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Site Update

# Next Gen HLRN System - HLRN-IV - for the North-German Science

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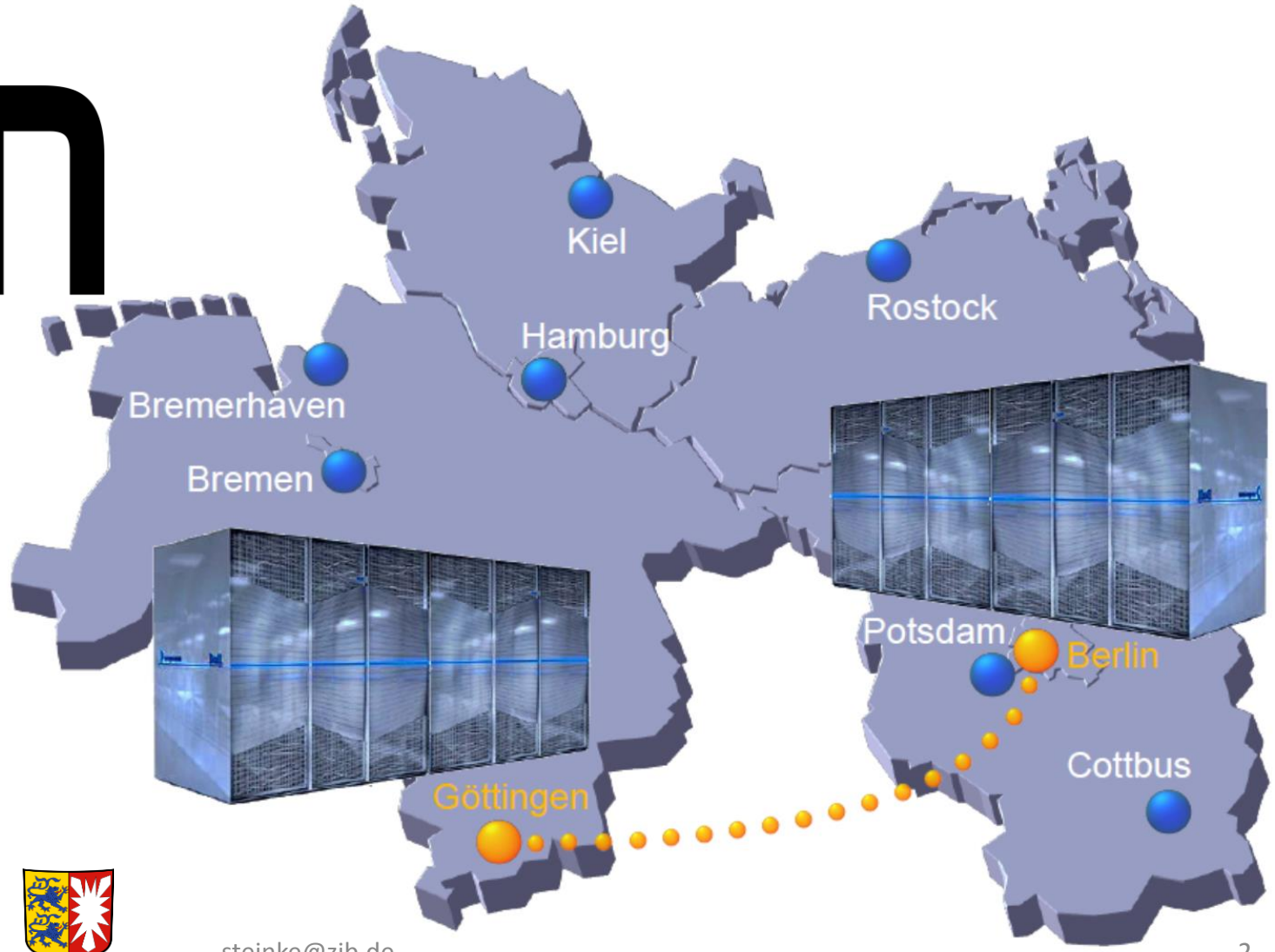
# HLRN: 7 Federal States – 1 HPC System

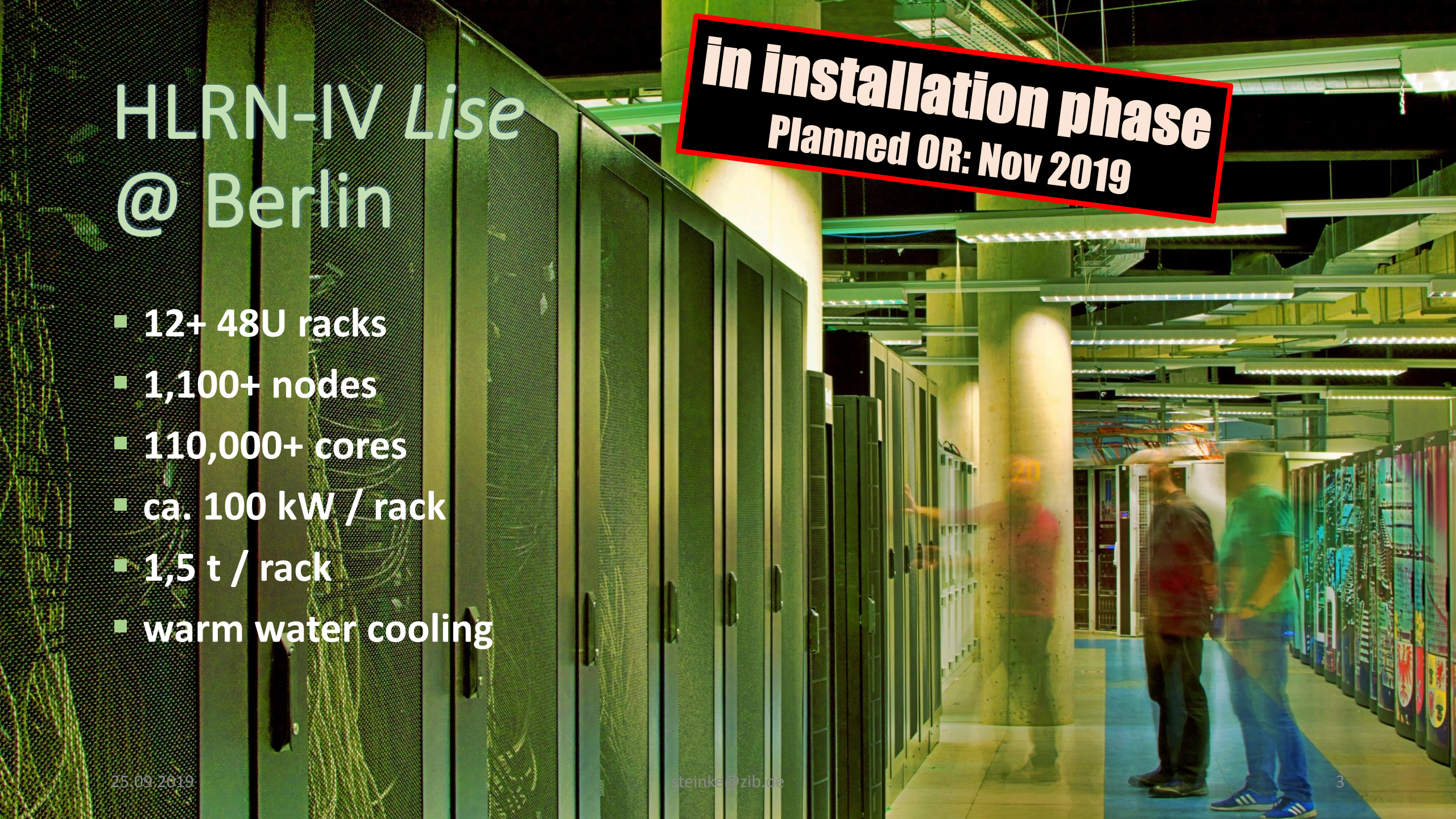
*founded in 2001*

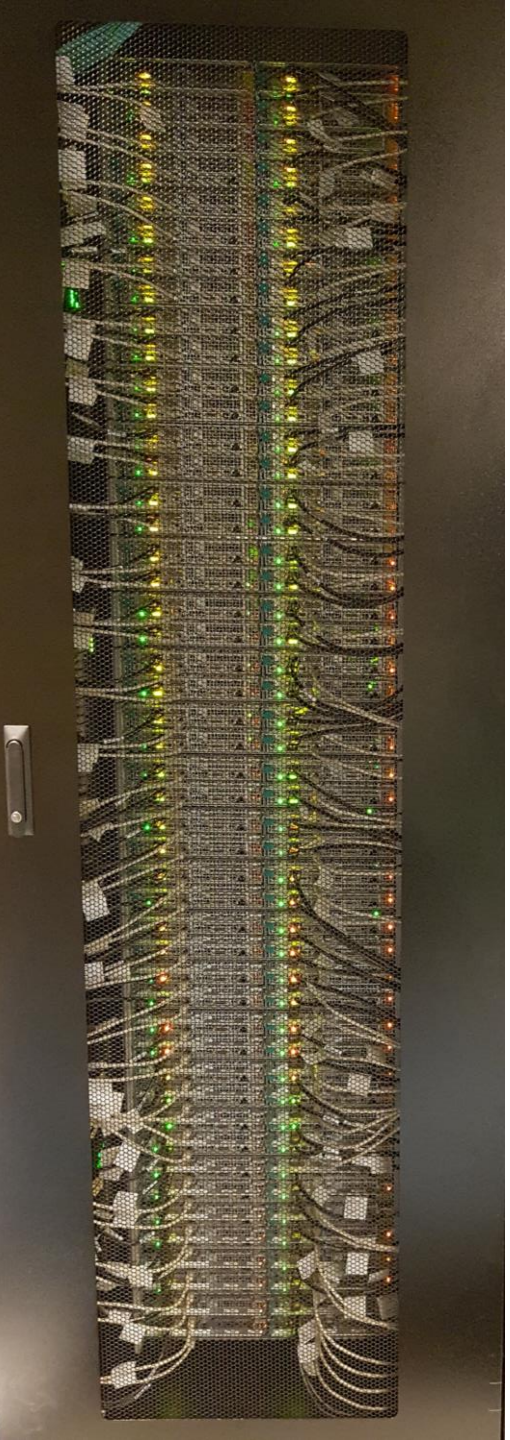


# HLRN-IV *Lise* @ Berlin

- 12+ 48U racks
- 1,100+ nodes
- 110,000+ cores
- ca. 100 kW / rack
- 1,5 t / rack
- warm water cooling

**in installation phase**
**Planned OR: Nov 2019**





# HLRN-IV Phase 2 System

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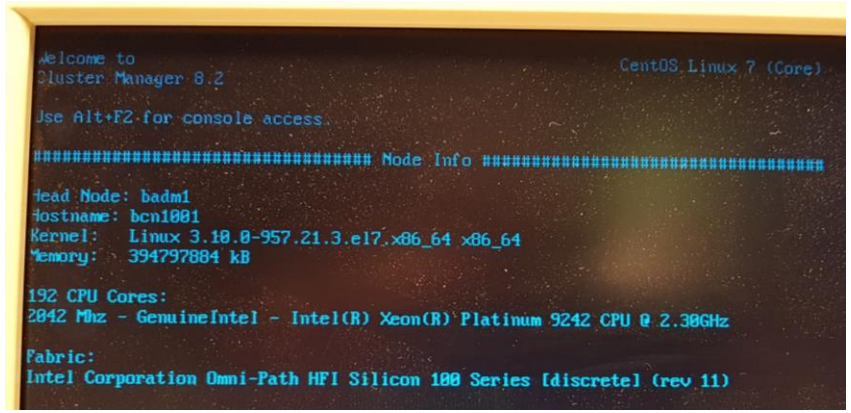
- 2,000+ nodes, 200,000+ cores
- Node configuration:
  - 2x Intel Xeon Platinum 9242, 2.3 GHz (Cascade Lake Advanced Processor)
  - 96 phys. cores in total per node
  - 385 GB … 768 GB … 1,536 GB



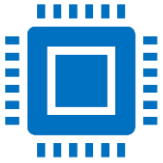

- > 500 TB distributed memory
- Intel Omni-Path interconnect
- 2x 8.1 PB Lustre file systems, 2x 300 TB GPFS appliance

- 16 PFlop/s peak performance (phase 2 + phase 1)

# Key Properties of HLRN-IV vs. HLRN-III

**5 ×** more theoretical peak performance reaching 16 PFlop/s

**3.5 ×** more sustained application performance based on HLRN application benchmark



**2.5 ×** more compute cores

**2 ×** of on-line permanent storage capacity

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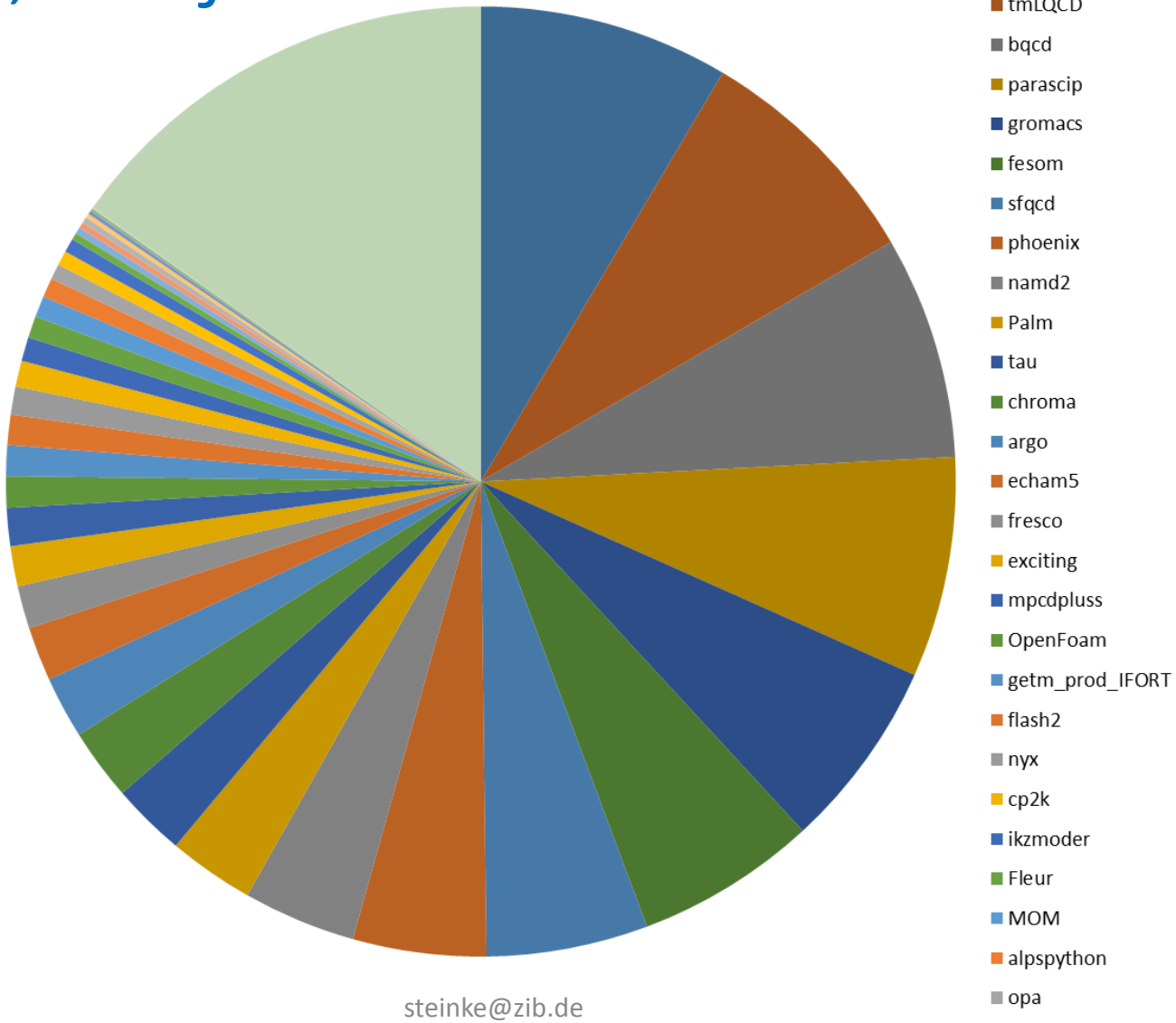
# HLRN Users, Projects & Workloads

- 1,800+ users
- 230+ large projects
- 750+ software packages




*data from 2015*

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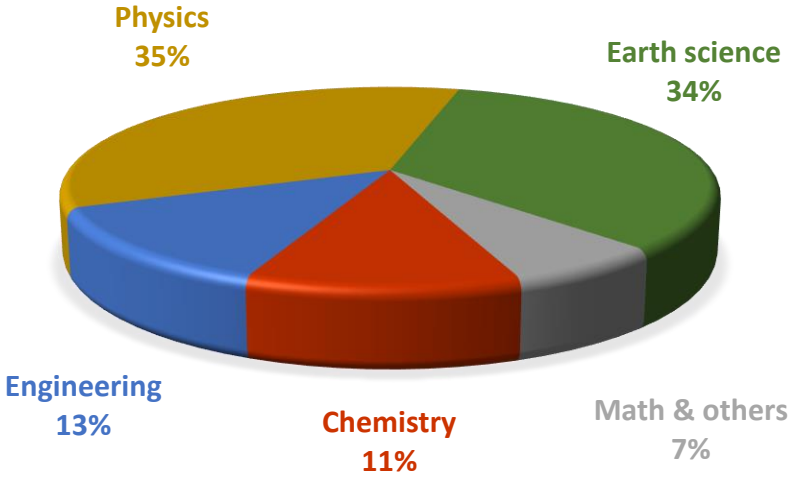
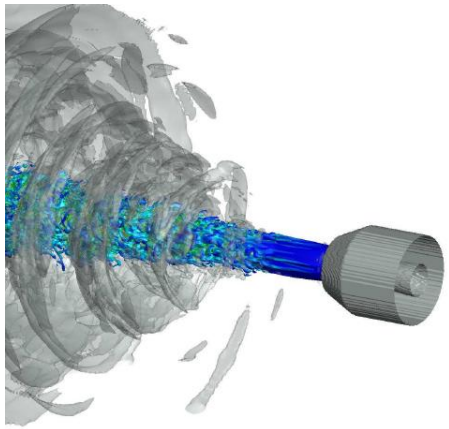
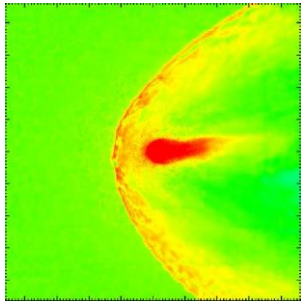
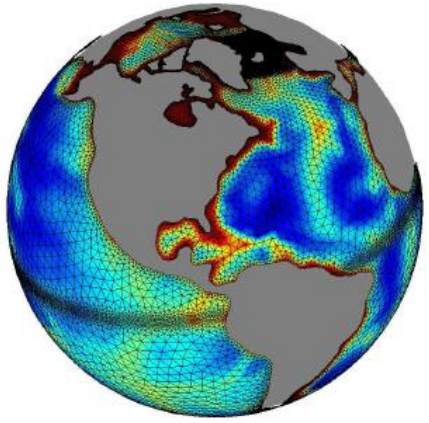
# Traditional HPC Domains …

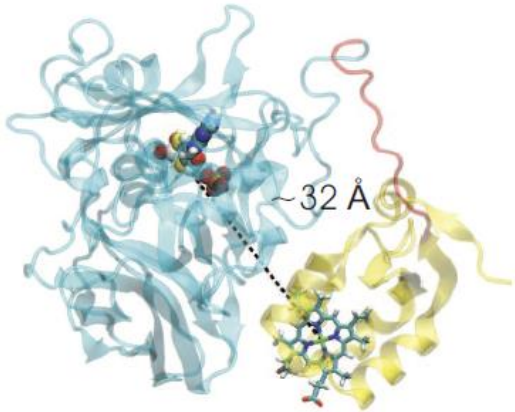
- **Physics** (astro, high-energy)
- **Chemistry** & material science
- **Engineering**
- **Earth Science** (incl. climate)
- **Life Science** (biology, medicine)

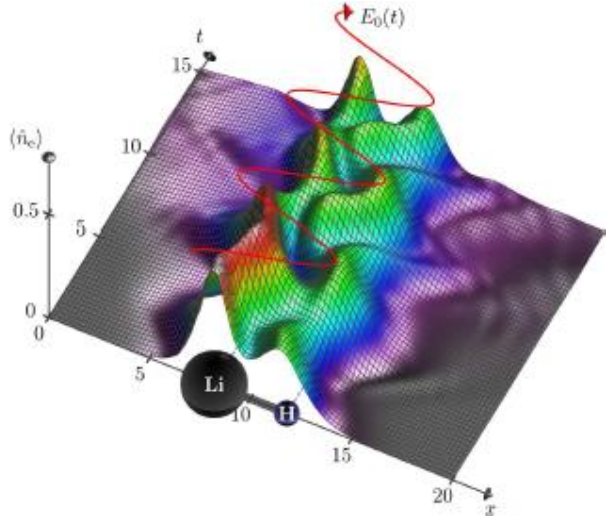










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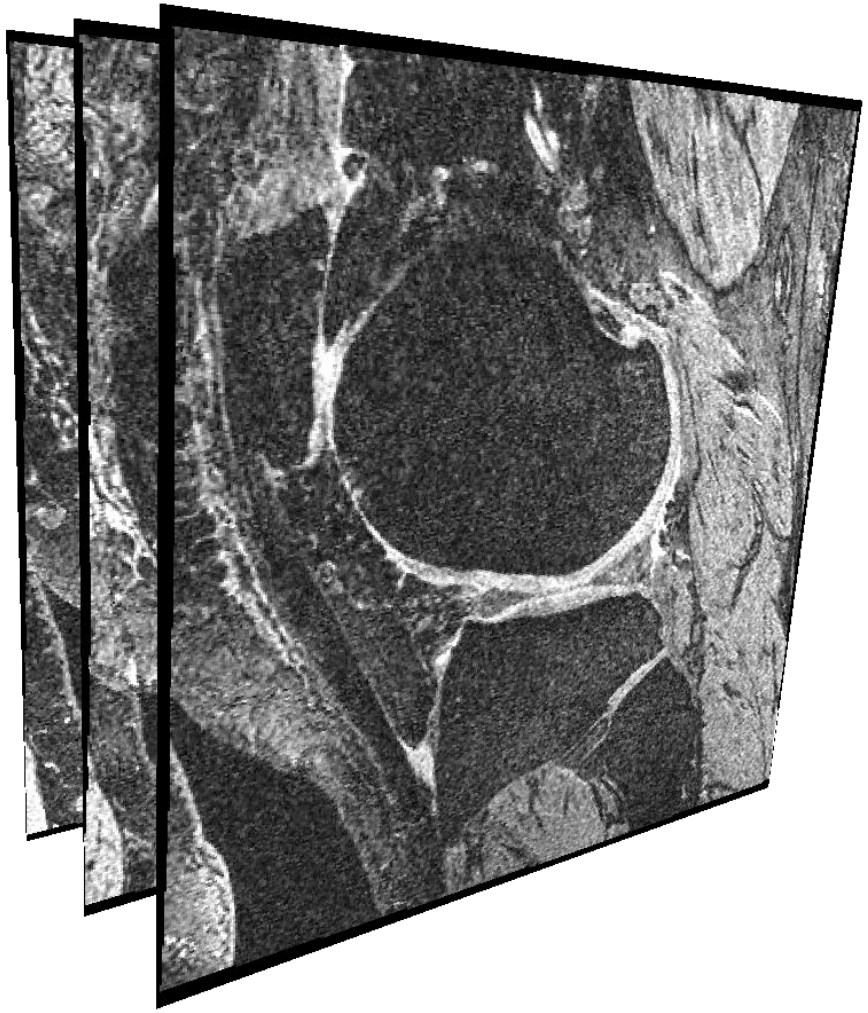
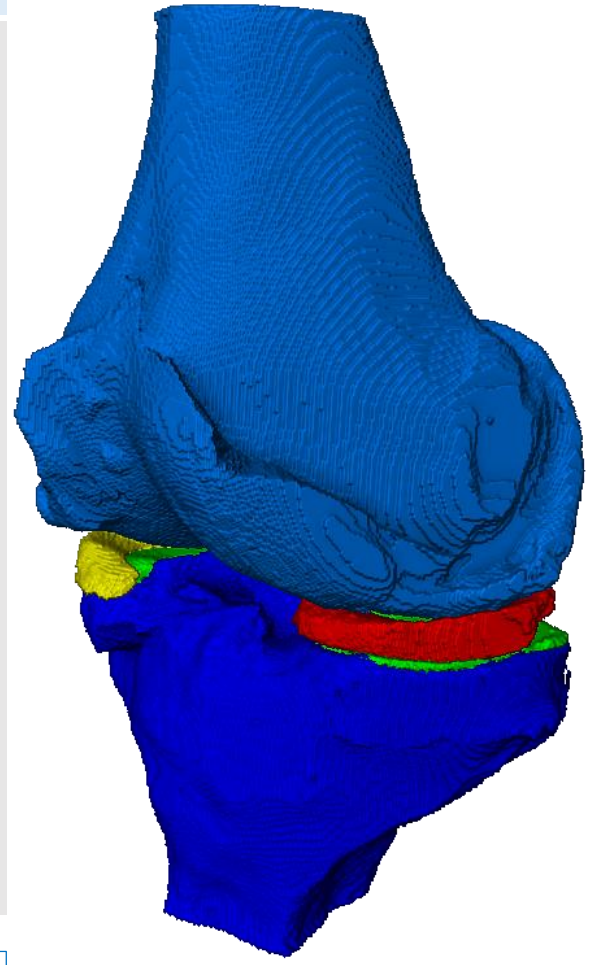
# … and Machine Learning



## Automatic Segmentation

- MRI data and corresponding volume rendering of knee structures (bone, cartilage, meniscus)
- **Used DL Frameworks: Theano + Keras → CNN**
- Benchmark with 50.000 data sets
- Evaluation using Intel DL Boost (incl. VNNI) on HLRN-IV ‘Lise’ *(Q1/2020)*



*work of A. Tack and St. Zachow, Zuse Institute Berlin*