



EUROPEAN
TECHNOLOGY
PLATFORM
FOR HIGH
PERFORMANCE
COMPUTING

ETP 4
HPC



ETP4HPC webinar #2

Meet our ISC co-exhibitors

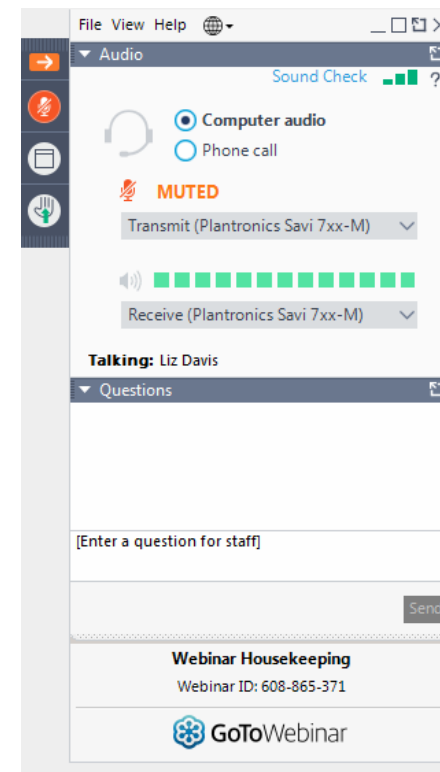
5 questions to projects DEEP-EST and
Mont-Blanc 2020

We will start at 10:30

The webinar will be recorded

Before we start

- This webinar is in listen-only mode
- This webinar is recorded, you will receive the link later today
- Use the GoToWebinar control panel displayed on the right of your screen to
 - ask questions
 - raise your hand
 - download handouts



Agenda

10:30	Housekeeping	
	Meet our new members	
10:35	Agenium Scale	Guillaume Quintin
10:40	Do IT Systems	Roberto Strano
10:45	EOFS	Frank Baetke
	Meet the 4 SMEs that were meant to exhibit on our booth at ISC	
10:50	Bright Computing	Terry Rush
10:55	Constelcom	Nicolas Tonello
11:00	NAG	Mike Croucher
11:05	Submer	Raúl Álvarez
11:10	5 questions to projects DEEP-EST and Mont-Blanc 2020 DEEP-EST	Moderated by Michael Malms Estela Suarez
11:25	Mont-Blanc 2020	Said Derradji
11:40	Q&A	
11:45	End	

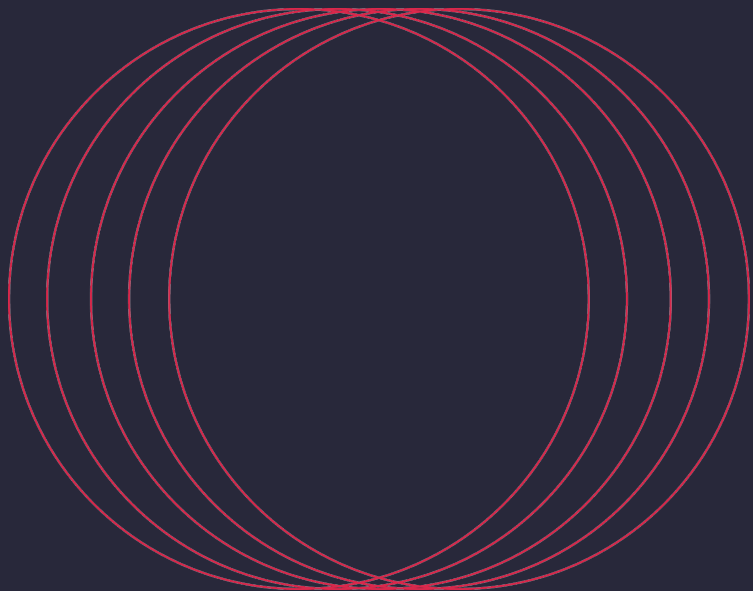
Welcome to our new members

- Agenium Scale
 - France, Associated member, SME
- DoIT Systems
 - Italy, Associated member, SME
- EOFS (European Open File System)
 - Europe, Associated member, Association





AGENIUM
SCALE



High-Performance Computing and Complex Systems

ACHIEVE NEW COMPUTING
PERFORMANCE

Guillaume Quintin
CEO

Juliette Mallez
Key Account Manager

contact.scale@agenium.com

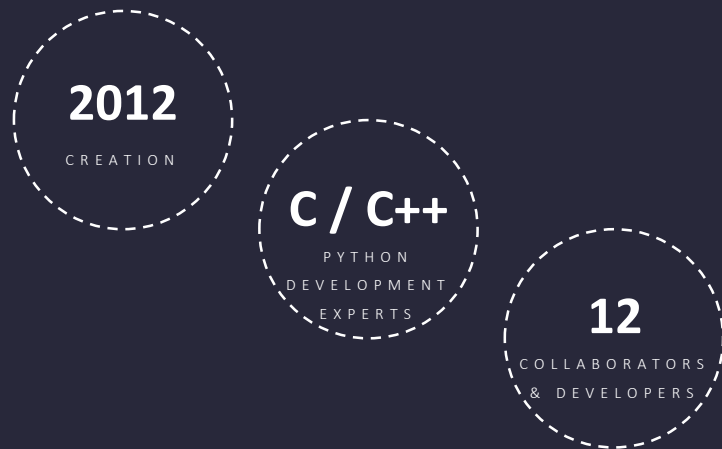




April 2019, **Numscale** joins **Agenium Group** and becomes **Agenium Scale**

Company based on the Plateau de Saclay in France providing software solutions for high performance numerical computing and complex systems.

Our skills : Knowledge of CPU / GPU and algorithms in the field of HPC



- GPGPU**
CUDA, ROCm, OpenCL
- Distributed computing**
MPI
- Vectorisation**
ARM, PowerPC, Intel, AMD, NVIDIA* (*GPU)
- Languages**
C, C++, C#, Fortran, Python, Matlab, R...
- Operating Systems**
Linux, Windows and compatibility with other processors

MEMBER OF:



Software and **processor** experts we offer different services

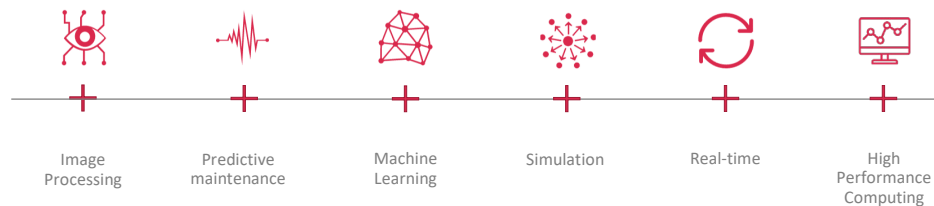
Diagnosis,
evaluation and
optimization of
existing software

Modernization
and code
redesign

Porting source
code from one
language to another

Custom
software
creation

We are involved in all business
areas requiring **computing**



Our Major Clients



Recent activities

NSIMD

OUR HIGH PERFORMANCE
COMPUTING LIBRARY (HPC)



Access the library [via our store](#)

An open source computing library for the development of **neural network engines**, **image processing** and vision **algorithms**, **numerical simulation** and **financial computing**.
Support for CPUs and GPUs

ARM

Submitted paper on the optimization of a EFISPEC3D kernel using NSIMD **x2 speedup**

NSIMD is now listed on Arm HPC website as a math library

Microsoft
Partner

Microsoft Partner

within the perimeter of our code optimization activities in Azure environment

MonteCarlo

Development of a POC for pricing financial instruments using the Monte-Carlo algorithm with NSIMD.

x2 speedup

Gromacs

Put NSIMD as a replacement of GROMACS native SIMD implementation to show that no overhead is incurred by NSIMD. It among the first to support Arm SVE within GROMACS thanks to NSIMD.

Divides by 2 the number of LOCs and same running time



Do IT Systems Simplifying Complexity

High Performance Computing Service Company

Roberto Minelli, CEO

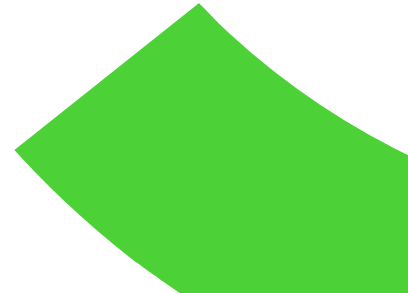
Roberto Strano, CSO

July 2020

About us



- Founded in 2010 but its origins starts in 1991
- Do IT Systems represents the natural evolution of its founders who come from more than twenty years of experience in the industrial high performance computing market.
- Do IT is the main Italian HPC service solution provider
- Do IT Systems mission is to become the main European HPC service solution providers for scientific research and industrial manufacturing
- Do IT support the customers to design, provides and implement a HPC solution considering specific users and application needs. We support the customers for the entire lifecycle HPC solution



Where - Offices



Do IT Systems operates as one of two key operational and sales offices located in North Italy. Each office manages the local clients or outside the country.

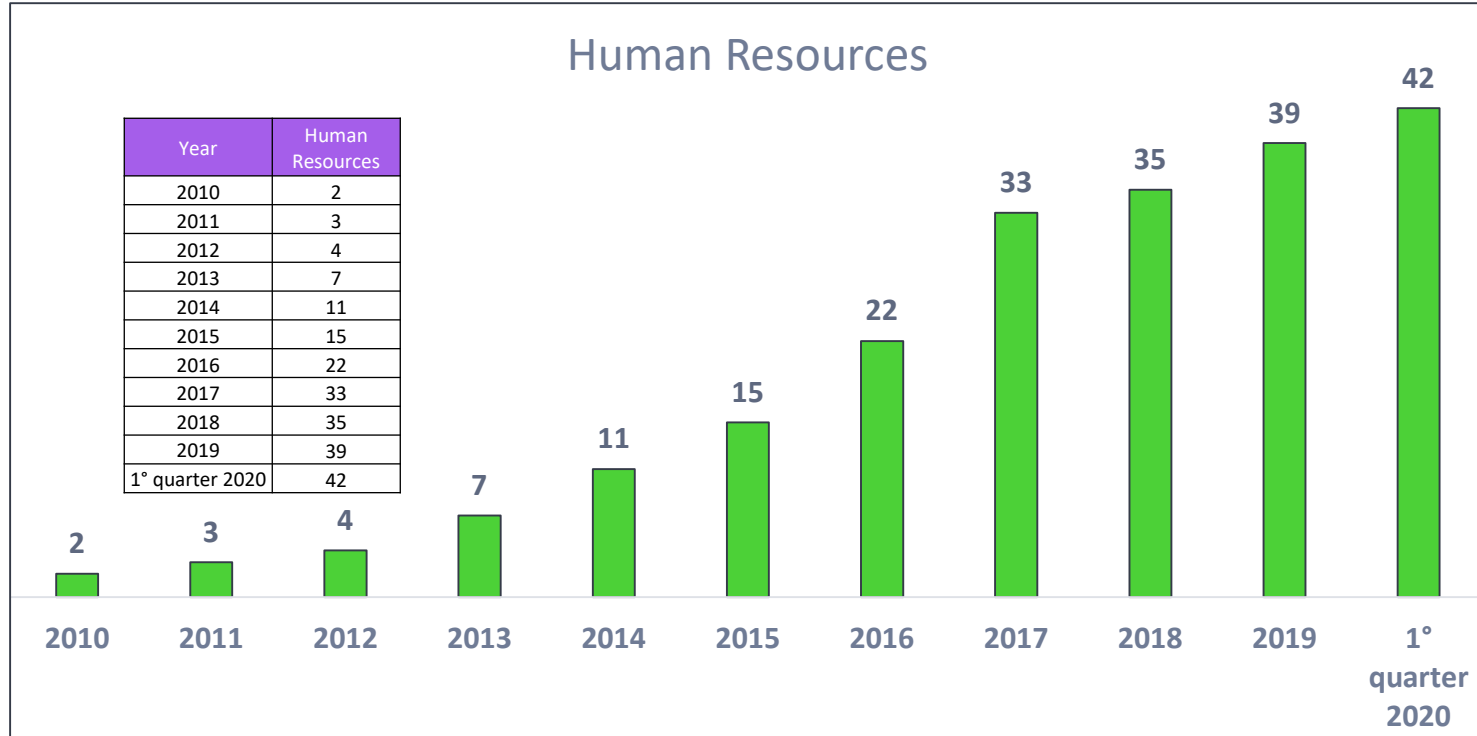


via Alessandro Antonelli 10 - 10093 Collegno (TO)
(600mq)



via Tazio Nuvolari, 55 – 41053 Maranello (MO)

Human Resources



Currently we have 42 employees with an average age of 35 years

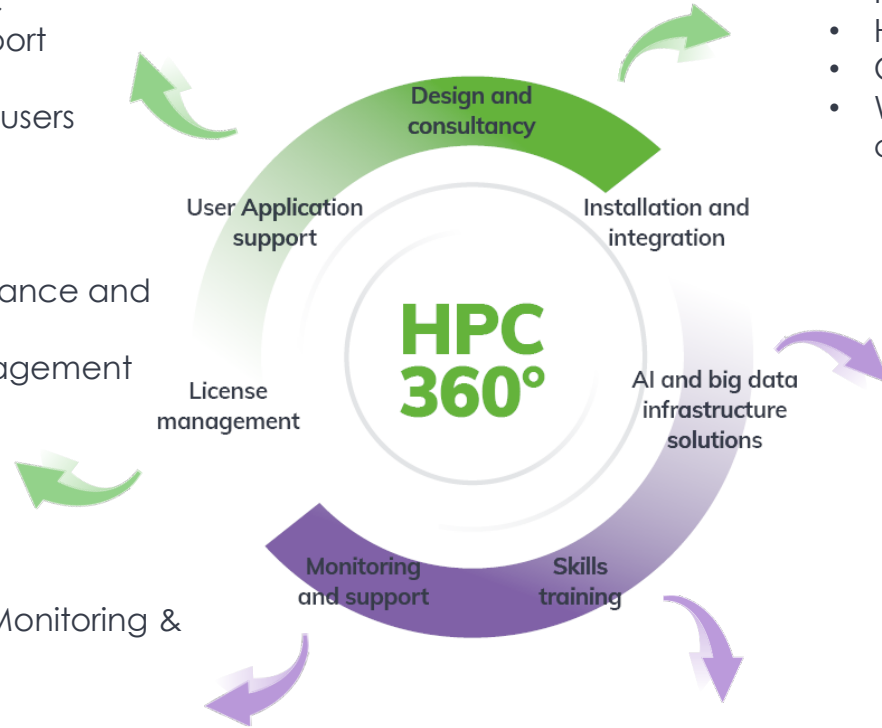
What we do - HPC Services Portfolio



- Engineering sw installation, integration with HPC infrastructure & support
- Interface support between ISV & HPC users

- Availability, Performance and License Monitoring
- License server management

- HPC Benchmarking, Monitoring & Optimization



- HPC Solution Definition
- Hardware & OS Installation
- HPC SW Stack installation
- Cluster Filesystems
- Workload sw installation, configuration & support

- Turnkey projects
- AI & BigData solution
- HPC Cloud Solutions

- Tailored HPC/Linux Training

Partners

doit



NetApp™



Partner



ALTAIR PBS WORKS™

Do IT is the Official Support team for Italy and is part of European Altair Team



Easily manage HPC cluster, cloud, and supercomputing environments

For IT administrators and HPC users

Direct sales and support

Also sold by computer hardware companies

Workload Management

Cloud Computing

Remote Visualization

IT Analytics

Cross-domain Security



Thank you !!!

Roberto Minelli: Roberto.minelli@doit-systems.it – +39 348 8563163

Roberto Strano: Roberto.strano@doit-systems.it – +39 331 1251913

Web : <http://www.doit.systems/>

Linkedin : <https://www.linkedin.com/company/do-it-systems-s.r.l./>

Via Antonelli 10 - 10093 Collegno (Turin) Italy

EOFS @ ETP4HPC



frank.baetke@eofs.eu

**EOFS was founded on Dec. 15th, 2010 as a “Societas Cooperativa Europaea”
Legally it is a non-profit association based on European Law**

EOFS President:

- Frank Baetke (for HPE)

(Membership is by Corporation or Organization)

Members of the Administrative Council:

EOFS Vice-President:

- Jacques-Charles Lafoucriere (CEA)

Directors of the Administrative Council:

- Hugo R. Falter (ParTec)
- Peter Jones (DDN/Whamcloud)

- Eric Monchalin (Bull/Atos)
- Jacques-Charles Lafoucriere (CEA)
- Thomas Stibor (GSI)
- Frank Baetke (for HPE)
- Johann Lombardi (Intel)
- Arndt Bode (LRZ)



EOFS's objective is to promote the establishment and adoption of open source parallel file-systems, sustain and enhance its quality, capabilities and functionality and ensure that specific requirements of European organizations, institutions, projects and companies are upheld.

EOFS maintains a website with relevant information of interest (www.eofs.eu)

EOFS – jointly with OpenSFS – has been organizing highly successful focus-sessions (BoFs) for LUSTRE and BeeGFS at the annual ISC and SC conferences and has been participating in related conferences such as LUG (Lustre User Group) and LAD (Lustre Admins & Developers Workshop)



But EOFS is definitely open to other related open-source products and/or projects

EOFS now plans establishment of a European technical working-group focusing on the specific European requirements for parallel file-systems in the context of European HPC and Exascale projects like EuroHPC.

On Nov. 2nd 2019 EOFS, together with its US-based counterpart OpenSFS, legally acquired the Lustre trademark, the logo, the website "lustre.org" and all associated rights from its previous owner Seagate Corporation (www.seagate.com). EOFS and OpenSFS will maintain those rights under joint ownership for the benefit of the Lustre community. See also www.lustre.org for further details.

So 50% of the trademark  and all its related assets are now owned by the European organization EOFS.

All companies or organizations with an interest in LUSTRE and its further development - but also in other open-source HPC file-systems like BeeGFS - are invited to join EOFS with associated voting rights in the organization. Annual fees are low.

For further questions contact frank.baetke@eofs.eu

Our ISC virtual showcase: meet 4 of our SME members



[Visit our website>](#)
[Contact us>](#)



[Visit our website>](#)
[NAG Cloud HPC Migration Service>](#)
[Contact us>](#)



[Visit our website>](#)
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[Download the HPC immersion cooled Use Case>](#)
[Corporate brochure>](#)
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Terry Rush
Sales Director, Bright Computing

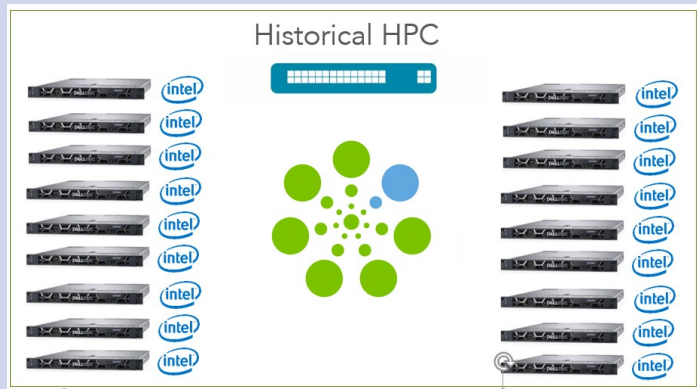
We launched our software in 2009 because managing clustered IT infrastructure was **hard** and we thought it should be **easy**.

11 years later, we are deployed in **hundreds** of IT environments worldwide, including several of the world's largest **supercomputers**.

Bright's mission is to provide the best software platform for deploying, managing, and monitoring clustered HPC infrastructure, in the datacenter, at the edge, or in the cloud

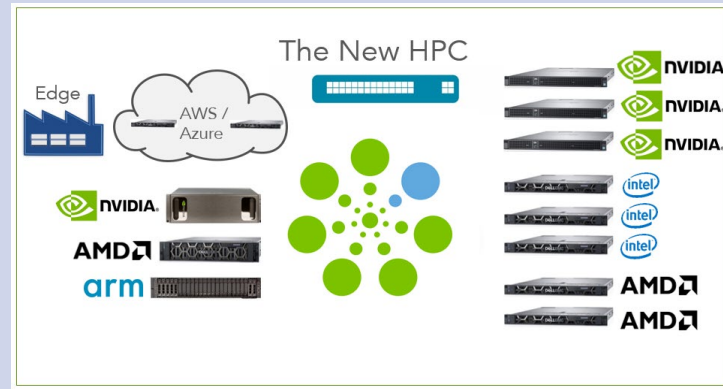
Underpinning the New Age of HPC

Traditional HPC



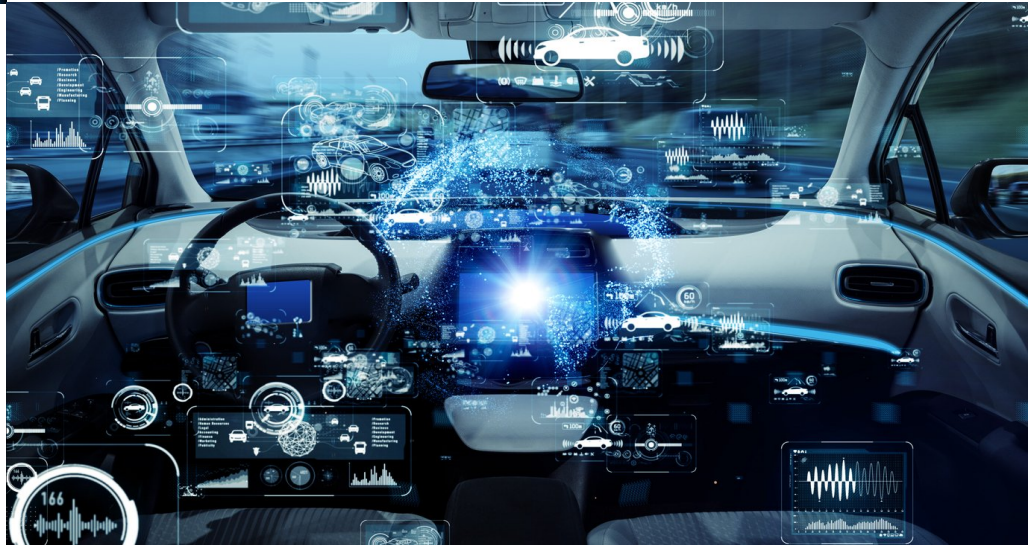
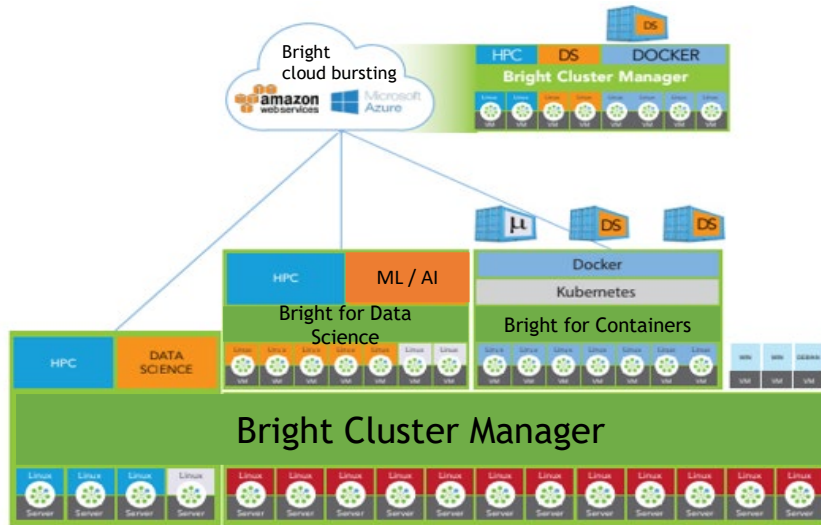
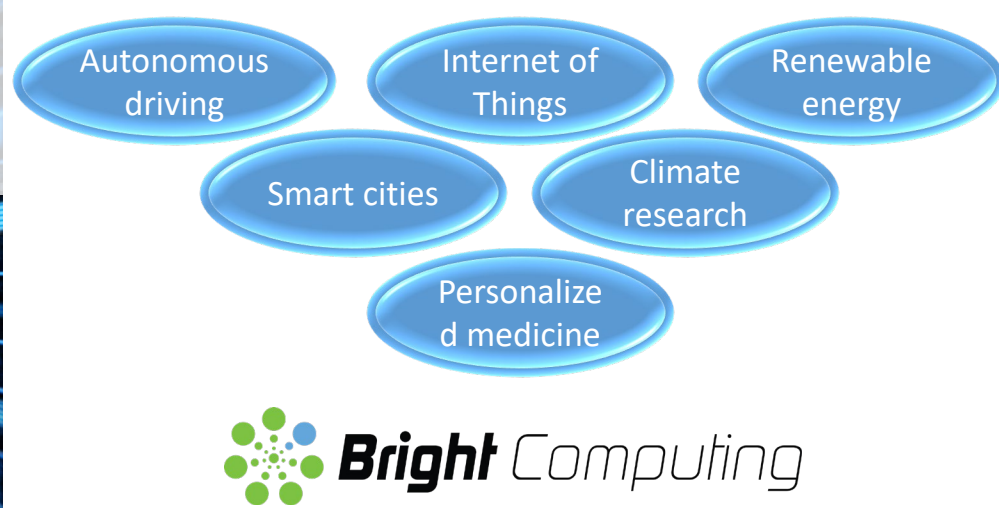
- Modelling and simulation
- Education, government, manufacturing, oil & gas, pharmaceutical
- X86 (Intel) dominated, single hardware vendor
- Running on bare metal
- On-premise

The New HPC



- Modelling and simulation, data analytics, AI, training and inferencing
- All industries, especially commercial/enterprise and research
- Intel + AMD + ARM + NVIDIA
- Bare metal + VMs + containers
- On-premise + cloud + edge + hybrid

Bright Computing, a partner for the future





brightcomputing.com
info@brightcomputing.com

CONSTEL COM

Supercomputing at your
fingertips – Delivering HPC
power and expertise to all



CONSTELLATION

Dr Nicolas Tonello CEO – ETP4HPC Webinar – 03 July 2020

- Mission: to be the HPC ecosystem of choice for both HPC centres and HPC users, empowering and freeing users to innovate, analyse and discover

"Anywhere, any time, self-managed, easy to use supercomputing at your finger tips"



CONSTELLATION®
By ConstelCom®

What is Constellation[®]?



- **Enterprise Constellation[®]**

- Ease of access, ease of use, speed, collaboration, increased productivity, reporting
- All industries, all applications
- Corporate user testimony: increased productivity. From login to HPC powered results in three clicks, regardless of application

- **Constellation[®] for HPC Centres**

- Management and monitoring of users, projects, systems, accounting
- Effortless user acquisition and support
- Maximised utilisation



Contact Us



To get in touch for more information and demos:

www.constelcom.com

info@constelcom.com

+44 (0)203 858 7802

Nicolas Tonello, CEO

nicolas.tonello@constelcom.com

Cloud HPC Migration Service

ETP4HPC

Webinar

3rd July 2020

Mike Croucher

Product Manager for Cloud and ML



Experts in numerical software and
High Performance Computing



NAG

Founded 1970
Started from UK
academia
Offices in UK, US &
Japan



NAG Products

NAG Library
Fortran Compiler
Algorithmic
Differentiation
PDE Toolkit



NAG Services

HPC Managed Services
Technology evaluation
& Benchmarking
Accelerator
development
Code Porting /
Optimization
Cloud HPC Migration

HPC in Cloud?

▣ Companies ARE moving HPC workloads to the Cloud



Should we?

What's the best way?

And how much will it cost?

Optimising the platform to fit your application

▣ Large local SSD

- 1x i3en.24xlarge – 60TB local SSD storage
- 48 Skylake cores, 768GB RAM
- \$10.848/hr

▣ Combine Compute + Storage

- 1x i3en.24xlarge + 4x c6g.16xlarge
- \$19.55/hr

▣ Over-decompose w/ SSD

- 16x c5d.24xlarge - ~3TB SSD
- 48 CascadeLake cores
- \$73.73/hr

Lift & Shift:
\$3.9M

\$1.64M

\$1.16M

\$2.52M

NAG Services to improved performance and cost

Optimise cloud resources

- Cloud allows you to optimise the platform to the application
- Every cloud provider has a unique set of strengths

HPC Optimization

- Improving the parallel scalability of the application
- Making maximum use of the underlying hardware
- Data driven analysis via profiling

Accelerators

- Offload to GPUs and other accelerator technologies
- Cloud enables experimentation on multiple architectures

Algorithms

- Rethinking the problem
- Example: Algorithmic Differentiation sped up a finite difference compute kernel by 30x

Real world challenges

▣ Integration with existing infrastructure

- Job schedulers, File Systems, etc.
- Policies, exposing infrastructure-as-code to users
- Some providers have a "cloud scheduler" that might work for you
 - AWS Batch, Azure Batch

▣ Availability of resources

- Cloud really isn't infinite

▣ Traditional global filesystems are expensive

- Move data from cold storage to hot storage during a job – return it later.

▣ Everything constantly changes

▶ New service offering from NAG

- HPC Cloud migration
- Cost-to-Solution focused platform & application optimization
- Partnering with the “Big 3” providers

<https://nag.com/cloud-hpc>

Submer's Immersion Cooling for High Performance Computing

An ETP4HPC Presentation

Raúl Álvarez
Solution Architect
raul@submer.com

Submer SmartPodX



- Up to 100 kW of heat dissipation
- 45U or 22U, 19" or 21" Open Compute (OCP)
- Compatible with major HW vendors and standards
- Local and remote management interfaces
- Simplified maintenance
- Submer Cloud (remote monitoring & management)
- DCIM API - integrate with monitoring tools
- Compact form factor
- Tier III and tier IV compatible
- Vertically Stackable configurations available
- Optional IP65 (water/dust proof)

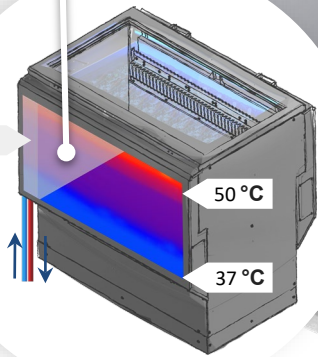
Sample installation

CDU

(w/embedded heat exchanger)

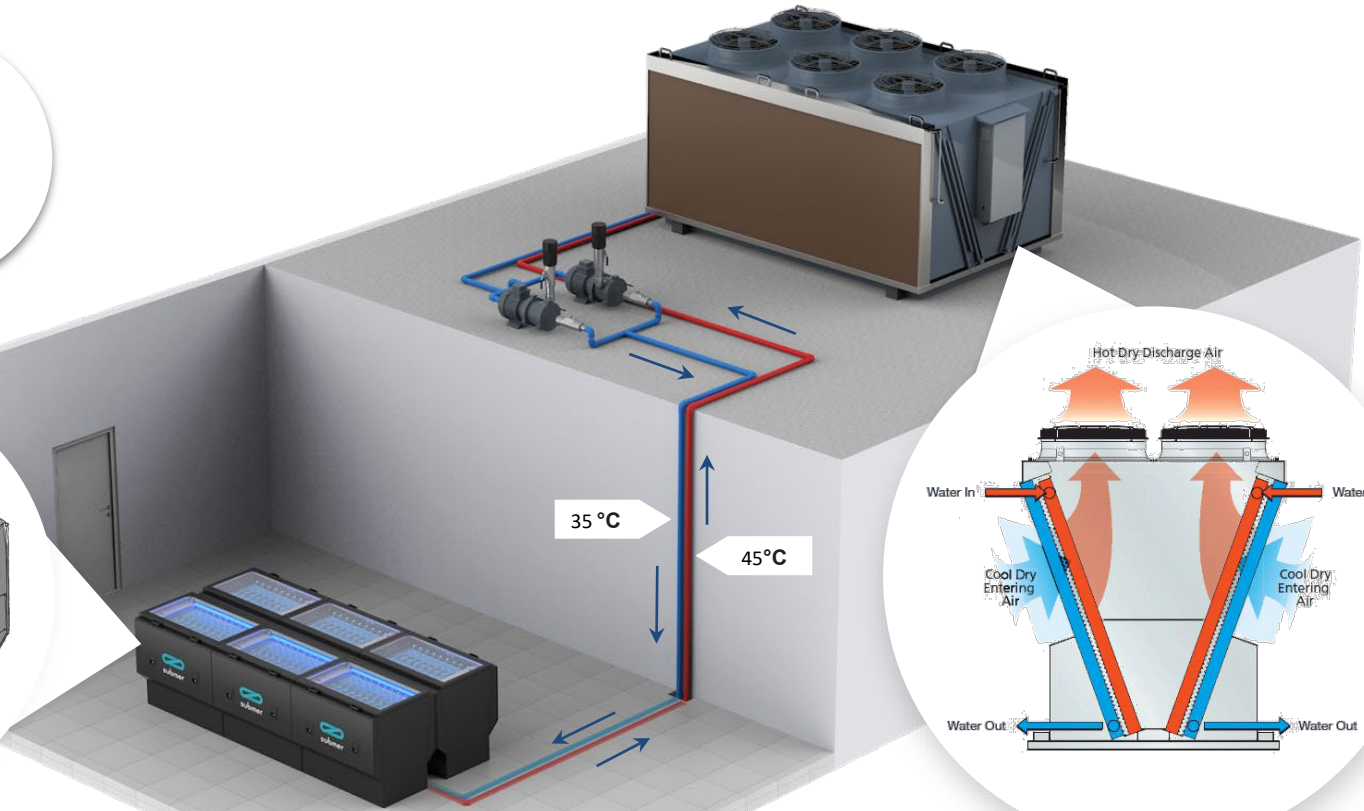


CDU



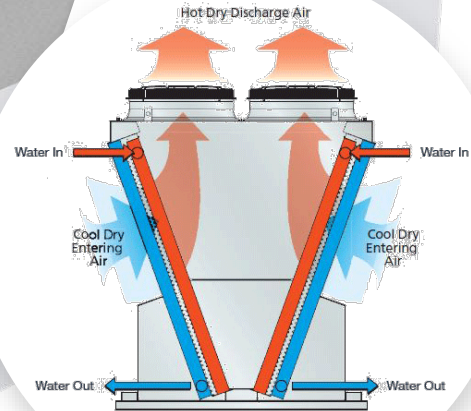
50 °C

37 °C



35 °C

45 °C





Main Immersion Cooling Benefits



reduce energy
consumption



increase computing
density per sqm



reduce building
costs



reduce latency
& increase
deployment speed

Unrivalled Total Cost of Ownership:

95%

Reduction in cooling
OPEX

Power Usage Effectiveness of 1.03 (certified by a 3rd party).
ROI of less than 1 year even only considering the electricity savings.

10x

Increase in
computing density

Dissipation capacity of **over 100 kW** per tank.
Leverage denser payload designs thanks to improved thermal properties.

50%

Reduction in
CAPEX build costs

Rapidly deployable in raw space without need for raised floors nor cold aisles.
Minimum retrofitting required for existing DCs

30%

Increase in
hardware life-span

No moving parts, no dust particles, no vibrations, less thermal and mechanical stress due to the uniformity provided by the liquid and its viscosity

60%

Reduction in
hardware failure

99%

Heat captured in the form of warm water.

No water consumed.

Allows for unprecedented **energy reuse** if DC's are built close to communities or industry. New revenue streams.



Compatible with the major HW Vendors & Standards

GIGABYTE™

FUJITSU



CISCO™

lenovo™



BITMAIN

AMD



IBM


**Hewlett Packard
Enterprise**



inspur



Certifications & Memberships



Best IoT Startup Of The Year 2018



Thank You!

Request more info at contact@submer.com



EUROPEAN TECHNOLOGY
PLATFORM FOR HIGH
PERFORMANCE COMPUTING

5 questions to projects DEEP-EST and Mont-Blanc 2020



5 questions to DEEP-EST and Mont-Blanc 2020

1. What **three top results** will the project deliver?
2. What are the **TRL levels** of these deliverables and which next steps do you plan to push them onto a higher TRL level?
3. What are your next steps to actively **promote the use** of these top 3 results?
4. Who would you like to **collaborate** with in Europe ?
5. EuroHPC is promoting **European sovereignty** in HPC technology provisioning. How will you contribute to this aim?



DEEP-EST



Estela Suarez, Jülich Supercomputing Centre (JSC)

03.07.2020 – ETP4HPC webinar



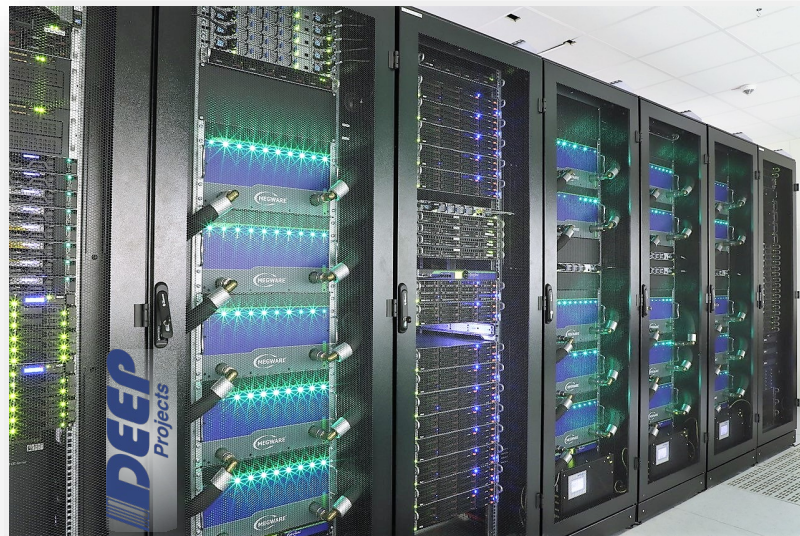
Questions

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 - (i.e. what functions and features of sw/hw/other)
2. What are the **TRL levels of these deliverables** and which next steps do you plan to push them onto a higher TRL level?
3. What are your next steps to **actively promote** the use of these top 3 results?
 - (By whom ? How wide? This can include standardisation.)
4. Who would you like to **collaborate within Europe** ?
 - (Why so? What do you expect from this collaboration?)
5. EuroHPC is promoting **European sovereignty in HPC** technology provisioning. How will you contribute to this aim?

1. Three selected results

- 1.) Modular Supercomputing Architecture (MSA)
- 2.) MSA Software Stack
- 3.) MEGWARE accelerated node

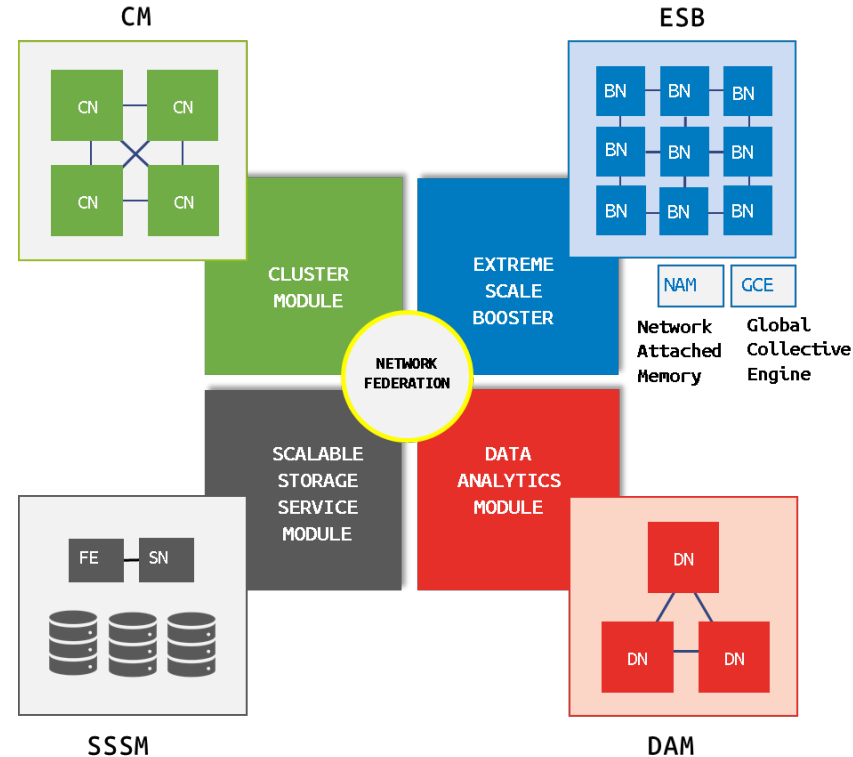
DEEP-EST Prototype @JSC



Source: Megware

1. Modular Supercomputing Architecture

- Hardware prototype with 3 modules:
 - Cluster Module (CM)
 - Extreme Scale Booster (ESB)
 - Data Analytics Module (DAM)
- Contained EU HW-technologies
 - MEGWARE's direct-liquid-cooled accelerated node
 - EXTOLL's Fabri³ network
 - Network attached accelerators
 - *Network Attached Memory (NAM)*
 - *Global Collective Engine (GCE)*



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DEEP-EST Prototype @JSC

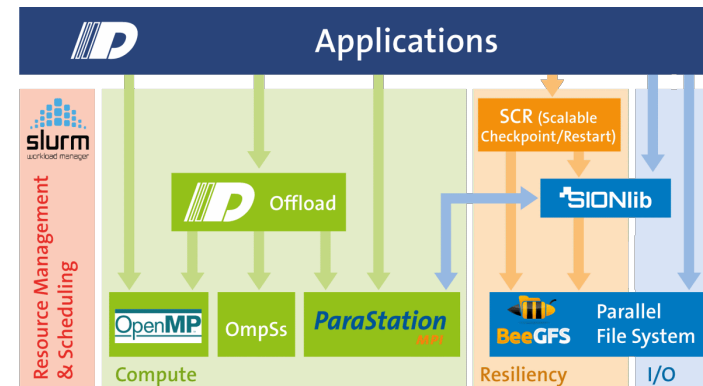


Source: MEGWARE

2. MSA Software Stack

ParaStation Modulo in combination with various Open Source elements

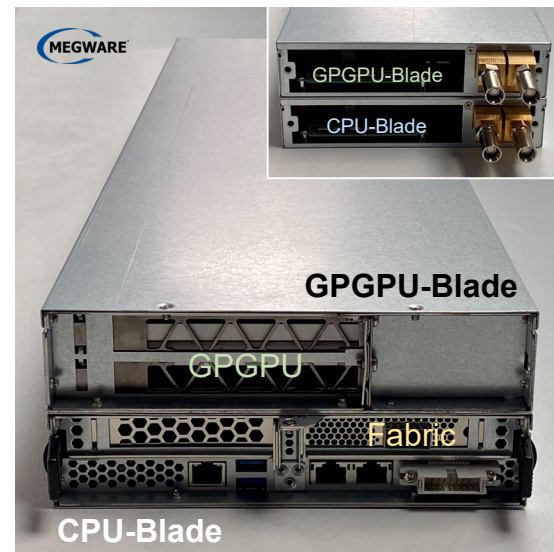
- **Programming model**
 - ParaStation MPI with GPU-direct and gateway support
 - OmpSs improved GPU support
- **Scheduler:** Slurm (+psslurm for res.mgmt)
 - Optimized to support workflows
 - Integration of shared resources (e.g. NAM)
- **Monitoring:** DCDB
- **File system:** BeeGFS
 - Integration with scheduler, plugin for storage servers supporting NVDIMM, monitoring
- **Libraries:** SIONlib
 - Map task-local I/O on parallel file systems, I/O forwarding



- **Eicker et al.**, *Bridging the DEEP Gap - Implementation of an Efficient Forwarding Protocol*, Intel EU Exascale Labs Report 2013 34-41, (2014)
- **Clauss et al.**, *Dynamic Process Management with Allocation-internal Co-Scheduling towards Interactive Supercomputing*, COSH@HiPEAC, (2016)

3. MEGWARE's accelerated node

- **MEGWARE SlideSX-LC “Combo-Node”**
 - Comprising CPU and PCIe accelerator (GPGPU)
- **Direct liquid cooled (warm water)**
 - Inlet temperature up to 55°C
 - No chillers required and fan-less
- **High precision energy meter hardware**
 - Continuous monitoring of power consumption
 - Data accessible to
 - *users (via e.g. Slurm)*
 - *system administrators → can prioritize efficient jobs*
 - Data stored also in DBDC, visualized via Grafana



Questions

1. What three top results will the project deliver?
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2. TRLs

- **1.) Modular Supercomputing Architecture (MSA)**
 - TRL 7 system prototype demonstration in operational environment
- **2.) MSA Software Stack (elements)**
 - TRL 8 system complete and qualified
 - TRL 9 actual system proven in operational environment
- **3.) MEGWARE accelerated node**
 - TRL 8 system prototype demonstration in operational environment

DEEP-EST Prototype @JSC



Source: MEGWARE

Questions

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3. Steps to promote the results

- **1.) Modular Supercomputing Architecture**
 - Early Access Program to the prototype
 - *Enlarged access after project ends (March 2021)*
 - *Use of DEEP-EST prototype in future projects*
 - Press releases, media channels, website
 - Promote adoption of MSA by EuroHPC Petascale and Pre-Exascale systems
 - Application of MSA in Pilot system (EuroHPC) and in future Exascale
- **2.) MSA Software stack for modular systems**
 - Integration of extensions in the packages main branches
 - Distribution by code owners (ParTec, FhG, BSC, FZJ, etc.)
 - Commercial support by providers (ParTec, thinkparQ)
- **3.) MEGWARE accelerated node**
 - Promotion of DEEP-EST prototype, display at exhibitions by MEGWARE

Questions

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4. Potential collaboration partners in Europe

- **PRACE and CoEs (HPC user communities)**
 - offer access to DEEP-EST prototype and environment
 - support in code adaptations
 - collect results from their applications
- **EC and EuroHPC projects and initiatives**
 - share experience
 - promote adoption of concepts and elements by future projects
- **Computer centres**
 - adopt MSA and its HW/SW elements at other sites
- **Industry**
 - adapt further SW packages and apply new HW-technologies to MSA

Questions

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5. Contribute to Europe's sovereignty

- **Further development of core European technologies**
 - **HW:** MEGWARE ColdCon, EXTOLL network (Fabri³), network accelerators (NAM, GCE)
 - **SW:** ParaStation Modulo, BeeGFS, OmpSs, SIONlib, Extrae/Paraver, etc.
 - **Applications:** NEST, GROMACS, xPic, CMSSW, etc.
- **MSA integrates European with international technologies**
 - European: hardware integration, network, most parts of SW stack, etc.
 - International: processor (in future can be European), memories, other networks, etc.

The MSA itself is a European invention to orchestrate heterogeneous resources, which **facilitates the adoption of European innovations**, stressing their added value **in an international context**

With thanks to:
the full team in the
DEEP projects



www.deep-projects.eu
[@DEEPprojects](https://twitter.com/DEEPprojects)

DEEP *Projects*



The DEEP projects have received funding from the European Union's Seventh Framework Programme (FP7) for research, technological development and demonstration and the Horizon2020 (H2020) funding framework under grant agreement no. FP7-ICT-287530 (DEEP), FP7-ICT-610476 (DEEP-ER) and H2020-FETHPC-754304 (DEEP-EST).



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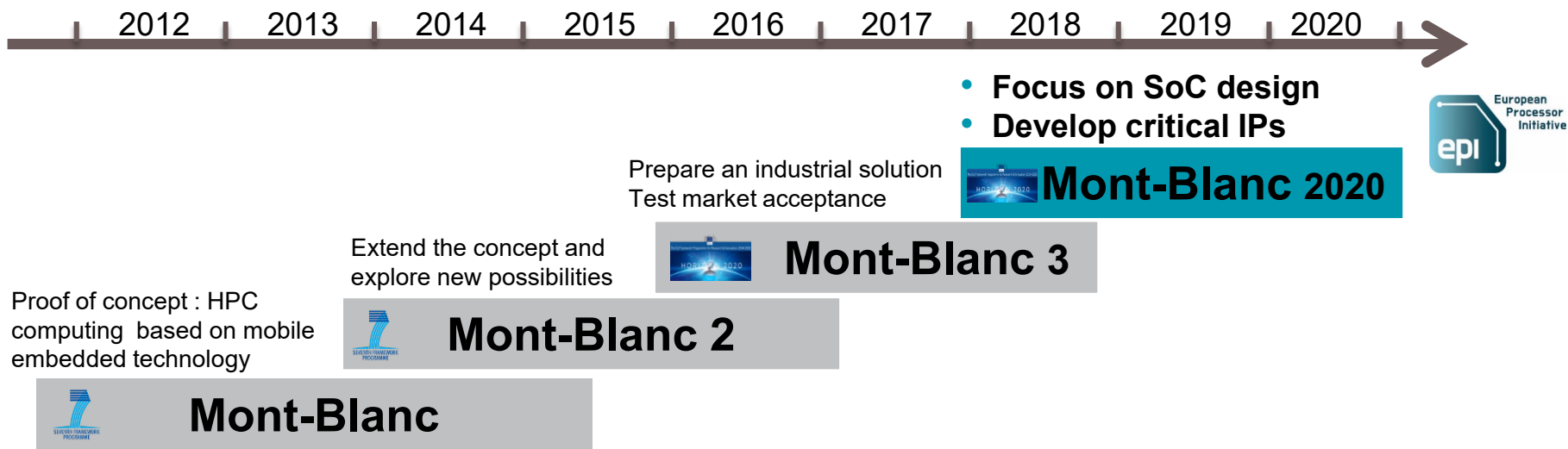
Mont-Blanc 2020

ETP4HPC webinar, July 3rd, 2020
Said Derradji, Atos, Project Coordinator



Mont-Blanc roadmap

Paving the way to a scalable, modular and power-efficient
European HPC processor



Atos

arm



KALRAY

JÜLICH
FORSCHUNGSZENTRUM

semidynamicS

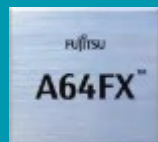
SIPEARL
The Silicon Pearl

MONT-BLANC

TRL-8:SVE-enabled core performance model



- **Scalable Vector Extension new ISA for Arm Servers and HPC**
 - New vectorisation paradigm
- **SVE-enabled core performance model**
 - Simulation framework (gem5) was delivered and published with SVE
 - Used across the project and externally for HW/SW codesign, performance studies and SW stack development
- **Now upstream**
 - <https://gem5.googlesource.com/public/gem5>
- **Add-on: activity-based power modeling using SVE stats**
 - <https://gem5.googlesource.com/arm/gem5/+mb2020/d4.2>
- **Promoted inside Gem5 Community, via Arm website and organizing hackathons or tutorials**



First Arm chip
with SVE



EPI with SVE

TRL-4: Low power Network on Chip (NoC)

New critical building block of a low-power System-on-Chip targeting HPC

- **NoC is Key and challenging maintaining low latency while increasing number of cores and throughput**
- **The NoC supports Multi-die**
- **The NoC supports Heterogenous compute**
 - Low latency and high bandwidth interface between CPU and accelerator (IO coherency or unified memory protocol)
- **The NoC supports the CHI standard and will be productized within EPI**
- **Promoted in conferences for SoC designers (publications and demo) and inside Mentor users community**



32 cores Mesh

Bisection 1024GB/s

64 cores

bisection 500GB/s

Mont-Blanc prototypes

2015

2016

2017

2018

2019

2020

Mont-Blanc prototype TRL-7



1080 Dual Cortex-A15 (+ Mali)

❖ 2160 Armv7 cores

Dibona TRL-9



48 nodes bi-socket THX2

❖ 3072 Armv8 cores

MB2020 Demonstrator TRL-4



Only one MB2020 SoC

❖ 32 SVE cores

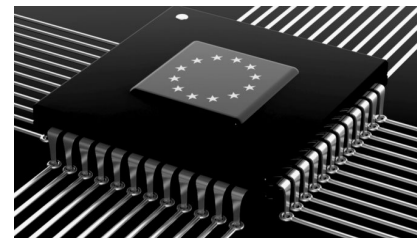
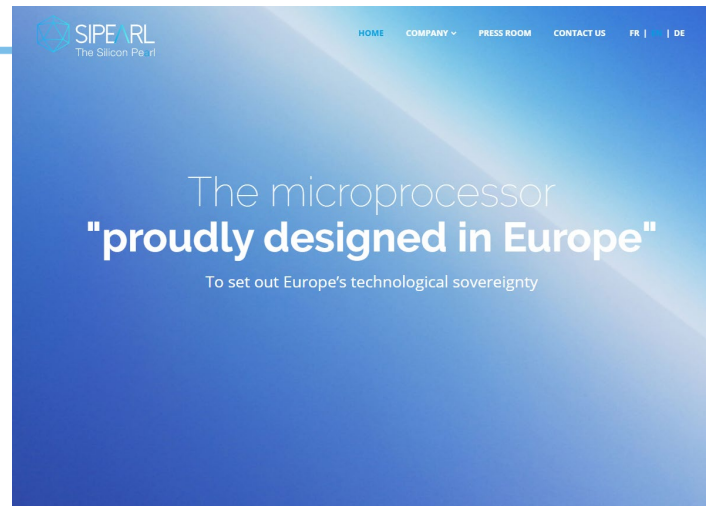
Collaborations

Industry/academia collaboration has been a strong point throughout the Mont-Blanc projects

- **A team of 3 core partners with complementary profiles (Arm, Atos, BSC)**
- **SMEs have an active role in the consortium (Kalray, Semidynamics)**
- **Prominent research partners (CEA, Jülich)**
- **The consortium recently welcomed a new SME, SIPEARL, whose mission is to incorporate our technology in their future product**

Symbiotic relationship with EPI project

- **European sovereignty in HPC technology provisioning is part of Mont-Blanc's vision**
- **Mont-Blanc IPs and results are already and will be re-used**
 - by EPI for the European Processor
 - for EuroHPC's Advanced Pilots towards the European Exascale Supercomputers
- **Revive an European ecosystem of SoC/accelerators fabless companies**
 - European IPs portfolio (NoC, memory controller)
 - Skills in state of the art silicon technology implementation in 7nm finfet
 - not only for HPC but for the edge (automotive) market





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Question time

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