



# POWER TO THE NEXT GENERATION WORKLOAD

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IBM Business Development Power Systems



#RedHatOSD

# IBM e Red Hat: una partnership strategica

“Riteniamo che Red Hat Enterprise Linux combinato alla generazione più recente di sistemi IBM Power, costituisca una scelta eccellente per gli ambienti aziendali che richiedono soluzioni ad alto impatto, in grado di ottimizzare le prestazioni e introdurre innovazione, scelta e flessibilità.

JIM TOTTON, VICE PRESIDENT, PLATFORM BUSINESS UNIT, RED HAT

“L'elaborazione dei Big Data richiede numerosi processori e thread per distribuire le query per le analisi parallele. Questi carichi di lavoro hanno anche bisogno di cache e spazi di memoria di grandi dimensioni per fornire il miglior contesto per le informazioni aziendali. Sul cloud o on-premise, la larghezza di banda della rete con riduzione della latenza è un fattore critico per queste nuove esigenze.

DOUG BALOG, GENERAL MANAGER, SISTEMI IBM POWER

## Una roadmap aperta focalizzata sull'innovazione

<https://www.redhat.com/it/partners/strategic-alliance/red-hat-and-ibm>



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# AGENDA

IBM e Open source

Il consorzio OpenPOWER

Soluzioni per la piattaforma Power

Ma... cosa è il Power?



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# IBM e Open Source

## **IBM è tra i maggiori contributori alle comunità open**

- Nel 1999, solo 5 persone IBM erano coinvolte nei progetti Linux e Apache
- Oggi oltre 50.000 persone IBM contribuiscono a oltre 150 organizzazioni open: Apache, Eclipse, OpenStack, Docker, Hadoop...

## **IBM partecipa all'ODPi**

Importante contribuzione agli standard per lo sviluppo di soluzioni di big data

## **IBM membro Platinum di OpenStack**

Un continuo contributo di risorse e investimenti significativi per il successo della community e del codice

## **Prodotti di punta IBM rilasciati in 'Versione Community'**

Esempio: Application server, Enterprise bus, MQ per la messaggistica...

## **Rilascio dei progetti per processore POWER**

Per migliorare le componenti tecnologiche e aumentare la diffusione della piattaforma

<https://www.ibm.com/middleware/it-it/knowledge/application-platform/open-source.html>



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# Il consorzio OpenPOWER



# Consorzio OpenPOWER



Soci  
Fondatori

Agosto 2013

<http://openpowerfoundation.org/>



# Consorzio OpenPOWER: anche Red Hat nel CdA

<https://openpowerfoundation.org/membership/current-members/>



320+

Members

31

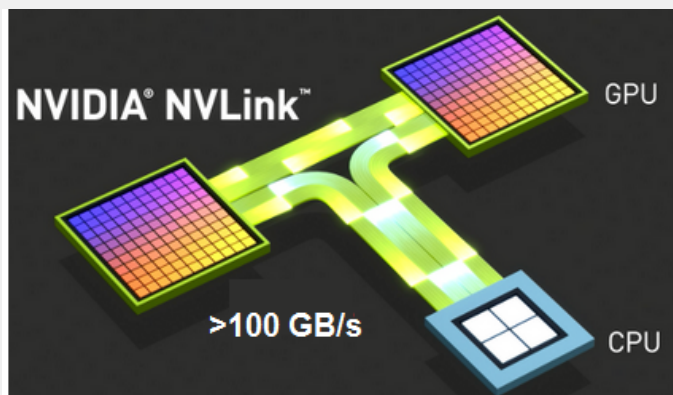
Countries

60+

ISVs



# Risultati Tangibili: tecnologia Nvlink



The journey that started four years ago, when IBM partnered with NVIDIA to embed a high-speed connection, [NVLink](#), between the IBM POWER8 CPU and the NVIDIA Tesla P100 GPU accelerator, has reached its first major milestone.

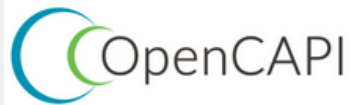
This platform resolves one of GPU computing developers' and users' fundamental pain points: keeping massively parallel GPUs fed with data.

<https://www.ibm.com/blogs/systems/ibm-nvidia-present-nvlink-server-youve-waiting>





# Risultati Tangibili: tecnologia OpenCAPI



**Ottobre 2016: nasce il Consorzio OpenCAPI**

Con AMD, Google, IBM, Mellanox Technologies, Micron

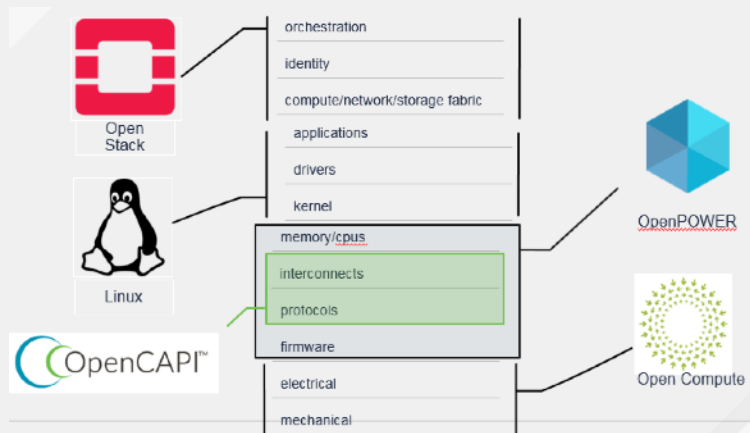
Bus Interface ad alte performance, coerente con standard Open

**OBIETTIVO:**

Superare i colli di bottiglia degli attuali bus  
(Carichi accelerati, soluzioni a intenso uso di memoria...)

Facilitare i carichi

<http://opencapi.org/>



# Risultati Tangibili: progetto Zaius (a cura di Google e IBM)



[Introducing Zaius, Google and Rackspace's open server running IBM POWER9](#)

[Google's data center has IBM inside](#)

[Articolo di Forbes](#)

Why, and for what, is Google using POWER9 processors? Google found that the performance of its web search algorithm, the heart and soul of the company, scaled well with both the number of cores and the number of threads available to it.

IBM's POWER9 processor is a many-core, many-thread beast.

POWER architecture's biggest advantage has always been in its acceleration capabilities



# Risultati Tangibili: il progetto D.A.V.I.D.E. di CINECA



<http://www.hpc.cineca.it/content/davide>



D.A.V.I.D.E. entered the TOP500 and GREEN500 list in June 2017  
Prodotto sviluppato dal Consorzio

**D.A.V.I.D.E.:** (Development of an Added Value Infrastructure Designed in Europe) represents the third generation of the European Prace Pre-Commercial Procurement (PCP) project to develop a Whole-System Design for Energy Efficient HPC. It is the energy-aware, **Peta flops Class High Performance Cluster** based on OpenPOWER servers and featuring liquid cooling and an innovative technology for monitoring and capping the power consumption, developed by E4 Computer Engineering and installed at CINECA. D.A.V.I.D.E. The system entered into production in January 2018.

# Risultati Tangibili: il progetto Summit del D.O.E. e IBM



<https://www.tomshw.it/summit-nuovo-supercomputer-spazza-via-concorrenza-94896>

+ Potenza

- Consumo di energia

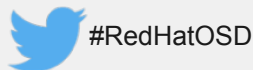


potenza di picco = 200 petaflop

- 4608 nodi, ciascuno con due CPU Power9 e sei GPU Nvidia Tesla V100
- Collegati con rete Mellanox dual-rail EDR InfiniBand
- Per da offrire 200 Gbps verso ogni server

Summit sarà usato dai ricercatori per simulazioni nell'ambito della fusione, delle fonti di energia alternative, nella scienza dei materiali, sugli studi climatici, sulla chimica...

E stanno già pensando al Sierra



# e... qualcosa che sia più vicino a noi?

## Il mondo accademico

### Politecnico di Milano

- Tecnologia Power per soluzione di big data con Hortonwork – Hadoop - Spark
- Centro per l'innovazione dedicato ai big data Scopo accademico –
- Preparare i nuovi professionisti
- Progetti di ricerca con entità esterne

### INAF - Istituto Nazionale di Astrofisica

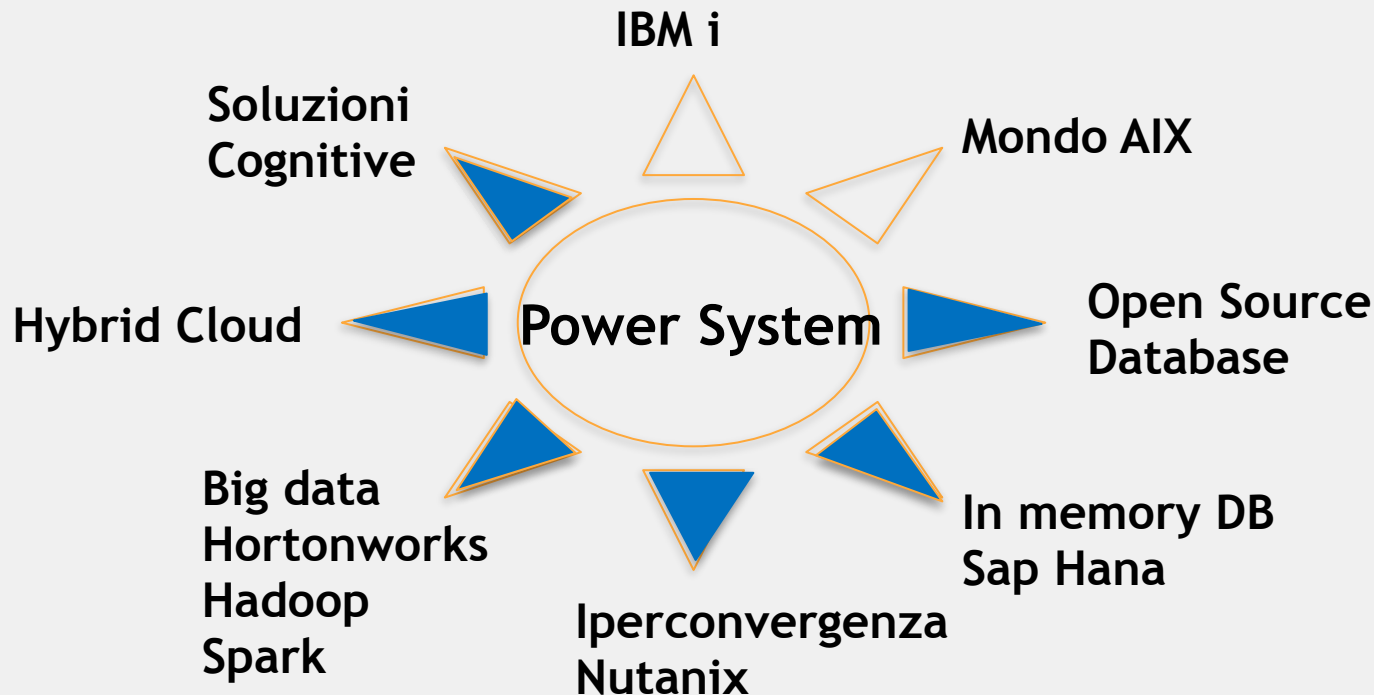
- Tecnologia POWER per analisi complete in tempo reale dei raggi Gamma su cui si concentra il CTA (complesso di 100 telescopi)
- In caso di problemi deve dare segnalazioni immediate
- OpenPOWER membership

# Soluzioni per la Piattaforma Power



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# Il poliedrico mondo del Power



# IBM PowerAI - Soluzioni Cognitive

<https://www.ibm.com/it-infrastructure/power/accelerated-computing>

## Open-Source AI Offering Ease of Use & Performance

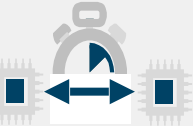
AC922  
System



Developer Ease-of-Use Tools



Open Source Frameworks: Supported Distribution

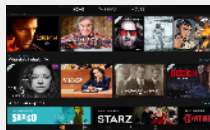


Faster Training via  
HW & SW Performance Optimization

- **5.6x more data throughput vs. PCIe Gen3** with NVIDIA NVLink optimization to the core
- **2x bandwidth** with PCIe Gen4 vs. PCIe Gen3
- **Access up to 2TB of system memory** delivered with coherence...only on POWER!
- **Superior data transfer to multiple devices**  
25G Links to OpenCAPI GPU devices
- **GPU ↔ CPU and GPU ↔ GPU speed-up**  
not just GPU ↔ GPU



# Casi d'uso: applicazioni in ogni settore d'industria



Automotive and Transportation	Broadcast, Media and Entertainment	Consumer Web, Mobile, Retail	Security and Public Safety	Medicine and Biology
<ul style="list-style-type: none"> <li>Autonomous driving:</li> <li>Pedestrian detection</li> <li>Accident avoidance</li> </ul> <p>Auto, trucking, heavy equipment, Tier 1 suppliers (Hyundai, Toyota, Komatsu, General Motors, Volvo)</p>	<ul style="list-style-type: none"> <li>Captioning</li> <li>Search</li> <li>Recommendations</li> <li>Real time translation</li> </ul> <p>Consumer facing companies with large streaming of existing media, or real time content</p>	<ul style="list-style-type: none"> <li>Image tagging</li> <li>Speech recognition</li> <li>Natural language</li> <li>Sentiment analysis</li> </ul> <p>Hyperscale web companies, large retail (Google photos, Twitter, Woolworths, Aeon)</p>	<ul style="list-style-type: none"> <li>Video Surveillance</li> <li>Image analysis</li> <li>Facial recognition and detection</li> </ul> <p>Local and national police, public and private safety/ security (ADT, IViz, Pinkerton, Sentry)</p>	<ul style="list-style-type: none"> <li>Drug discovery</li> <li>Diagnostic assistance</li> <li>Cancer cell detection</li> </ul> <p>Pharmaceutical, Medical equipment, Diagnostic labs (Takeda, Asian Pharma, Pfizer)</p>

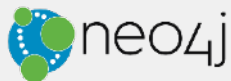


<https://www.ibm.com/blogs/systems/ibm-and-h2o-ai-machine-learning-ibm-power-systems/>

# I dati al centro delle applicazioni



Hadoop



spark

## Vantaggi

Prestazioni elevate

Price/Performance  
concorrenziale

Opzione di Supporto  
IBM

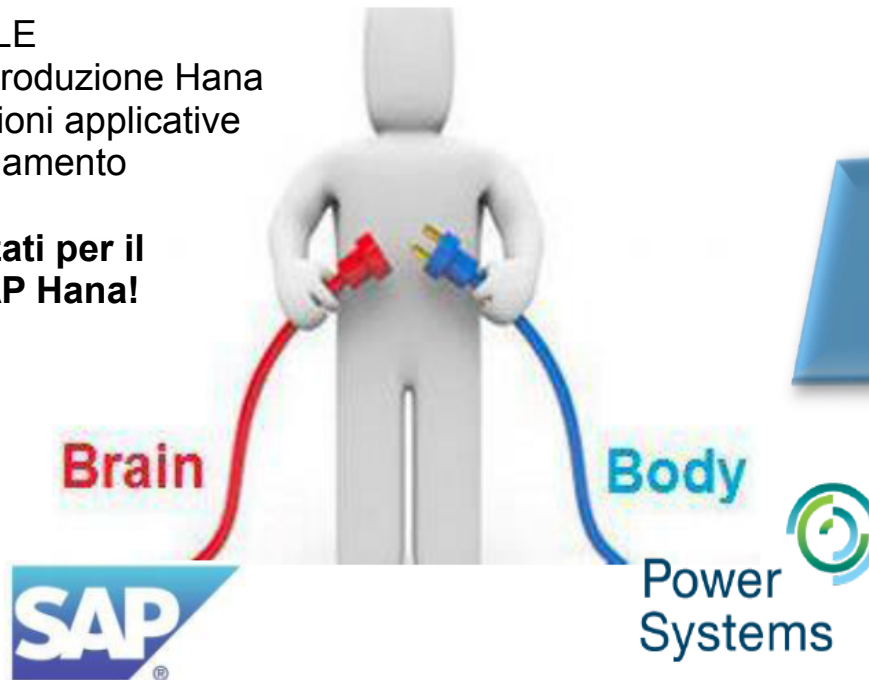
Nessun vincolo con  
software proprietari

<https://developer.ibm.com/linuxonpower/open-source-pkgs/>

# Infrastruttura Power per SAP Hana

- Da SAP HANA 2.0 in LE
- Fino a 8 partizioni di produzione Hana
- Più tutte le altre partizioni applicative
- Alto fattore di consolidamento

**Server specifici ottimizzati per il database in-memory SAP Hana!**

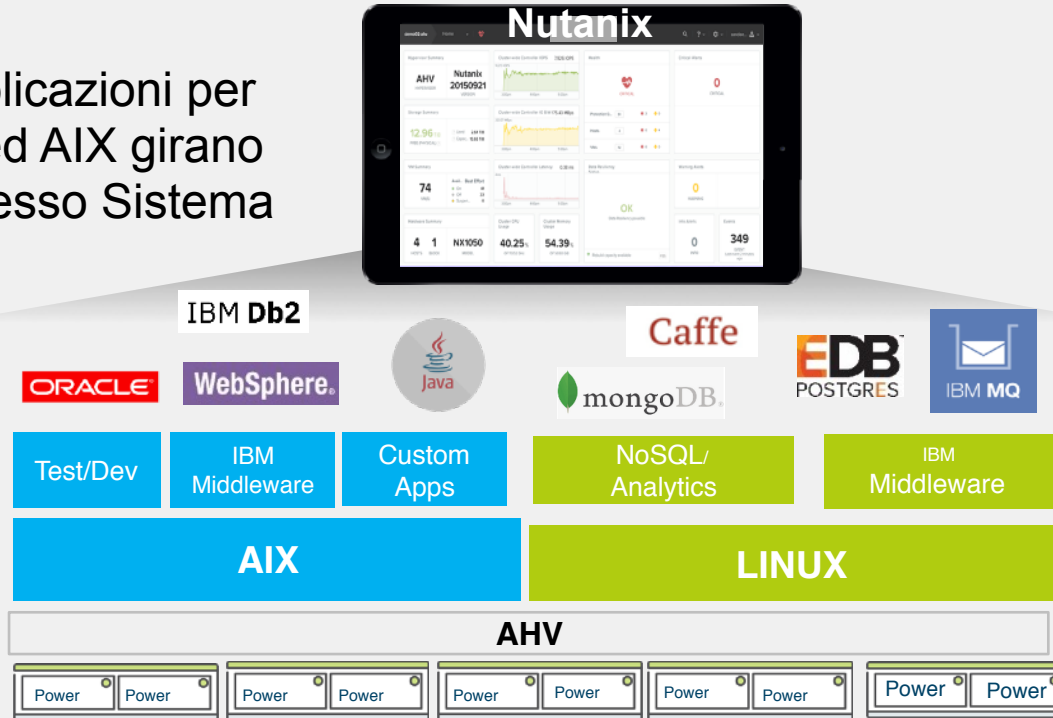


**Resilient  
Performant  
Flexible**



# Soluzioni di iperconvergenza: Nutanix on Power

Le applicazioni per Linux ed AIX girano sullo stesso Sistema



**con la stessa  
operatività di  
sempre**

Prism

Nutanix  
Acropolis

**Price/performance  
concorrenziale**

# IBM Cloud Private Basics

*Built with open standards*



Executable package of software that includes everything needed to run it



Automate deployment, scaling, and management of containerized applications



Define, install, and upgrade Kubernetes applications



Infrastructure as code to provision public cloud and on-premises environments

Runs on existing IaaS:



IBM Spectrum

Dell, Cisco, NetApp, Lenovo, ...



# Sinergia tra OpenShift e IBM Cloud Private (ICP)

## Accordo con OpenShift

- Benefici nell'adozione combinata delle due tecnologie
- Entrambe utilizzabili per il cloud pubblico e privato
- Avere una piattaforma integrata per app dockerizzate
- Il middleware IBM in versione docker certificata per OpenShift
- Massimizzare gli investimenti tecnologici già fatti



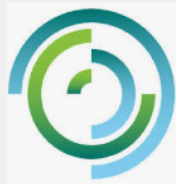
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- Docker
- Infrastructure integration
- Multi-cloud management
- Innovation
- modernization

<https://newsroom.ibm.com/2018-05-08-IBM-and-Red-Hat-Join-Forces-to-Accelerate-Hybrid-Cloud-Adoption>

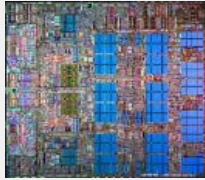
Ma... cos'è il Power?



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# POWER - Continuous System Innovation

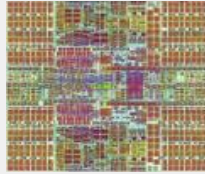
2004



**POWER5/5+**  
130/90 nm

- 64 cores
- 4TB memory
- Micro-partitions
- Virtual I/O
- Unified POWER virtualization
- 2-way SMT
- On-chip memory controller

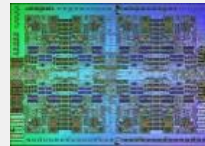
2007



**POWER6/6+**  
65/65 nm

- 8-core chips
- 8TB memory
- Larger L2
- Up to 5.0GHz
- On-chip L3 controller
- Dynamic CPU sparing
- LPAR mobility
- Storage keys

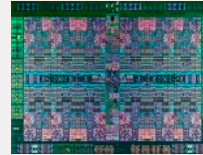
2010



**POWER7/7+**  
45/32 nm

- 256 cores
- 16TB memory
- 8-core chips
- 80 MB on-chip eDRAM L3 cache
- 4-way SMT
- Enterprise pools
- Hypervisor memory mirror
- Spare DRAMs

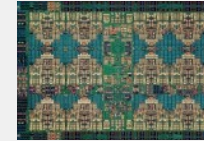
2014



**POWER8**  
22 nm

- 12-core chips
- 8-way SMT
- CAPI
- Transactional memory
- Multi-path interconnect
- PCIe Gen3 On-chip controller

2017



**POWER9**  
14 nm

- 12 / 24 core chips
- Slim or Fused core
- 4 / 8-way SMT
- CAPI 2.0
- NVlink 2.0
- 10MB L3 cache per core
- DDR4 RAM
- 25 GB/s interconnect
- PCIe Gen4 On-chip

2020



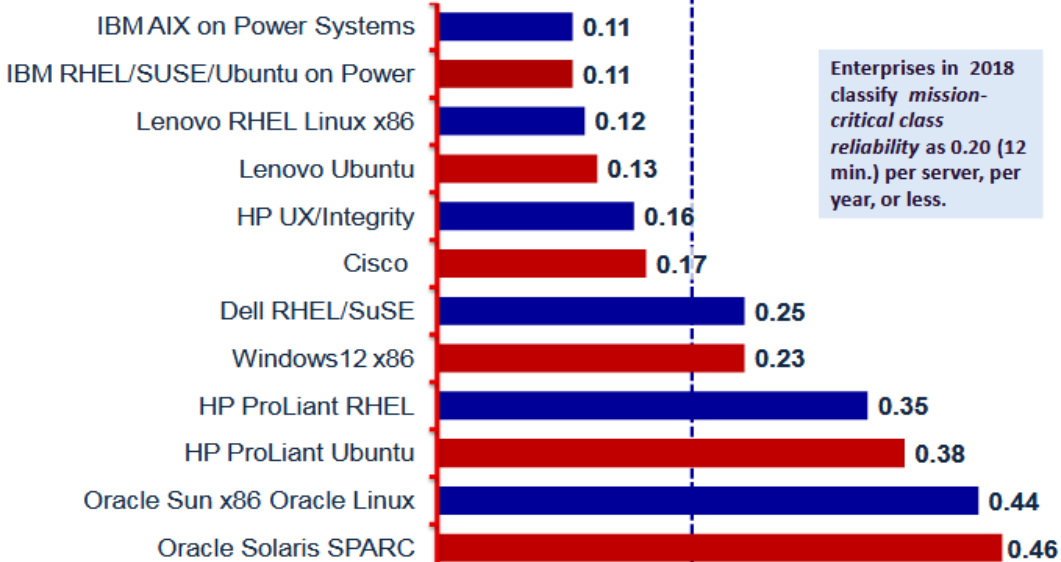
**POWER10**  
10 nm

- .....
- .....
- .....



# Ranked Number 1 in every major reliability category by ITIC

## Unplanned Downtime in 2017 - 2018 (Hours per Year)



# When data intensive workloads are the bottom line

Built-in PowerVM virtualization, IBM POWER9-based Power Systems are cloud-ready, enabling you to deploy the right cloud environment to meet your needs.

## Enterprise cloud-ready



Power Systems easily integrate into your organization's private or hybrid cloud strategy to handle flexible consumption models and changing customer needs.

## Number 1 in reliability



Ranked #1 in every major reliability category by ITIC, IBM Power Systems deliver the most reliable on-premises infrastructure to meet around-the-clock customer demands.

## Industry-leading value and performance



With Power Systems, clients can take advantage of superior core performance and memory bandwidth to deliver both performance and price-performance advantages.

# IBM POWER9 Family

*When data-intensive workloads are the bottom line*



## Mission Critical Data Intensive Workloads for Private Clouds

Entry

Midsize

Enterprise

Big Data Workloads

Enterprise AI Workloads

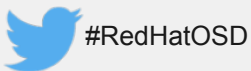
S922/S914/S924  
H922/H924/L922

E950/H950

E980/H980

LC922/LC921

AC922





**GRAZIE PER L'ATTENZIONE**

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IBM Business Development Power Systems



**#RedHatOSD**