



Partnership for Advanced Computing in Europe

International HPC Summer School 2019

Kobe, 08.07.2019

Florian Berberich
PRACE Board of Directors



Hiroshima

- ▶ What would you do first in order to reach peace in the world?





PRACE - OVERVIEW



PRACE | what we do

- ▶ Open access to world-class HPC systems to EU scientists and researchers
- ▶ Variety of architectures to support the different scientific communities
- ▶ High standards in computational science and engineering
- ▶ Peer Review at European level to foster scientific excellence
- ▶ Robust and persistent funding scheme for HPC supported by national governments and European Commission (EC)
- ▶ Support the development of intellectual property rights (IPR) in Europe by working with industry and public services
- ▶ Collaborate with European HPC industrial users and suppliers



PRACE | achievements

- ▶ 688 scientific projects enabled
- ▶ >21 000 000 000 (thousand million) core hours awarded since 2010
- ▶ Of which 63% led by another PI nationality than the HM
- ▶ R&D access to industrial users with >50 companies supported
- ▶ >12 000 people trained through PRACE Training
- ▶ ~110 Petaflops of peak performance on 7 world-class systems
- ▶ 26 PRACE members, including 5 Hosting Members
(France, Germany, Italy, Spain and Switzerland)
- ▶ PRACE is the only e-infrastructure Landmark on the ESFRI Roadmap 2016

PRACE | Tier-0 Systems in 2019



MareNostrum: IBM
BSC, Barcelona, Spain
#25 Top 500



Piz Daint: Cray XC50
CSCS, Lugano, Switzerland
#5 Top 500



NEW ENTRY 2018/2019
SuperMUC NG : Lenovo
cluster GAUSS @ LRZ,
Garching, Germany #8
Top 500



NEW ENTRY 2018
JOLIOT CURIE : Bull Sequana
GENCI/CEA, Bruyères-le-Châtel,
France #40 Top 500



MARCONI: Lenovo
CINECA, Bologna, Italy
#19 Top 500

Hazel Hen: Cray
GAUSS/HLRS,
Stuttgart, Germany
#30 Top 500



NEW ENTRY 2018
JUWELS (Module 1):
Bull Sequana
GAUSS @ FZJ, Jülich,
Germany #26 Top 500



Close to 110 Petaflops
cumulated peak
performance

The European HPC Systems Map (t.b.p.)



26 PRACE Members

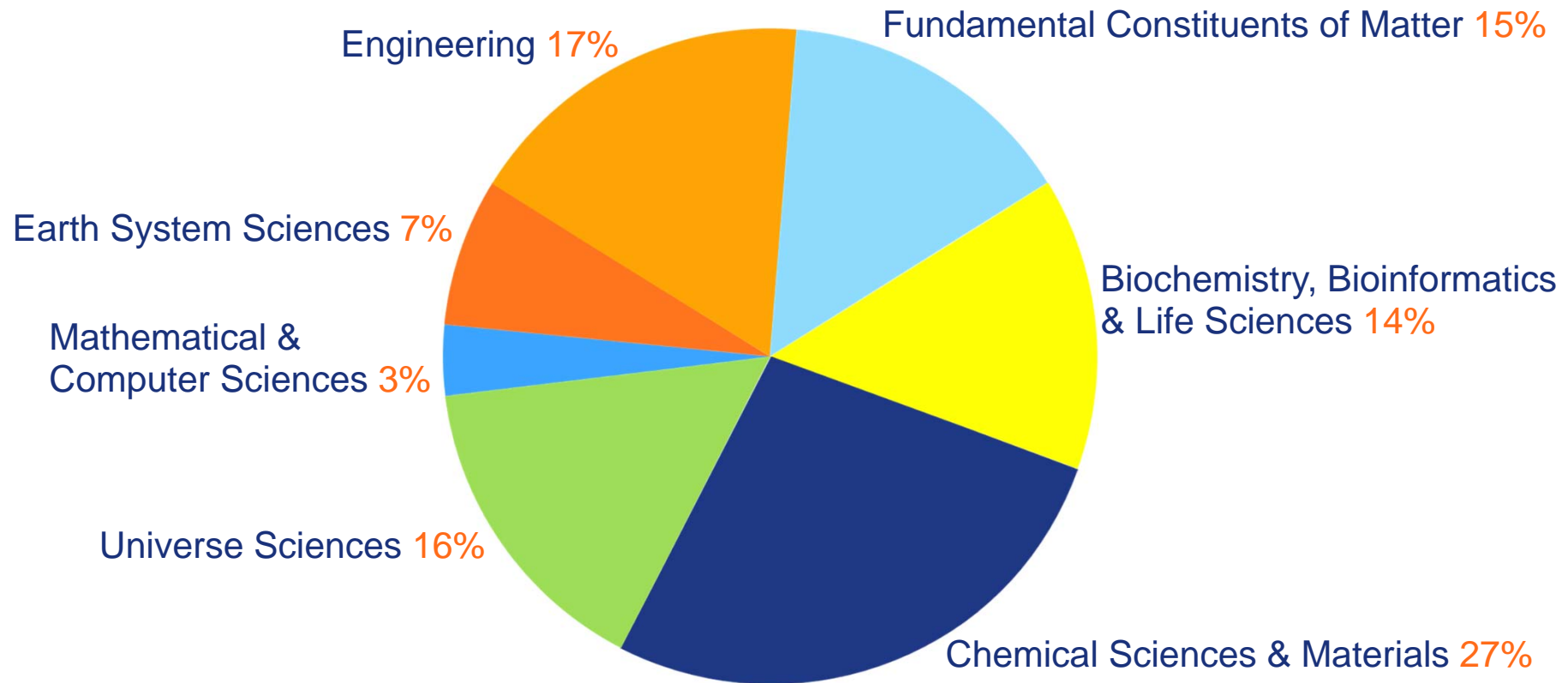
Belgium
Bulgaria
Cyprus
Czech Republic
Denmark
Finland
Greece
Hungary
Ireland
Israel
Luxembourg
Netherlands
Norway
Poland
Portugal
Slovakia
Slovenia
Sweden
Turkey
United Kingdom

France
Germany
Italy
Spain
Switzerland



PRACE's support to science

**Criterion:
Scientific
Excellence**



Data up to and including Call 16, % of total projects awarded (Project Access)

PRACE – Scientific Case

- ▶ **Scientific applications**
 - ▶ urgent need for more compute cycles, AND
 - ▶ huge demands memory bandwidth & I/O
- ▶ **Need new approaches**
 - ▶ scaling via ensembles, deep learning, and statistical models
 - ▶ systems able to handle tens of thousands of active jobs and large I/O requests
- ▶ **Software & algorithms** take longer to change than hardware
 - ▶ PRACE & Europe need a much more ambitious strategy to develop the SW part of next-generation computing



“Future Infrastructures and operations will need to be much more diverse to support HPC, Data Science and different types of accelerators - but we also need to avoid fragmentation.” - PRACE Scientific CASE



Access through PRACE Peer Review



Free-of-charge BUT required to **publish results** at the end of the award period



Preparatory Access (*2 or 6 months*)



SHAPE Programme (*2 or 6 months*)



Project Access (*12, 24 or 36 months*)

**Criterion:
Scientific
Excellence**



PRACE TRAINING



PRACE Training Offerings

Seasonal Schools

CodeVault

PRACE Training Centres

IHPCSS

MOOCs

Training Portal

On-demand Events

The screenshot shows the PRACE Training Portal website. At the top is the PRACE logo and the text "PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE". Below this is a navigation bar with links: Training Courses, Tutorials, Material, Codevault, and Blog. The main content area is divided into two columns. The left column lists "PRACE Events Website - Register for PRACE Events", "PRACE MOOCs Website", and "Summer of HPC". Below these are sections for "PRACE Seasonal Schools" (listing "PRACE Summer of HPC 2019") and "Upcoming PTC Events". The right column has a section for "Upcoming PATC Events" with a list of events including "Practical Software Development @ EPCC at Leeds 10-11 July 2019", "Message-passing Programming with MPI @ EPCC", "Advanced MPI @ EPCC at Oxford 22-23 Jul 2019", "Single Node Performance Optimisation @ EPCC at Imperial 30-31 July 2019", "Modern C++ for Computational Scientists @ EPCC at Strathclyde, Glasgow", and "GPU Programming with OpenACC @ CSC". To the right of the main content, there is a sidebar with the text "Training events are advertised on the following pages:" followed by a list of links: "PRACE Training Events", "PRACE Partners' Training Events", and "PATC 2016-2017 Training Programme". Below this is a link to "Access the PRACE Best Practise Guides". Further down are links to "Visit the HiPEAC Summer School" (with the HiPEAC logo), "Visit the compute canada Portal" (with the compute canada logo), and "Visit the XSEDE Training Portal" (with the XSEDE logo).

PRACE Training Portal

Training Courses | Tutorials | Material | Codevault | Blog

- PRACE Events Website - Register for PRACE Events
- PRACE MOOCs Website
- Summer of HPC

PRACE Seasonal Schools

- PRACE Summer of HPC 2019

Upcoming PTC Events

Upcoming PATC Events

- Practical Software Development @ EPCC at Leeds 10-11 July 2019
- Message-passing Programming with MPI @ EPCC
- Advanced MPI @ EPCC at Oxford 22-23 Jul 2019
- Single Node Performance Optimisation @ EPCC at Imperial 30-31 July 2019
- Modern C++ for Computational Scientists @ EPCC at Strathclyde, Glasgow
- GPU Programming with OpenACC @ CSC

PRACE Training Material Copyright

Training events are advertised on the following pages:

- PRACE Training Events
- PRACE Partners' Training Events
- PATC 2016-2017 Training Programme

Access the PRACE Best Practise Guides

Visit the HiPEAC Summer School

Visit the compute canada Portal

Visit the XSEDE Training Portal

Seasonal Schools

- Have been running since 2008
- Offering top-quality face-to-face training events
- Organised around / all over Europe
- Topics range from generic intermediate to advanced
- From programming techniques to more specialised topical schools



Last Seasonal Schools

- ▶ 10 Jun - 13 Jun 2019
 - PRACE/BioExcel Seasonal School 2019, KTH, Stockholm, Sweden - HPC for Life Sciences



PTC Programme

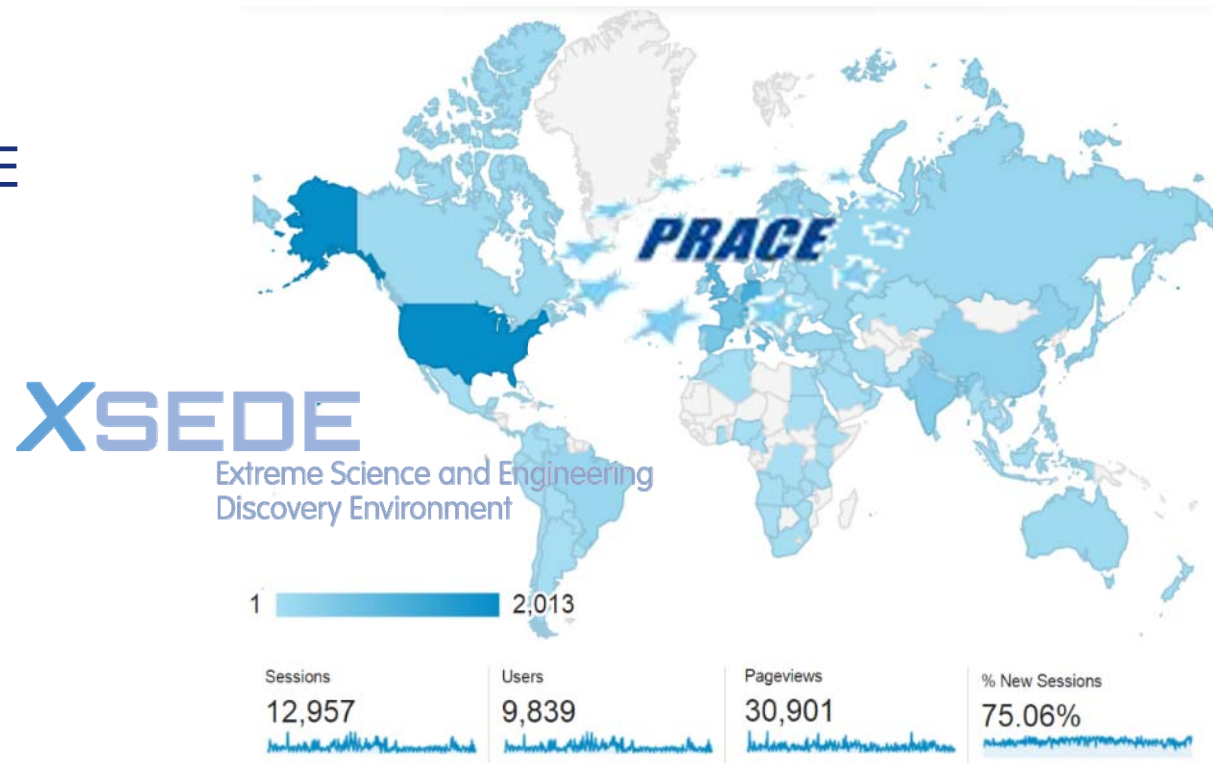
- ▶ 90 – 100 courses in each term
- ▶ PRACE Training Centres
 - ▶ PRACE Advanced Training Centres renamed
 - ▶ Common annual planning
- ▶ Go on: <http://www.prace-ri.eu/patcs-courses-calendar?start=20190701> to see the current PATs courses events calender

July 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1 Efficient Parallel Programming with GASPI @ HLRS	2 Efficient Parallel Programming with GASPI @ HLRS Introduction to GPU programming with OpenACC and OpenMP @ MdlS/Idris	3	4 Introduction to Parallel Programming with HPX @ HLRS	5 Introduction to Parallel Programming with HPX @ HLRS	6	7
8	9	10 Practical Software Development @ EPCC at Leeds 10-11 July 2019	11 Practical Software Development @ EPCC at Leeds 10-11 July 2019	12	13	14
15	16	17 Message-passing Programming with MPI @ EPCC	18 Message-passing Programming with MPI @ EPCC	19 Message-passing Programming with MPI @ EPCC	20	21
22 Advanced MPI @ EPCC at Oxford 22-23 Jul 2019	23 Advanced MPI @ EPCC at Oxford 22-23 Jul 2019	24	25	26	27	28
29	30 Single Node Performance Optimisation @ EPCC at Imperial 30-31 July 2019	31 Single Node Performance Optimisation @ EPCC at Imperial 30-31 July 2019				

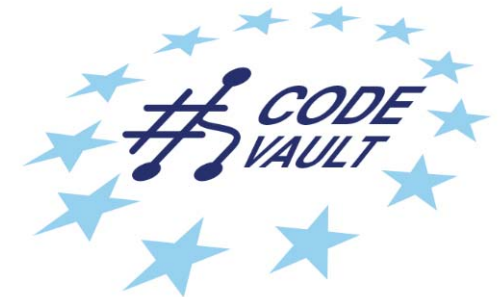
Training and Events Portal

- ▶ www.training.prace-ri.eu
- ▶ Single hub for the PRACE training events, training material and tutorials
- ▶ Will change soon:
www.hpc-in-europe.eu



CodeVault and More

- ▶ Repository of Open Source code samples
 - ▶ <https://gitlab.com/PRACE-4IP/CodeVault>
 - ▶ Examples and model solutions of common HPC programming tasks
 - ▶ *Possible to utilise in training and as building blocks of real-world applications*
 - ▶ Anonymous read access
- ▶ Best Practice Guides
 - ▶ <http://www.prace-ri.eu/best-practice-guides/>
- ▶ White Papers
 - ▶ <http://www.prace-ri.eu/white-papers/>





Future Training Activities

- ▶ On-demand events addressing the needs of the CoEs
 - ▶ Needs for basic, intermediate, and advanced training
- ▶ Massive Open Online Courses (MOOCs)
 - ▶ *Supercomputing, coordinated by EPCC*
 - ▶ *Managing Big Data with R and Hadoop, coordinated by Univ. Ljubljana*

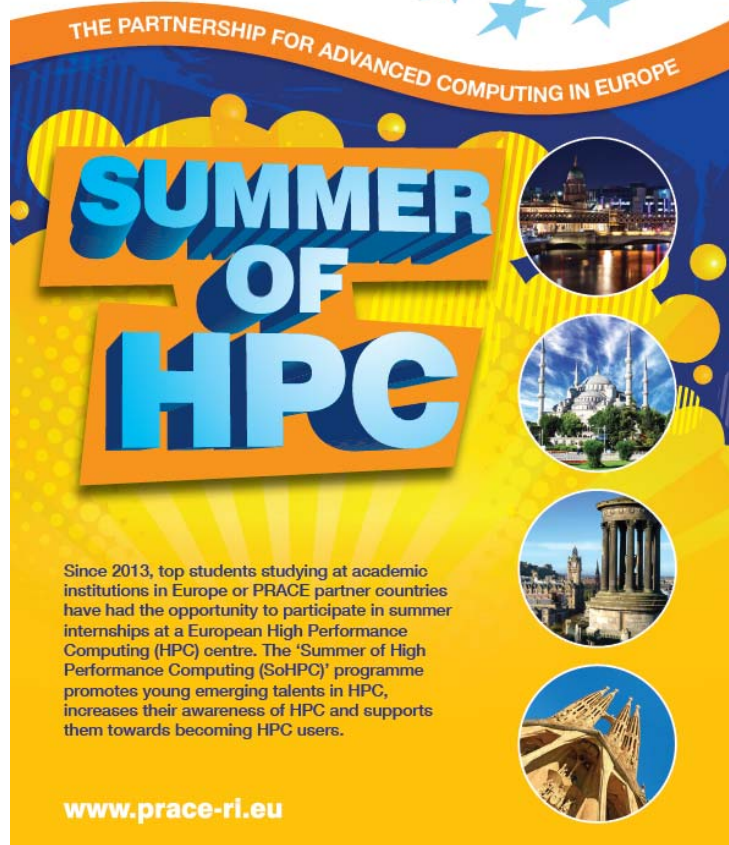
In preparation:

- ▶ *High-performance computing with Python, coordinated by CSC*
 - ▶ *Defensive programming and debugging, coordinated by KU Leuven*
 - ▶ *MPI-3 Shared Memory Programming, coordinated by HLRS*
- ▶ PRACE Training Centres (PTCs)
 - ▶ Cover basic and advanced needs across Europe



PRACE Summer of HPC (SoHPC)

PRACE
Summer of HPC



Goal: To inspire the next generation of software engineering, system administrators, and general users of HPC



PRACE – JOB OPPORTUNITIES



Job Opportunities

- ▶ PRACE is an association of 26 members with over 50 HPC centres involved
- ▶ Job offers are announced on the HiPEAC jobs portal:
- ▶ <https://www.hipeac.net/jobs/>
- ▶ Approximately one job announcements every week by PRACE





University of Ljubljana



Fakulteta za informacijske študije
Faculty of information studies



KØBENHAVNS
UNIVERSITET



Who brought running shoes to IHPCCSS?





THANK YOU!

QUESTIONS?