 20 has POWER8 support
- **Supported add-ons**
  - JBoss
  - High Performance Network Add-on
  - More SW in future

- **SLES 11**
  - POWER8 with SP3 (P7-compatibility mode)
  - POWER7+ encryption, RNG accelerators with SP3
  - Full support of POWER7 (native mode)
  - LE and baremetal host support in future
- **SLES 10**
  - POWER7 supported with SP3 (P6-compatibility mode)
  - Full support of POWER6 (native mode)
- **openSUSE**
  - openSUSE 12.2 re-launched for IBM POWER
  - openSUSE 13.2 includes POWER8 support
- **Supported add-ons**
  - SUSE Linux Enterprise High Availability Extension
  - More SW in future

- **Ubuntu 14.04**
  - POWER8 enabled (native mode)
  - No official support for POWER7+ and older systems
  - No support for 32-bit applications. 64-bit only.
  - Supported in KVM only at this time
  - Baremetal / host supported as tech preview, official support in near future
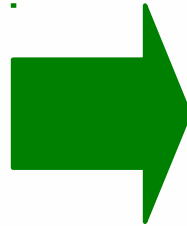- **Supported add-ons**
  - Ubuntu openstack
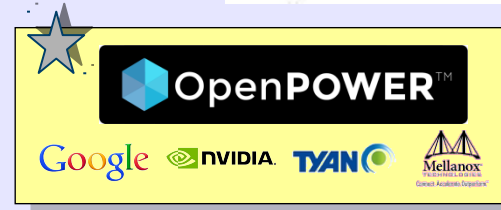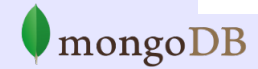 - JuJu Charms
  - MaaS (Metal as a Service)
  - Landscape
- **Debian**
  - Community enablement, officially supported architecture

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Linux on Power – Future Direction

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