



HPC Infrastructure at RWTH Aachen University

Systems and Storage

Compute Nodes & Performance (Tier 2)

CLAIX-2018

1032 MPI nodes

- 2-socket Intel Xeon Platinum 8160 (Skylake)
- 24 cores each (48 cores total per node)
- 2.1 GHz, 3.7 GHz turbo mode
- 192 GB main memory
- Local SSD: 480 GB

48 MPI-GPU nodes

- MPI nodes with 2 NVIDIA V100 SXM2 GPUs
- GPU-GPU interconnect: NVLink technology

Performance

- Theoretical peak: 3.55 Pflops
- Linpack: 2.04 Pflops on 1024 nodes
- Job-Mix: average performance per core increases by 30% for the same data input sets (compared to CLAIX-2016)

Vendor: **NEC**

CLAIX-2016

609 MPI nodes

- 2-socket Intel Xeon E5-2650v4 (Broadwell-EP)
- 12 cores each (24 cores total per node)
- 2.2 GHz, 2.9 GHz turbo mode
- 128 GB main memory

8 SMP nodes

- 8-socket Intel Xeon E7-8860v4 (Broadwell-EX)
- 18 cores each (144 cores total per node)
- 2.2 GHz, 3.2 GHz turbo mode
- 1024 GB main memory

10 MPI-GPU nodes

- MPI nodes with 2 NVIDIA P100 SXM2 GPUs
- GPU-GPU interconnect: NVLink technology

Performance

- Theoretical peak: 0.53 Pflops
- Linpack: 0.51 Pflops

Network, Storage & Cooling

Network (both clusters)

- Intel Omni-Path 100G fabric

Storage (CLAIX-2016)

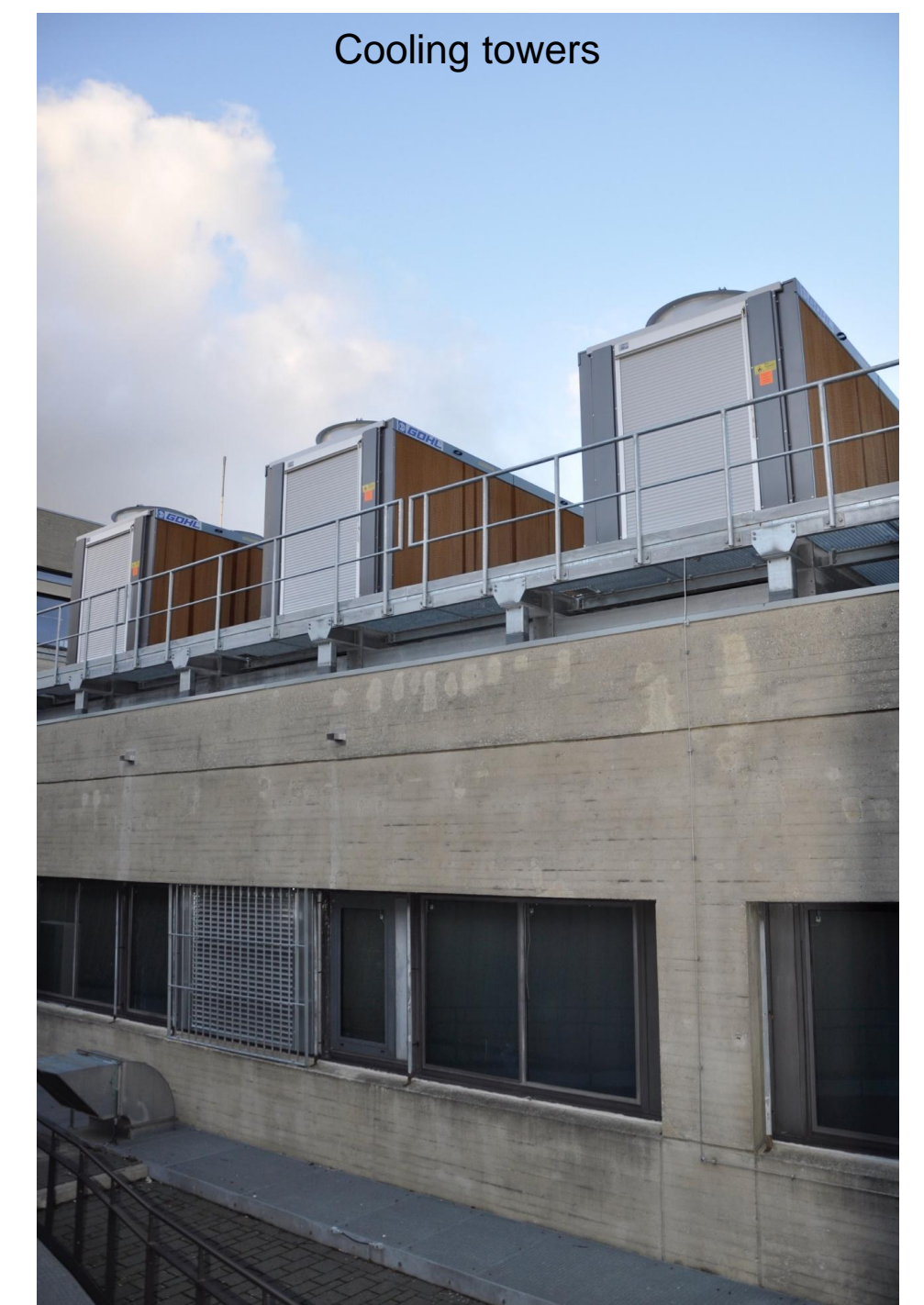
- Lustre-based solution
- Capacity: 3 PB
- Read/write bandwidth: 45 GB/s

Storage (CLAIX-2018)

- New Lustre-based solution
- Also accessible from compute nodes of CLAIX-2016
- Capacity: 10 PB
- Read/write bandwidth: 150 GB/s

Cooling

- Racks: NEC side cooler solution
- Inlet water: 30°C
- Free cooling



Technical and Methodical Support

IT Center & JARA-CSD Support

Single point of contact: servicedesk@itc.rwth-aachen.de



General & Effective Usage of HPC Systems at RWTH

- Service for Tier-2 system, Tier-3 system, and hosted clusters
- Account creation, login, usage, batch system, installation of software, ...
- Performance analysis and optimization
- Extensive training (e.g., PPCES & aiXcelerate events) and documentation
- Guidance and advice regarding the project-based access



Collaboration with FZ Jülich within JARA Center for Simulation and Data Science (JARA-CSD)

- Cross-sectional group "Parallel Efficiency"
- Performance and correctness analysis of parallel programs
- Development of performance and correctness tools
 - MUST (correctness), Score-P (measurement), Scalasca (analysis)



3rd-party Funded Projects



Performance Optimisation and Productivity

European Centre of Excellence in HPC

- Parallel application performance audit and plan
 - Analysis measuring a range of performance metrics to assess quality of performance
 - Further performance evaluation to identify root causes of issues found
- Proof-of-concept: experiments with customer codes to demonstrate actual benefits of proposed optimizations



Process-oriented Performance Engineering

- Structured performance engineering process: systematic bottleneck-centric performance analysis and optimization
- Nation-wide performance engineering support infrastructure (blueprint)
- Job monitoring & analysis: automatic light-weight performance profile and bottleneck analysis for all applications running on the HPC system
- HPC curriculum: coordinated nation-wide workshop and tutorial program
- HPC wiki: central web offering, knowledge base

Project-based Access for Compute Time

Project Category	Affiliation of Principle Investigator	Submission and Reviewing	Computers	Max CPU time quota per project [Mio core-h]	Total CPU time quota per anno [Mio core-h]
JARA-HPC	RWTH+FZJ	twice a year: scientific + technical review	CLAIX-2016 (Tier 2) CLAIX-2018 (Tier 2)	> 2.4 per year	300
BUND	any German research institution	continuous submission: scientific + technical review	CLAIX-2018 (Tier 2)	0.6 - 6.0 per year	100
PREP / NOVA		continuous submission: technical review	CLAIX-2016 (Tier 2) CLAIX-2018 (Tier 2)	0.24 per year	-
RWTH Medium	RWTH+FZJ	continuous submission: scientific + technical review	CLAIX-2018 (Tier 2)	2.4 per year	120
RWTH Small	RWTH+FZJ	continuous submission: technical review	CLAIX-2018 (Tier 3)	0.24 per year	40
RWTH Thesis / Lecture	RWTH		CLAIX-2018 (Tier 3)	0.048	40
RWTH Open (employees / students)	RWTH+FZJ		CLAIX-2018 (Tier 3)	0.002 / 0.0005 per month	



<https://www.itc.rwth-aachen.de/hpc>



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