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JÜLICH
FORSCHUNGSZENTRUM

Welcome to the

Jülich Supercomputing Centre

N. Attig, D. Rohe
Jülich Supercomputing Centre (JSC), Forschungszentrum Jülich

Schedule: Thursday, November 23

13:00 – 13:30	Welcome and Introduction of JSC Norbert Attig (JSC)
13:30 – 14:50	JURECA: An Overview – P. Thörnig, C. Paschoulas (JSC)
14:50 – 15:20	Break
15:20 – 16:00	JURECA – Tuning for the platform – part I F. Robel (ParTec)
16:00 – 16:30	Using GPU accelerators on JURECA W. Homberg (JSC)
16:30 – 17:30	JURECA – Tuning for the platform – part II Heinrich Bockhorst (Intel)
17:35	Bus SB20 from Seecasino to Rurtalbahn and Aachen/Jülich

Schedule: Friday, November 24 (morning)

08:45 – 10:00	HPC Software – Compiler and Tools M. Knobloch (JSC)
10:00 – 10:15	Break
10:15 – 10:45	HPC Software – Math Libs & Application Software I. Gutheil (JSC)
10:45 – 11:15	Remote Visualization – H. Zilken (JSC)
11:15 – 12:00	Uniform Resource Access at JSC UNICORE – B. Hagemeier (JSC) LLView – C. Karbach (JSC)
12:00 – 13:00	Lunch break

Schedule: Tuesday, May 23 (afternoon)

13:00 – 13:30	JURECA Booster – Intro, D. Krause (JSC)
13:30 – 14:45	JURECA Booster – Tuning and Tweaks Heinrich Bockhorst (Intel)
14:45 – 15:15	Break
15:15 – 16:30	Taming Wild Threads – Tips and Pitfalls in Hybrid Programming, Christoph Pospiech, Lenovo/IBM
16:30	End of Day 2
16:35	Bus 219 from Seecasino to Rurtalbahn
16:47	Bus SB 20 from Seecasino to Aachen/Jülich

Organisational Information

- List of participants -> after coffee break
- Slides of all talks are available after the course at
  - http://www.fz-juelich.de/jsc , English
    Expertise - Services - Documentation – Presentations
- WLAN access
  - Eduroam
  - Temporary access, forms will be handed out

- More workshops and conferences on JSC website:
  www.fz-juelich.de/ias/jsc/events
- Twitter: @fzj_jsc, @fzj_jscuser

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Jülich Supercomputing Centre

Introduction

N. Attig
Jülich Supercomputing Centre (JSC), Forschungszentrum Jülich

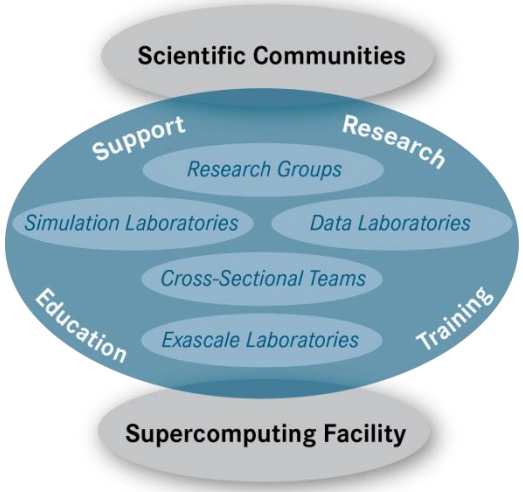
Jülich Supercomputing Centre

Supercomputer operation for:

- Centre – FZJ
- Region – RWTH Aachen University
- Germany – Gauss Centre for Supercomputing
  John von Neumann Institute for Computing
- Europe – PRACE, EU projects

Application support

- Unique support & research environment at JSC
- Peer review support and coordination



R&D work

- Methods and algorithms, computational science, performance analysis and tools
- Scientific Big Data Analytics with HPC
- Computer architectures, Co-Design
  Exascale Labs together with IBM, Intel, NVIDIA

DEEP

Education and training

Access to Supercomputing Resources at Jülich

- Access to JURECA via
  - JARA-HPC Vergabegremium (VGG) and/or
    Kommission zur Vergabe von SC Ressourcen (VSR)
    (for FZJ and RWTH staff members only; JARA-HPC Partition)
  - John von Neumann Institute for Computing (NIC)
- Access to JUQUEEN via
  - JARA-HPC Vergabegremium (VGG) and/or
    Kommission zur Vergabe von SC Ressourcen (VSR)
    (for FZJ and RWTH staff members only; JARA-HPC Partition)
  - Gauss Centre for Supercomputing (GCS)
    (JUQUEEN CPU time proposals are evaluated by NIC)
  - European Research Infrastructure PRACE
    - Project Access: Biannual CfPs since June 2010
    - Call for preparatory access open, no closing dates

Gauss Centre for Supercomputing (GCS)

A German Success Story:

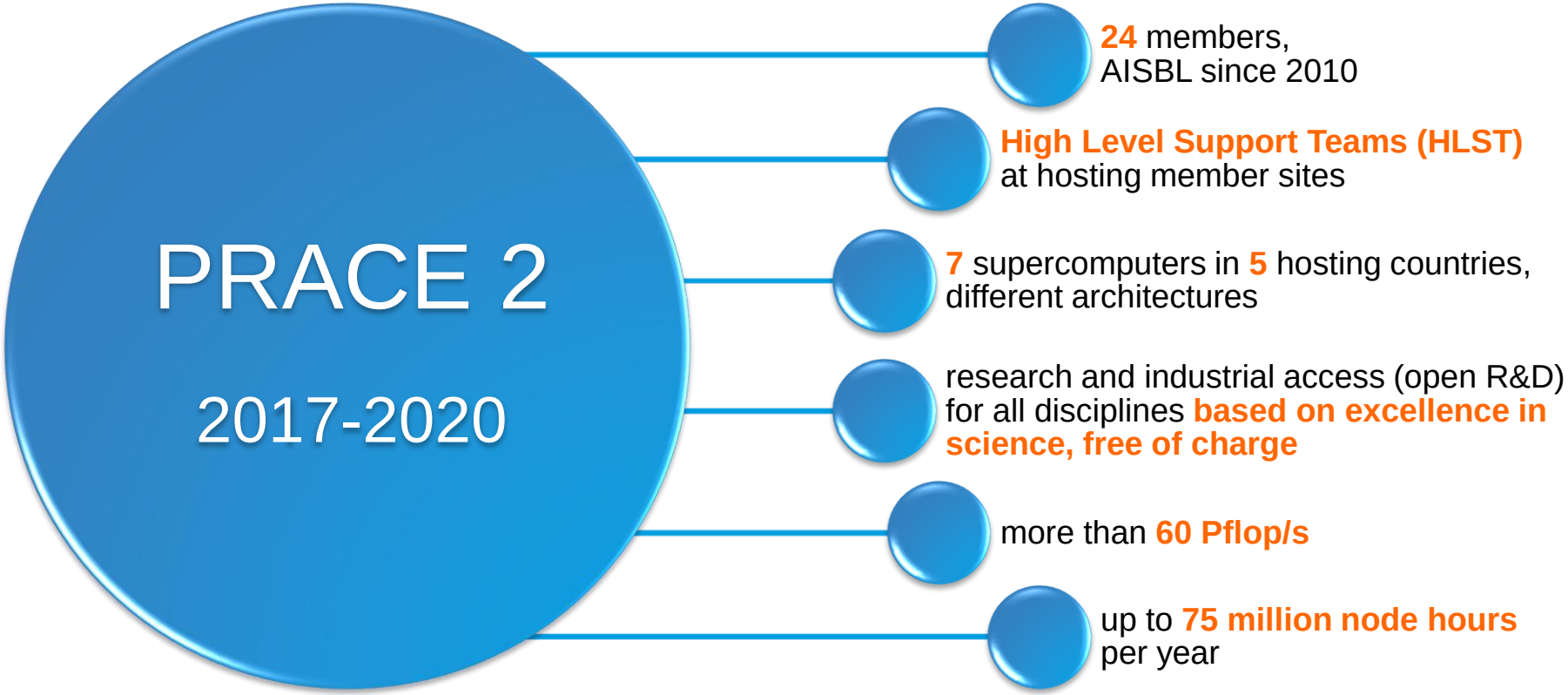
GCS is the leading Tier-0 HPC centre in Europe

- Alliance of the three German Tier-1 centres
- Jülich Supercomting Centre (JSC)
- High Performance Computing Centre Stuttgart (HLRS)
- Leibniz Rechenzentrum (LRZ), Garching

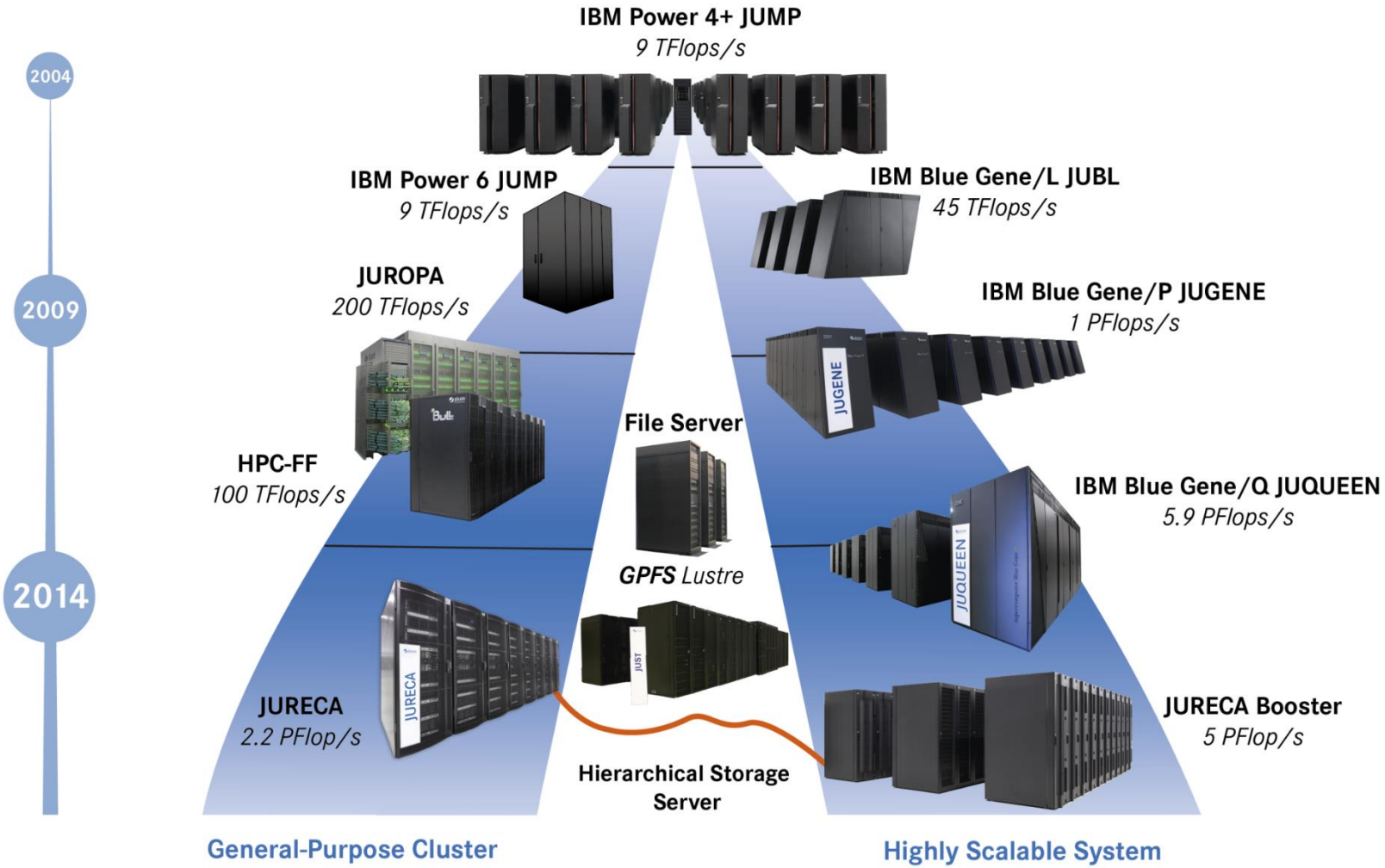
Key Facts

- To date in sum more than 20 Petaflops (continuously expanding)
- 400 people for Operation, HPC-research, Services, Training
- Extensive know-how in key scientific fields

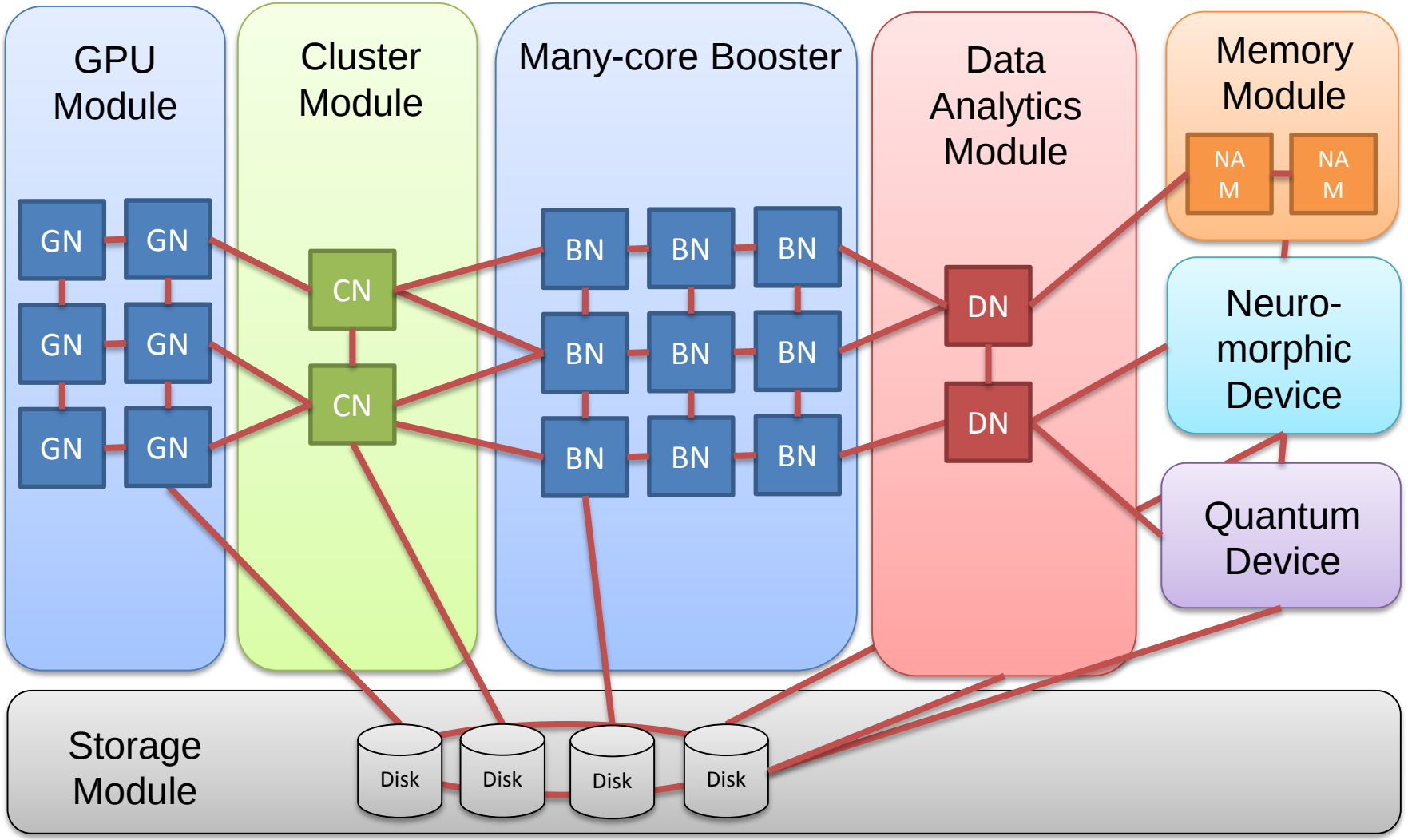
PRACE - Partnership for Advanced Computing in Europe
The European HPC e-infrastructure (ESFRI)



Dual Hardware Strategy at FZJ …



… and Evolution to Modular Supercomputer Architecture



JUQUEEN: Jülich's Scalable Petaflop System

IBM Blue Gene/Q JUQUEEN

- IBM PowerPC® A2 1.6 GHz,
  16 cores per node
- 28 racks, 458,752 cores
- 5,9 Petaflop/s peak
  5,0 Petaflop/s Linpack
- 448 TByte main memory
- connected to a Global Parallel File System (GPFS) with
  O(10) PByte online disk and O(50) PByte offline tape capacity
- 5D network
- Production start: Nov 5, 2012

Nov 2017:
#07 in Europe
#22 worldwide
#94 in Green500

JURECA: Jülich Research on Exascale Cluster Architectures

JURECA Cluster

- 2 Intel Haswell 12-core processors,
  2.5 GHz, SMT, 128 GB main memory
- 1,884 compute nodes or 45,216 cores, thereof
  - 75 nodes with 2 K80 NVIDIA graphics cards each and
  - 12 nodes with 512 GB main memory and 2 K40 NVIDIA graphics cards each for visualisation
- 2.245 Petaflop/s peak (with K80 graphics cards)
  1.425 Petaflop/s Linpack from CPUs (out of 1,693 Petaflop/s peak)
- 281 TByte memory
- Mellanox Infiniband EDR
- Connected to the GPFS file system on JUST

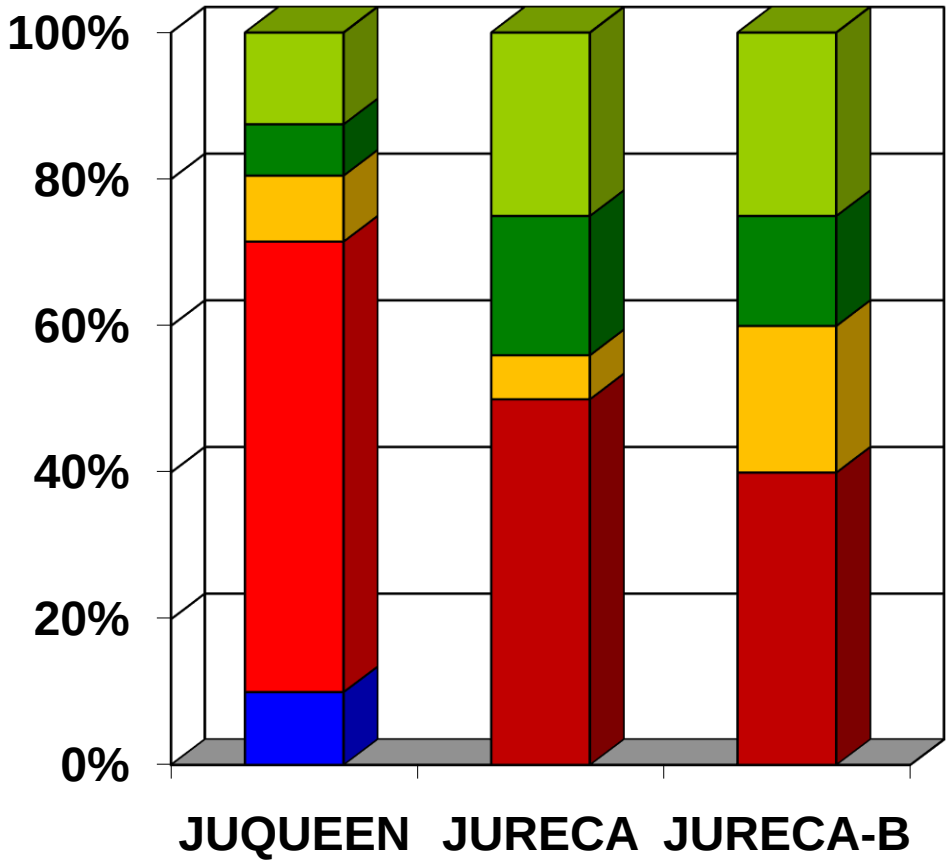
JURECA (II)

JURECA Booster

- Intel Xeon Knights Landing
- 1,640 compute nodes with 68 cores each
- 96 GiB memory per node
  plus 16 GiB MCDRAM high-bandwidth memory per node
- Shared login infrastructure with the cluster module
- Intel Omni-Path Architecture high-speed network
  with non-blocking fat tree topology
- 100+ GiB per second storage connection to JUST
- 5 Petaflop per second peak performance

JURECA Cluster & Booster: **#29 worldwide** (3,78 Petaflop/s Linpack)

Stakeholder‘s Compute Time Shares

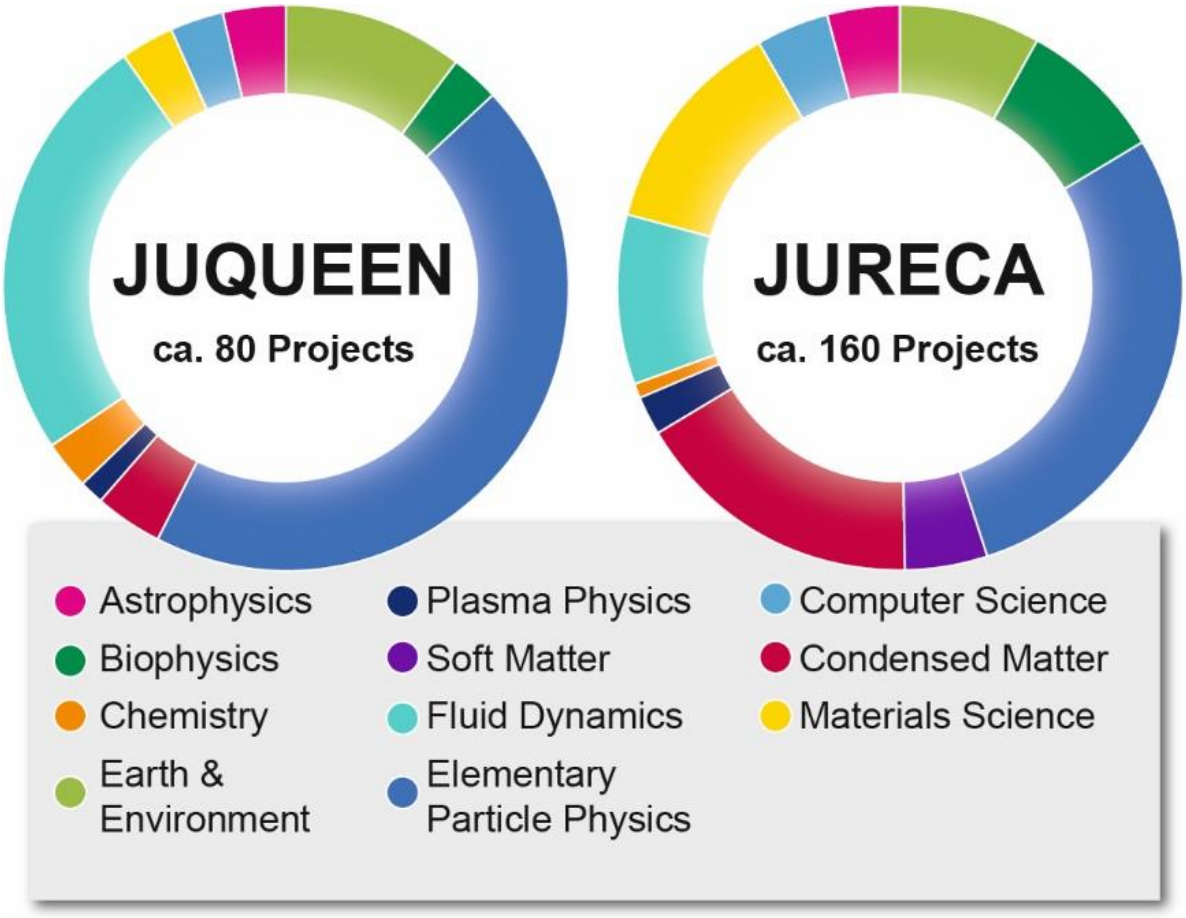


80% of the available time is being granted!

Research Field Usage 05/2017-04/2018

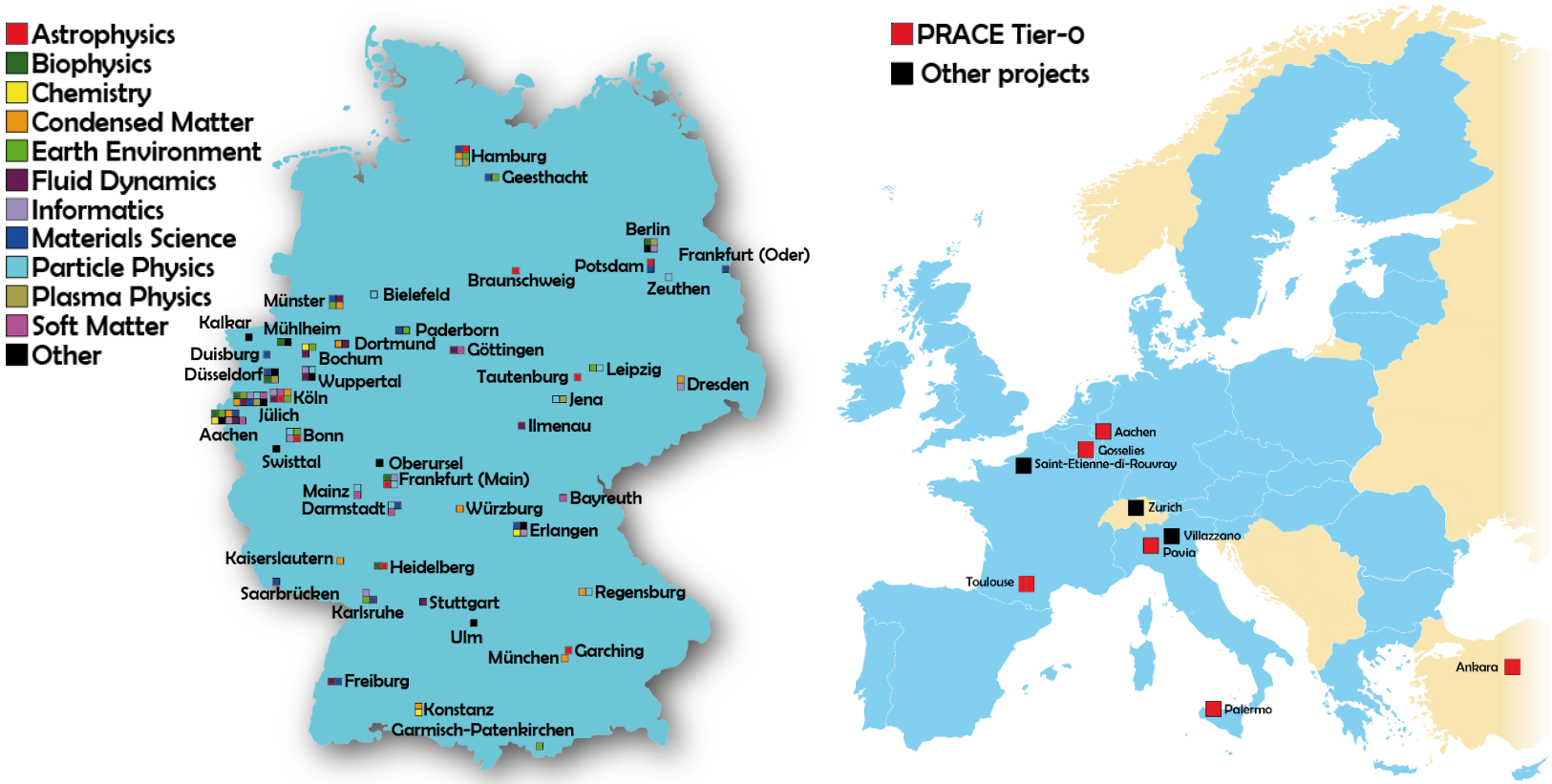
Leadership-Class System

General-Purpose Supercomputer



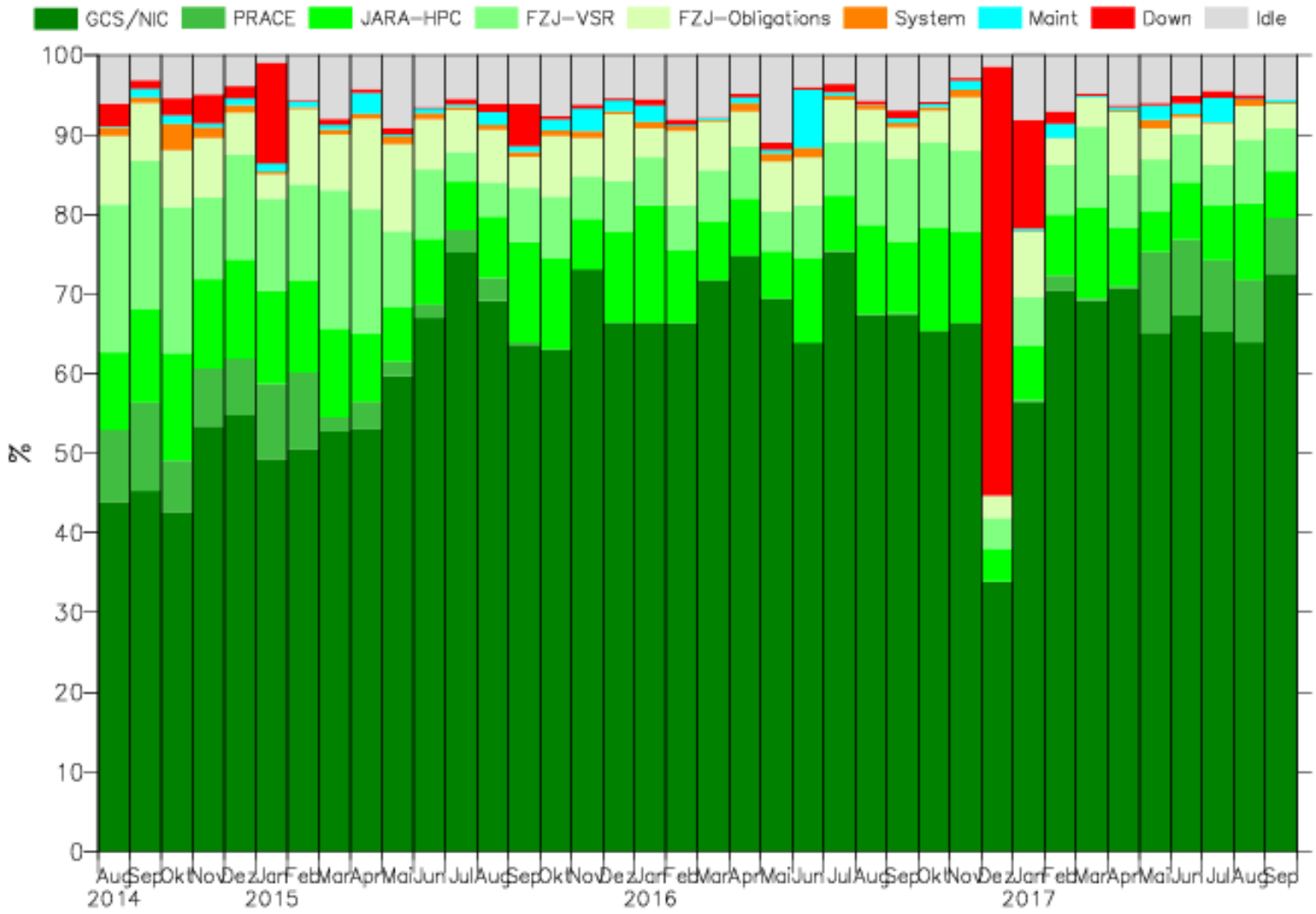
Granting periods
11/2017 – 10/2018
05/2017 – 04/2018

National and European User Groups

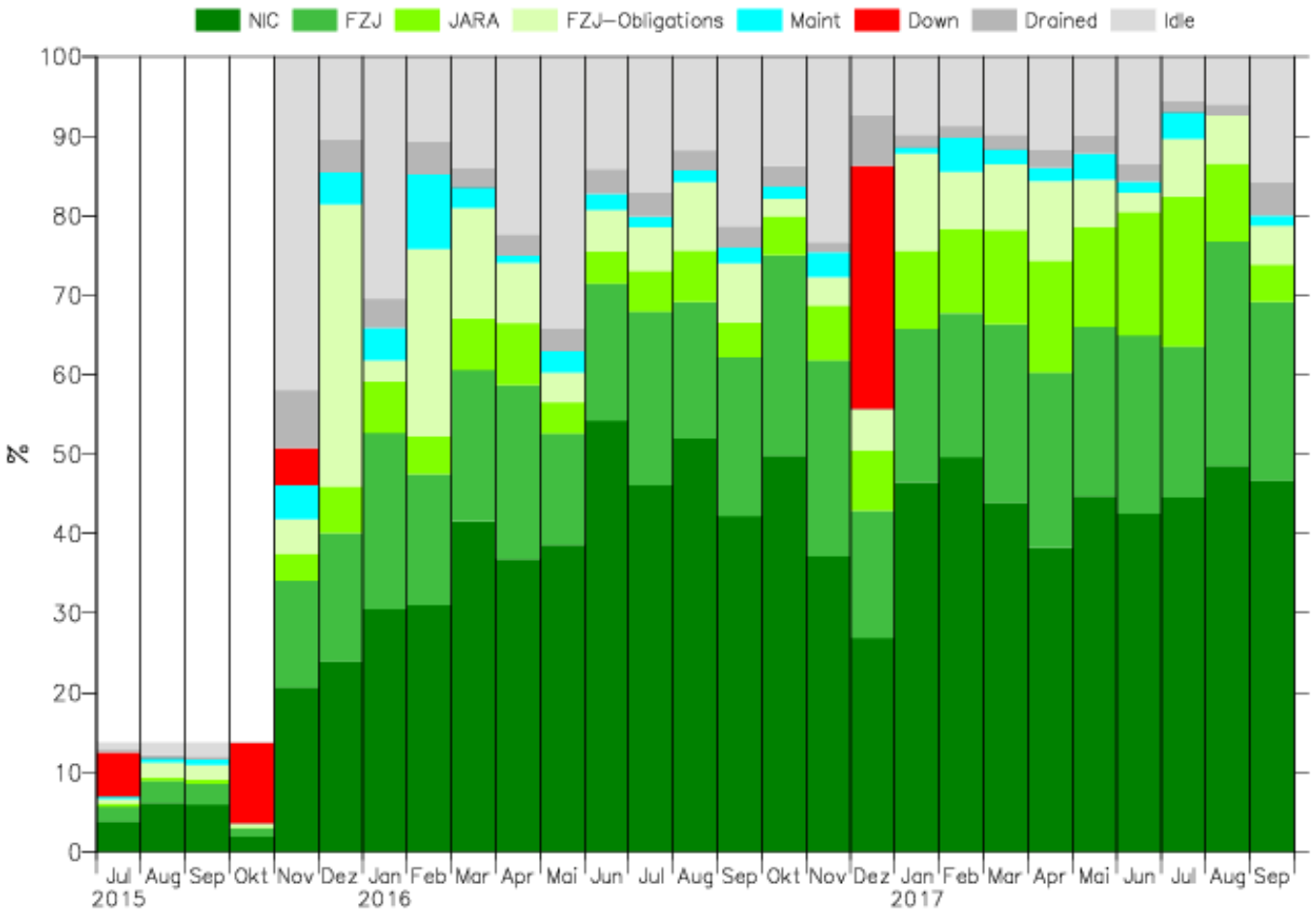


- Proposals for computer time accepted from Germany and Europe
- Peer review by international referees
- CPU time is granted by independent Scientific Councils

JUQUEEN Usage

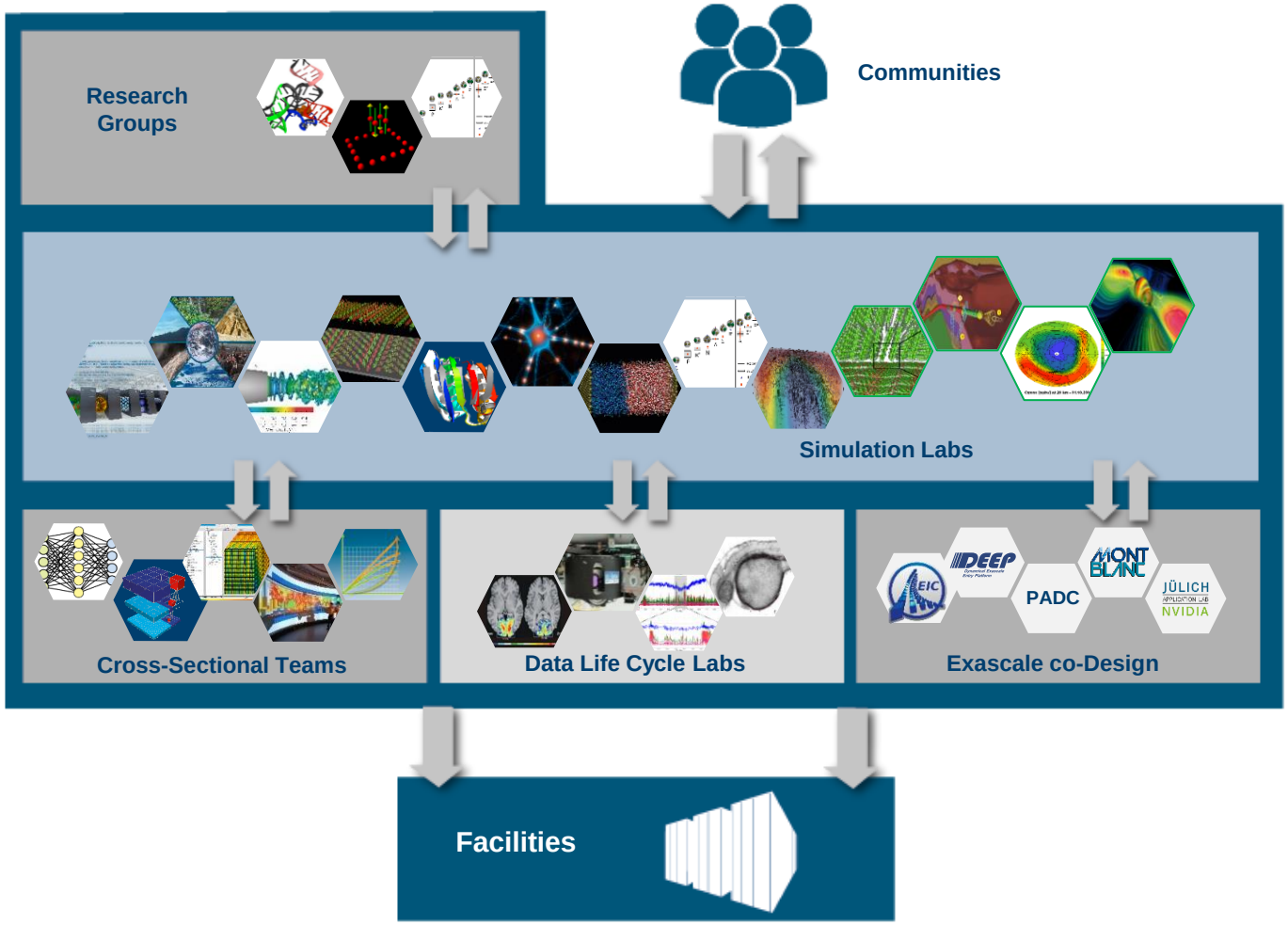


JURECA Usage



Launch of JURECA, phase 1, 260 nodes: Jul 13, 2015
phase 2, 1,884 nodes: Nov 02, 2015

Support and Research Landscape at JSC



Summary

- The Jülich Supercomputing Centre provides
  - Tier-0/1 HPC resources
  - high-end primary and domain-specific user support
  - …

  to German and European research groups working in the computational sciences and in engineering

- JSC expects to see
  - breakthrough science
  - parallel applications, using a substantial number of processors simultaneously

End of Presentation