

E4

COMPUTER
ENGINEERING

WHEN
PERFORMANCE
MATTERS



WHEN PERFORMANCE MATTERS:

EXTENDING THE COMFORT ZONE: DAVIDE

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E4 IN A NUTSHELL

Since 2002, E4 Computer Engineering has been innovating and actively encouraging the adoption of new computing and storage technologies. Because new ideas are so important, we invest heavily in research and hence in our future. Thanks to our comprehensive range of hardware, software and services, we are able to offer our customers complete solutions for their most demanding workloads on: HPC, Big-Data, AI, Deep Learning, Data Analytics, Cognitive Computing and for any challenging Storage and Computing requirements.

E4. When Performance Matters.

OUR MODUS OPERANDI

SUPER PARTES APPROACH

Choosing technology over vendors

STRONG PARTNERSHIPS WITH MAJOR TECHNOLOGY PROVIDERS

Outstanding time-to-market

LISTEN

Customers' need and requirements

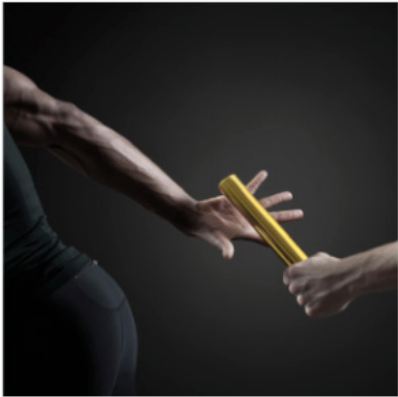
OPTIMIZE EACH DETAIL

Achieving the best solution is the objective

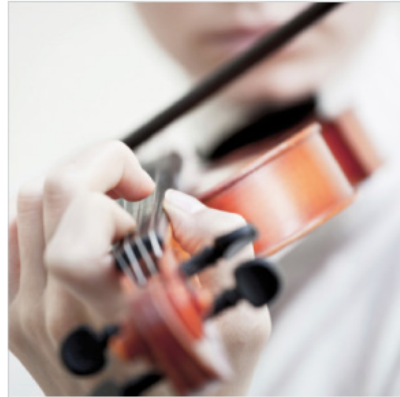
TECHNICAL ASSISTANCE

Fast response to ensure business continuity

OUR CORE VALUES



COOPERATION



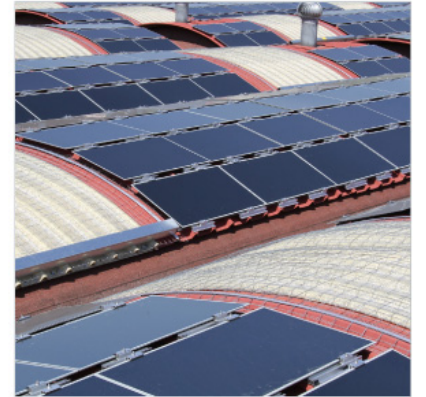
PASSION



ETHICS



COMMITMENT



ENERGY
AWARENESS

OUR KEY FIGURES

2002

E4 WAS
FOUNDED

30+

EMPLOYEES

20^{mln}
€

2016 REVENUE

THOU
SANDs

UNITS
TO CERN

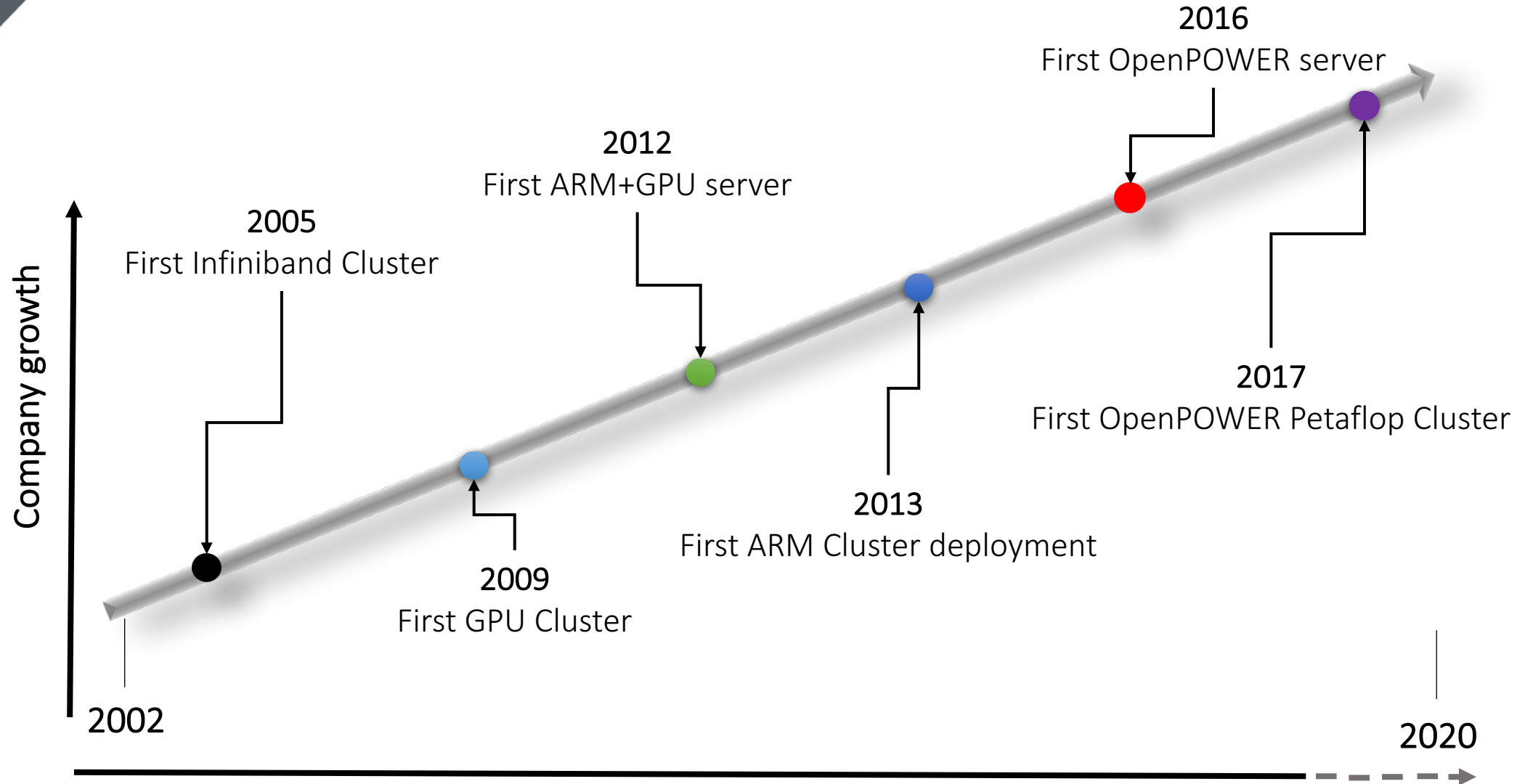
50%

R&D
PEOPLE

99%

CUSTOMER
RETURN RATE

KEY COMPANY MILESTONES



OUR EXPERTISE MARKETS



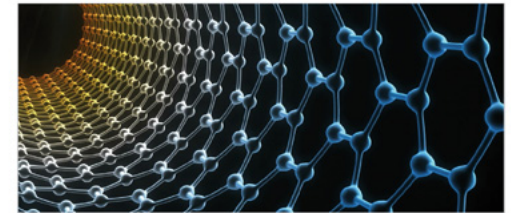
UNIVERSITY
& RESEARCH



ENTERPRISE



GOV. & DEFENCE



INNOVATION



FINANCE



BIOINFORMATICS



MANUFACTURING



SERVICE PROVIDER

THE COMFORT ZONE

Definition (my definition, not Merriam-Webster's)

- Where I know I won't fail

THE COMFORT ZONE???

But science and scientific discovery is about testing, failing, and finding new (and possibly better) answers

- Karl Popper's lesson
- Iterative approach, possibly converging to a firm and falsifiable theory
- Extending/expanding the current knowledge domain

A COUPLE OF FACTS....

- The past several decades have witnessed tremendous strides in our capabilities to model 'things'
- A large number of 'things' (simulations models) & applications have been ported against GPUs and are running on High Performance Systems
 - Optimized programming paradigms have enabled excellent exploitation of the computational resources
 - Advances in numerical models have enabled lower FLOP count for performing the same function



“UNFORTUNATELY...”

Computational simulations have grown more and more complicated, complex and demanding because:

- Of the vast diversity of the models simulated in realistic environments
- Of the widespread use of multi-scale physics
- Of the requirements for serving industrial applications
- Of the finer detail of the simulations

TO KEEP PACE WITH THE COMPLEXITY...

Not only High Performance Computing is required, but a complete and consistent simulation ecosystem, including:

- Big Data (HPDA), the ability to sift through multi-terabyte datasets and results with reasonable performance
- Artificial Intelligence, the ability to deduce from different and unspecific signals across a wide range of datasets the likelihood that a data is significant for a specific context
- Remote/Distributed Visualization, to share the results as images (pixels...) and not transfer the actual results (PBytes...)

TO KEEP PACE WITH THE COMPLEXITY...

- Are we/you ready to change the way you make research?
- Are we/you ready to leave your comfort zone?
- Are we/you ready to let a machine decide which data are important and which are noise?

TO KEEP PACE WITH THE COMPLEXITY...

E4 can provide PIs, Scientists, Engineers, geeks with

- HPC systems
- AI systems
- HPDA systems
- Remotized visualization

ADDRESSING LARGE CORE COUNT AND LARGE MEMORY

SGI (now HPE) UV 3000

REQUIREMENTS High Performance Computing Cluster

CHALLENGES Maximizing CPU efficiency
Minimizing simulation times
Combining High Performance Computing & energy efficiency
Complex, multi-scale simulations, electron microscopy,
analysis of new materials

SOLUTION Up to 256 sockets
Infiniband Switch 336 QDR 40Gbps ports
64 TBytes of coherent shared memory
100+ TFlops
E4® HPC Open Suite

APPLICATION API X86/64

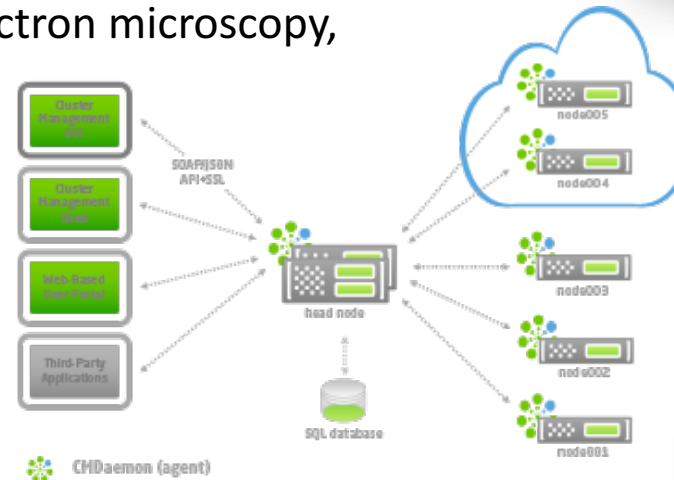
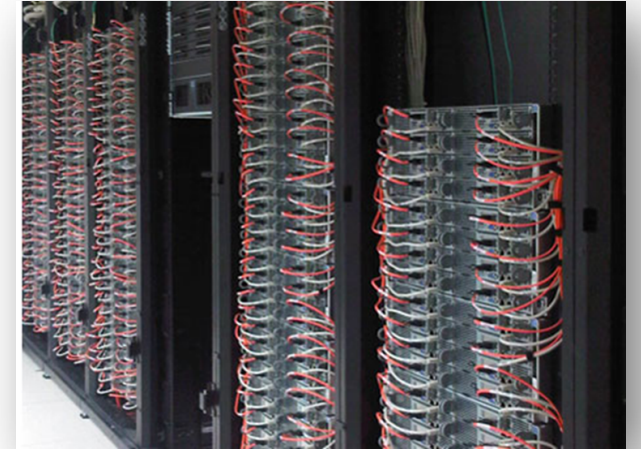
KEY FACTORS Single System Image, Large memory, Large core count

BENEFITS Reduced simulation times
In-memory computing



X86/64-BASED HPC CLUSTER

- REQUIREMENTS** High Performance Computing Cluster
GPU-intensive workload
- CHALLENGES** Maximizing ROI and CPU efficiency
Reducing simulation times
Complex, multi-scale simulations, electron microscopy,
analysis of new materials
- SOLUTION** X86/64 multi-node compute cluster
NVIDIA TESLA P100
E4® HPC Open Suite
- APPLICATION API** X86/64
- KEY FACTORS** Scale-out solution
- BENEFITS** Commodity-based
Scales as per your needs



NVIDIA®

SOMETHING NEW...

Very recently, a new version of an old architecture has been made available within an entirely open standard mode

- It is not the usual X86/64..
- It is not what are used to (up to now..)
- It brings (much needed) fresh air in the (stagnating..) HPC environment
- It is challenging (and stimulating) the 'usual' vendors

DAVIDE: OPENPOWER-STANDARD BASED HPC CLUSTER

DEVELOPED WITHIN PRACE PCP PHASE III PROJECT

REQUIREMENTS High Performance Computing Cluster
GPU-intensive workload

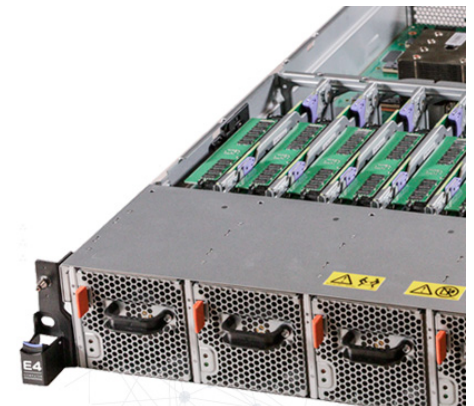
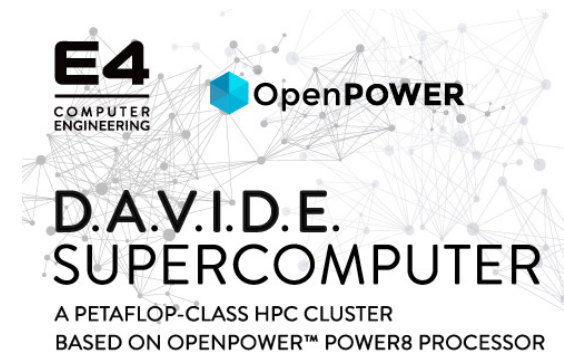
CHALLENGES Maximizing performance
Minimizing simulation times
Complex, multi-scale simulations, electron microscopy, analysis of new materials

SOLUTION E4® OP206 Gold
E4® HPC Open Suite

APPLICATION API P8

KEY FACTORS Scale-out solution
Power monitoring & profiling
Power management
Power capping & prediction

BENEFITS Liquid cooling
Scales as per your needs
Code porting & optimization (with IBM)



DATA MANAGEMENT

E4 LU-M-E-A

LUSTRE MADE EASY APPLIANCE

- Large storage capacity for fast computing
- High throughput parallel storage
- Specifically developed for HPC environments, handling large amount of data, large datasets and multiple compute nodes
- Ideal for R&D organizations, Academic departments, weather forecast and climate centers
- Cost effective: pay as you grow
- Open source solution



l·u·s·t·r·e®



DISTRIBUTED CLOUD VISUALIZATION

- Virtualization and Distributed Cloud Visualization
- 2D and 3D graphics independent of geographical location
- DCV technology delivers an amazing user experience both in LAN and in WAN environments
- A single GPU can be shared among more users delivering the performances and compatibility of a local graphical workstation
- Data security
- Support for mobile devices



ARTIFICIAL INTELLIGENCE

	FLEXIBLE SOLUTION BY E4	IBM POWER AI SOLUTION	NVIDIA DGX-1
PURPOSE	Flexible Deep Learning solution for test, development, benchmarks, production	Deep Learning solution for mid-range data set analysis	Deep Learning solution fully integrated with hardware, software and development tools to run accelerated analytics applications
AI SOFTWARE	Base Libraries	Deep Learning frameworks	NV Docker, Deep Learning Frameworks, Monitoring software.
NVLINK	GPU – GPU	GPU-GPU, GPU -CPU	GPU – GPU
GPU	From 1 to 8 NVIDIA® GPUs	Up to 4 NVIDIA® Tesla® P100	8 NVIDIA® Tesla® P100 (with NVIDIA® NVLink™)
CPU	2 x Intel® Xeon® Processors	2x IBM POWER8™ Processor	2 x Intel® Xeon® Processors

DAVIDE

- **Development of a Added-Value Infrastructure Designed in Europe**
- A single infrastructure providing
 - ‘Quality’ HPC (i.e. application performance, not only peak performance)
 - AI (PowerAI framework including caffe, theano, torch, tensorflow)
 - GPU accelerated database
 - Remote visualization

CONCLUSION

- No matter the level of complexity you are currently simulating, your goal is making a better (more complex, realistic and physic-based) model
- The very nature of science is extending and expanding the fidelity of the simulations and discover new phenomena
- The knowledge gained will be used for the design, synthesis, processing, characterization and utilization of new materials and compounds
- Are you ready to challenge your comfort zone????

CONTACTS

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