NEW MEMBERS

EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

PRESENTATIONS BY OUR NEW MEMBERS

Evangelos Floros - GRNET
Dr Alain Refloch - ONERA
Dr Giovanni Bracco - ENEA
Dr Sebastien Varrette – University of Luxembourg
Dr Mike Dewar – NAG Ltd
Sabri Pllana PhD - Individual member
Carlo Cavazzoni PhD on behalf of Quantum Expresso Foundation
Dr Johannes Langguth - Simula Research Laboratory
Dr Martin Palkovic - IT4Innovations National Supercomputing Center
Prof Jesus Carretera – University Carlos III Madrid
Vincent Hindriksen - StreamComputing

GREEK RESEARCH AND TECHNOLOGY NETWORK SUPERCOMPUTING SERVICES

EVANGELOS FLOROS

http://www.grnet.gr

Greek Research and Technology Network

Supercomputing Services

Vangelis Floros

ETP4HPC General Assembly

Munich, 21/3/2017

GRNET at a glance

Government owned company

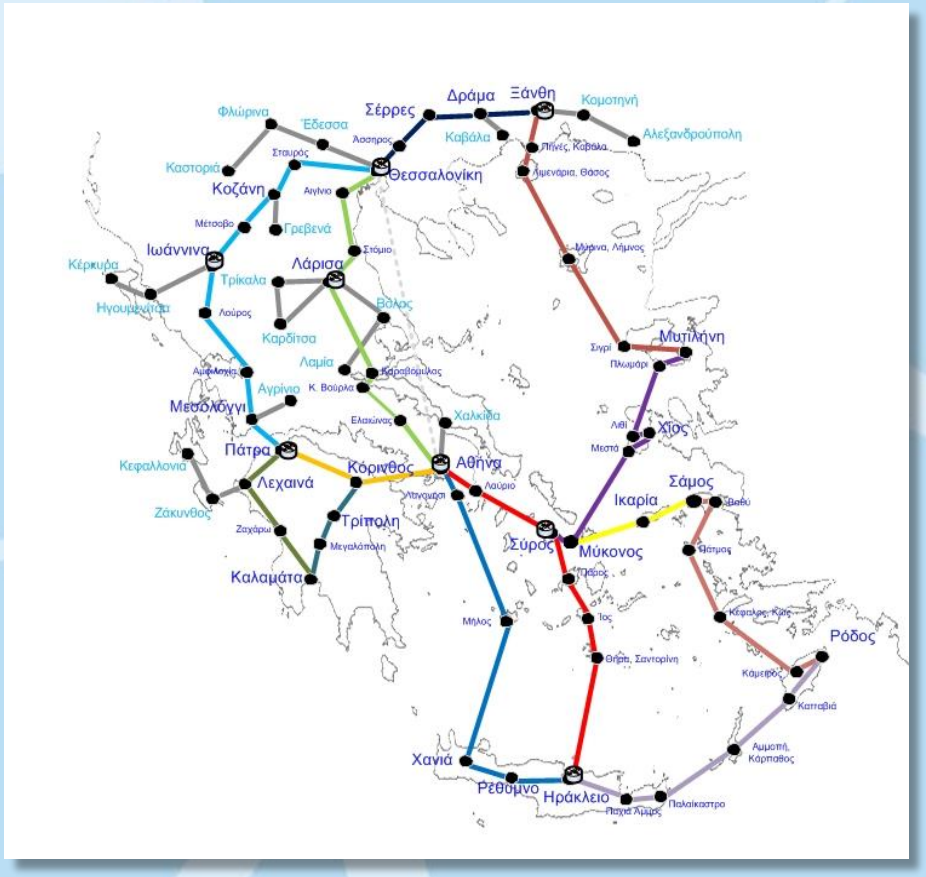
- Operating under the auspices of Ministry of Education and the General Secretariat of Research and Technology

Academic & Research Network Provider

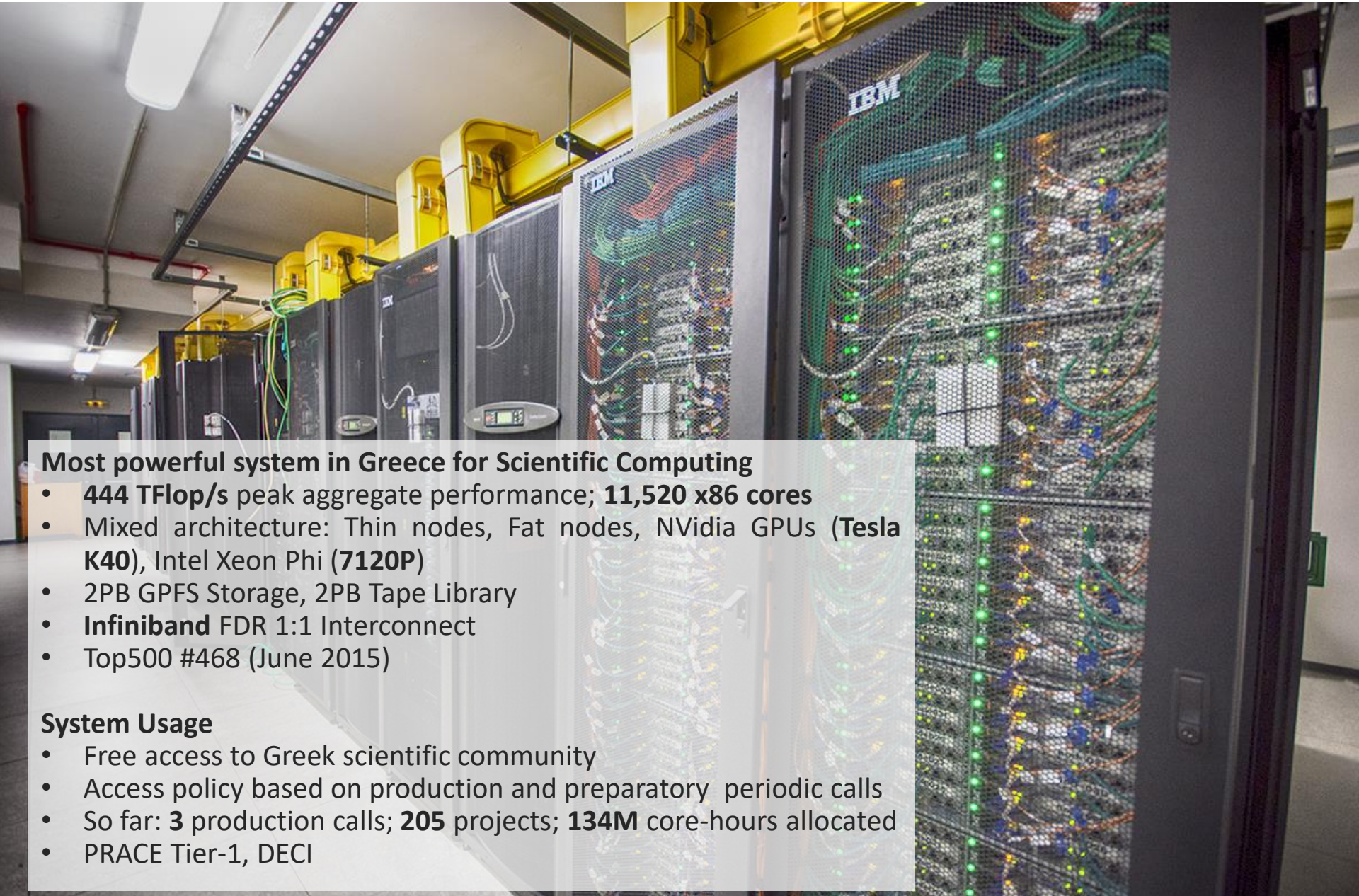
- Greek NREN. Connectivity to GEANT
- 87 PoPs
- 8410 km optical fibre network

Computing Services

- 4 Data Centers (Athens, Crete, Epirus)
- Grid Computing
- Cloud Computing
- High Performance Computing



ARIS (Advanced Research Information System)



Most powerful system in Greece for Scientific Computing

- **444 TFlop/s** peak aggregate performance; **11,520 x86 cores**
- Mixed architecture: Thin nodes, Fat nodes, NVidia GPUs (**Tesla K40**), Intel Xeon Phi (**7120P**)
- 2PB GPFS Storage, 2PB Tape Library
- **Infiniband** FDR 1:1 Interconnect
- Top500 #468 (June 2015)

System Usage

- Free access to Greek scientific community
- Access policy based on production and preparatory periodic calls
- So far: **3** production calls; **205** projects; **134M** core-hours allocated
- PRACE Tier-1, DECI

Competence Areas

http://www.grnet.gr

Areas and domains of interest and expertise include:

- e-Infrastructure provisioning and coordination activities
- Scientific community support
- Leading role in Greece & South-Eastern Europe HPC activities

Organizations - Memberships

- PRACE AISBL
- ETP4HPC
- EGI.eu
- EUDAT
- EPIC
- GEANT

HPC Projects

- PRACE-IPs
- ViSEEM (coordinators)
- HPC-Europa
- SESAME-Net

HPC-Europa2
Pan-European Research Infrastructure on High Performance Computing

ePIC
Persistent Identifiers for eResearch

PRACE

ETP 4 HPC

EGI

EUDAT

Vi-SEEM

GÉANT

sesamenet
SUPERCOMPUTING EXPERTISE FOR SMALL & MEDIUM ENTERPRISE NETWORK

thank you

Useful Links
GRNET main web site: http://www.grnet.gr
HPC Service web site: http://hpc.grnet.gr
System documentation:
http://doc.aris.grnet.gr

Generic Information: hpc-info@lists.grnet.gr
Access information: hpc-access@lists.grnet.gr
Tech support: support@hpc.grnet.gr

ΕΣΠΑ 2007-2013 πρόγραμμα για την ανάπτυξη
ΕΥΡΩΠΑΪΚΗ ΕΝΩΣΗ
ΠΕΠ Περιφερειακό Επιχειρησιακό Πρόγραμμα Αττικής πραγματική ανάπτυξη
ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ Υπουργείο Παιδείας & Θρησκευμ
Ευρωπαϊκή Ένωση Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
ψηφιακήελλάδα Όλα είναι δυνατά Επιχειρησιακό Πρόγραμμα "Ψηφιακή Σύγκλιση"
ΕΣΠΑ 2007-2013 πρόγραμμα για την ανάπτυξη Ποιότητα ζωής για όλους
Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης

HIGH PERFORMANCE COMPUTING FOR PEOPLE

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ONERA

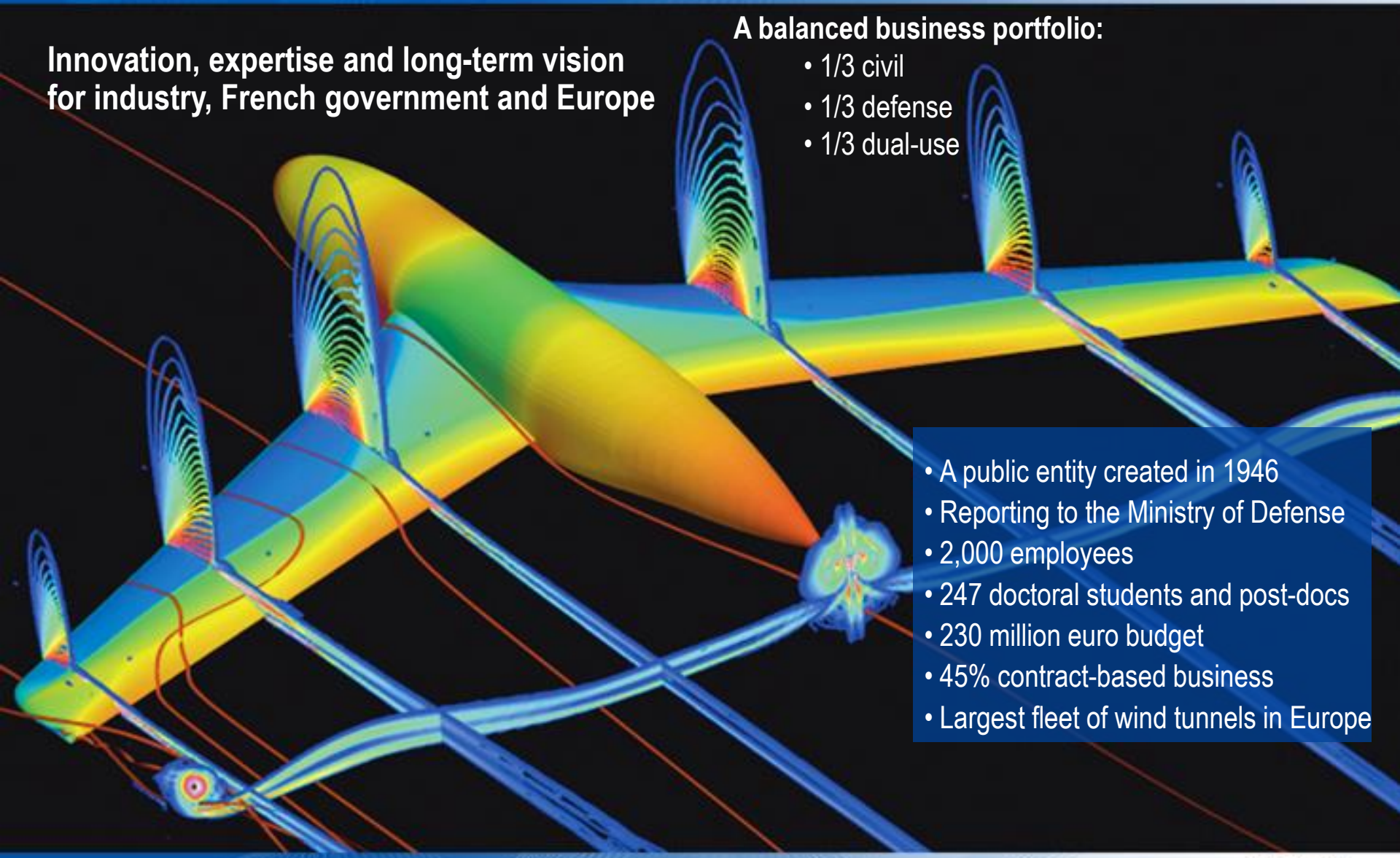
Dr Alain Refloch

ONERA : The French Aerospace Lab

Innovation, expertise and long-term vision for industry, French government and Europe

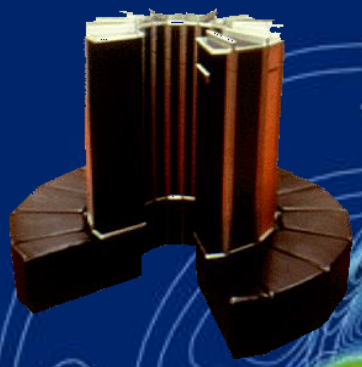
A balanced business portfolio:

- 1/3 civil
- 1/3 defense
- 1/3 dual-use

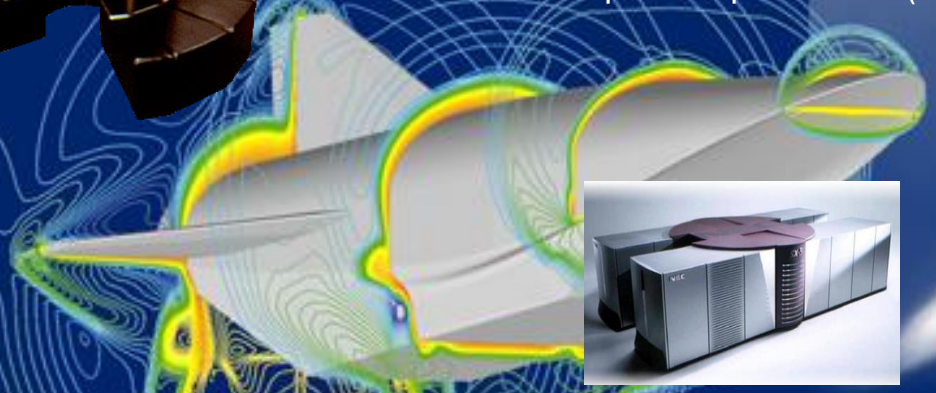


- A public entity created in 1946
- Reporting to the Ministry of Defense
- 2,000 employees
- 247 doctoral students and post-docs
- 230 million euro budget
- 45% contract-based business
- Largest fleet of wind tunnels in Europe

ONERA & HPC : 1984 - 2017



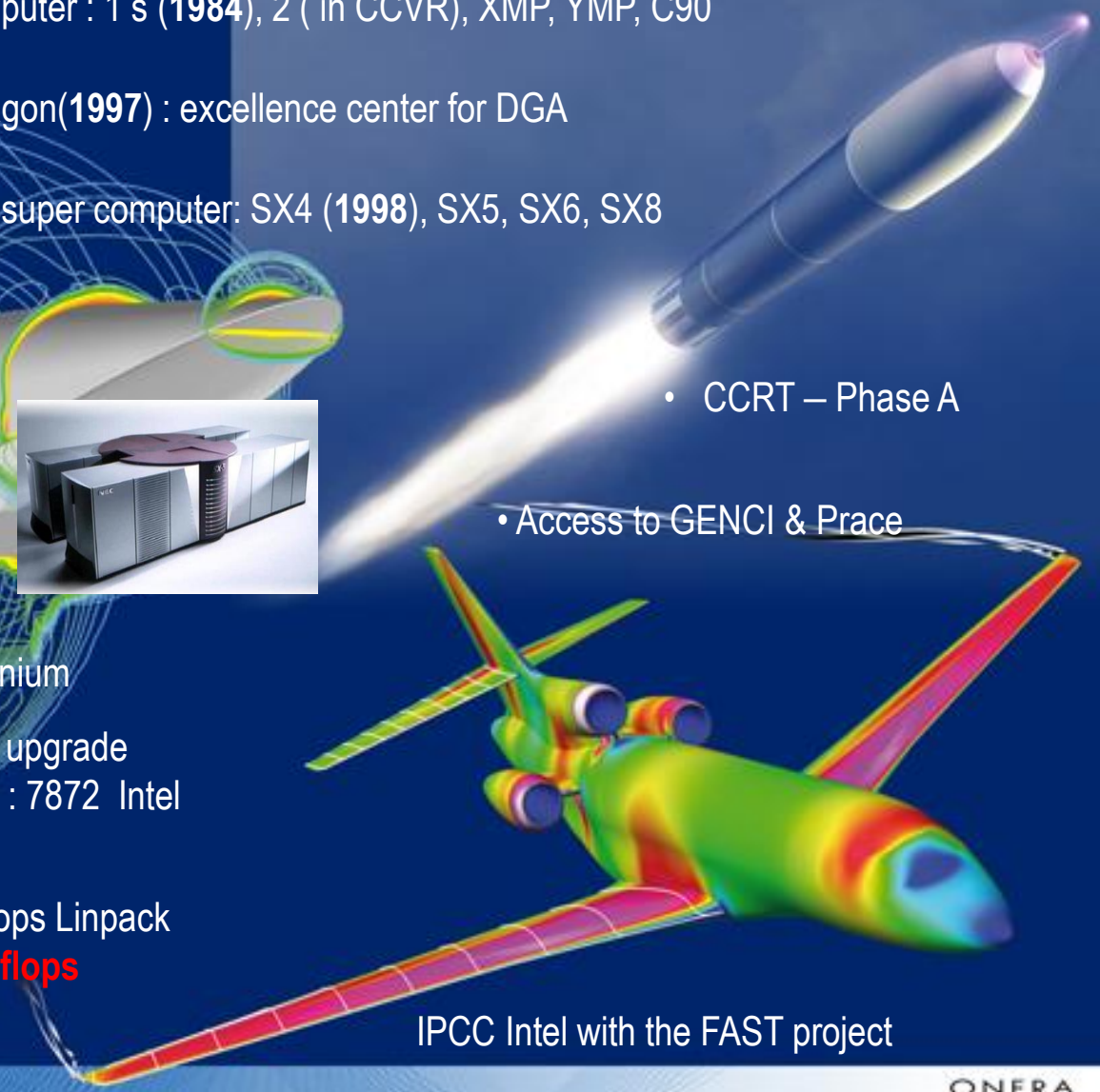
- Cray supercomputer : 1 s (**1984**), 2 (in CCVR), XMP, YMP, C90
- Intel Paragon(**1997**) : excellence center for DGA
- NEC super computer: SX4 (**1998**), SX5, SX6, SX8



- CCRT – Phase A
- Access to GENCI & Prace

- Superscalar BULL (**2005**) : 528 cores Itanium
- SGI ICE : NHM (**2009**) + WESTMERE + upgrade (**2013**) (2880 cores Ivy Bridge) - 01/2014 : 7872 Intel cores – Peak performance 115 Tflops

Spring 2017 : 17360 cores BDW - 566 Tflops Linpack
End 2018 : option for Skylake cores -> **1 Pflops**

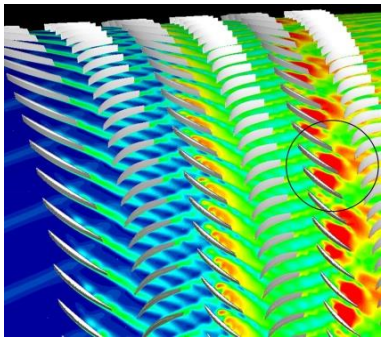


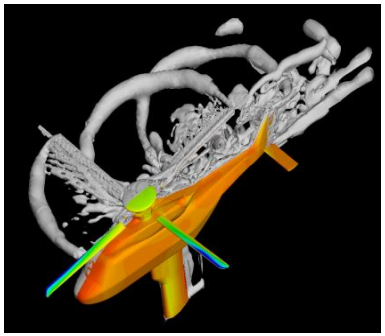
IPCC Intel with the FAST project

ONERA & codes : 2 'Legagy codes' : elsA and CEDRE software

elsA Multi-purpose CFD simulation platform

- → Internal and external aerodynamics, From low subsonic to high supersonic, for Compressible 3-D Navier-Stokes equations, with Moving deformable bodies, for Aircraft, helicopters, turbomachinery, CROR, missiles, launchers…
- → Python/C++/Fortran 1.7 M lines of code





Onera and research partners

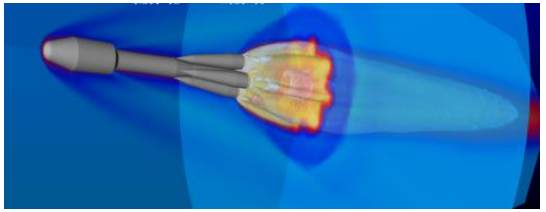
→ Onera departments, Cerfacs, Dynfluid, LMFA, Cenaero, Von Karman Institute, …

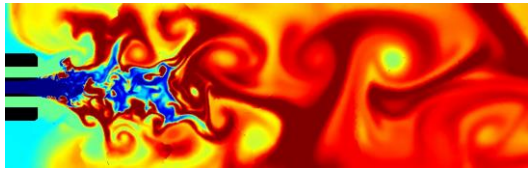
Industry users & clients

→ Airbus, Safran (*Snecma, Turbomeca, Techspace Aero*), Eurocopter, …..

CEDRE : Simulation tools for propulsion and energetics, using **generalized unstructured grids** for **Multiphysics** simulations , with Internal Solvers :

- Navier-Stokes multiple-species, turbulent, reactive, Dispersed phases (Eulerian), Dispersed phases (Lagrangian), Convection-Diffusion, …





HIGH PERFORMANCE COMPUTING FOR PEOPLE

ETP 4 HPC

ENEA

Dr Giovanni Bracco

Italian National Agency for New Technologies,
Energy and Sustainable Economic Development

A 3 slides presentation about ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development, now a member of ETP4HPC

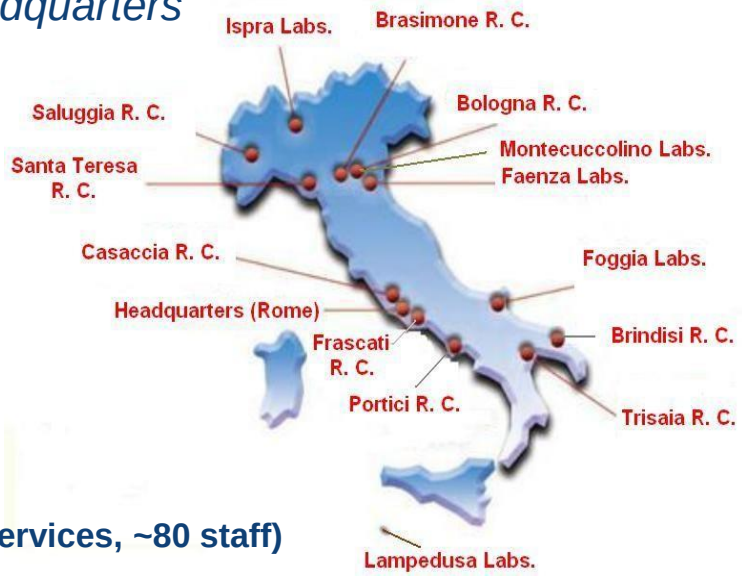
ETP4HPC General Assembly, Munich 21/3/2017

G. Bracco, S. Migliori, A. Quintiliani
ENEA Energy Technologies Department, DTE-ICT
giovanni.bracco@enea.it, silvio.migliori@enea.it, andrea.quintiliani@enea.it

ENEA: the mission of the Agency and the ICT Division

Research and development activities in the field of energy, environment and new technologies; dissemination and transfer of knowledge and innovation to industry, institution and civil society at large.

9 Research Centres, 5 Research laboratories
11 territorial offices, Brussels Liaison Office, Rome Headquarters
~2500 permanent staff



3 Departements:

- Fusion & Nuclear Safety
- Sustainability of territorial systems
- **Energy Technologies**:
  - Photovoltaics &Smart Networks
  - Thermal and Thermodynamic Solar Division
  - Bioenergy, Biorefinery and Green Chemistry
  - Efficient production,Conversion and Use of Energy
  - Smart Energy
  - **Information and Communication Technology (HPC & Services, ~80 staff)**
    HPC ~20 permanent staff

ENEA HPC Infrastructure: ENEAGRID/CRESCO Clusters

ENEA HPC resources are integrated into **ENEAGRID** (AFS file system HOMES, GPFS (1.3 PB) as PFS, LSF job management).
6 Research Centres connected by GARR, the Italian NREN.
The main computing facilities are **CRESCO clusters** (~165 Tflops), main site is **Portici** (Naples)

Cluster name (Linux x86_64)	Network	Cores/Tflops
CRESCO3 AMD	IB DDR	2016/~17
CRESCO4 INTEL	IB QDR	4864/~100
CRESCO5 INTELv3	IB QDR	672/~25
CRESCO6F AMD	IB QDR	456/~4
CRESCOC AMD	IB DDR	192/~1.5
K40/PHI/Large RAM	IB QDR	300/~17
Total in production		**~8500/~165**
Q3'17 CRESCO6	**SKL OPA**	**~10000/~700**

Research area 2015	Usage (%)
Material science	55.7
Combustion	16.7
Nuclear energy	8.4
Climate	7.7
Complex systems	1.1
Biotec	0.4
Aerospace	0.3
Minor activities	9.7

Type of users 2015	Number of users
ENEA	67 (48.6 %)
ENEA contract	32 (23.2 %)
Italian Univ./Inst.	30 (21.7 %)
Foreign Univ./Inst.	5 (3.6 %)
Enterprises	4 (2.9 %)
Total	138

In the context of the Italian HPC ecosystem, an agreement has been signed between ENEA and CINECA to promote joint activities. In this framework ENEA/CINECA has provided to EUROFUSION the **MARCONI-FUSION** system 1-5 Pflops, in operation since 2016/Q3.

ENEA participation in National/European HPC/ICT projects

Topics of interest and opportunities:

- HPC infrastructures & technologies,applications (material science), distributed data management, I/O performances, collaboration and remote access tools...
- Many different systems for testing and benchmarking

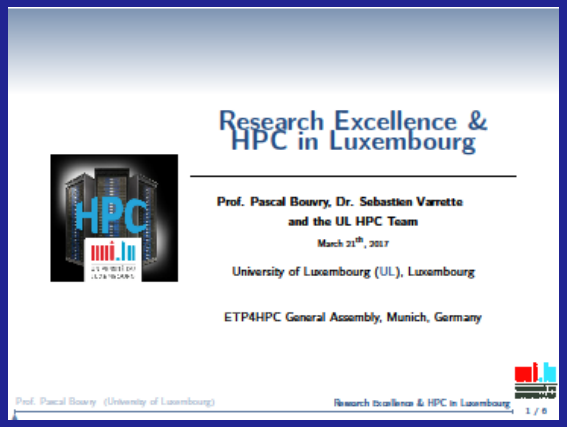
Main previous projects:

- National (European Regional Development Funds and Italian Ministry of Education & Research): **CRESCO** (2008-2012), **TEDAT** (2013-2015)
- European: Dc4Cities 2013-2015 [An environmentally sustainable data center for Smart Cities]

Running projects:

- **H2020 Centre of Excellence: EoCoE -** *http://www.eocoe.eu/*

  Energy oriented Centre of Excellence for computing application (Transversal basis, Meteorology, Materials,Water, Nuclear Fusion)
  - WP1/Task3 Efficient I/O (Juelich,PSNC,ENEA,CEA)
  - WP3 Materials (WP leader M.Celino, ENEA DTE-ICT)
- The Division participates with ICT support tasks to several H2020 projects: SEADATACLOUD, NEXTOWER, M4F, INSPYRE, GEMMA... and to EERA-JPNM (Joint Programme on Nuclear Materials)



HIGH PERFORMANCE COMPUTING FOR PEOPLE

ETP4HPC

University of Luxembourg

Dr Sebastien Varrette

Research Excellence & HPC in Luxembourg

Prof. Pascal Bouvry, Dr. Sebastien Varrette

and the UL HPC Team

March 21th, 2017

University of Luxembourg (UL), Luxembourg

ETP4HPC General Assembly, Munich, Germany

University of Luxembourg

http://www.uni.lu

Among Top 200 Universities Worldwide

- Multilingual European research university
  - ↪ founded in 2003
- $\simeq$ 6300 students (incl. ~570 PhD)
  - ↪ 110 different student nationalities
  - ↪ 11 Bachelor & 32 Master Degrees, 7 Doctoral Schools
- ~1500 employees (researchers + staff)
  - ↪ 1098 scientific publications in 2014
    - ✓ 566 in refereed journals
  - ↪ 78 exchange agreements/research coop.
- 177.5 million euros total budget in 2014

High Performance Computing @ UL

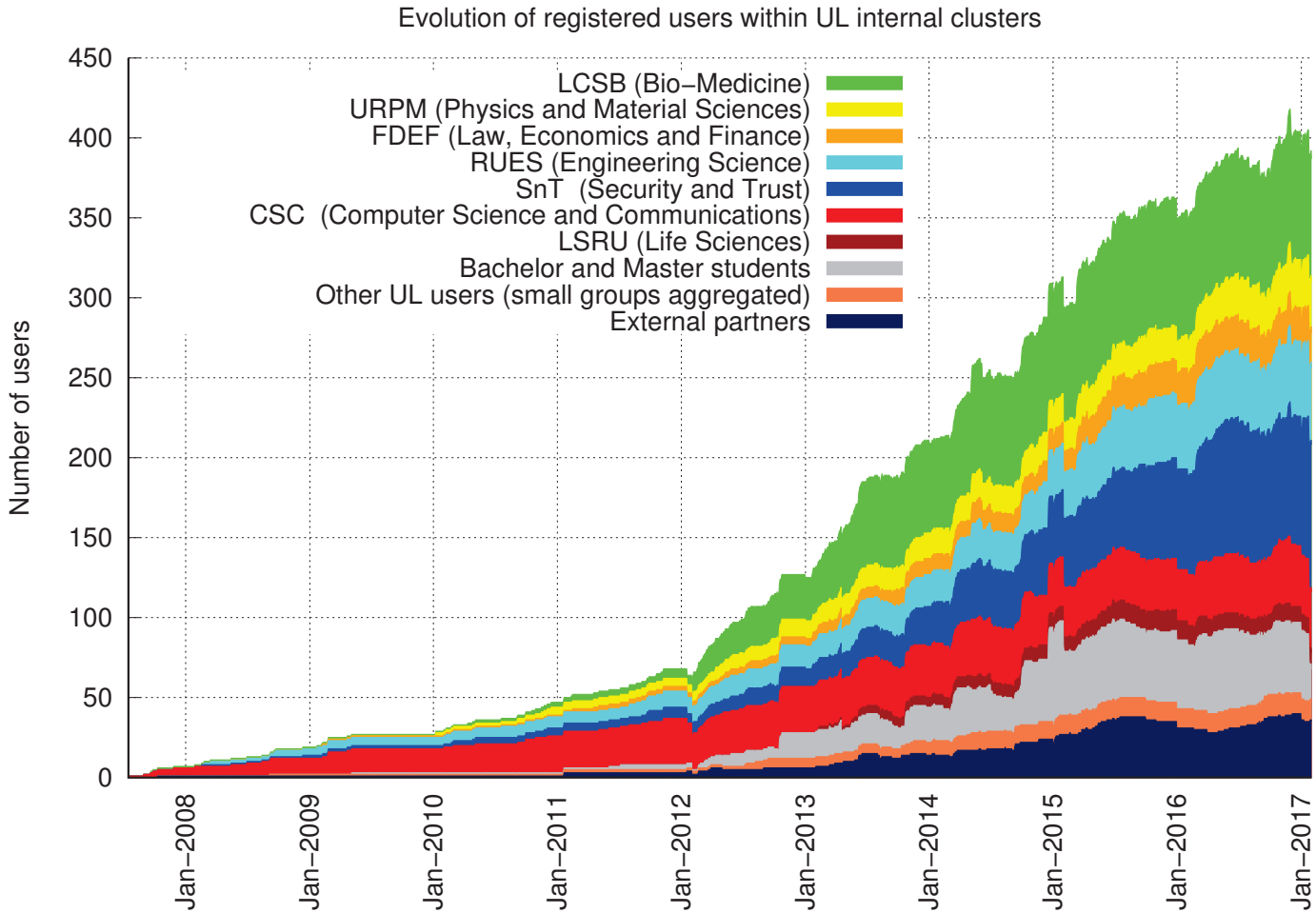
http://hpc.uni.lu

Key numbers

- 401 users
- 98 servers
- 494 nodes
  - ↪ 5428 cores
  - ↪ **90.659 TFlops**
  - ↪ 50 accelerators
    - ✓ + **76 TFlops**
- **5354.4 TB**
- 4 sysadmins
- 2 sites
  - ↪ Kirchberg
  - ↪ Belval

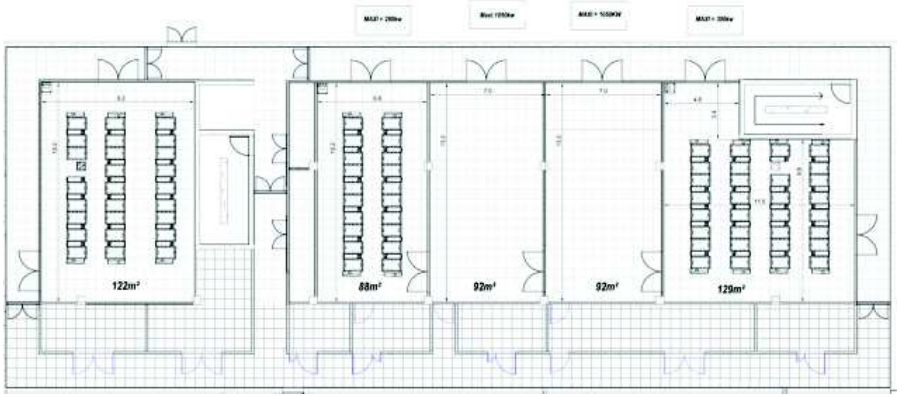
UL HPC User Base (up to Jan. 2017)

- **Active** HPC Users



UL HPC: Incoming Milestones

- **New `iris` cluster** *being installed...*
  - ↪ **+2800 cores** ($\mathbf{R}_{max}$ **+= 94.08 TFlops**) Xeon E5-2680v4
  - ↪ Infiniband Mellanox EDR 100Gb/s
  - ↪ GPFS/SpectrumScale Storage: **+1.44 PB (raw)**, $>$ 10Gb/s RW
- **New** UL HPC Data Center (operational end 2017)
  - ↪ 2 server rooms for UL HPC DLC equipment $\simeq$ 2x1050kW
  - ↪ 3 server rooms for Data storage equipment $\simeq$ 3x300kW
  - ↪ **Stepwise implementation starting Q4 2017**



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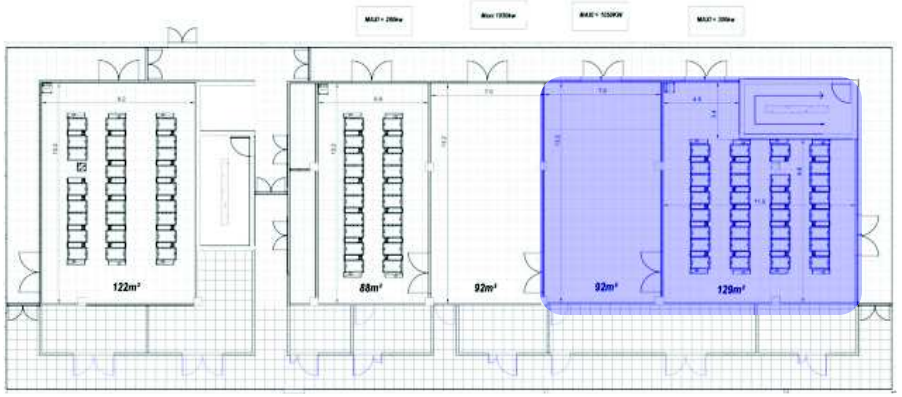

Questions?

Prof. Pascal Bouvry
Dr. Sebastien Varrette
University of Luxembourg, Belval Campus:
Maison du Nombre, 4th floor
2, avenue de l'Université
L-4365 Esch-sur-Alzette
mail: hpc@uni.lu

http://hpc.uni.lu

HIGH PERFORMANCE COMPUTING FOR PEOPLE

ETP 4 HPC

NAG Ltd

Dr Mike Dewar

The Numerical Algorithms Group Ltd (NAG)

- Global software and services company with headquarters in Oxford, UK
  - Subsidiaries in USA and Japan, staff in France, Germany, Egypt.
  - Around 70 staff worldwide
- Specialists in:
  - Numerical Algorithms
  - High Performance Computing Applications and Technology Advice
  - Software Engineering for Science and Technology
- Not-for-profit Company
  - Founded as inter-University project in 1970
  - Became independent Company in 1976
  - Collaborates with leading mathematicians and computer scientists

Markets & Customers

- Over 3000 customer sites
- Broad range of industries and academic areas
- Key markets:
  - Financial Services (investment banking)
  - Energy (oil & gas)
- Work with major vendors (AMD, ARM, Intel, …)
- Involved in many EU projects over the years:
  - EXA2CT
  - Fortissimo Experiments
  - POP

NAG & ETP4HPC

- NAG is part of European HPC community
  - … so joining ETP4HPC is a natural step!
- Continuing EU support for HPC is crucial
  - Would like to see more focus on software and algorithms
  - Centres of Excellence are a great step forward
- Important that SMEs' interests are served
  - Would like more flexibility and agility in projects
  - Perhaps more projects like Fortissimo

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ETP 4 HPC

Individual member

Sabri Pllana PhD

Modeling and Optimization of Parallel Computing Systems: A Personal View

Sabri Pllana, PhD

Associate Professor
Department of Computer Science
Linnaeus University, Växjö, Sweden
http://homepage.lnu.se/staff/saplaa/

About Me

- **Associate Professor**
  - Department of Computer Science, LNU, Växjö (SE), since 2013

- **Before joining LNU**
  - worked 12 years at the Vienna University (Est. in 1365) in Austria
  - Ph.D. in Computer Science (with distinction), January 2007
  - coordinated PEPPHER (EU FP7)

- **Selected memberships**
  - CHIPSET
  - HiPEAC
  - IEEE Senior Member

PEPPHER presentation at HiPEAC'12 conference

Selected Research Results in
Performance Modeling, Prediction, Optimization

2002 — Extension of UML for performance modeling of parallel and distributed programs. <<UML 2002>>

2004 — Extension of UML for Grid workflow applications. AxGrids 2004

2006 — High-level Specification of QoS-aware Grid Workflows. Scientific Programming Journal, 2006

2009 — Hybrid performance modeling and prediction of large-scale parallel systems. Book chapter, IOS Press book series "Advances in Parallel Computing", 2009

2012 — Platform Description Language for heterogeneous computing systems. Parallel Computing Journal, 2012

2015 — Potential of the Intel Xeon Phi for Supervised Deep Learning and DNA Sequence Analysis. HPCC 2015, ISPA 2015

Gescher Cluster (80 processors), a subcluster of single CPU nodes, a subcluster of 4xCPU SMP nodes

Grid Computing Systems Picture: courtesy of the DataGrid Project

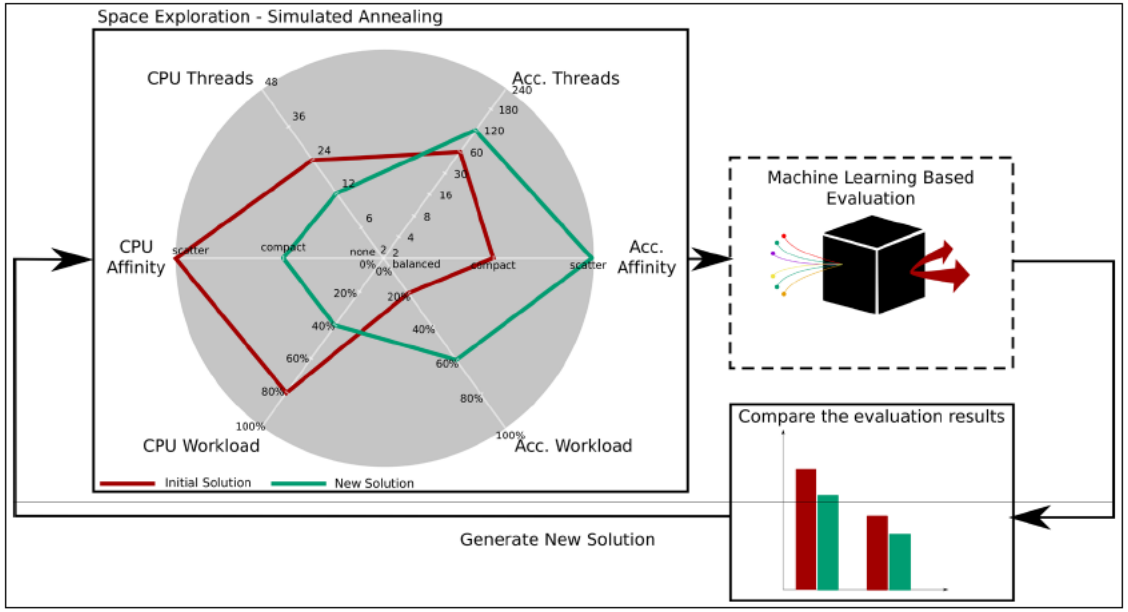
Luna Multi-core Cluster, Dual-Core AMD Opterons, (288 processor cores)

Cora, two quad-core CPUs and three GPUs (2x C2050 and 1x C1060)

Emil, two 12-core CPUs and one Intel® Xeon Phi™ co-processor (61 cores)

Recent Work at LNU

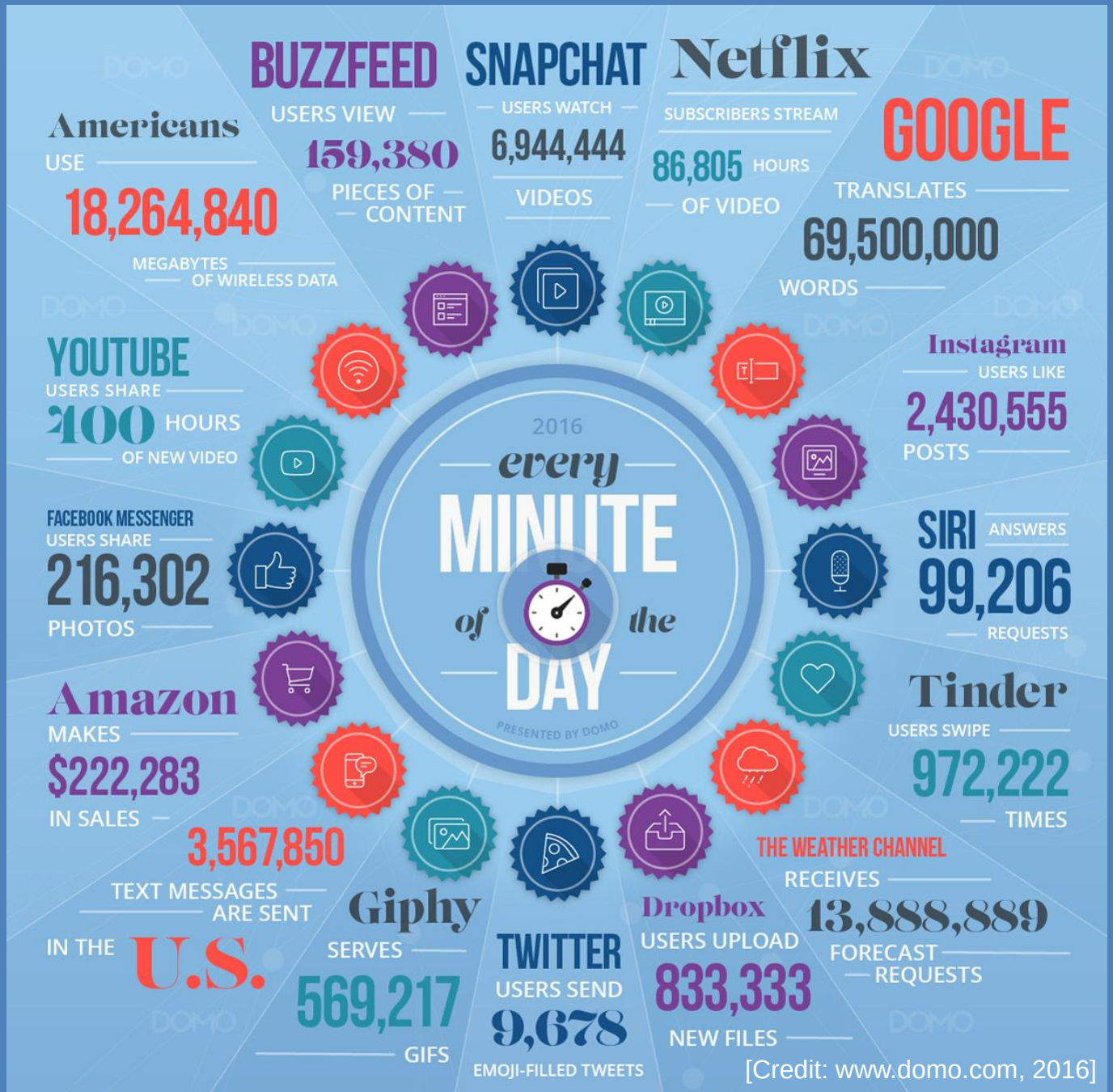
- **Parallelization for accelerated computing systems**
  - DNA sequence analysis
  - Deep learning



REFERENCE

Suejb Memeti, Sabri Pllana, Joanna Kołodziej. ***Optimal Worksharing of DNA Sequence Analysis on Accelerated Platforms****. Chapter in book: Resource Management for Big Data Platforms: Algorithms, Modelling, and High-Performance Computing Techniques, Springer, 2016, 279-309.*

Thank you for your attention!



[Credit: www.domo.com, 2016]

HIGH PERFORMANCE COMPUTING FOR PEOPLE
ETP 4 HPC

Carlo Cavazzoni PhD
on behalf of

Quantum Expresso Foundation

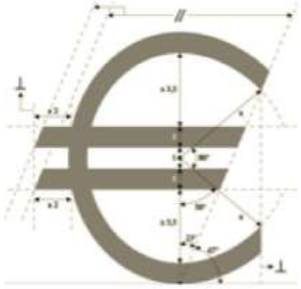
QUANTUM ESPRESSO
FOUNDATION

qef/Objects

coordinate and support research, education, and outreach within the QUANTUM ESPRESSO community

own the trademarks and protect the open-source character of QUANTUM ESPRESSO

raise funds to foster the QUANTUM ESPRESSO project



/the Company

PRIVATE COMPANIES LIMITED BY GUARANTEE

ARTICLES OF QUANTUM ESPRESSO FOUNDATION

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6. Committees

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15. Records of decisions to be kept
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18. Termination of director's appointment
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20. Directors' expenses

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BECOMING AND CEASING TO BE A MEMBER

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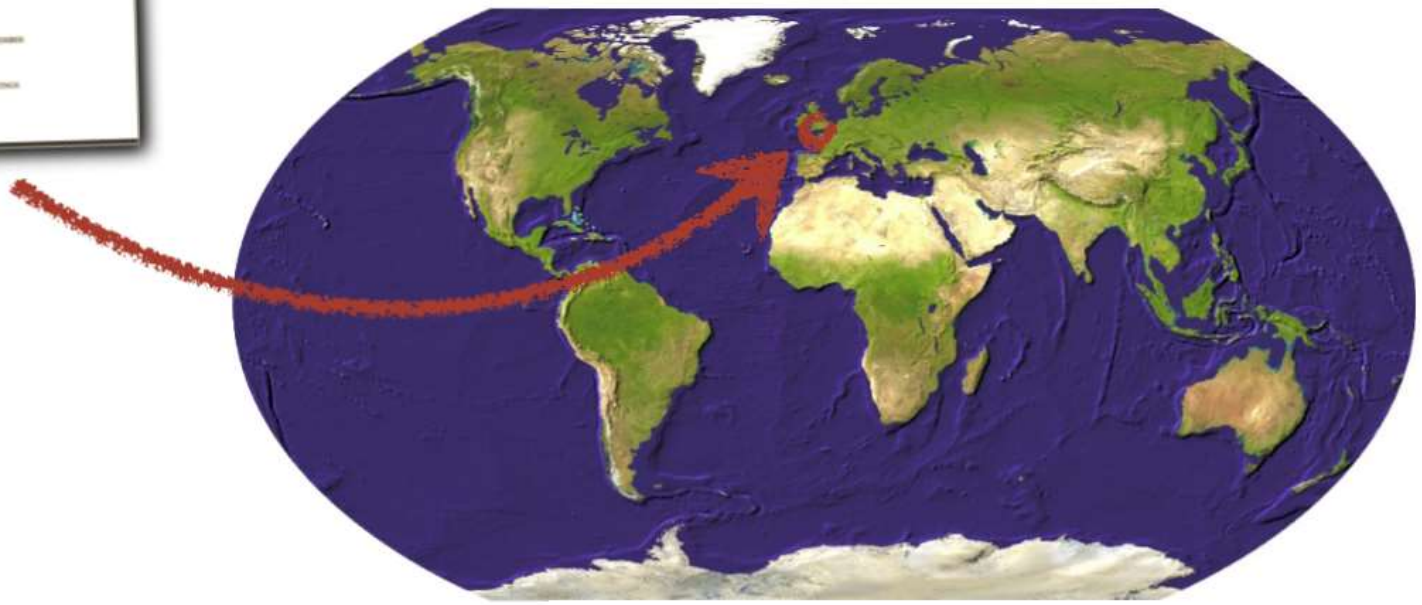
ORGANISATION OF GENERAL MEETINGS

- London-based non profit company limited by guarantee
- public company articles



/Members

- Scuola Internazionale Superiore di Studi Avanzati, Trieste
- Ecole Polytechnique Fédérale de Lausanne
- International Centre for Theoretical Physics, Trieste
- Consiglio Nazionale delle Ricerche, Italy
- CINECA supercomputing center, Bologna
- University of North Texas
- the Foundation is open to new groups / institutions wishing to join

/the Business Model

where will the foundation's money go

- dissemination (web sites, web-based community-oriented users' assistance)
- training
- funding (micro-) prizes and super-computing grants
- code development and community-oriented code gluing

where will the foundation's money come from

- membership fees
- (micro-) donations
- academic and corporate training
- brokering of custom-tailored code development / porting / optimization / benchmarking

HIGH PERFORMANCE COMPUTING FOR PEOPLE

ETP4HPC

Simula Research Laboratory

Dr Johannes Langguth

la

Simula Research Laboratory

Established: 2001
Number of employees: 140
Owner: The Norwegian government via the Ministry of Education and Research
Organisation: Limited company, strong connection with University of Oslo

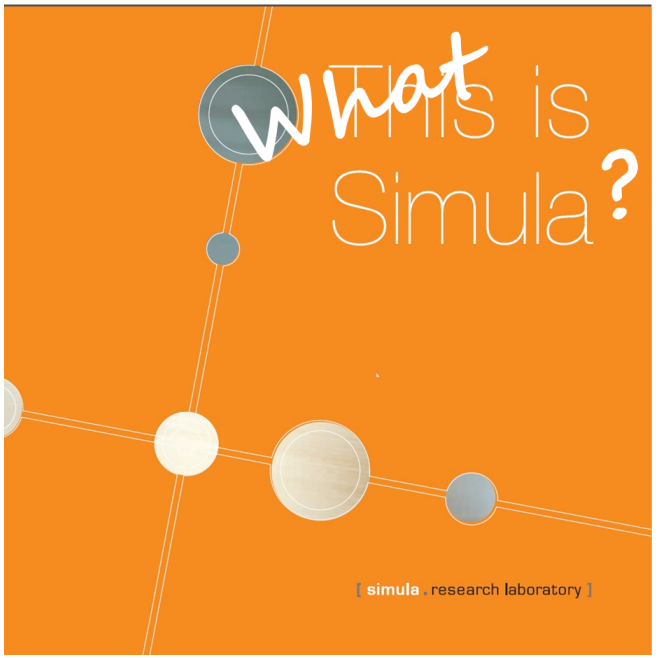
Financing:

- Basic funding from the Norwegian Gouvernment
- Grants from the Norwegian Research Council and EU
- Private money from Statoil and other mostly oil (related) companies

Purpose:

- Fundamental ICT-research with applicable goals.
- Education
- Innovation

Simula welcomes more European collaborators



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HPC research at Simula

Large Scale Biomedical Simulations

- Scientific computing (numerical methods, PDE software, large-scale simulations)
- Programming paradigms
- Use of heterogeneous supercomputers
- In-house expertise on modelling, methods, and HPC.

Applications, Programming

Media Performance Optimization

- Heterogeneous architectures for scalable media performance
- PCIe as an ultra-low latency interconnection network (*device lending)*

Programming, Infrastructure

Expanding HPC activities into Data Science

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HPC research at Simula

Networks and Cloud Computing

- Routing, fault tolerance, congestion management in HPC interconnection networks
- Utilisation of HPC interconnects to facilitate Big Data in the cloud (*ERAC*)
- Large shard-memory machines from off-the-shelf components (*NumaMultiConnect*)

Infrastructure/
Network mg

Fabriscale spinoff (to become an ETP4HPC member)

- Goal: Commercialization of network and management research
- Products: Fabric manager (IB), SDN controller, monitoring system
- Financing: SME Horizon2020, external investors

fabrisca

Dolphin INTERCONNECT SOLUTIONS

NUMASCALE BIGGER DATA ANALYTICS

ORACLE

IBM

Mellanox TECHNOLOGIES

sin

HIGH PERFORMANCE COMPUTING FOR PEOPLE

ETP 4 HPC

IT4Innovations National Supercomputing Center

Dr Martin Palkovic

T4Innovations national supercomputing center

Martin Palkovič

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upercomputing
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EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
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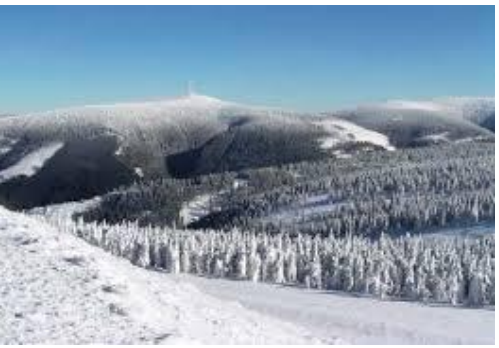
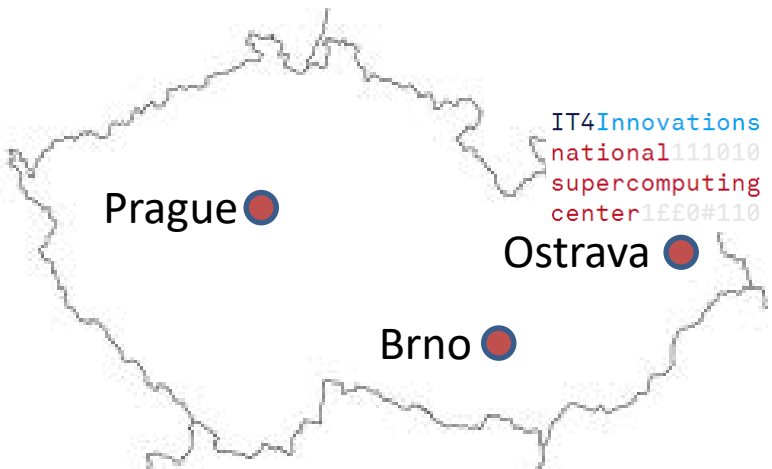
2007-13
OP Research and
Development for Innovatio

T4I is the national supercomputing center of the Czech Republic





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supercomputing
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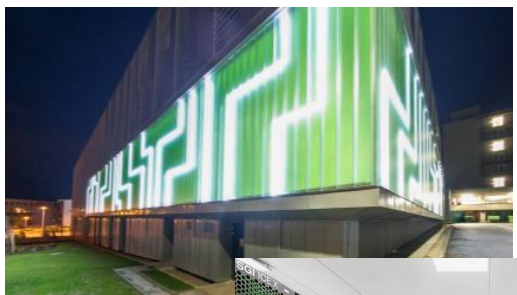

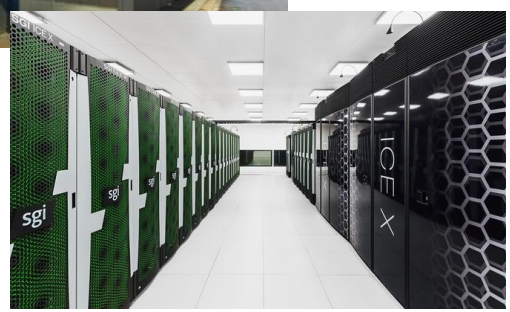

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upercomputing
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EUROPEAN UNION
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INVESTING IN YOUR FUTURE

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OP Research and Development for Innovatio

T4I operates the most powerful supercomputers in the Czech Republic

State-of-the-art datacentre (April 2015):

- 500 m^2, 2x2.5MVA DUPS
- 5 independent hot and cold water loops (2+3)
- Heat recuperation

Supercomputer Anselm (June 2013):

- Performance **94 TFLOPS** Rpeak (3k cores)
- ~30 mil corehours/year

Supercomputer Salomon (June 2015):

- Performance **2 PFLOPS** Rpeak (24k+53k cores)
- ~200 mil corehours/year
- 863 Intel(r) Xeon Phi(tm) coprocessors

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EUROPEAN REGIONAL DEVELOPMENT FUND
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OP Research and Development for Innovatio

30+ researchers (FTE) in 5 labs active in EU and national projects related to HPC

- 5 FP7 projects (PRACE IP, EXA2CT, …)
- 8 H2020 projects (see logos below, …)
- 3 other international projects (IPCC, ESA TEP, …)
- 3 applied research national projects
- 3 basic research national projects
- 2 large national projects (>10 mil EUR for 4+ years)
  - operation of large research infrastructure
  - support excellent research

IT4Innovations
National Supercomputing Center

PRACE

EXCAPE

ANTAREX 10^18
READEX
Runtime Exploitation of Application Dynamism

sesame net
SUPERCOMPUTING EXPERTISE FOR SMALL & MEDIUM ENTERPRISE NETWORK

ROPEAN UNION
ROPEAN REGIONAL DEVELOPMENT FUND
VESTING IN YOUR FUTURE

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OP Research and Development for Innovatio

HIGH PERFORMANCE COMPUTING FOR PEOPLE

ETP 4 HPC

University Carlos III Madrid

Prof Jesus Carretera

University Carlos III of Madrid

Prof. Jesús Carretero

Computer Architecture and Systems Group (ARCOS)
Computer Science and Engineering Department

jesus.carretero@uc3m.es

ETP4HPC General Assembly - Munich, March 2017

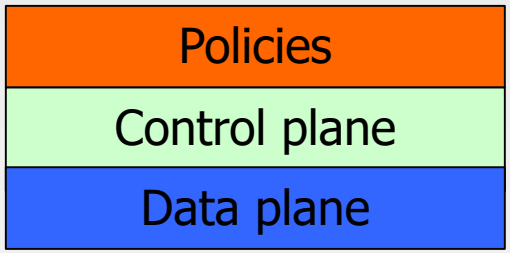
University Carlos III of Madrid

- Created in 1989.
  - 25,000 students
  - 33 in ranking QS Top 50 Under 50
- Polytechnic Engineering School.
  - Computer Science & Engineering Department
  - Among top 200 in ARWU 2015 in Computer Science
  - Research group: Computer Architecture and Systems (ARCOS)
- HPC research and application
  - Goal: Applied research on large-scale parallel and distributed systems (parallelization, runtimes and I/O).
  - Research: High-Performance I/O and programming models
  - Applications: bioinformatics, engineering process simulation, data and signal analytics, aeronautics, finance, …
- Cooperation: Argonne Labs, Northwestern, CINVESTAV, DKRZ, INRIA, CNRI, CIBERSAM, IBM Research, CERN, …

High-performance I/O Research

- Middleware for I/O coordination and control
- Decouple policy, control and data management
- Cross-layer abstractions and run-time
  - Facilitate the flow of control and data across the I/O stack
- In-memory data-locality aware storage
- Malleability in MPI

CLARISSE



- Research opportunities
  - Dynamic I/O load balancing (S.R.A. 5.3.2)
  - Locality exploitation (S.R.A. 5.2.4, 5.3.1)
  - I/O elasticity (S.R.A. 5.2.4)
  - Adaptive buffering in parallel applications workflows (S.R.A. 5.5, 5.6.2)
  - Novel resilience protocols (S.R.A. 5.4.4, 5.5)
  - Data-aware parallel I/O scheduling (S.R.A. 5.2.4, 5.3.1)
  - Cross-layer optimizations (S.R.A. 5.3.6)

Hercules

- Integrated with Swift/T scheduler

Argonne NATIONAL LABORATORY

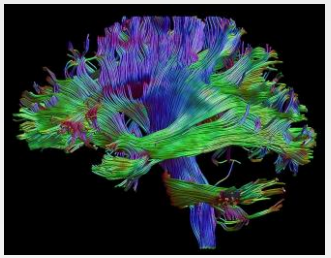
ARCOS uc3m

Programming Models and Application Improvement

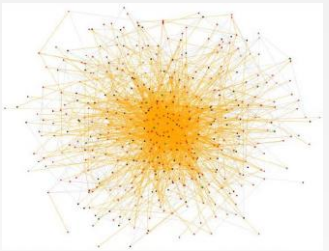
- Research activities:
  - Parallel patterns extraction from sequential legacy code (S.R.A. 5.3.3, 5.6.4).
  - Runtime support for parallel patterns/skeletons with special attention to Parallel Heterogeneous Architectures (S.R.A. 5.3.4, 5.3.6).
  - Refactoring from DSLs (e.g MATLAB or R) into highly pattern/skeleton based parallel C++ (S.R.A. 5.3.5).
  - Contracts based programming to improve program correctness (S.R.A. 5.3.8).
- C++ language design and evolution: C++11, C++14, C++17, …
- Recent Projects: REPARA (FP7), RePhrase (H2020)

Applications

- Novel Cone-Beam X-Ray Simulation framework (FUX-Sim)

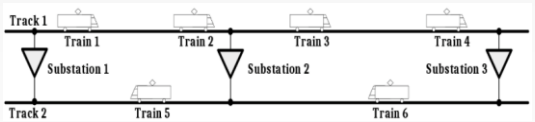


- CPU/GPU-accelerated spherical deconvolution of diffusion MRI data (pHARDI)

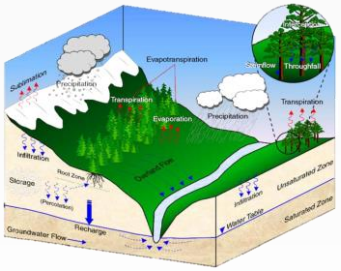


- Epigraph. Flu simulator including social data

- Railway power consumption simulation



- Hydrogelogy modelling based on real-time data



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ETP4HPC General Assembly - Munich, March 2017

STREAMCOMPUTING
Performance Engineers

Builds **fast** and **scalable** software on CPU, GPU and FPGA

Focuses on Structured Big Data, Large-scale scientific experiments, Image/Video processing and AI

Are OpenCL and CUDA experts

Founded in 2010

Distributed team in Europe

Well-known in the GPU-world

Clients in Europe, N-America and East-Asia

HIGH PERFORMANCE COMPUTING FOR PEOPLE
ETP4HPC

StreamComputing

Vincent Hindriksen

StreamComputing
Performance Engineers

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- Are OpenCL and CUDA experts

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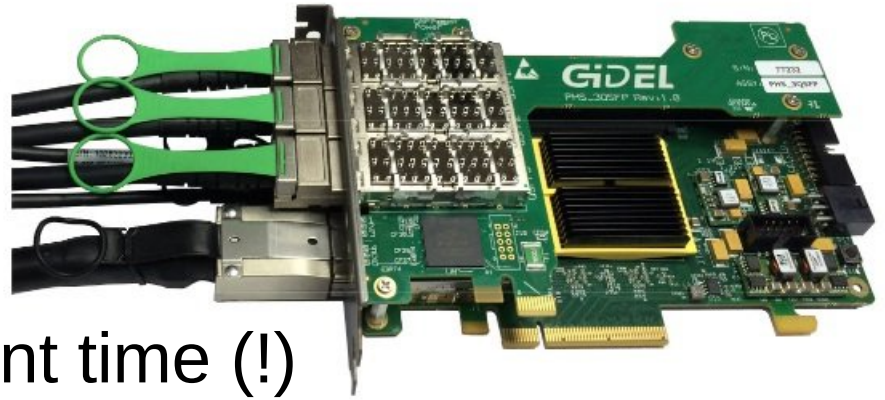
OpenCL on Networked FPGAs



What is it?

- Low latency < 5 µs
- 4 times faster development time (!)
- New version can be tested and deployed in one day.
- 80 to 90% of VHDL/Verilog-performance
- Focus on more complex and variable code

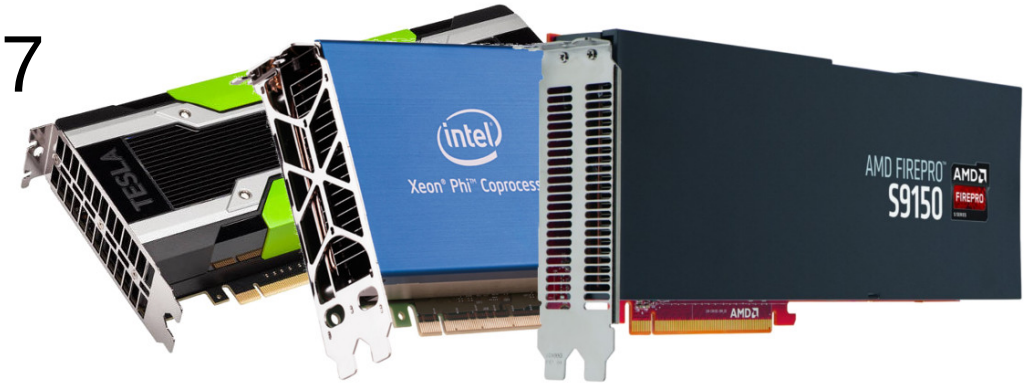
Why us?

- All IP under own control
- 3 years experience on OpenCL-on-FPGAs

OpenCL/CUDA on GPUs

What is it?

- NVIDIA Tesla and AMD Instinct
- 2 to 8 times speedup
- 20+ TFLOPS in 2017



Why us?

- Handling full projects
- Extensive algorithmic knowledge
- 7 years of experience: TATA, Stanford,

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STREAM COMPUTING
Performance Engineers

Questions?

"Building a globally competitive European world-class HPC technology value chain"

ETP4HPC

THANK YOU FOR YOUR ATTENTION!

For more information:
www.etp4hpc.eu ■ contact: office@etp4hpc.eu

HPC strategy, work programmes and HPC related news:
ec.europa.eu/horizon2020-hpc