

Université IBM i 2017

17 et 18 mai – IBM Client Center de Bois-Colombes

S24 – Architecture IBM POWER: tendances et stratégies

Jeudi 18 mai – 11h00-12h30

Jean-Luc Bonhommet – IBM



AGENDA

- **POWER systems trends and direction**

- POWER4 to POWER8 CPU roadmap
- POWER7 & POWER8 portfolio
- OPENPOWER
- POWER9

- **IBM i trends & directions**



POWER Systems Trends & direction

2008



2000

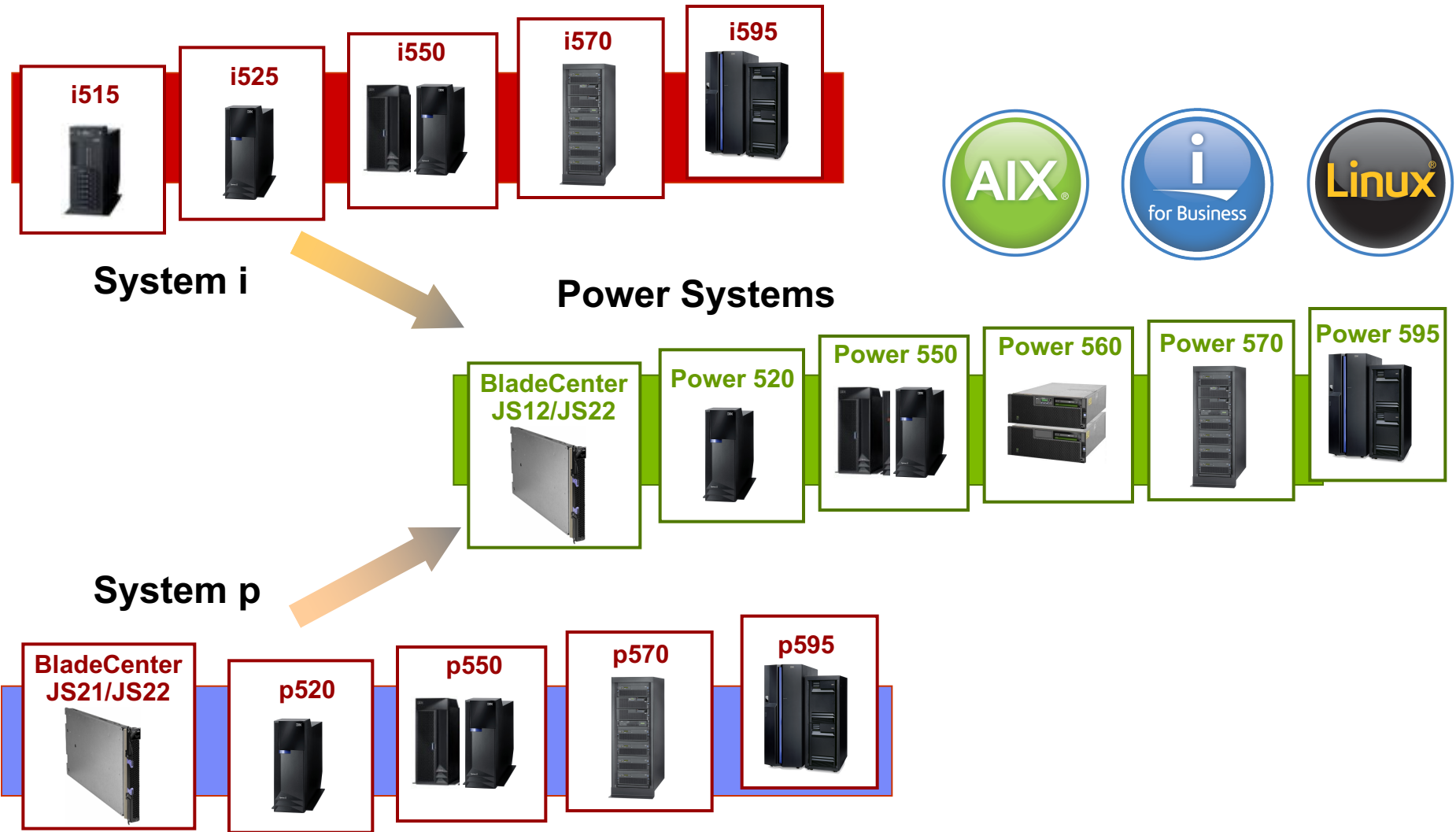


IBM iSeries

1988

AS/400®

System i & System p fusion in 2008



POWER Processor Roadmap

Focus on Enterprise Technology and Performance Driven				Focus on Scale-Out and Enterprise Cost and Acceleration Driven					Future	
POWER6 Architecture		POWER7 Architecture		POWER8 Architecture		POWER9 Architecture		Partner Chip POWER8/9	POWER10	
2007 POWER6 2 cores 65nm New Micro-Architecture New Process Technology	2008 POWER6+ 2 cores 65nm+ Enhanced Micro-Architecture Enhanced Process Technology	2010 POWER7 8 cores 45nm New Micro-Architecture New Process Technology	2012 POWER7+ 8 cores 32nm Enhanced Micro-Architecture New Process Technology	2014 POWER8 12 cores 22nm New Micro-Architecture New Process Technology	2016 POWER8 w/ NVLink 12 cores 22nm Enhanced Micro-Architecture With NVLink	2017 P9 SO 24 cores 14nm New Micro-Architecture Direct attach memory New Process Technology	TBD P9 SU TBD cores 14nm Enhanced Micro-Architecture Buffered Memory	T B D	2018 - 20 P8/9 SO 10nm - 7nm Existing Micro-Architecture Foundry Technology	2020+ New Micro-Architecture New Technology
High Frequency Enhanced RAS Dynamic Energy Management		Large eDRAM L3 Cache Optimized VSX Enhanced Memory Subsystem		Optimized for Data-Centric Workloads Integrated PCIe CAPI Acceleration // I/O		Scale-Out Datacenter TCO Optimization Scale-up performance Optimization Acceleration Enhancements to CAPI and NVLINK Modularity for OpenPOWER			OpenPOWER Ecosystem Design Targeting Partner Markets & Systems Leveraging Modularity	New Features and Functions

Price, performance, feature and ecosystem innovation





Power 7/7+ System Portfolio



Enterprise Systems:

- Data Center Efficiency
- Private Cloud
- Elastic COD
- Power Systems Pool



PureSystems Family

PureSystems + Power delivers higher value for hybrid consolidation and Application server and Development clouds



New Power 750 & 760:

- midrange price-performance for virtualized workload consolidation
- New CoD option



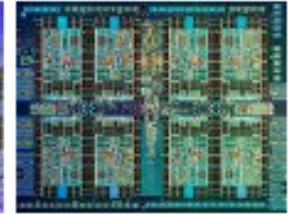
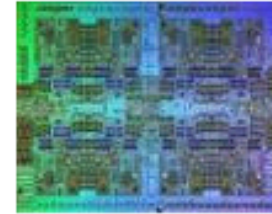
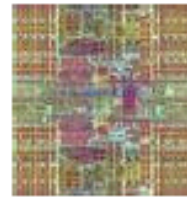
Entry systems: new workloads at Intel prices with Power performance, resilience and security



System software lowers IT costs and speeds dynamic response to business changes

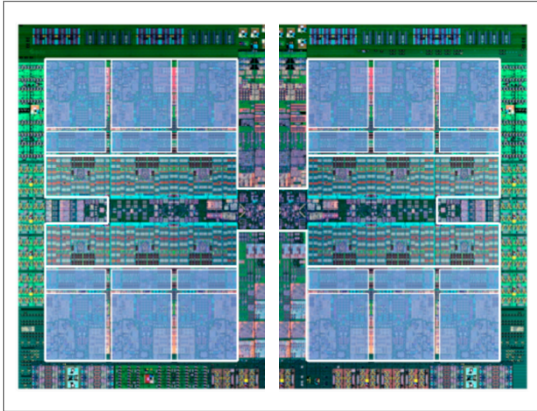
POWER7 vs POWER7+

Processor Designs



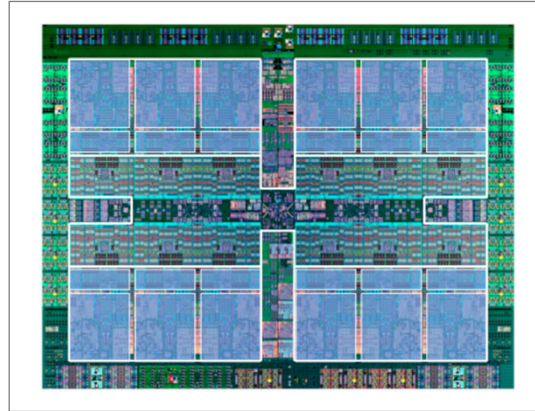
	POWER5	POWER5+	POWER6	POWER7	POWER7+
Technology	130nm	90nm	65nm	45nm	32nm
Size	389 mm ²	245 mm ²	341 mm ²	567 mm ²	567 mm ²
Transistors	276 M	276 M	790 M	1.2 B	2.1 B
Cores	2	2	2	8	8
Frequencies	1.65 GHz	1.9 GHz	4 - 5 GHz	3 – 4 GHz	3.6 – 4.4+ GHz
L2 Cache	1.9MB Shared	1.9MB Shared	4MB / Core	256 KB per Core	256 KB per Core
L3 Cache	36MB	36MB	32MB	4MB / Core	10MB / Core
Memory Cntrl	1	1	2 / 1	2 / 1	2 / 1
Architecture	Out of Order	Out of Order	In of Order	Out of Order	Out of Order
LPAR	10 / Core	10 / Core	10 / Core	10 / Core	20 / Core

POWER8 Chips



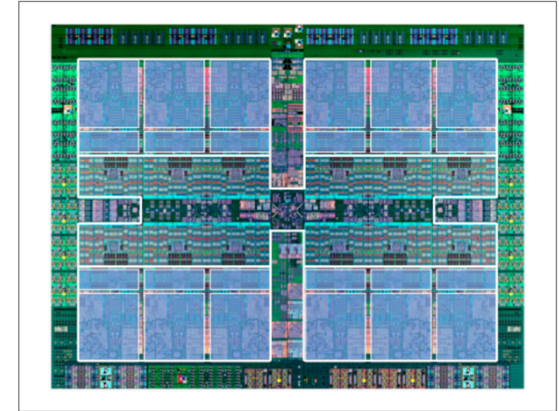
Scale-Out Systems

Dual Chip Module
6 Cores per Chip



Enterprise Systems

Single Chip Module
12 Cores per Chip



LC Systems

OpenPOWER Chip
12 Cores per Chip

POWER8 Scale-Out Family



S812

1 or 2 socket, 2U
1 (IBM i) / 6 - 20 cores



S822

1 or 2 socket, 2U
4 (IBM i) / 6 - 20 cores



S814

1 socket, 4U
4 - 8 cores



S824

2 socket, 4U
6 - 24 cores



S812L

1 socket, 2U, Linux
10 - 12 cores



S822L

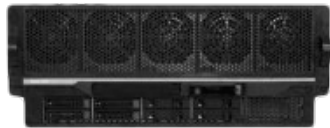
2 socket, 2U, Linux
16 - 24 cores



S824L

2 socket, 4U, Linux
8 - 24 cores

POWER8 Enterprise Family



E850

16 - 48 Cores
128 GB – 4 TB Memory
7 - 51 PCI Adapters



E870

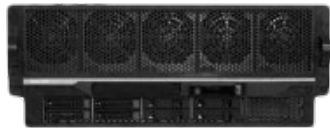
8 - 80 Cores
256 GB – 16 TB Memory
8 - 96 PCI Adapters



E880

8 - 192 Cores
256 GB – 32 TB Memory
8 - 192 PCI Adapters

POWER8 Enterprise C-Models Family



E850C

16 - 48 Cores
128 GB – 4 TB Memory
7 - 51 PCI Adapters



E870C

8 - 80 Cores
256 GB – 16 TB Memory
8 - 96 PCI Adapters



E880C

8 - 192 Cores
256 GB – 32 TB Memory
8 - 192 PCI Adapters

E850, E870, E880 will be withdrawn on July 17, 2017

POWER8 E870/E880 E870C/E880C Models



19-inch Rack
(E870 Shown)

- **EXP24S SAS Drawers (2U)**

- 24 SFF SSD/HDD
- Connects via 2 SAS adapters

- **PCIe I/O Drawers (4U)**

- 12 PCIe expansion slots
- Connects via 2 PCIe adapter slots

- **System Control Unit (2U)**

- **System Nodes (5U)**

- 32 – 48 cores / node
- 32 DIMM slots / node
- 8 PCIe Gen3 I/O slots / node

IBM Power Systems Enterprise Cloud Offering (C-models)

Modernize your Power infrastructure for the Cloud, get access to IBM Cloud for free and cut your current operating costs by 50%

On-Premises Cloud

Transform traditional infrastructure with automation, self-service and elastic consumption models



- OpenStack-based Cloud Management: enabling DevOps to Full production
- **Open source automation: installation and config. recipes**
- Flexible elastic private cloud capacity and consumption models
- **Cross Data Center Inventory and Performance Monitoring via the IBM Cloud**

Hybrid Infrastructure

Securely extend to Public Cloud with rapid access to compute services and API integration

- Manage VMs across on and off-premises clouds with a single pane of glass (e.g., VMware vRealize)
- Securely connect traditional workloads with cloud-native apps (Power & API Connect, BlueMix)
- **Optional DR as a Service (GDR for Power)**
- **Free access and capacity flexibility with SoftLayer**
 - Free SoftLayer starter pack (12 server months)
 - Flexibility to run capacity On Premises or in SoftLayer

Free Built-in Cloud Deployment Service Options

- Design for Cloud Provisioning and Automation
- Build for Infrastructure as a Service
- Build for Cloud Capacity Pools across Data Centers
- Design for Hybrid Cloud with BlueMix
- Deliver with automation for DevOps
- **Deliver with Database as a Service**

Note: Yellow text indicates new content in addition to packaging

Introducing the **IBM Power Systems LC Line POWER8**

OpenPOWER servers for cloud and cluster deployments that are different by design

High Performance Computing

Compute Intensive

Big Data



S812LC

- Storage rich single socket system for big data applications
- Memory Intensive workloads

Withdrawn May 26

NEW
S822LC For Big Data

Announce and GA 9/8



- Ideal for storage-centric and high data through-put workloads
- Brings 2 POWER8 sockets for Big Data workloads
- Big data acceleration with work CAPI and GPUs

NEW
S822LC For High Performance Computing

Announce 9/8, GA 9/26



- Incorporates the new POWER8 processor with NVIDIA NVLink
- Delivers 2.8X the bandwidth to GPUs accelerators
- Up to 4 integrated NVIDIA "Pascal" GPUs

NEW
S821LC

Announce and GA 9/8



- 2 POWER8 sockets in a 1U form factor
- Ideal for environments requiring dense computing

S822LC



- 2X memory bandwidth of Intel x86 systems
- Memory Intensive workloads

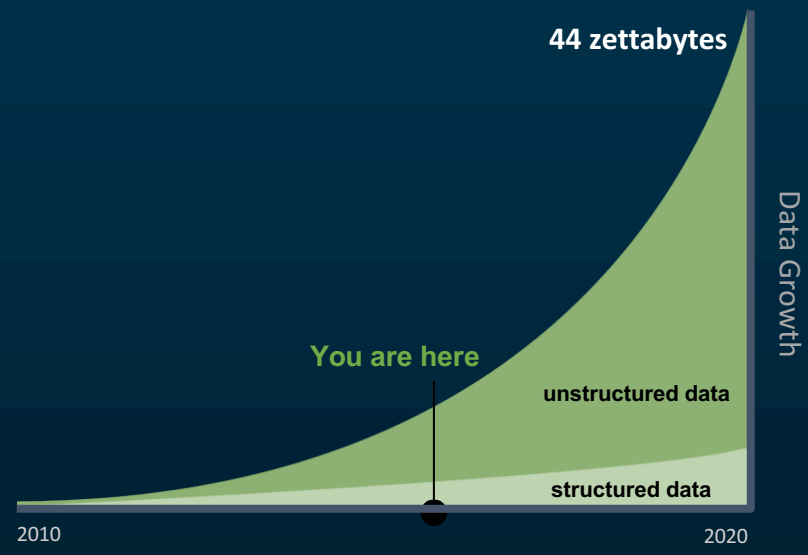
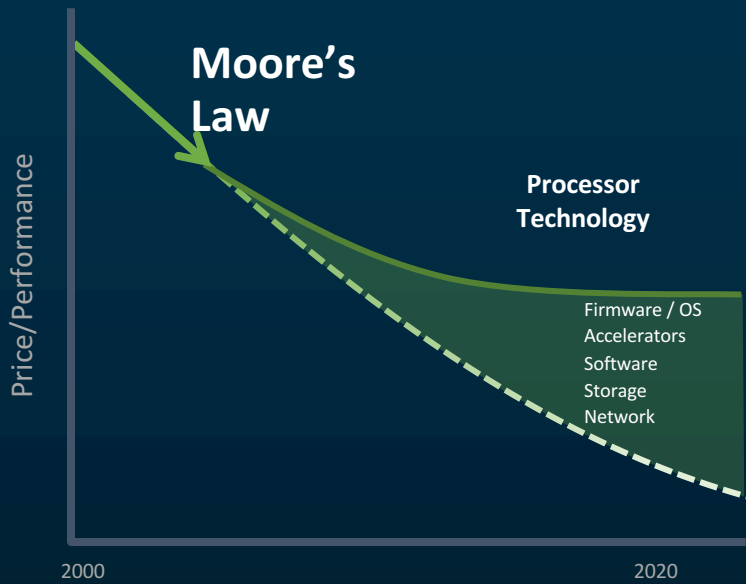
**Withdrawn May 26
GTA model only**

OPENPOWER

Today's challenges demand innovation

Full system and stack open innovation required

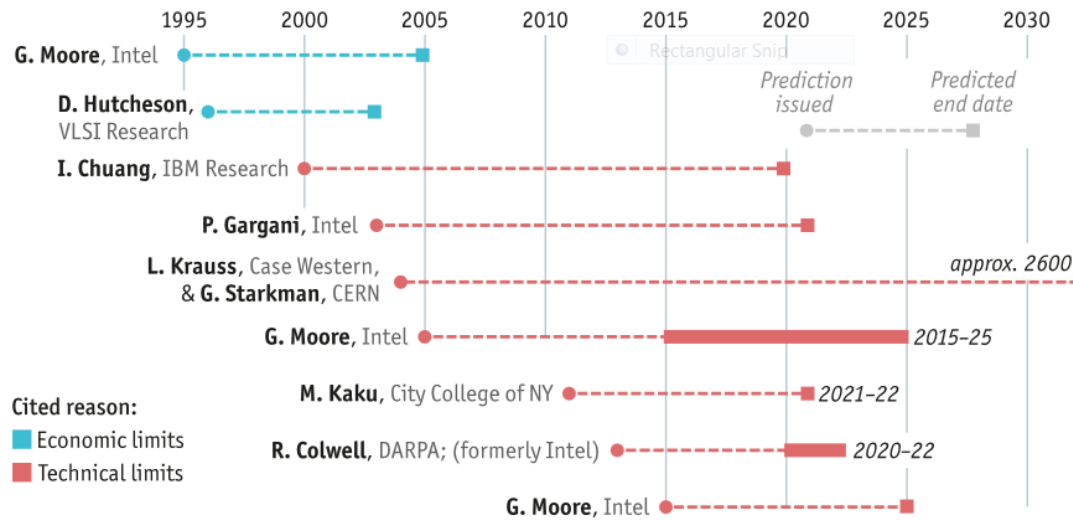
Data holds competitive value



Moore's Law to price/performance

Faith no Moore

Selected predictions for the end of Moore's law

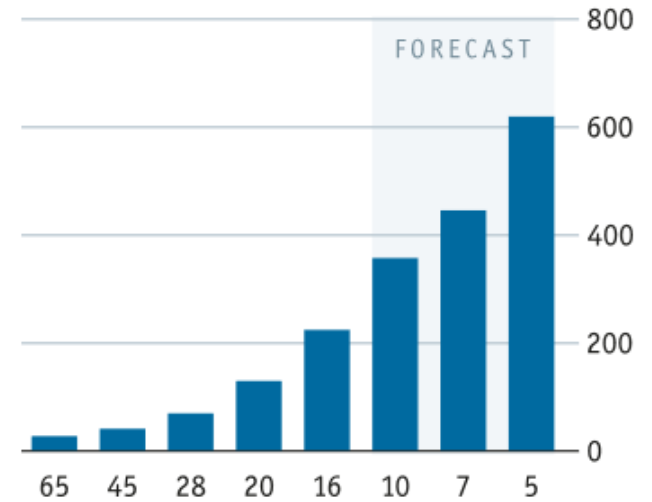


Cited reason:
■ Economic limits
■ Technical limits

Sources: Intel; press reports; *The Economist*

This can't go on

Design cost by chip component size in nm, \$m



Source: IB Consulting

OpenPOWER, a catalyst for Open Innovation

Market Shifts

Moore's law no longer satisfies performance gain

Growing workload demands

Numerous IT consumption models

Mature Open software ecosystem

OpenPOWER Strategy

Vibrant ecosystem through open development



Accelerated innovation through collaboration of partners



Amplified capabilities driving industry performance leadership



Industry adoption, Open choice

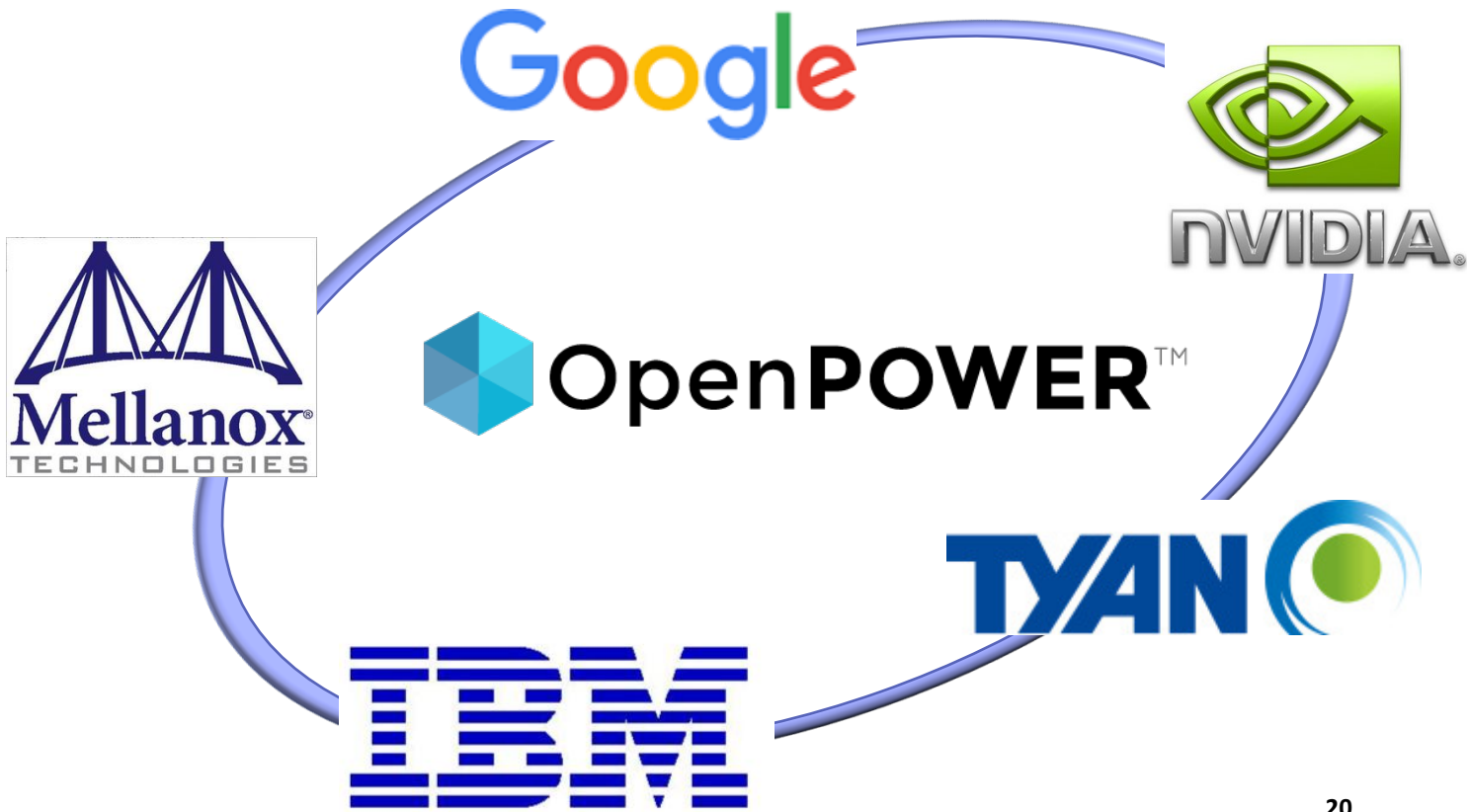
Cloud Computing
*Hyperscale & Large scale
Datacenters*

High Performance
Computing & Analytics

Domestic
IT Agendas

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

June 2013: OpenPower Foundation



20



OpenPOWER™

This is what a revolution looks like

300+ members

Implementation / HPC / Research	ASU, ASTRI, AUBURN, Agency for Science, Technology and Research, CAMBRIDGE CARES, Carnegie Mellon University, cfms, CINECA, EXETER, Hartree Centre, inf-b, icm, I, JÜLICH, Lawrence Livermore National Laboratory, LSU, M, NUS, NANYANG TECHNICAL UNIVERSITY, OAK RIDGE National Laboratory, OSU, UNIV.COM, UNIVERSITÄT PADERBORN, Rackspace, MAISON DE LA SIMULATION, RICE, rzg, SASTRA UNIVERSITY, Sandia National Laboratories, SDSC, TEES, UF UNIVERSITY OF FLORIDA, TACC, USC, TUNING, UNICAMP, UNIVERSITY OF DELHI, Western, Synthesis Institute of Computer Studies & Research
Software	American Megatrends, BYOSOFT, 红旗 Linux, FIXSTARS, FreeBSD, Google, SUSE, synerSCOPE, KOLAB, RECONFIGURE, ubuntu
System / Integration	AVNET, BULL, CIARA, 创新通讯, Cirrascale, CSPI, DRC, E4, IBM, Mark III Systems, Microway, NEC, OCF, ONE STOP SYSTEMS, PENGUIN COMPUTING, RAPTOR ENGINEERING, rikor, WRTDS, STACK VELOCITY, TEXHOPOM, TK SERVER, UNISOURCE, YA DR
I/O / Storage / Acceleration	ALBU-LOGIC, ALPHA DATA, AVAGO TECHNOLOGIES, BittWare, blaeograph, BLUEBEE, BROCADE, Chelsio, CONVEY, DataDirect, eASIC, edioo, genome, EVERSPIN, FUSION-IO, HGST, HITACHI, Inphi, Interface Masters, MAXELLER Technologies, Mellanox, MEGAZEE, Micron, Microsemi, MYRiCOM, Nallatech, NVIDIA, PMC, QLOGIC, SAMSUNG, SanDisk, Semptian, SK hynix, SOLARFLARE, XII INX.
Boards / Systems	acer, Celestica, IBM, inspur 浪潮, Inventec, msi, New Cloud Oriental, FET, TYAN, wistron, 中太服务器 ZOOM SERVER
Chip / SOC	IBM, IDT, infineon, POWERCORE, SYNAPSE design, VeriSilicon

© 2016 OpenPOWER Foundation

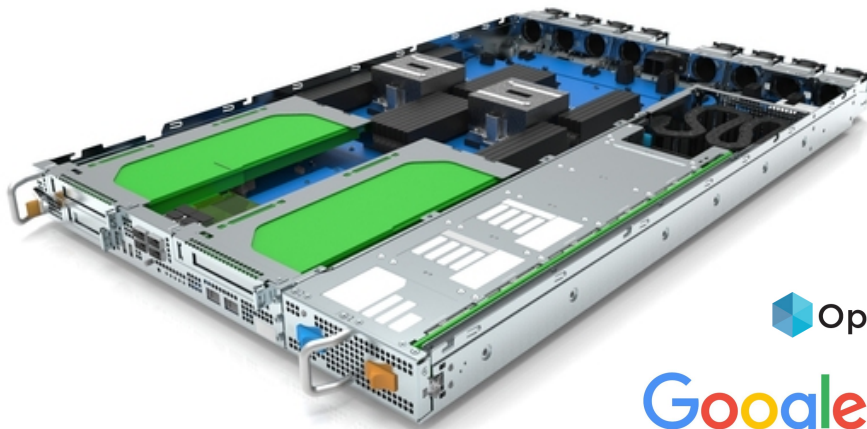
“ZAIUS”, the next Google machine fueled with IBM POWER9

April 2016, during OpenPOWER Summit 2016, Google announced a partnership with Rackspace to develop a new server platform, based on IBM Power9, code-named ZAIUS.

More information:

<http://www.nextplatform.com/2016/04/06/inside-future-google-rackspace-power9-system/>

http://www.theregister.co.uk/2016/04/07/open_power_summit_power9/



ZAIUS 1.25 OU

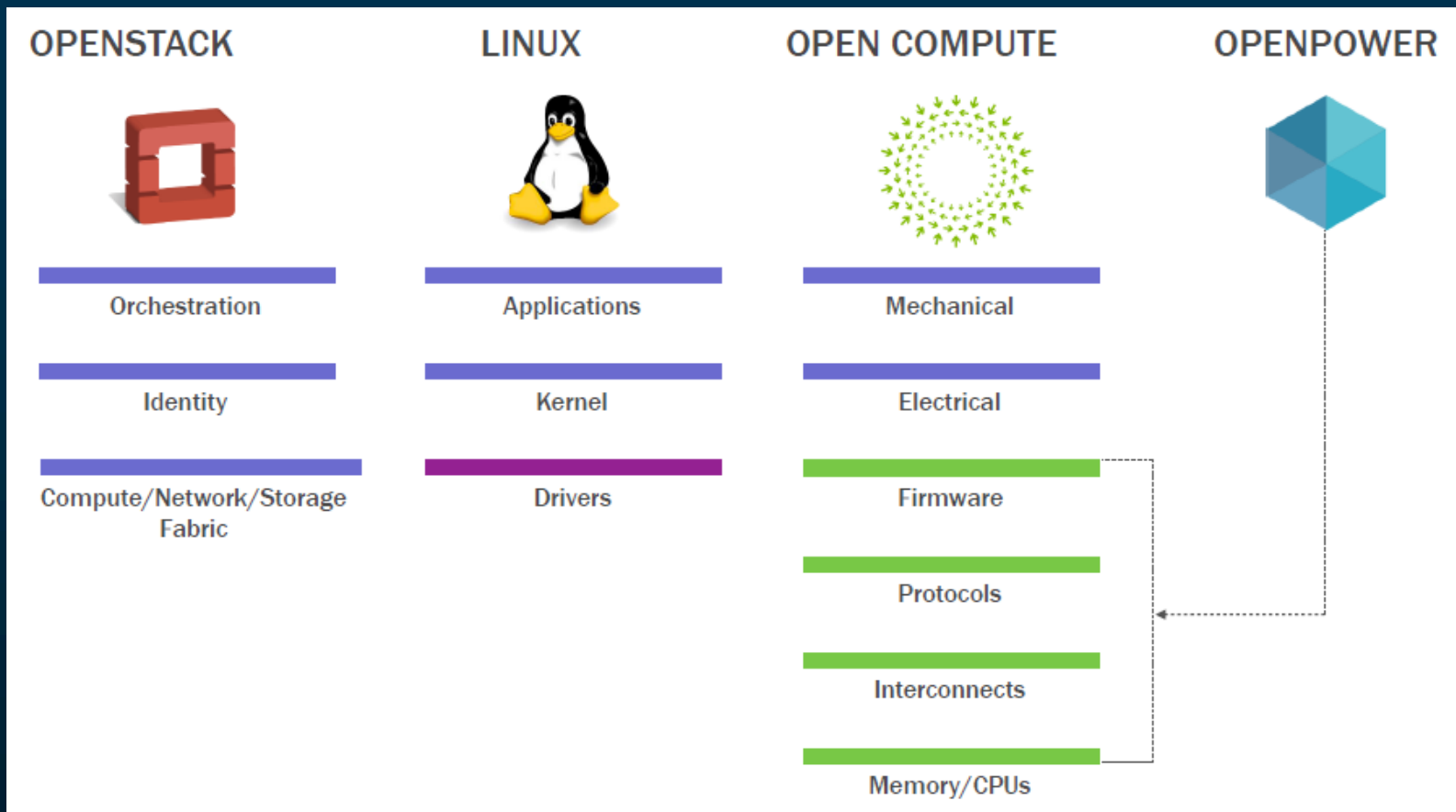
 OpenPOWER™




the #1 managed cloud company

- 2x POWER9 CPU
- 32x DDR4 DIMM Slots
- 2x PCIe Gen4 x16 FHFL slots
- 1x PCIe Gen4 x16 HHHL slot
- 1x PCIe Gen4 x16 OCP Mez
- 1x M2 Sata Port
- 1x Sata Port
- 15x 2.5" SAS/SATA/NVME Slots
- BMC w/ GbE LOM
- “Diskless” Option

Cross community collaboration is essential



Accelerates Technology roadmap

Mellanox
Interconnect



Connect-IB FDR Infiniband PCIe Gen3	ConnectX-4 EDR Infiniband CAPI over PCIe Gen3	ConnectX-5 Next-Gen Infiniband Enhanced CAPI over PCIe Gen4
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Xilinx FPGAs



UltraScale CAPI, PCIe Gen3	UltraScale + Enhanced CAPI, PCIe Gen3	UltraScale + CAPI 2.0, PCIe Gen4
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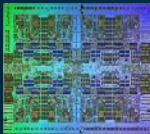
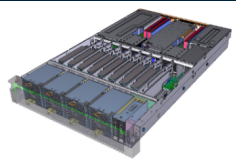
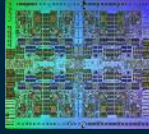
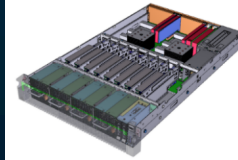
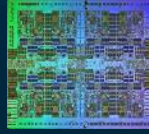
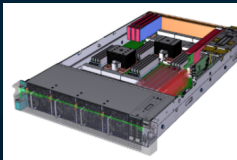
NVIDIA GPUs



Kepler PCIe Gen3	Pascal NVLink	Volta Enhanced NVLink
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IBM CPUs
& Systems



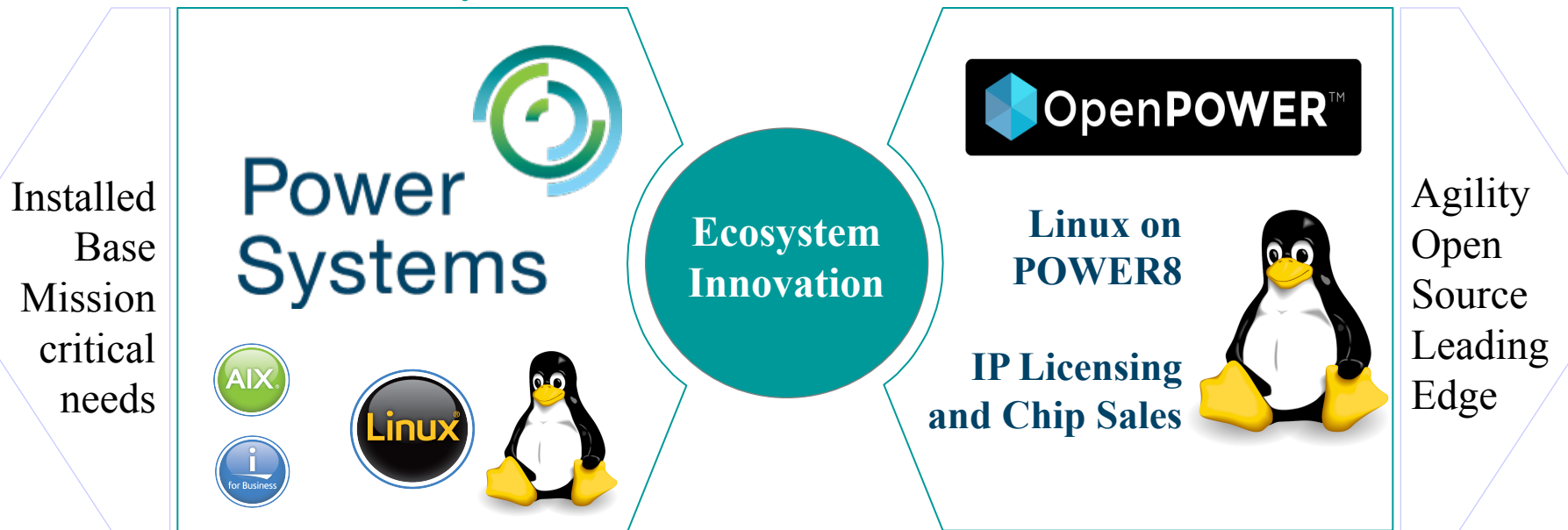
<p>POWER8</p>  <p>OpenPower CAPI Interface</p> <p>2015</p> 	<p>POWER8 with NVLink</p>  <p>2016</p> 	<p>POWER9</p>  <p>Enhanced CAPI & NVLink</p> <p>2017</p> 
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Power Systems: An Ecosystem for Innovation



IBM Power Systems

Industry



POWER8 Processor with


CAPI
Technology



IBM POWER9

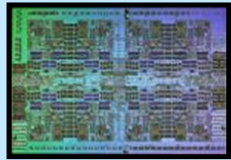
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Price, performance, feature and ecosystem innovation



POWER Processor Technology Roadmap

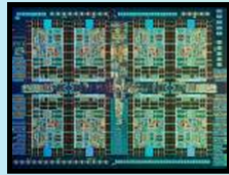


POWER7
45 nm

Enterprise

- 8 Cores
- SMT4
- eDRAM L3 Cache

1H10

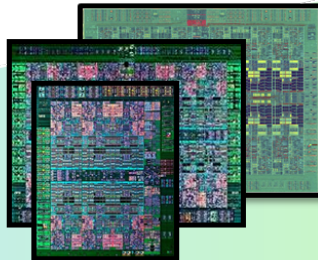


POWER7+
32 nm

Enterprise

- 2.5x Larger L3 cache
- On-die acceleration
- Zero-power core idle state

2H12

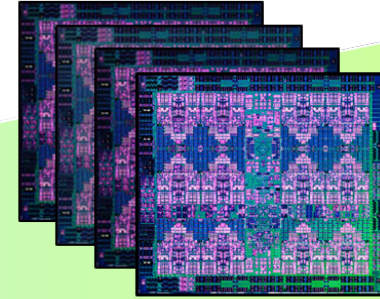


POWER8 Family
22nm

**Enterprise &
Big Data Optimized**

- Up to 12 Cores
- SMT8
- CAPI Acceleration
- High Bandwidth GPU Attach

1H14 – 2H16



POWER9 Family
14nm

Built for the Cognitive Era

- Enhanced Core and Chip Architecture Optimized for Emerging Workloads
- Processor Family with Scale-Up and Scale-Out Optimized Silicon
- Premier Platform for Accelerated Computing

2H17 – 2H18+

POWER9 Family – Deep Workload Optimizations

Emerging Analytics, AI, Cognitive

- New core for stronger thread performance
- Delivers 2x compute resource per socket
- Built for acceleration – OpenPOWER solution enablement



Technical / HPC

- Highest bandwidth GPU attach
- Advanced GPU/CPU interaction and memory sharing
- High bandwidth direct attach memory



Cloud / HSDC

- Power / Packaging / Cost optimizations for a range of platforms
- Superior virtualization features: security, power management, QoS, interrupt
- State of the art IO technology for network and storage performance



Enterprise

- Large, flat, Scale-Up Systems
- Buffered memory for maximum capacity
- Leading RAS
- Improved caching





New POWER9 Cores

Optimized for Stronger Thread Performance and Efficiency

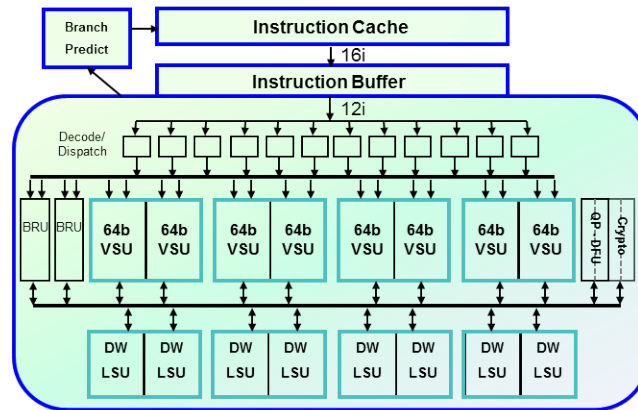
- Increased execution bandwidth efficiency for a range of workloads including commercial, cognitive and analytics
- Sophisticated instruction scheduling and branch prediction for unoptimized applications and interpretive languages
- Adaptive features for improved efficiency and performance especially in lower memory bandwidth systems

Available with SMT8 or SMT4 Cores

8 or 4 threaded core built from modular execution slices

POWER9 SMT8 Core

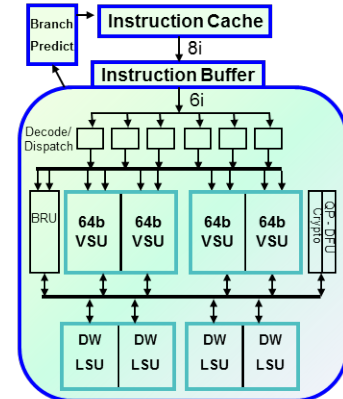
- PowerVM Ecosystem Continuity
- Strongest Thread
- Optimized for Large Partitions



SMT8 Core

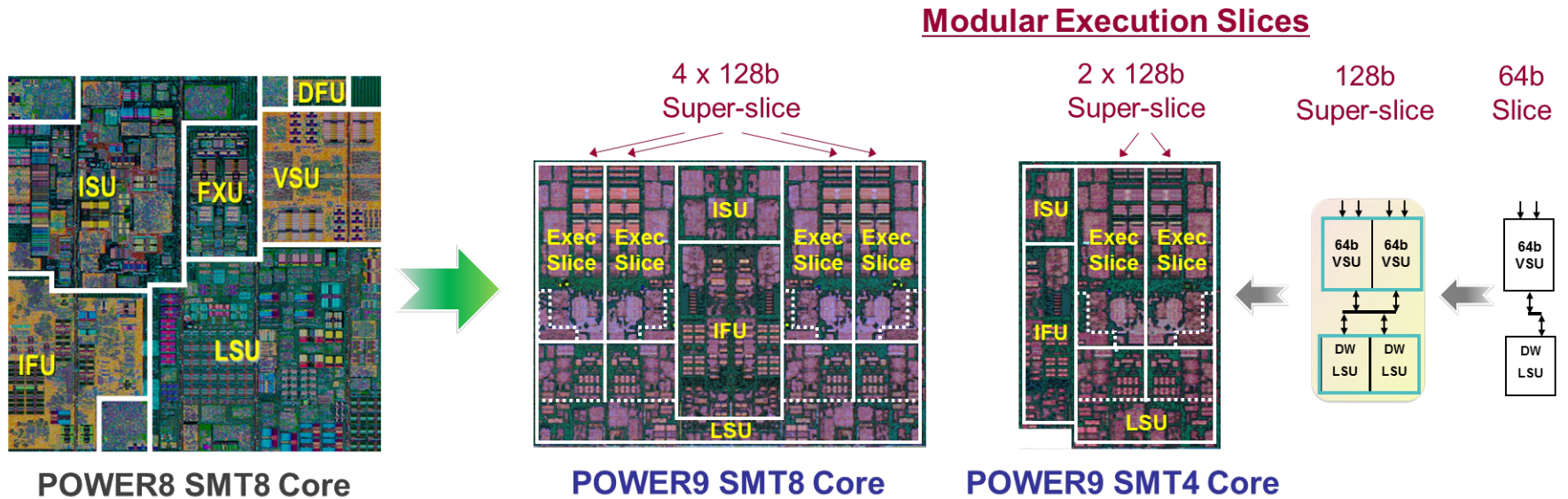
POWER9 SMT4 Core

- Linux Ecosystem Focus
- Core Count / Socket
- Virtualization Granularity



SMT4 Core

POWER9 Core Execution Slice Microarchitecture



Re-factored Core Provides Improved Efficiency & Workload Alignment

- Enhanced pipeline efficiency with modular execution and intelligent pipeline control
- Increased pipeline utilization with symmetric data-type engines: Fixed, Float, 128b, SIMD
- Shared compute resource optimizes data-type interchange

POWER9 Processor – Common Features

New Core Microarchitecture

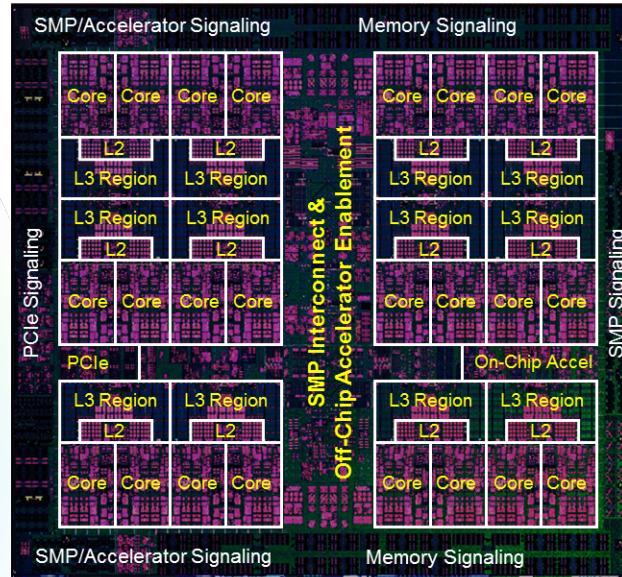
- Stronger thread performance
- Efficient agile pipeline
- POWER ISA v3.0

Enhanced Cache Hierarchy

- 120MB NUCA L3 architecture
- 12 x 20-way associative regions
- Advanced replacement policies
- Fed by 7 TB/s on-chip bandwidth

Cloud + Virtualization Innovation

- Quality of service assists
- New interrupt architecture
- Workload optimized frequency
- Hardware enforced trusted execution



14nm finFET Semiconductor Process

- Improved device performance and reduced energy
- 17 layer metal stack and eDRAM
- 8.0 billion transistors

Leadership

Hardware Acceleration Platform

- Enhanced on-chip acceleration
- Nvidia NVLink 2.0: High bandwidth, advanced new features
- CAPI 2.0: Coherent accelerator and storage attach (PCIe G4)
- New CAPI: Improved latency and bandwidth, open interface

State of the Art I/O Subsystem

- PCIe Gen4 – 48 lanes

High Bandwidth Signaling Technology

- 16 Gb/s interface
 - Local SMP
- 25 Gb/s interface – 25G Link
 - Accelerator, remote SMP

POWER9 Processor Family

Four targeted implementations

SMP scalability / Memory subsystem

Scale-Out – 2 Socket Optimized

Robust 2 socket SMP system

Direct Memory Attach

- Up to 8 DDR4 ports
- Commodity packaging form factor

Scale-Up – Multi-Socket Optimized

Scalable System Topology / Capacity

- Large multi-socket
- Additional lanes of 25G Link (96 total)

Buffered Memory Attach

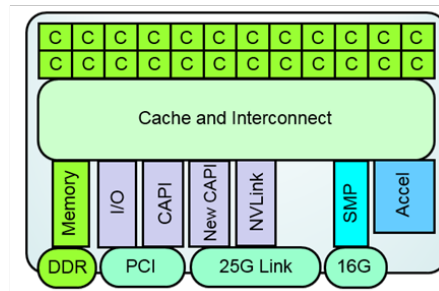
- 8 Buffered channels

Core Count / Size

SMT4 Core

24 SMT4 Cores / Chip

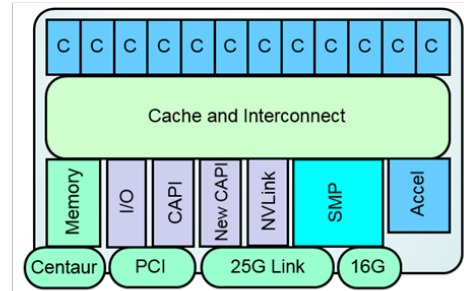
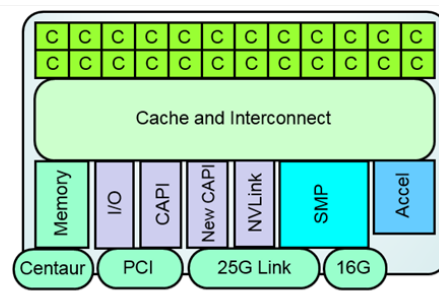
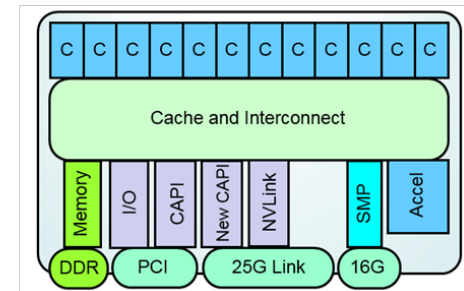
Linux Ecosystem Optimized



SMT8 Core

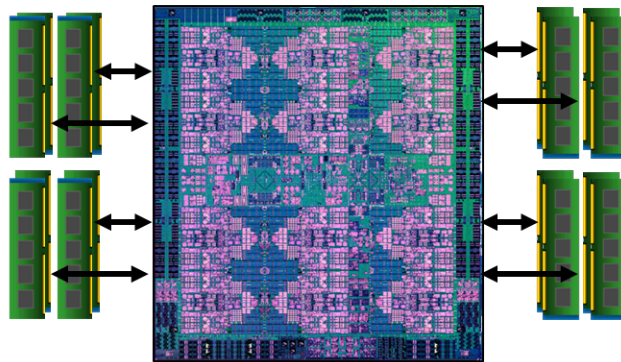
12 SMT8 Cores / Chip

PowerVM Ecosystem Continuity



POWER9 – Dual Memory Subsystems

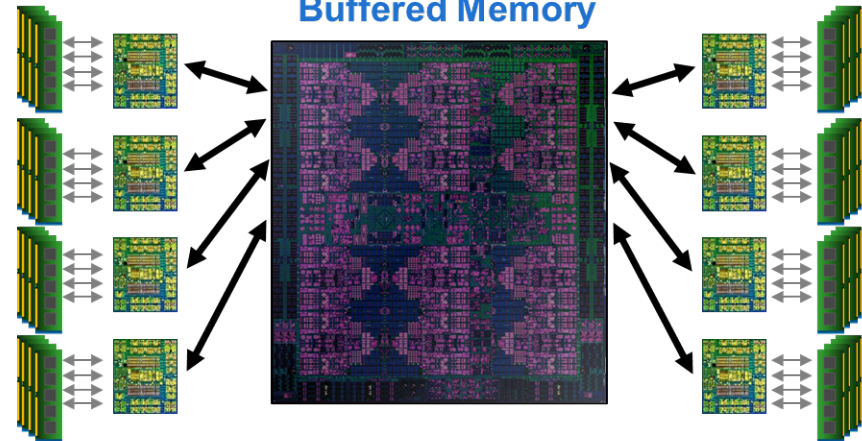
Scale Out Direct Attach Memory



8 Direct DDR4 Ports

- Up to 120 GB/s of sustained bandwidth
- Low latency access
- Commodity packaging form factor
- Adaptive 64B / 128B reads

Scale Up Buffered Memory



8 Buffered Channels

- Up to 230GB/s of sustained bandwidth
- Extreme capacity – up to 8TB / socket
- Superior RAS with chip kill and lane sparing
- Compatible with POWER8 system memory
- Agnostic interface for alternate memory innovations

POWER9 Core Pipeline Efficiency

Shorter Pipelines with Reduced Disruption

Improved application performance for modern codes

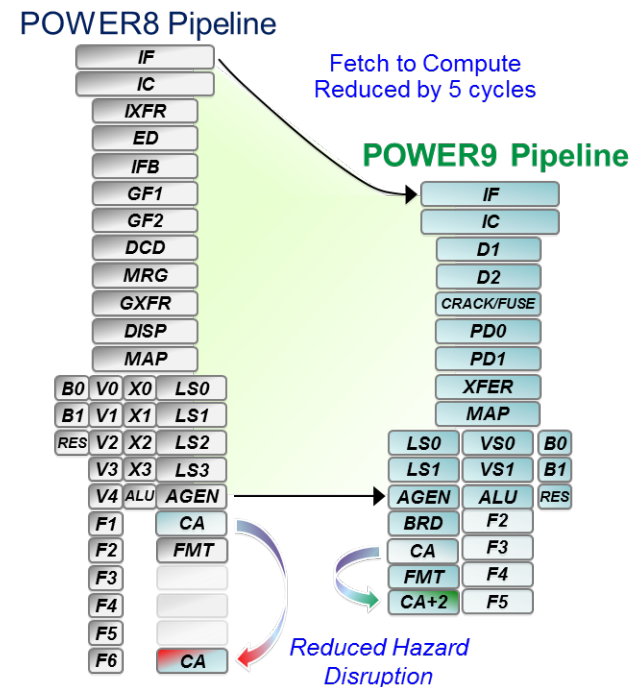
- Shorten fetch to compute by 5 cycles
- Advanced branch prediction

Higher performance and pipeline utilization

- Improved instruction management
 - Removed instruction grouping and reduced cracking
 - Enhanced instruction fusion
 - Complete up to 128 (64 – SMT4 Core) instructions per cycle

Reduced latency and improved scalability

- Local pipe control of load/store operations
 - Improved hazard avoidance
 - Local recycles – reduced hazard disruption
 - Improved lock management



POWER9 – Core Compute

SMT4 Core Resources

Fetch / Branch

- 32kB, 8-way Instruction Cache
- 8 fetch, 6 decode
- 1x branch execution

Slices issue VSU and AGEN

- 4x scalar-64b / 2x vector-128b
- 4x load/store AGEN

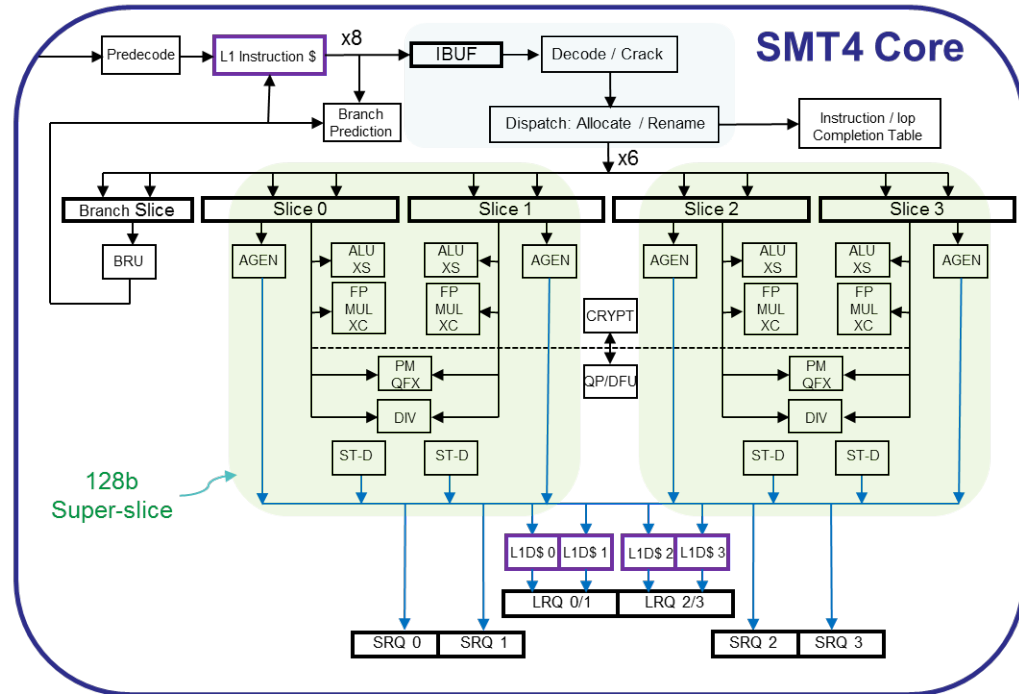
Vector Scalar Unit (VSU) Pipes

- 4x ALU + Simple (64b)
- 4x FP + FX-MUL + Complex (64b)
- 2x Permute (128b)
- 2x Quad Fixed (128b)
- 2x Fixed Divide (64b)
- 1x Quad FP & Decimal FP
- 1x Cryptography

Load Store Unit (LSU) Slices

- 32kB, 8-way Data Cache
- Up to 4 DW load or store

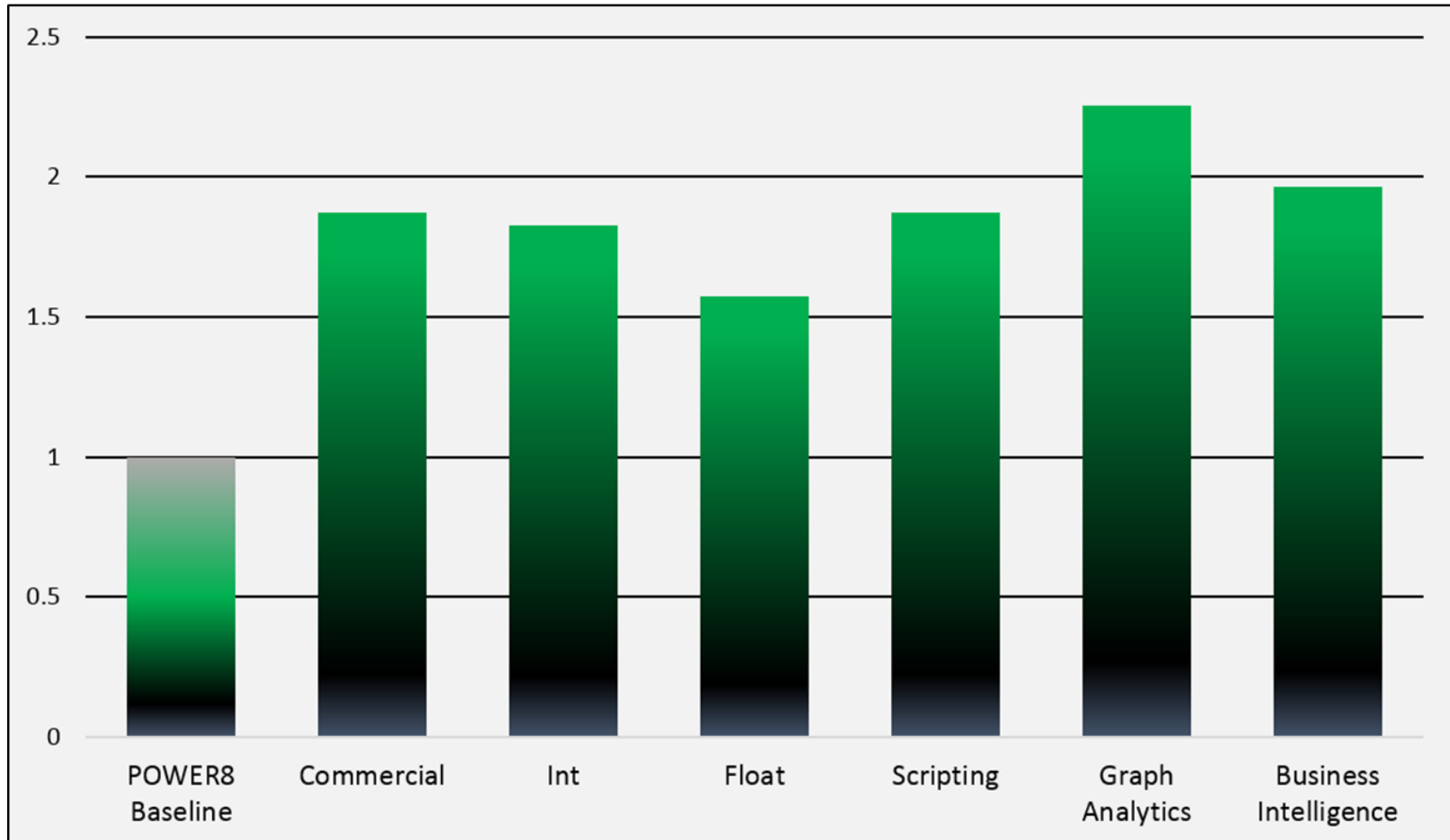
Symmetric Engines Per Data-Type for Higher Performance on Diverse Workloads



Efficient Cores Deliver 2x Compute Resource per Socket

POWER9 – CPU Core Performance

Socket Performance



Scale-Out configuration @ constant frequency

POWER ISA v3.0

New Instruction Set Architecture Implemented on POWER9

Broader data type support

- 128-bit IEEE 754 Quad-Precision Float – Full width quad-precision for financial and security applications
- Expanded BCD and 128b Decimal Integer – For database and native analytics
- Half-Precision Float Conversion – Optimized for accelerator bandwidth and data exchange

Support Emerging Algorithms

- Enhanced Arithmetic and SIMD
- Random Number Generation Instruction

Accelerate Emerging Workloads

- Memory Atomics – For high scale data-centric applications
- Hardware Assisted Garbage Collection – Optimize response time of interpretive languages

Cloud Optimization

- Enhanced Translation Architecture – Optimized for Linux
- New Interrupt Architecture – Automated partition routing for extreme virtualization
- Enhanced Accelerator Virtualization
- Hardware Enforced Trusted Execution

Energy & Frequency Management

- POWER9 Workload Optimized Frequency – Manage energy between threads and cores with reduced wakeup latency

POWER 

POWER9 – Data Capacity & Throughput

Big Caches for Massively Parallel Compute and Heterogeneous Interaction

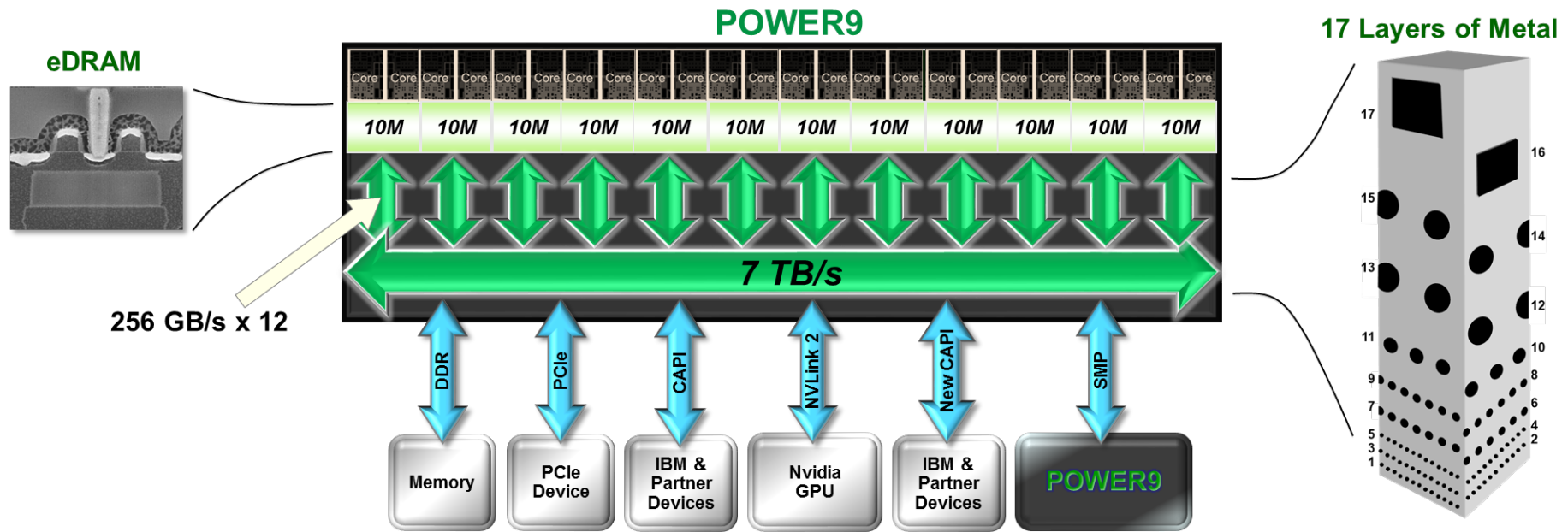
Extreme Switching Bandwidth for the Most Demanding Compute and Accelerated Workloads

L3 Cache: 120 MB Shared Capacity NUCA Cache

- 10 MB Capacity + 512k L2 per SMT8 Core
- Enhanced Replacement with Reuse & Data-Type Awareness
12 x 20 way associativity

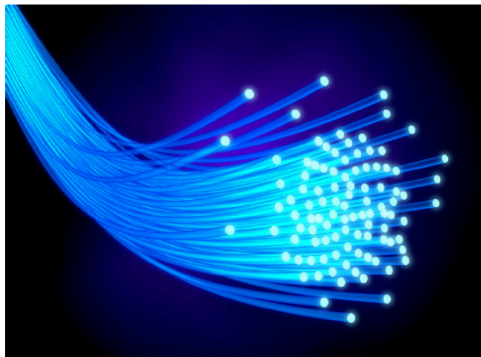
High-Throughput On-Chip Fabric

- Over 7 TB/s On-chip Switch
- Move Data in/out at 256 GB/s per SMT8 Core

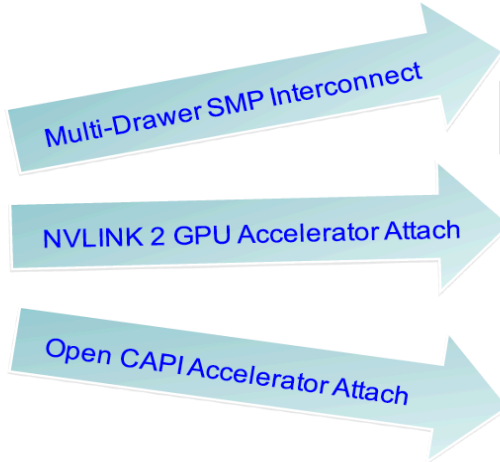




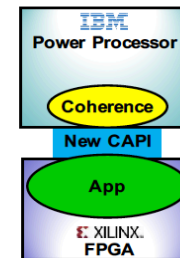
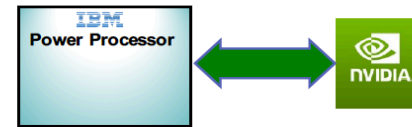
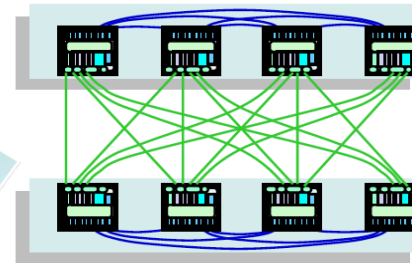
Modular Constructs → High-speed 25 Gb/s Signaling



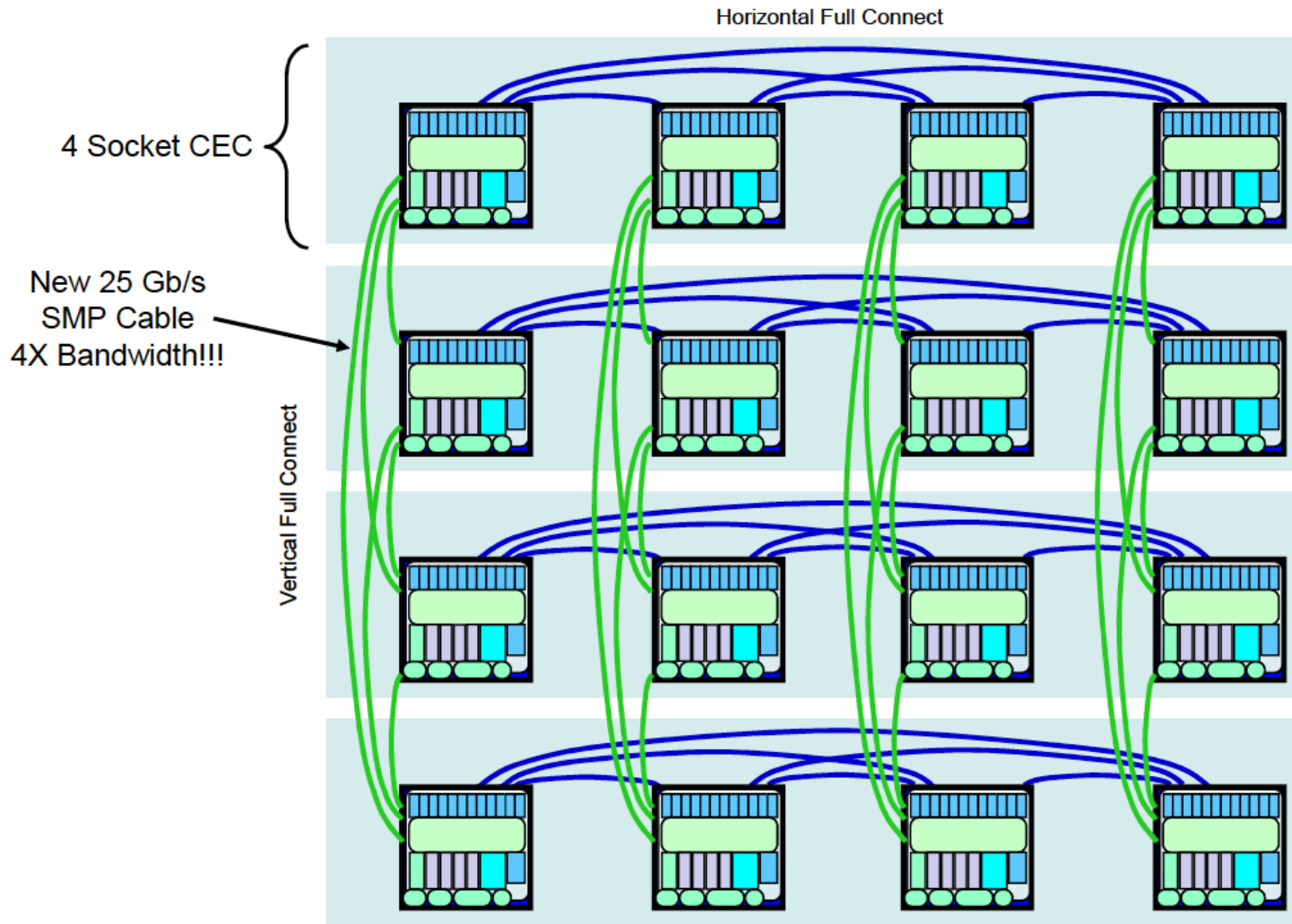
Utilize Best-of-Breed
25 Gb/s Optical-Style
Signaling Technology



Flexible & Modular
Packaging
Infrastructure



16 Socket 2-Hop POWER9 Enterprise System Topology

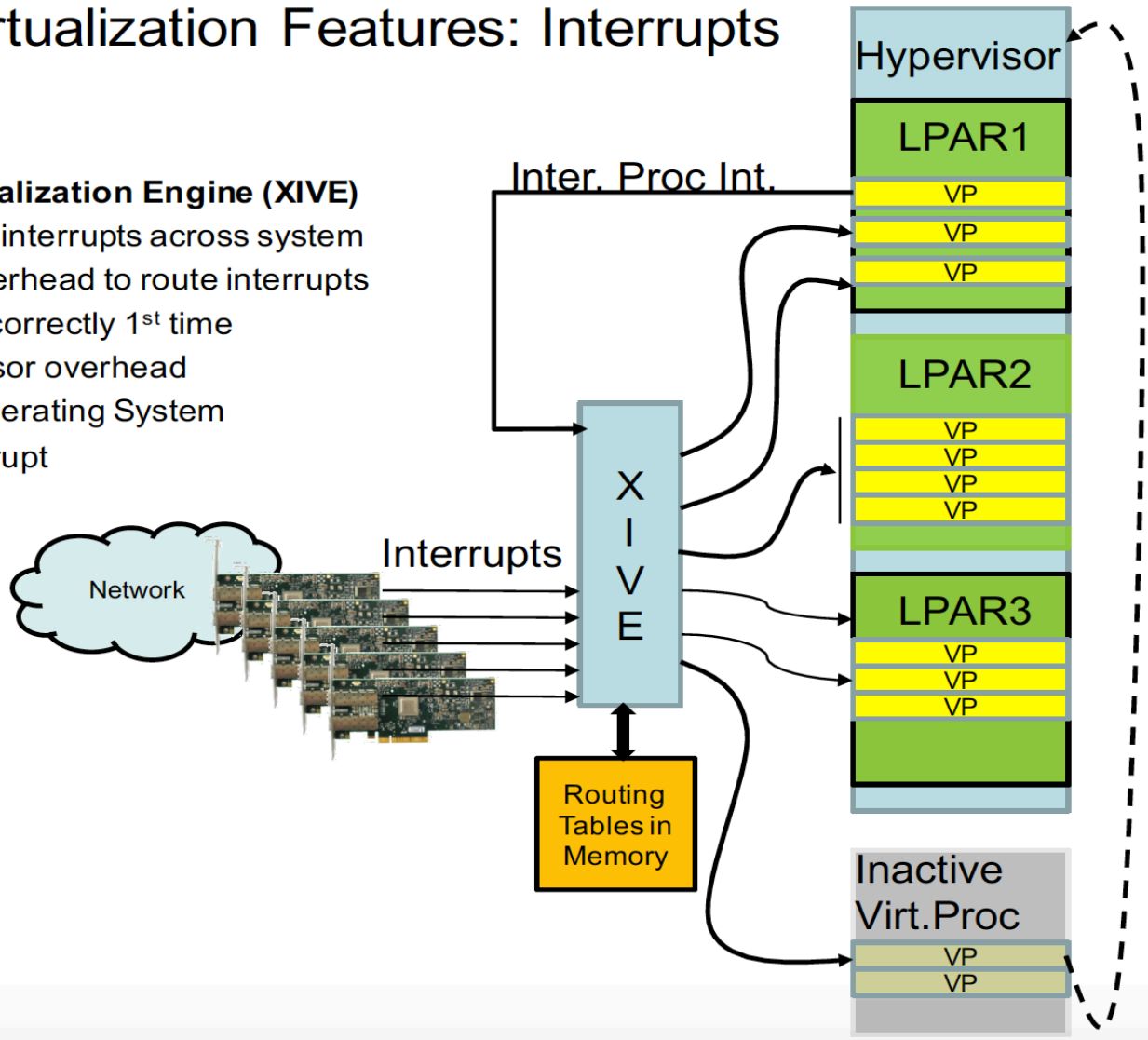




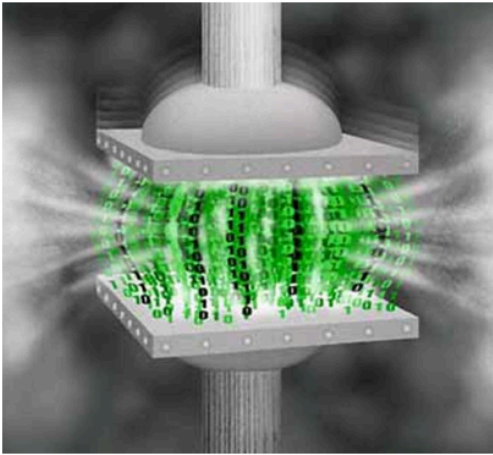
Platform Virtualization Features: Interrupts

New External Interrupt Virtualization Engine (XIVE)

- Prior processors distributed interrupts across system
 - Significant Software overhead to route interrupts
- New XIVE hardware routes correctly 1st time
 - Eliminates host processor overhead
 - Directly target guest Operating System
 - Enable User level Interrupt



Platform Virtualization Features: Accelerators



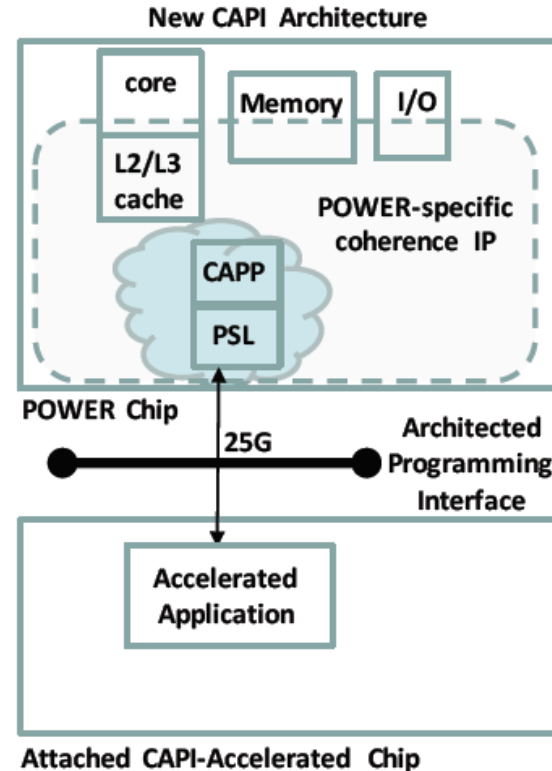
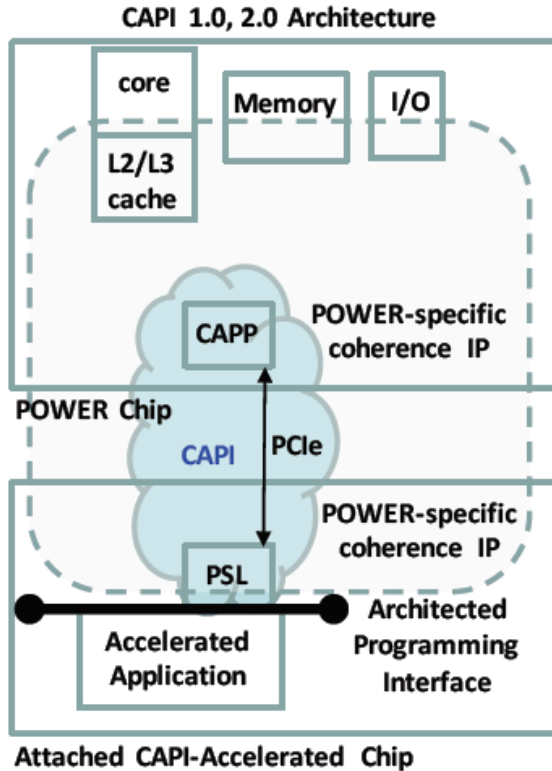
On-Processor Accelerators

- Virtualized: User mode invocation (No Hypervisor Calls)
- Industry Standard GZIP Compression / Decompression
- AES Cryptography Support
- True Random Number Generation
- Data Mover





Open Innovation Interfaces: Open CAPI



Open Industry Coherent Attach

- Latency / Bandwidth Improvement
- Removes Overhead from Attach Silicon
- Eliminates "Von-Neumann Bottleneck"
- FPGA / Parallel Compute Optimized
- Network/Memory/Storage Innovation



POWER9 – Premier Acceleration Platform

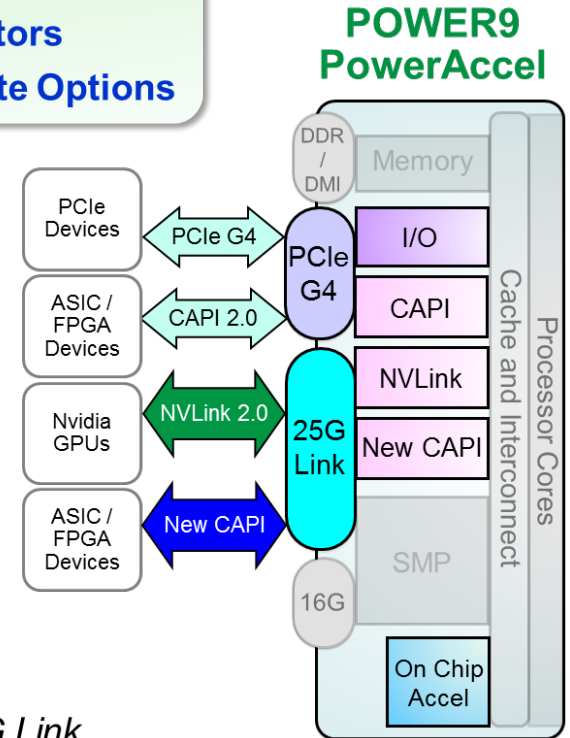
- Extreme Processor / Accelerator Bandwidth and Reduced Latency
- Coherent Memory and Virtual Addressing Capability for all Accelerators
- OpenPOWER Community Enablement – Robust Accelerated Compute Options

• **State of the Art I/O and Acceleration Attachment Signaling**

- PCIe Gen 4 x 48 lanes – 192 GB/s duplex bandwidth
- 25G Link x 48 lanes – 300 GB/s duplex bandwidth

• **Robust Accelerated Compute Options with OPEN standards**

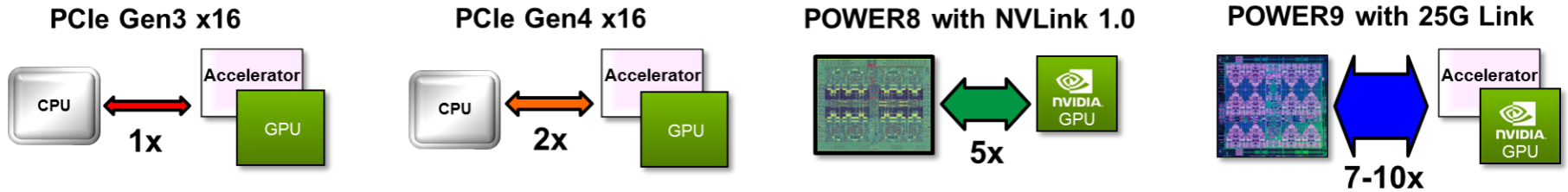
- On-Chip Acceleration – Gzip x1, 842 Compression x2, AES/SHA x2
- CAPI 2.0 – 4x bandwidth of POWER8 using *PCIe Gen 4*
- NVLink 2.0 – Next generation of GPU/CPU bandwidth and integration
- New CAPI – High bandwidth, low latency and open interface using *25G Link*





POWER9 – Ideal for Acceleration

Extreme CPU/Accelerator Bandwidth



Seamless CPU/Accelerator Interaction

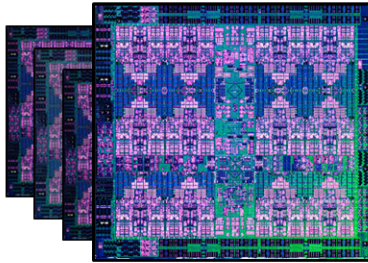
- Coherent memory sharing
- Enhanced virtual address translation
- Data interaction with reduced SW & HW overhead

Broader Application of Heterogeneous Compute

- Designed for efficient programming models
- Accelerate complex analytic / cognitive applications



POWER9 Processor



Built for the Cognitive Era



Enhanced Core and Chip Architecture for Emerging Workloads

- New Core Optimized for Emerging Algorithms to Interpret and Reason
- Bandwidth, Scale, and Capacity, to Ingest and Analyze

Processor Family with Scale-Out and Scale-Up Optimized Silicon

- Enabling a Range of Platform Optimizations – from HSDC Clusters to Enterprise Class Systems
- Extreme Virtualization Capabilities for the Cloud

Premier Acceleration Platform

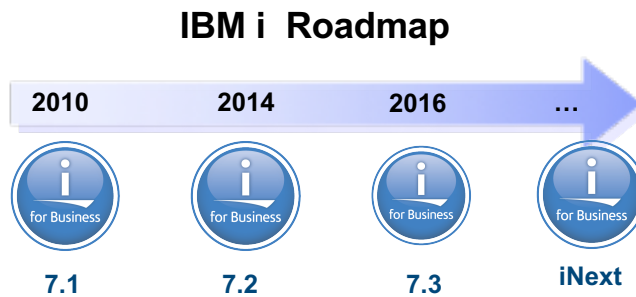
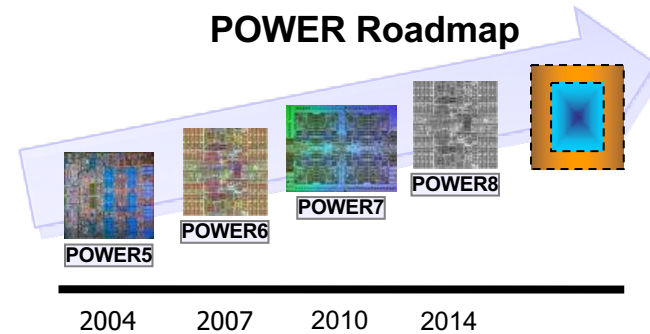
- Heterogeneous Compute Options to Enable New Application Paradigms
- State of the Art I/O
- Engineered to be Open

IBM POWER9 Systems Availability

- Late 2017
 - First IBM POWER9 Systems (no IBM i support)

- Early 2018
 - IBM POWER9 Systems supporting IBM i

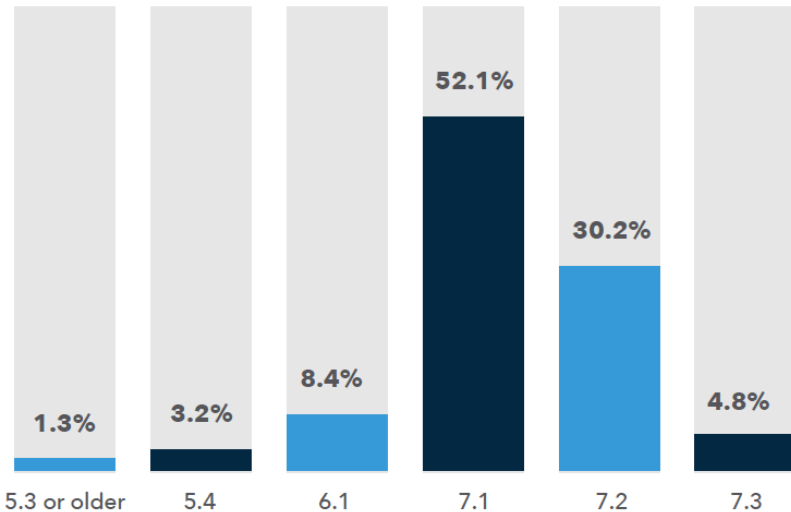
The Future of IBM i - The Roadmaps



	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
VSR4																					
IBM i 6.1																					
IBM i 7.1																					
IBM i 7.2																					
IBM i 7.3																					
IBM i Next																					
IBM i Next + 1																					

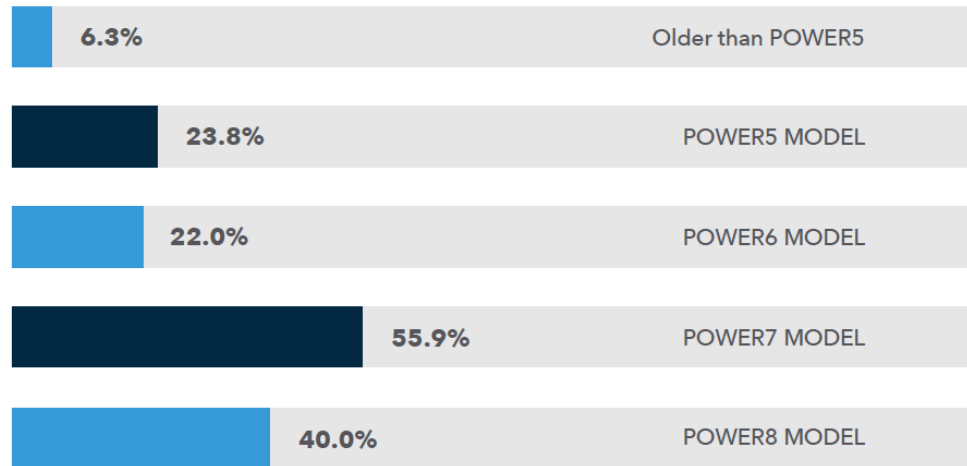
IBM i marketplace by HelpSystems 2017

What version of IBM i is your primary operating system level?



- IBM i 7.1 is once again most popular IBM i version
- Use of 7.2 has grown considerably since last year (14,5%)

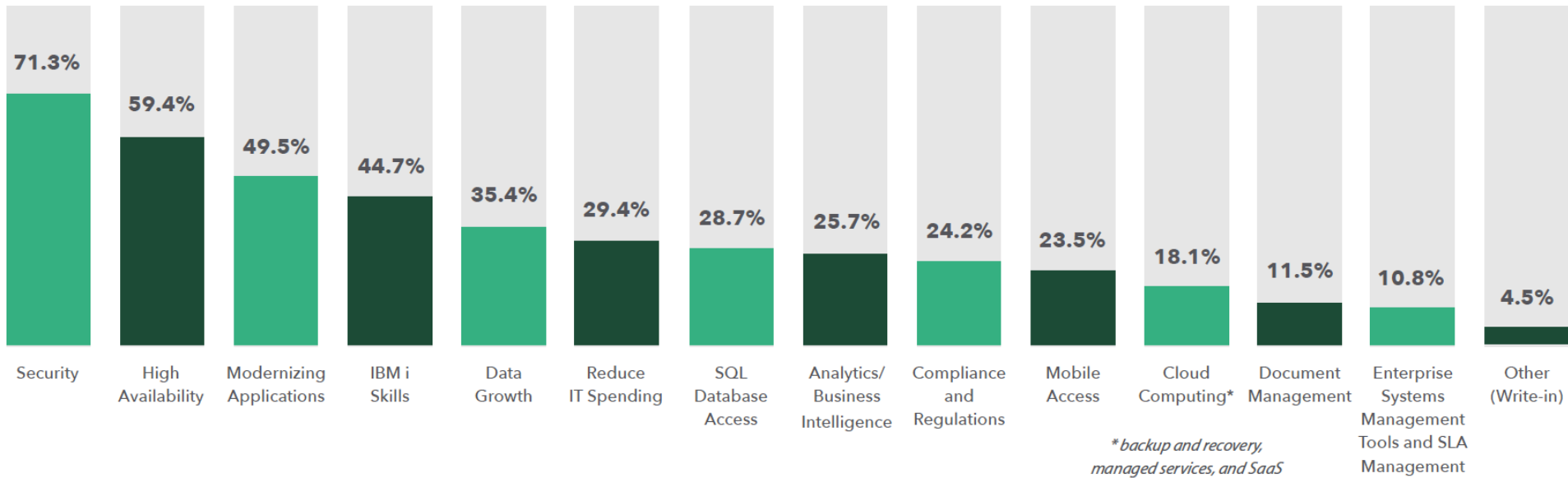
What IBM Power servers do you own?



- POWER8 has significantly increased over last year from 23% to 40%

HelpSystems – Top concerns

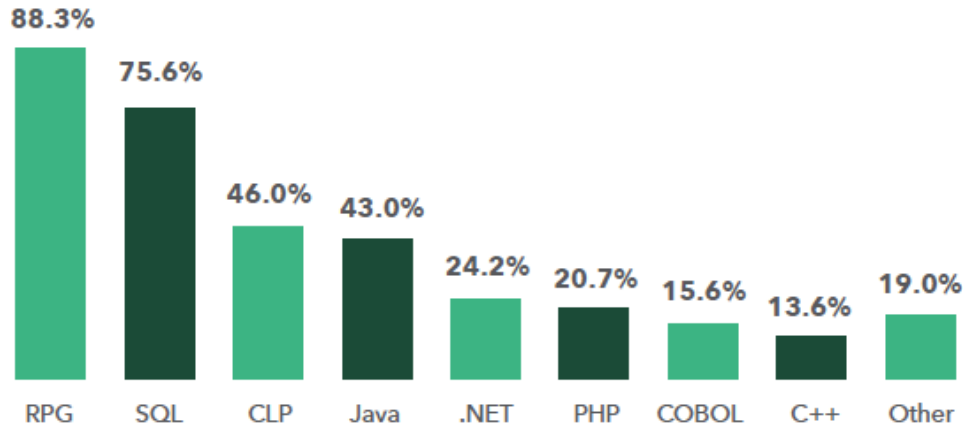
What are your top concerns as you plan your IT environment? Check all that apply.



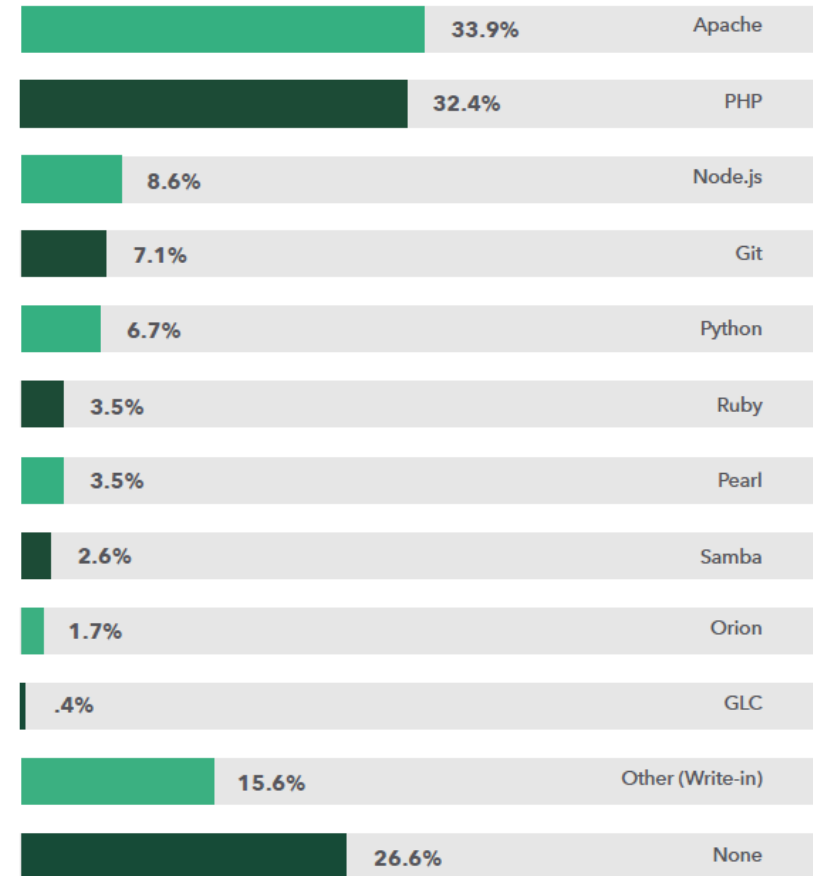
- Explosive growth on security concerns from 33,1% last year
- High Availability and IBM i skills get increased attention
- Modernizing applications and data growth concerns stay flat

Development languages & tools

What development languages do you use today for new development? Check all that apply.

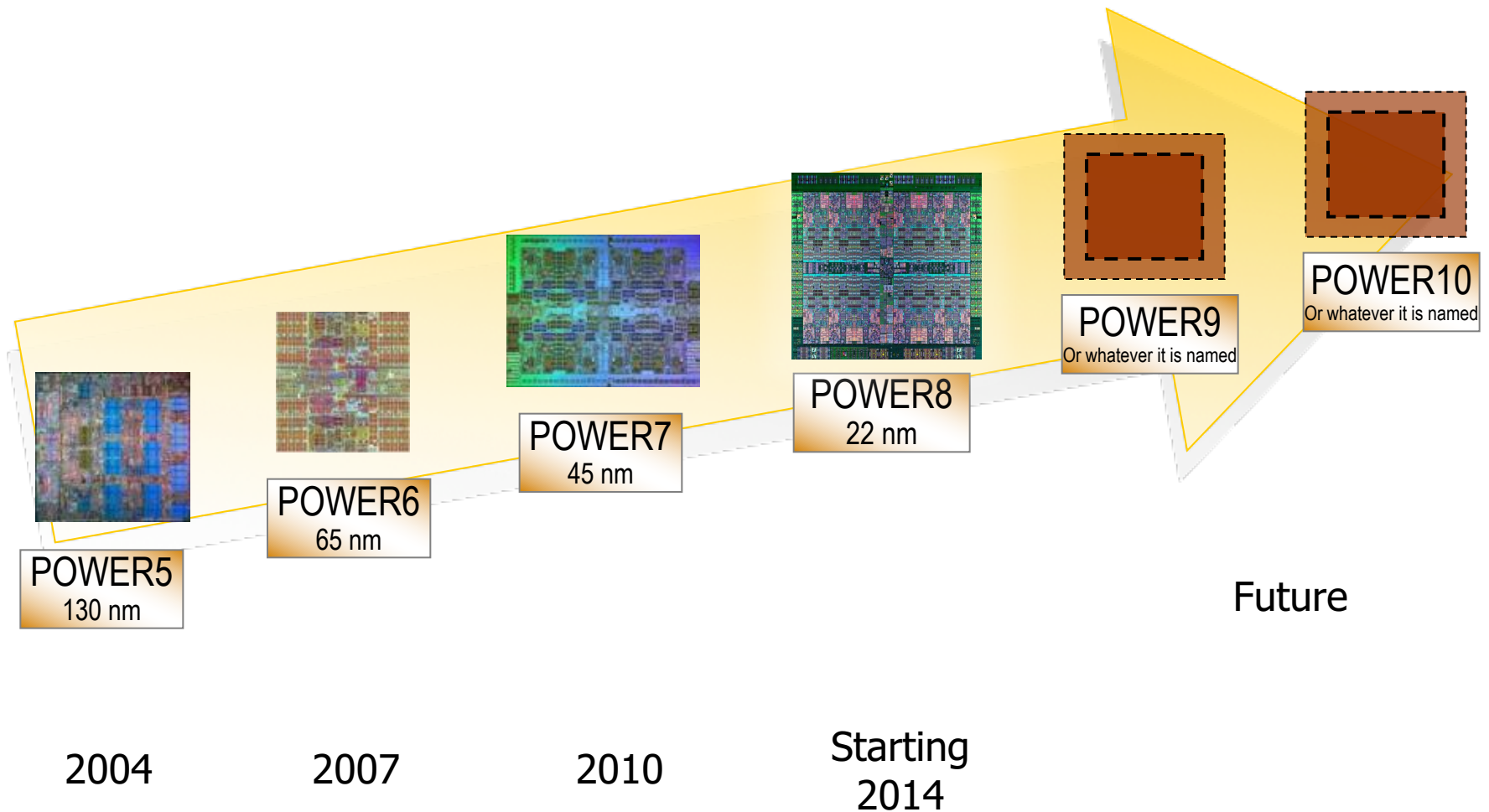


What open source development tools are you using for IBM i apps? Check all that apply.





Processor Technology Roadmap



IBM i Roadmap



- Three Major Releases supported
- Two future Major Releases under development
- Semi-annual Technology Refreshes for additional non-disruptive new function

IBM i Strategy Whitepaper | 2016



“IBM i plays a critical role in our Power Systems software portfolio.



We continuously provide new solutions and are actively engaged in expanding into new technology areas to support the new business requirements of our clients.”

<https://www-03.ibm.com/systems/power/software/i/smartpaper/>

Doug Balog
General Manager, Power Systems

IBM i – IBM Commitment



June 27, 2016

"Many of our largest clients run their critical workloads on IBM i, and I don't see that fundamentally changing," Balog says.

"We have a long roadmap that goes out at least 10 years from a development standpoint, and it is only 10 years because I can't see beyond 10. We will keep innovating and providing capabilities around IBM i.

Doug Balog
General Manager, Power Systems

IBM i Strategy

Power Solutions

- Delivering an integrated platform focused on leading industry applications
- Providing flexible solutions delivery options for ISVs and MSPs
- Enabling clients to transform their customer experience via mobile solutions



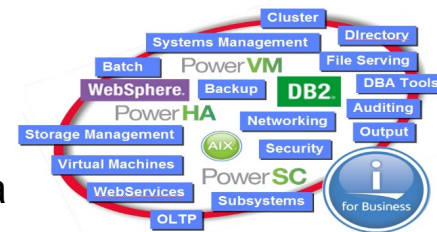
Open Platform for Choice

- IBM delivered IBM i 7.3 in 2016, confirming commitment
- Growing IBM i solutions options including open source languages and applications
- Extending IBM i solutions portfolio with Linux and AIX application choices

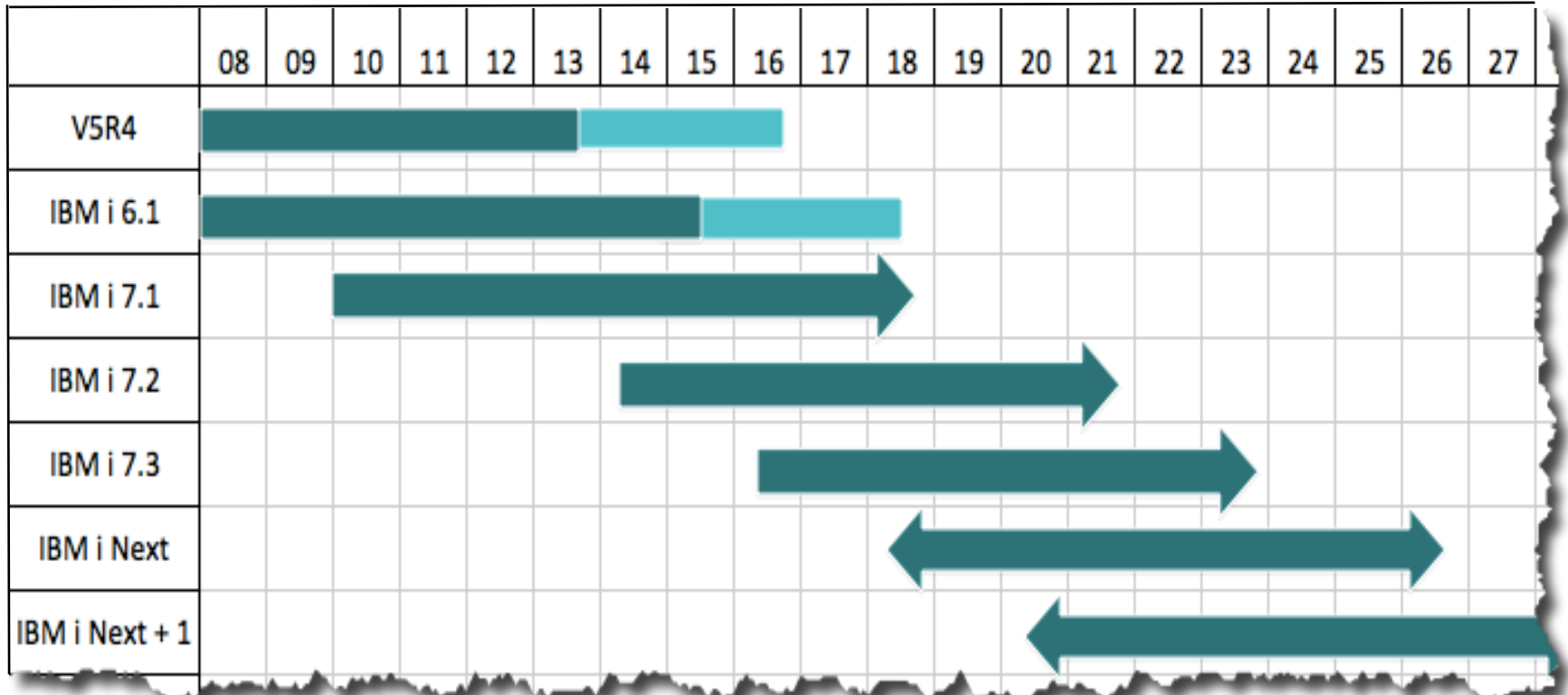



The *Integrated* Promise of IBM i

- Deliver a simple, high value platform for business applications
- Provide exceptional security and resiliency for critical business data
- Leverage IBM systems, storage and software technologies



IBM i Support Roadmap



 Normal Software maintenance - SWMA

 Extended support

IBM i 7.1 support will end on April 30, 2018 – extended support might be available

** Arrows indicate general timeframes, not specific dates.

** All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Top IBM i Client Projects



New Insights from Business Data

HA/DR



Cloud infrastructure

**Modern technology
for existing solutions**



**Security in Mobile,
Cloud, Shared**

**Exploit
Storage**



IBM i Priorities

- **Solutions for Today and the Future**
 - Focus on solutions integration with new technology
 - Invest in DB2 and language features for strategic solutions
 - Enable Mobile Device Support
- **Systems On-Site or In the Cloud**
 - Exploit future POWER system technology
 - Deliver advanced virtualization of system & storage
 - Provide resiliency, availability & flexibility
- **Simple & Integrated, Secure & Available**
 - Simplify management of systems and high availability
 - Broaden storage area network integration
 - Extend industry-leading integrated security



#ibmiOSS

PowerVM

PowerVC

PowerHA



IBM i Application Languages Strategy

- RPG is the most commonly used language on IBM i so
 - Enable RPG as a powerful, modern procedural language
 - Partner for tools which transform older RPG to modern RPG
 - Work with partners & schools to teach RPG to non-RPG developers quickly
- Extensive skills and catalogs of solutions exist for business in other languages
 - Support key industry languages and programming models on IBM i
 - Ensure those new approaches can integrate with existing IBM i solutions
 - Enable tools for development, debug, lifecycle – from IBM and from partners

RPG





Jean-Luc Bonhomme
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*New Technology Introduction
POWER Systems & IBM i
IBM Client Center Montpellier
France*

