



PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

# PRACE | The Research Infrastructure Supporting Science and Industry through Provision of High Performance Computing Resources

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# PRACE | Mission

- ▶ The mission of PRACE is to enable **high-impact scientific discovery** and **engineering research** and development across all disciplines to enhance **European competitiveness** for the benefit of society.
- ▶ PRACE seeks to realise this mission by offering world-class computing and data management resources and services through a peer review process.
- ▶ PRACE also seeks to strengthen the European users of HPC in **industry through various initiatives**.
- ▶ PRACE has a strong interest in improving energy efficiency of computing systems and reducing their environmental impact.



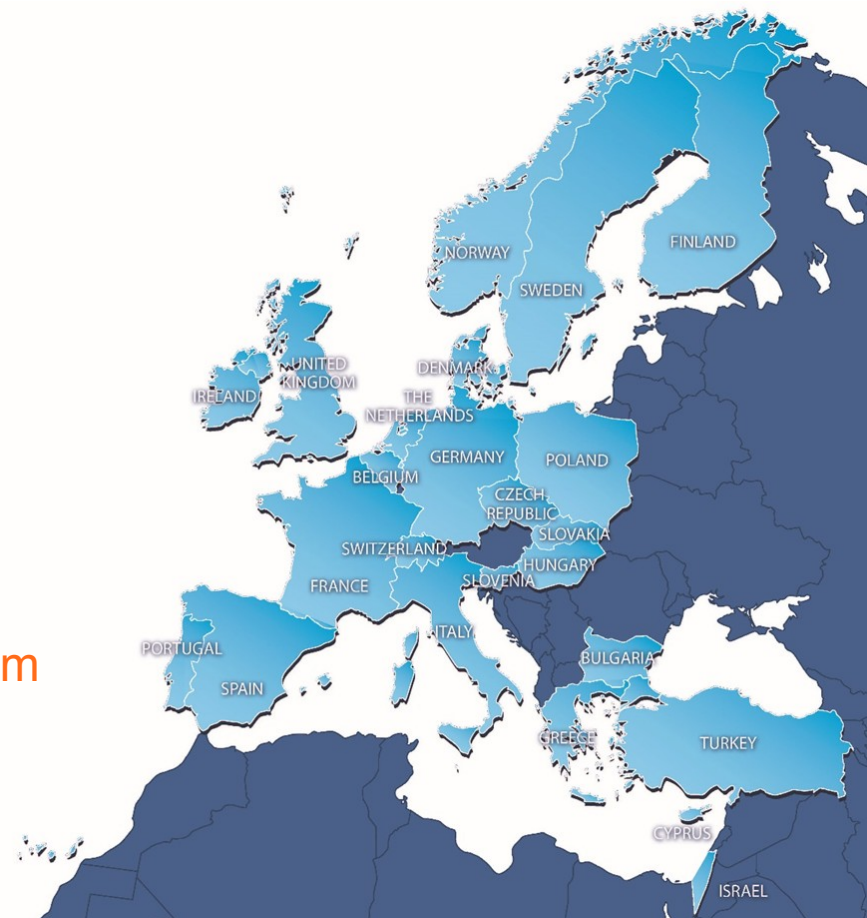
# PRACE | 26 members

## Hosting Members

- ▶ France
- ▶ Germany
- ▶ Italy
- ▶ Spain
- ▶ Switzerland

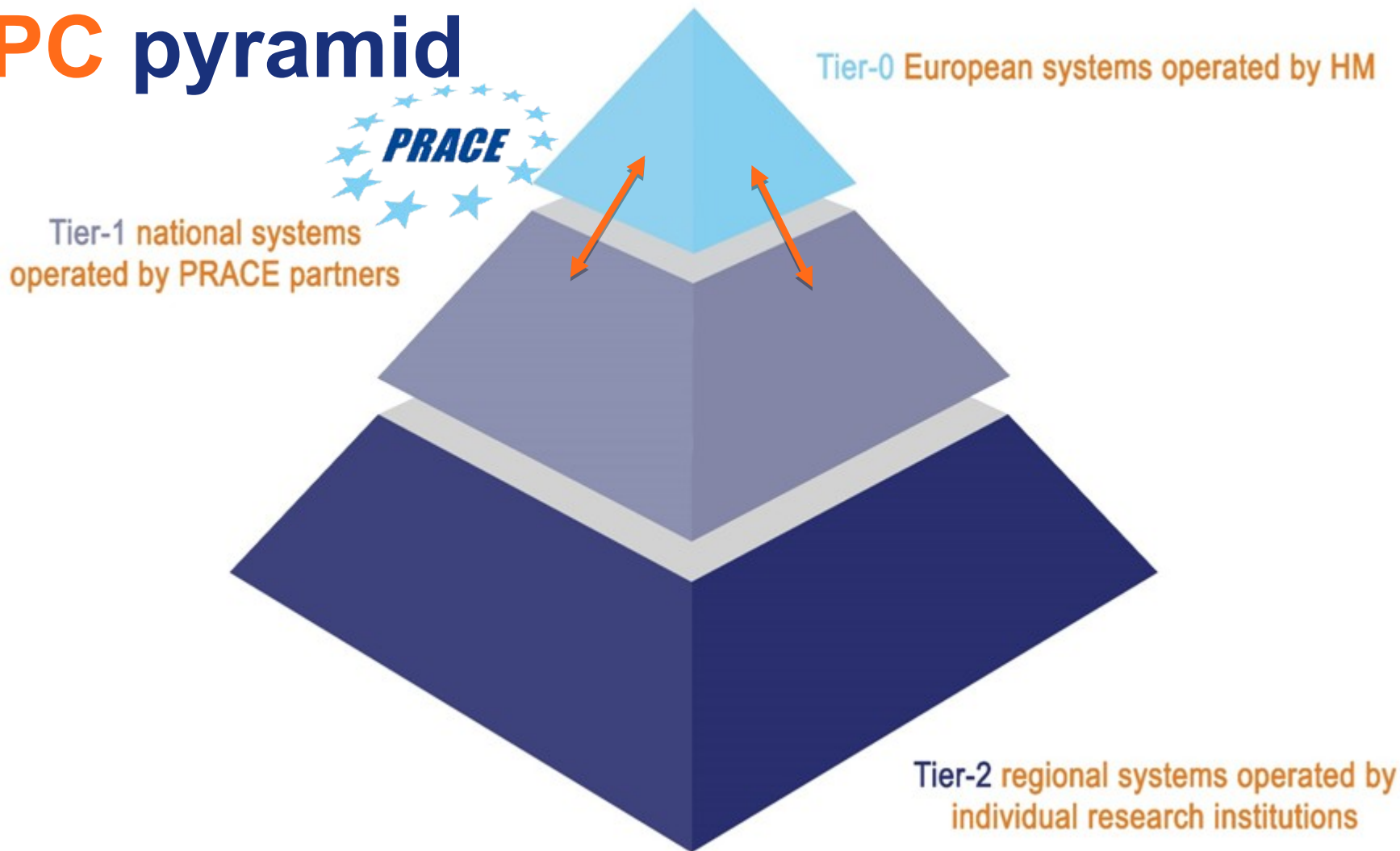
## General Partners (PRACE 2)

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





# HPC pyramid





## TOP500.org – updated Nov, 2018

Rank	System	Cores	Rmax (TFlop/s)	Rpeak (TFlop/s)	Power (kW)
1	<b>Summit</b> - IBM Power System AC922, IBM POWER9 22C 3.07GHz, NVIDIA Volta GV100, Dual-rail Mellanox EDR Infiniband , IBM DOE/SC/Oak Ridge National Laboratory United States	2,397,824	143,500.0	200,794.9	9,783
2	<b>Sierra</b> - IBM Power System S922LC, IBM POWER9 22C 3.1GHz, NVIDIA Volta GV100, Dual-rail Mellanox EDR Infiniband , IBM / NVIDIA / Mellanox DOE/NNSA/LLNL United States	1,572,480	94,640.0	125,712.0	7,438
3	<b>Sunway TaihuLight</b> - Sunway MPP, Sunway SW26010 260C 1.45GHz, Sunway , NRCPC National Supercomputing Center in Wuxi China	10,649,600	93,014.6	125,435.9	15,371
4	<b>Tianhe-2A</b> - TH-IVB-FEP Cluster, Intel Xeon E5-2692v2 12C 2.2GHz, TH Express-2, Matrix-2000 , NUDT National Super Computer Center in Guangzhou China	4,981,760	61,444.5	100,678.7	18,482
5	<b>Piz Daint</b> - Cray XC50, Xeon E5-2690v3 12C 2.6GHz, Aries interconnect , NVIDIA Tesla P100 , Cray Inc. Swiss National Supercomputing Centre (CSCS) Switzerland	387,872	21,230.0	27,154.3	2,384



## TOP500.org – updated Nov, 2018

Rank	System	Cores	Rmax (TFlop/s)	Rpeak (TFlop/s)	Power (kW)
6	<b>Trinity</b> - Cray XC40, Xeon E5-2698v3 16C 2.3GHz, Intel Xeon Phi 7250 68C 1.4GHz, Aries interconnect , Cray Inc. DOE/NNSA/LANL/SNL United States	979,072	20,158.7	41,461.2	7,578
7	<b>AI Bridging Cloud Infrastructure (ABCI)</b> - PRIMERGY CX2570 M4, Xeon Gold 6148 20C 2.4GHz, NVIDIA Tesla V100 SXM2, Infiniband EDR , Fujitsu National Institute of Advanced Industrial Science and Technology (AIST) Japan	391,680	19,880.0	32,576.6	1,649
8	<b>SuperMUC-NG</b> - ThinkSystem SD530, Xeon Platinum 8174 24C 3.1GHz, Intel Omni-Path , <b>Lenovo</b> Leibniz Rechenzentrum Germany	305,856	19,476.6	26,873.9	
9	<b>Titan</b> - Cray XK7, Opteron 6274 16C 2.200GHz, Cray Gemini interconnect, NVIDIA K20x , Cray Inc. DOE/SC/Oak Ridge National Laboratory United States	560,640	17,590.0	27,112.5	8,209
10	<b>Sequoia</b> - BlueGene/Q, Power BQC 16C 1.60 GHz, Custom , IBM DOE/NNSA/LLNL United States	1,572,864	17,173.2	20,132.7	7,890



# PRACE Tier-0 Systems in 2018

**JUWELS Module 1: Bull**

Sequana

GAUSS@FZJ, Jülich, Germany

#26 Top 500



**MareNostrum:** Lenovo  
BSC, Barcelona, Spain  
#25 Top 500



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



**SuperMUC-NG:** Lenovo  
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





# PRACE | Achievements to-date

- ▶ **>650** scientific projects enabled
- ▶ **>17** billion 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
- ▶ **>11 000** people trained through PRACE Training
- ▶ Close to **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 | current services

Towards End-Users

## Access

### Tier-0 systems (open R&D)

- Project Access  
1-3 years
- Preparatory Access  
Type A, B, C, D

### Tier-1 systems (open R&D)

- DECI Programme

## Support

### Application Enabling & Support

- Preparatory access Type C
- Preparatory access Type D
  - Tier-1 for Tier-0
- SHAPE
- HLST support

### Training

- Training Portal
- PTC
- Seasonal Schools & on demand
- International HPC Summer School
- MOOC
  
- Code Vault
- Best Practice Guides
- White Papers

## Communication, Dissemination, Outreach

- Website
- Public Relations
- Scientific Communication
- Summer of HPC

### Events

- PRACEdays
- SC, ISC, ICT, ICRI, DI4R, ...

### Operation & Coordination of the common PRACE Operational Services

- Service Catalogue
- PRACE MD-VPN network
- Security

### HPC Commissioning & Prototyping

- Technology Watch, PCP
- Infrastructure WS
- Best Practices
- UEABS

Towards PRACE Partners



# PRACE | access

**Criterion:  
Scientific  
Excellence**

- ▶ Free-of-charge, obligation to publish results at the end of the award period
- ▶ Project Access (bi-annual calls)
  - ▶ For a specific project; award period 1 to 3 years
  - ▶ For individual researchers and (international) research groups (PI has to come from a PRACE 2 supporting member)
  - ▶ Requires to demonstrate technical feasibility of project
- ▶ Preparatory Access
  - ▶ Optionally with support from PRACE experts
  - ▶ Prepare proposals for Project Access
  - ▶ SHAPE projects receive Preparatory Access
- ▶ **DECI**
- ▶ **0,5% of resources for CoEs**



# PRACE | training

a **sustained, high-quality** training and education service for the European HPC community

Different **levels** of training

- Basic, intermediate, advanced **HPC**
- Parallel programming
- Accelerators
- Performance optimisation

**Domain-specific** topics

- Simulation software
- Visualisation
- Data intensive computing

10 PRACE **Training Centres**

PRACE **Training Events**: Seasonal Schools, International HPC Summer School, On-demand training events

PRACE Training and Events portal

**Code Vault**

Massive Open Online Courses (**MOOCs**)

**Summer of HPC**

(Programme for undergraduate and postgraduate students)



PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

# THANK YOU FOR YOUR ATTENTION

[www.prace-ri.eu](http://www.prace-ri.eu)