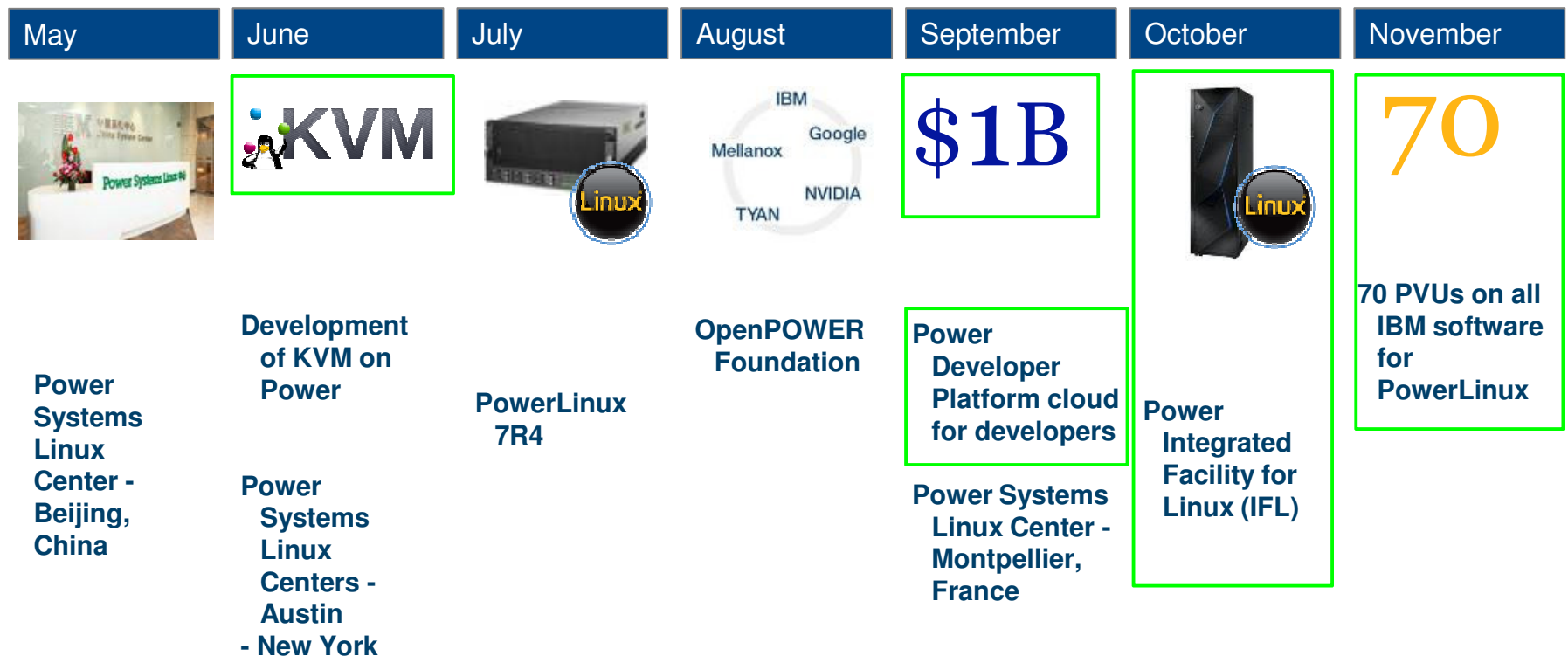# Revolutionizing Open

Cecilia Carniel
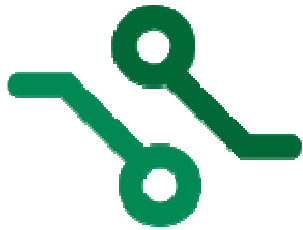
IBM Power Systems Scale Out sales
cecilia_carniel@it.ibm.com

Linux on Power in 2013:
Setting the stage for transformation...

May	June	July	August	September	October	November

Power Systems Linux Center - Beijing, China

Development of KVM on Power

Power Systems Linux Centers - Austin - New York

PowerLinux 7R4

OpenPOWER Foundation

Power Developer Platform cloud for developers

Power Systems Linux Center - Montpellier, France

Power Integrated Facility for Linux (IFL)

70 PVUs on all IBM software for PowerLinux

Defining the age of Open

Open Innovation Platform

- **Linux**
  RedHat, SUSE, and Ubuntu
  Little endian distribution

- **Industry Standards**
  Simpler management via Docker, KVM, OpenStack

- **OpenPOWER**
  Innovate Full Stack Solutions leveraging a community
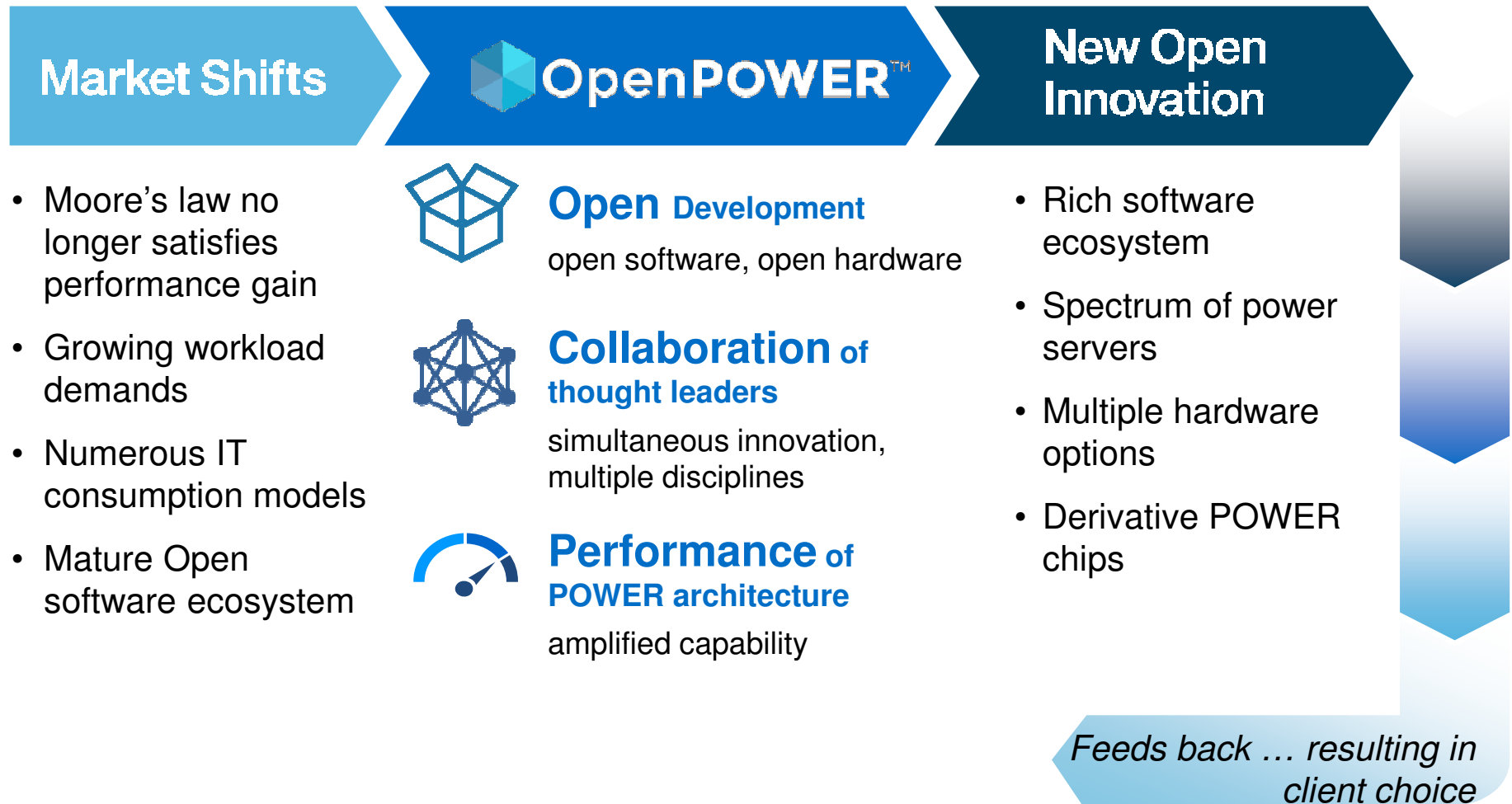
What's the hardware strategy?
"Open is good"

OpenPOWER

The goal of the OpenPOWER Foundation is to create an open ecosystem, using the POWER Architecture to share expertise, investment, and server-class intellectual property to serve the evolving needs of customers.

- Opening the architecture to give the industry the ability to innovate across the full Hardware and Software stack
  - Simplify system design with alternative architecture
  - Includes SOC design, Bus Specifications, Reference Designs, FW OS and Open Source Hypervisor
  - Little Endian Linux to ease the migration of software to POWER

- Driving an expansion of enterprise class Hardware and Software stack for the data center

- Building a complete ecosystem to provide customers with the flexibility to build servers best suited to the Power architecture

OpenPOWER, a catalyst for Open Innovation

Market Shifts → **OpenPOWER™** → **New Open Innovation**

Market Shifts

- Moore's law no longer satisfies performance gain
- Growing workload demands
- Numerous IT consumption models
- Mature Open software ecosystem

OpenPOWER™

Open Development
open software, open hardware

Collaboration of **thought leaders**
simultaneous innovation, multiple disciplines

Performance of **POWER architecture**
amplified capability

New Open Innovation

- Rich software ecosystem
- Spectrum of power servers
- Multiple hardware options
- Derivative POWER chips

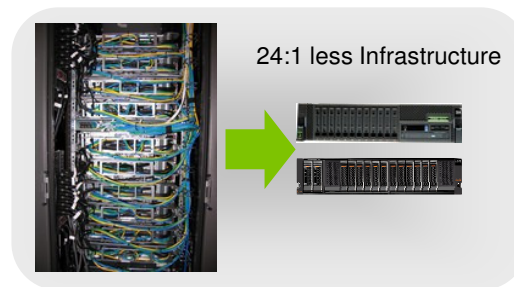*Feeds back … resulting in client choice*

OpenPOWER is an open development community,
using the POWER Architecture to serve the evolving needs of customers.

Potential impact on Business IT – available today

Higher Performance

24:1 less Infrastructure

Lower IT Costs

Algorithm

Faster time to Value
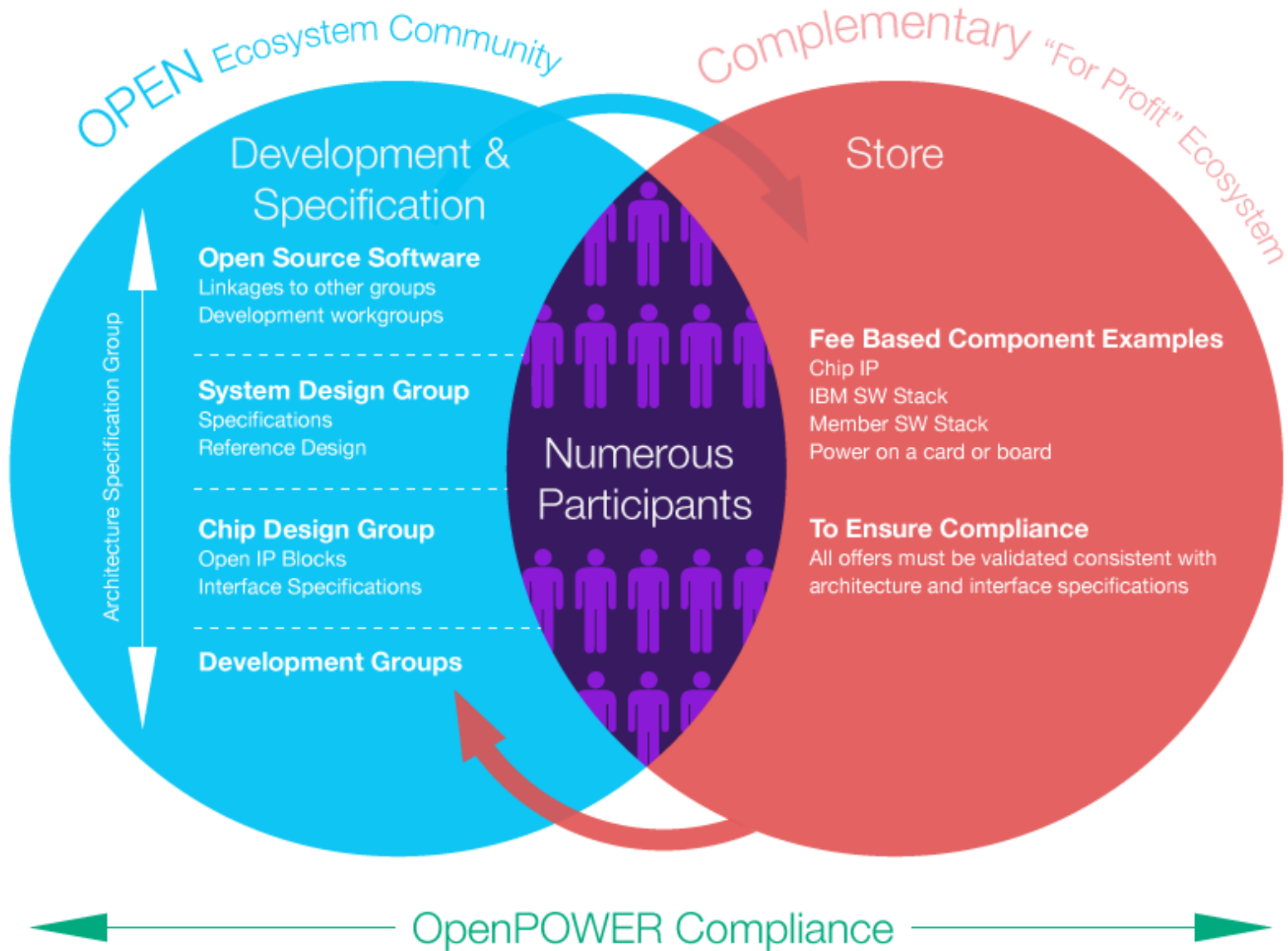
IBM POWER8 thrashes Intel Xeon - Business Cloud, January 2015

IBM's OpenPOWER Foundation: What Is It And Does It Matter?

Seeking Alpha, January 2015

- *"POWER8 is everything Intel's Xeon wants to be when it grows up."*
- *"The importance of partnerships with Chinese companies, with the tacit backing of the Chinese government, should not be underestimated."*

OpenPOWER Development Community

OPEN Ecosystem Community

Complementary "For Profit" Ecosystem

Development & Specification

Open Source Software
Linkages to other groups
Development workgroups

System Design Group
Specifications
Reference Design

Chip Design Group
Open IP Blocks
Interface Specifications

Development Groups

Architecture Specification Group

Store

Fee Based Component Examples
Chip IP
IBM SW Stack
Member SW Stack
Power on a card or board

To Ensure Compliance
All offers must be validated consistent with
architecture and interface specifications

Numerous Participants

OpenPOWER Compliance

Fueling an Open Development Community

Implementation / HPC / Research

ASU Arizona State University · ASTRI · CINECA · Hartree Centre · ICCS-NTUA · mt-b · JÜLICH FORSCHUNGSZENTRUM · Lawrence Livermore National Laboratory · USC University of Southern California · Oak Ridge National Laboratory · OSU Oregon State · OVH.COM · rackspace the #1 managed cloud company · RICE Unconventional Wisdom · IPP rzg Rechen-Zentrum Garching · Sandia National Laboratories · Symbiosis Institute of Computer Studies & Research · LSU Louisiana State University · 清华大学 · University of Arkansas · University of Oregon · ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ · Waseda University · University of Hawaii · INAF Istituto Nazionale di Astrofisica National Institute for Astrophysics

Software

American Megatrends · BYOSOFT · FreeBSD · Google · SANMARCO INFORMATICA · gpudb · ubuntu Supported by Canonical · Neu Cloud Oriental · redislabs

System / Integration

AVNET · ALPHA DATA · BULL an atos company · Cirrascale · IBM · inspur 浪潮 · HKC · OCF · ONE STOP SYSTEMS · PENGUIN COMPUTING · rikor · RTDS Technologies · STACK VELOCITY · UNISOURCE · 中太数据 ZOOM NETWORKS · ZTE 中兴

I/O / Storage / Acceleration

ALGO-LOGIC · ALTERA · BLUEBEE High Performance Genomics · Chelsio Communications Accelerate · CONVEY COMPUTER · DataDirect NETWORKS · EXABLAZE · FUSION-IO · HGST a Western Digital company · HITACHI Inspire the Next · Inphi · Interface Masters TECHNOLOGIES Innovative Network Solutions · MAXELER Technologies · Mellanox TECHNOLOGIES · MEMBLAZE · Micron · Nallatech · numascale · NVIDIA · PMC · QLOGIC · SAMSUNG · SK hynix · XILINX

Boards / Systems

Celestica · 创和通讯 · IBM · Inventec · TYAN · wistron

Chip / SOC

IBM · IDT · POWERCORE · SYNAPSE design · VeriSilicon

A Fast Start for OpenPOWER!

August
Announced intent to form OpenPOWER

January
First two Chinese members joined

July
IBM, with contributions from Google, released 420,000 lines of firmware code

October
Multiple offerings made available from Altera, Canonical, IBM, Nvidia, Redis Labs, OVH and Tyan

November
Department of Energy chose OpenPOWER design for $325M supercomputing contract

March
OpenPOWER kicks off first Summit
• 50+ member presentations
• 10+ product reveals
• **110+ members**

2013 **2014** **2015**

December
Incorporated Foundation and elected officers; **five members**

April
Public launch of web-site, members and demonstrations (Tyan and Google planars)

October
China government endorsed and supported OpenPOWER ecosystem through the formation of China Power Technology Alliance

November
Nallatech CAPI Developer Kit released

December
Seven work groups chartered; Rackspace declares Open Compute, OpenPOWER strategy

March
SoftLayer announces world's first OpenPOWER bare metal as a service offering

The year ahead
• Collaborative solutions, standards, and reference designs available
• Independent members solutions and systems
• Sector growth in technical computing and cloud
• Global growth with increasing depth in all layers
• Broad adoption across hardware, software, and end users

IBM and NVIDIA deliver new acceleration capabilities for analytics, big data, and Java

NEW

✓ Runs pattern extraction analytic workloads faster

✓ Provides new acceleration capability for analytics, big data, Java, and other technical computing workloads

✓ Delivers faster results and lower energy costs by accelerating processor intensive applications

Power System S824L
- Up to 24 POWER8 cores
- Up to 1 TB of memory
- Up to 2 NVIDIA K40 GPU Accelerators
- Ubuntu Linux running bare metal

OpenPOWER™

New Chips & Components

DMI connection between an Altera Stratix V FPGA accelerator and a POWER8 CPU

Convey's CAPI developer kit based on the company's Xilinix-based co-processors

First *China "local" POWER derivative chip, CP1*

Components & Systems

First *commercially available OpenPOWER third-party server*
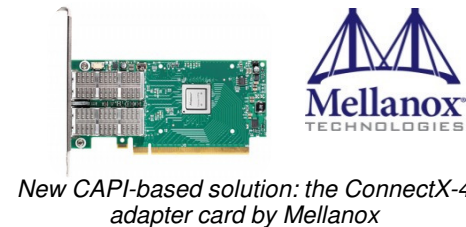
New CAPI-based solution: the ConnectX-4 adapter card by Mellanox

Nallatech's OpenPOWER CAPI Developer Kit

New Systems & Platforms

First *Open server specification and motherboard combining OpenPOWER, OpenCompute and OpenStack (mock-up)*

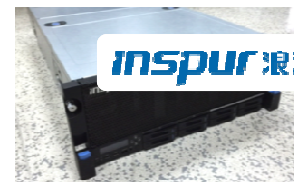***First*** *GPU-accelerated OpenPOWER developer platform*

Prototype of Firestone, a new high-performance server on the path to exascale

First *commercially available OpenPOWER server*

RedPower, the first China OpenPOWER 2-socket system coming to market in 2015

Inspur 2-socket POWER8 Server

ChuangHe China-branded OpenPOWER systems with POWER8

Bringing It All Together

Data Engine for NoSQL with 40TB CAPI-attached flash
24:1 Server consolidation for 3x lower cost per user

Clustering **+** *Open Source Redis*

192 Vcores + CAPI **+** *40TB in 2U*

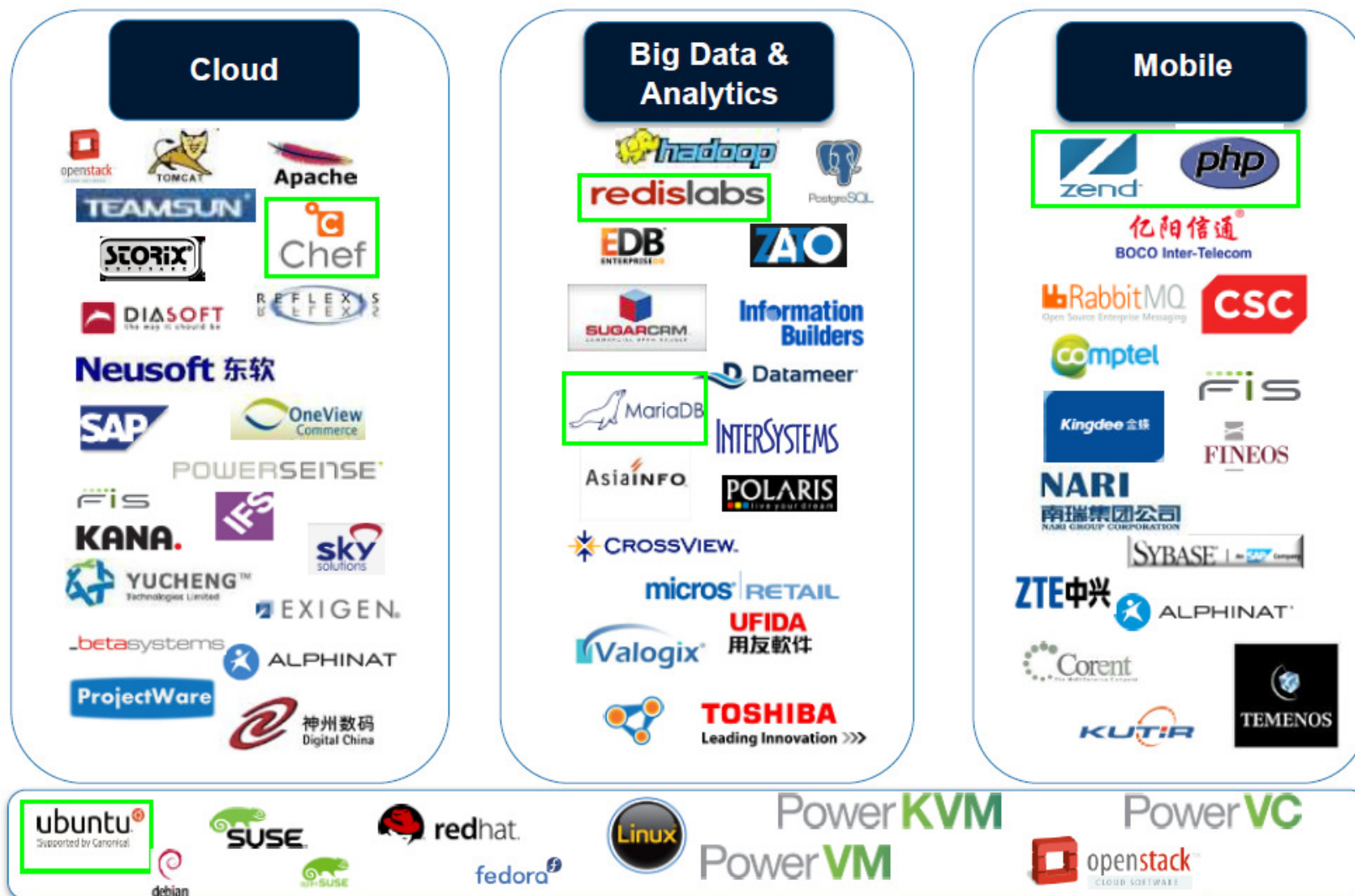# Over **1,400 Linux ISVs** developing on Power

- Support for little endian applications

- PoCs available through the Power Development Platform

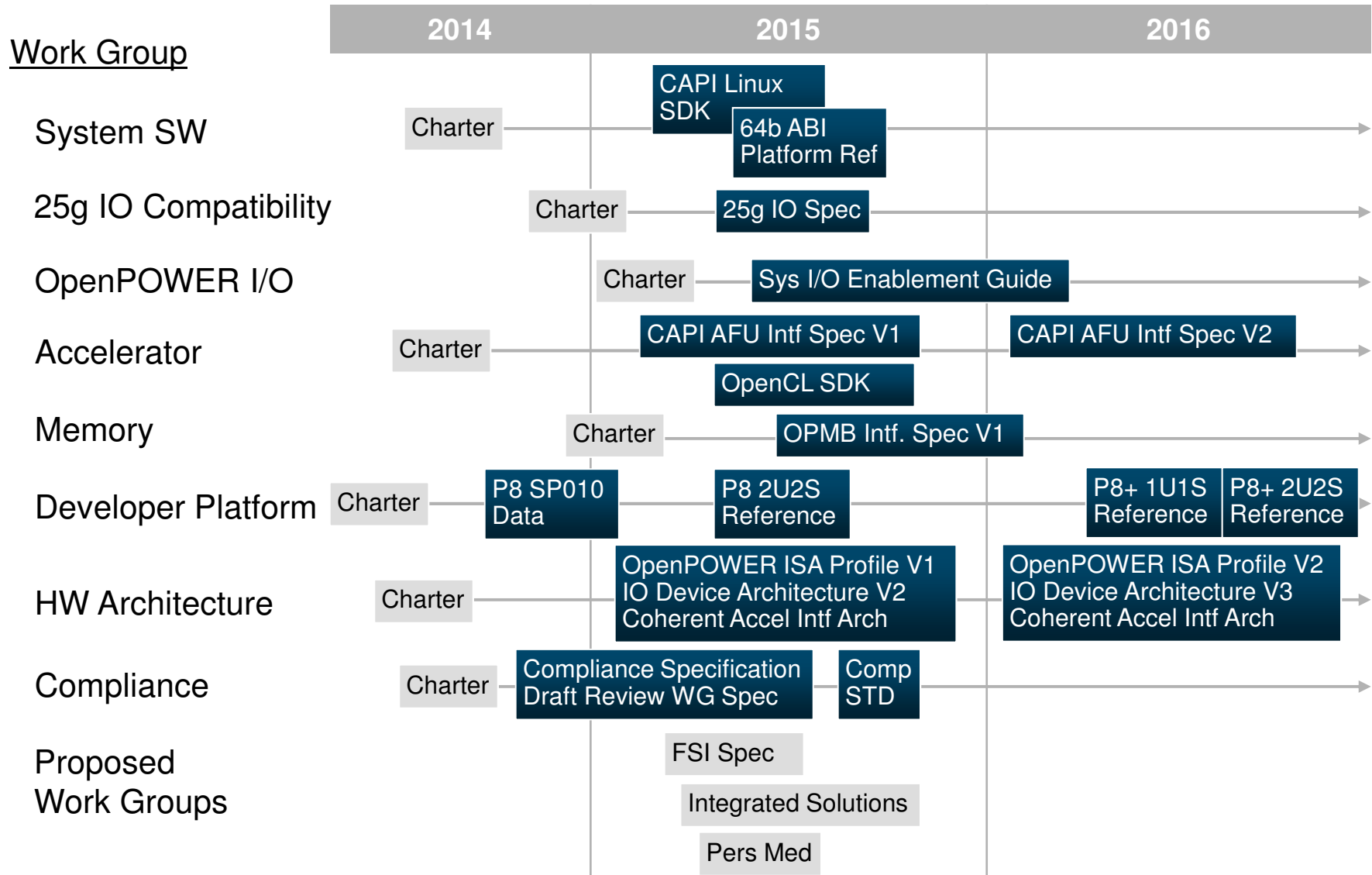- 50 IBM Innovation Centers and Client Centers Worldwide

ubuntu

suse

redhat

OpenPOWER Work Group Roadmap

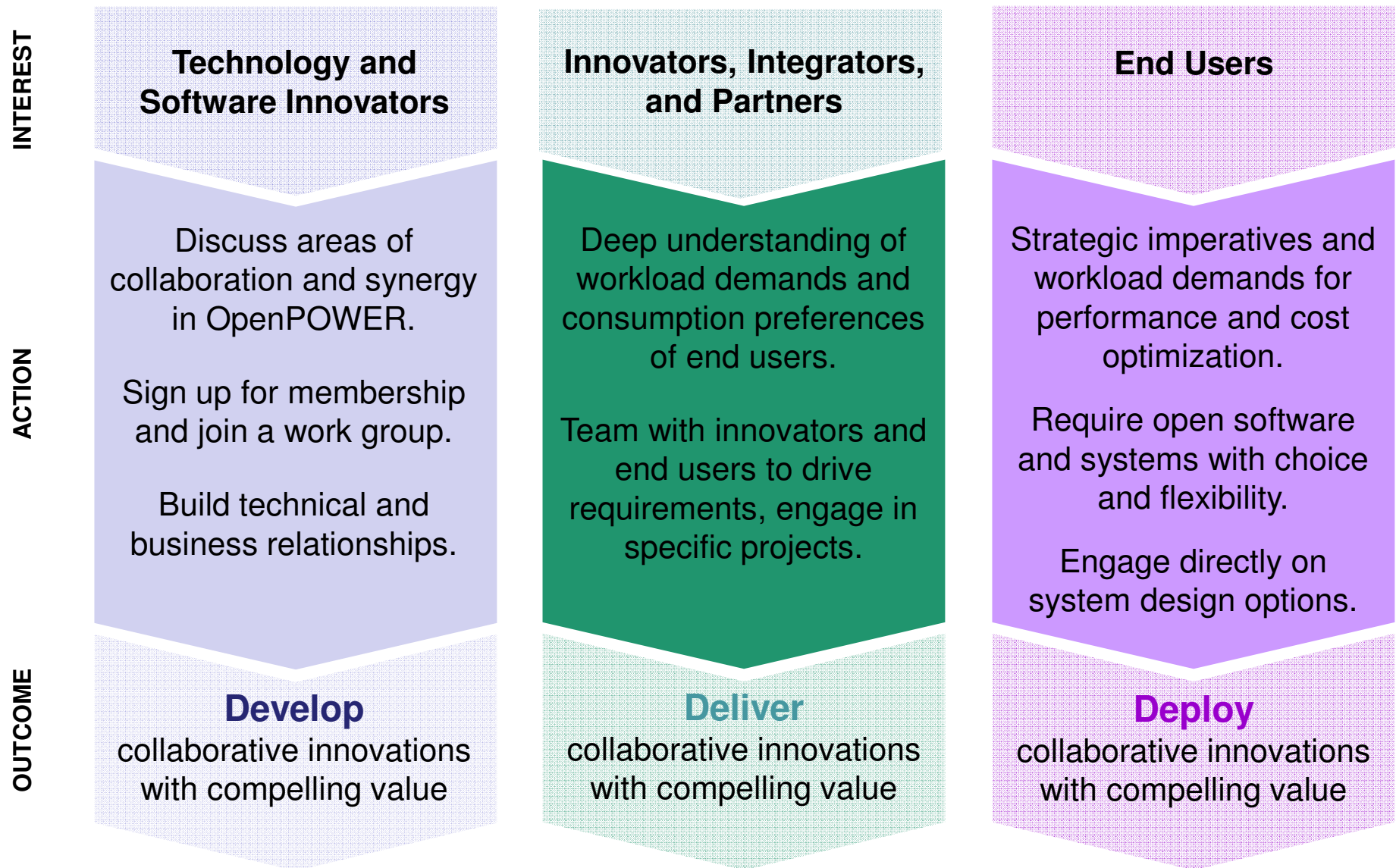| Work Group	2014	2015	2016
System SW	Charter	CAPI Linux SDK / 64b ABI Platform Ref	
25g IO Compatibility	Charter	25g IO Spec	
OpenPOWER I/O	Charter	Sys I/O Enablement Guide	
Accelerator	Charter	CAPI AFU Intf Spec V1 / OpenCL SDK	CAPI AFU Intf Spec V2
Memory	Charter	OPMB Intf. Spec V1	
Developer Platform	Charter	P8 SP010 Data	P8 2U2S Reference	P8+ 1U1S Reference / P8+ 2U2S Reference
HW Architecture	Charter	OpenPOWER ISA Profile V1 / IO Device Architecture V2 / Coherent Accel Intf Arch	OpenPOWER ISA Profile V2 / IO Device Architecture V3 / Coherent Accel Intf Arch
Compliance	Charter	Compliance Specification Draft Review WG Spec / Comp STD	
Proposed Work Groups		FSI Spec / Integrated Solutions / Pers Med	

SP010 – Tyan OpenPOWER Customer Reference System
CAPI – Coherent Accelerator Processor Interface
ABI – Application Binary Interface

AFU – Accelerator Function Unit
FSI – Field Replaceable Unit (FRU) Service Interface
SDK – Software Developer Kit

OPMB – OpenPOWER Memory Bus

Engage in the OpenPOWER community

INTEREST

Technology and Software Innovators	Innovators, Integrators, and Partners	End Users

ACTION

Discuss areas of collaboration and synergy in OpenPOWER.

Sign up for membership and join a work group.

Build technical and business relationships.

Deep understanding of workload demands and consumption preferences of end users.

Team with innovators and end users to drive requirements, engage in specific projects.

Strategic imperatives and workload demands for performance and cost optimization.

Require open software and systems with choice and flexibility.

Engage directly on system design options.

OUTCOME

Develop
collaborative innovations with compelling value

Deliver
collaborative innovations with compelling value

Deploy
collaborative innovations with compelling value

Summary

OpenPOWER™

1. Leveraging Power Systems **benefits** using RHEL, SLES, Ubuntu and other open technologies (like KVM, …)

2. The software strategy for Linux on Power focuses on the **next generation of open source software**/**middleware** on top of common opensource infrastructure and emerging third-party x86 Linux workloads.

3. The **OpenPOWER Foundation** drives the hardware strategy while jointly enabling a shared software ecosystem with IBM's efforts.

Questions ?