Karlsruhe Institute of Technology

GridKa Future

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Immediate Future – LHC Run 3

Satisfy increased computing and storage requirements at highest possible reliability!

GridKa

Ready for LHC Run 3

Mid-term Future
Preparing for HL-LHC

Upgrade TIER-Centers for HL-LHC

- HL-LHC generates **new challenges** for data management and analytics – addressing them properly enables new scientific discovery
- Without alternatives, **Germany needs** powerful data and analysis centers so that the German physics community can participate in the scientific discovery at HL-LHC

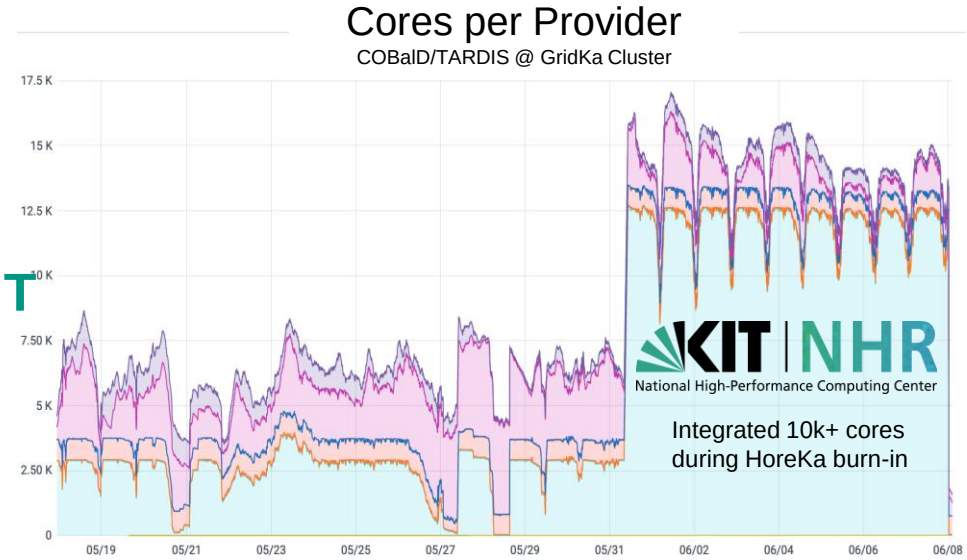
➔ "**Upgrade TIER-Centers for HL-LHC**"
joint proposal of KIT, DESY, GSI and part of the Helmholtz FIS roadmap 2021, page 53

	2025	2026	2027	2028	Total
DESY [Mio. €]	1	3	4	0	8
GSI [Mio. €]	1	1	2	0	4
KIT [Mio. €]	1	7	7	6	21
Total [Mio. €]	3	11	13	6	33

R&D on Opportunistic Resource Usage

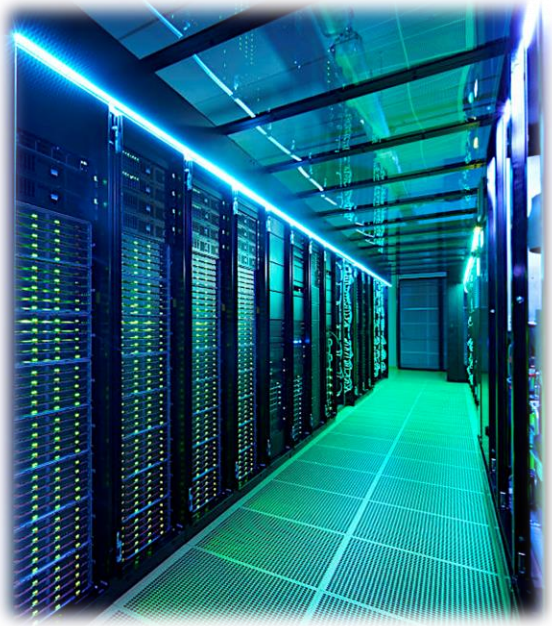
- Research and Development to provide third-party compute resources via established entry points
  - Combine expertise of Grid centers with capacities of HPC, Cloud, …
  - In-house experience for modern resource provisioning alternatives
- Domain agnostic software suite **COBalD/TARDIS developed at KIT**

  ➔ Production deployment across HEP University- & HPC-resources **coordinated at KIT/GridKa**



Cooperation with NHR/HPC

- **SDL Astroparticle and Particle Physics** for NHR@KIT
  - Goal: software and consulting to use NHR@KIT; coordinated by GridKa experts
  - Enable **knowledge and technology transfer** with other compute driven scientific communities
- Opportunity to shape NHR/HPC usage for physics
  - Close cooperation of experts for both HPC and Grid
  - Establishing **tooling and policies** for HPC usage by large-scale, distributed scientific communities
  - Support other sites to use HPC for physics communities e.g. HEP@CLAIX at RWTH Aachen



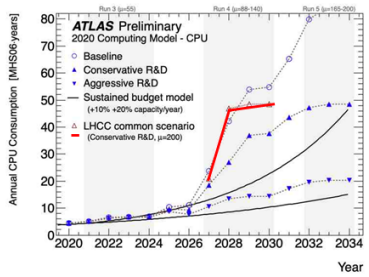
Expected Changes

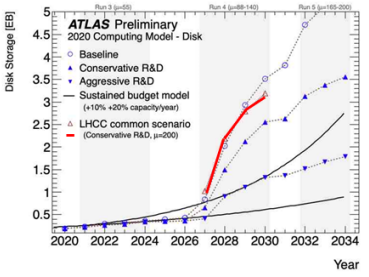
- **Centrally** accessible but **distributed** and **dynamic** resources
  - **GridKa as gateway** to both static and opportunistic on- and off-site resources
- **Data Lake**
  - GridKa Online and Offline Storage need to serve dynamic remote caches
  - WAN bandwidth ever more important
- New architectures for offline computing
  - **Algorithms optimized** for **CPU** usage and **Accelerators** (GPUs)

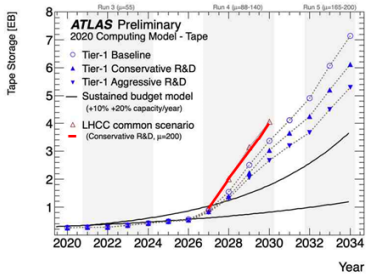
Long-Term Future
GridKa 2030

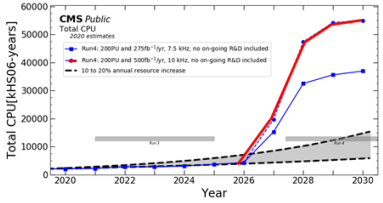
GridKa 2030 for HL-LHC

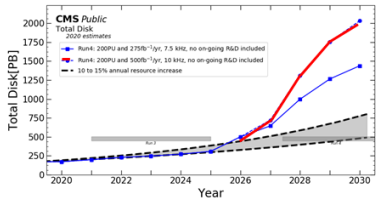
- Extrapolation based on experiment predictions
- CPU: ~3.5MHS06
- Disk: ~350PB
- Tape: 1EB
- Power/Cooling: ~1MW

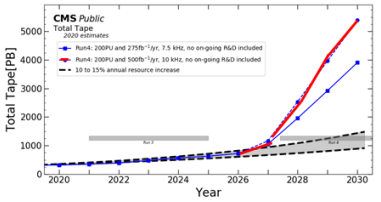












- Many open questions …

Open Questions

- Requirements vs. long term computing R&D of LHC experiments
  - GPUs …
- On-site vs. off-site resources
  - commercial clouds, NHR, HPC, …
- Sustainability
  - Energy efficiency, Green IT
- Long term funding