

# High Performance Computing challenges

- Accessing and using resources at HPC centers comes with different challenges:
  - Need to incorporate HPCs keeping integration costs in check, transparently for the operations
  - Diversity in access and usage policies, system architectures
  - Heterogeneous computing architectures: non x86 CPUs and different GPUs
  - CPU remains central, but offload compute-intensive/specialized algorithms to compute accelerators
  - Opportunistic CPU usage but no opportunistic disk
  - Managing storage at HPC
  - Outgoing connectivity from the worker node
- HPC comes with a cost
  - Requires significant investment in training and development
  - Much harder for smaller collaboration

# First successful jobs on Nurion HPC @KISTI

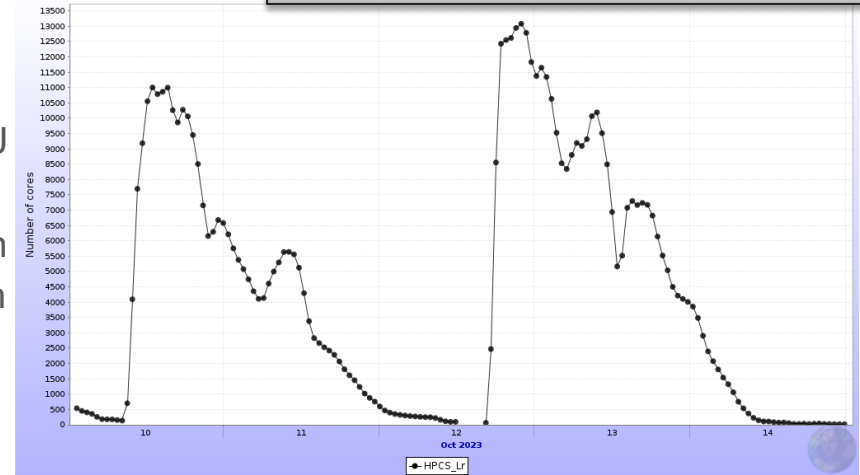
- Integration project for Nurion HPC @KISTI
  - Joint project of KISTI HPC and Grid groups, CBNU university and ALICE
  - Fully opportunistic resources
  - Useful for Grid use are 132 nodes (2x Intel Xeon 6148 CPUs), total of 10K cores
- Challenges of the project
  - Older style HPC (build 2017) with zero outgoing network (solved)
  - Special batch system and no CVMFS (solved)
  - WAN connectivity is limited (solution in progress)
- First successful jobs ran (MC and hyperloop)
  - Goal - extend the operation to as many slots as possible
- Long-term goal
  - Continue the cooperation and use the experience gained for the next HPC @KISTI (in planning phase)



# CTF Remote Reconstruction at US HPC Sites

- Tested the use of the US HPCs, Lawrence Livermore (Lr) and Perlmutter, for remote Pb-Pb reconstruction
- Fully opportunistic resources
- **Jobs were run with remote access to the data**
- **Adequate network - data pulled from CERN, no saturation**
- Possible to expand temporary T0 with additional 6-10k cores
- Porting of asynchronous reco code to GPUs:
  - Offloaded 60% of the processing to the GPU
- Tests ongoing to exploit GPU's at Perlmutter
- Not entirely new - ALICE did remote Pb-Pb reco in Run 2, with limited radius due to network limitation
- Since the progress in the network over the past 5 years has been remarkable, eligibility increased
- Evaluating other potential candidates

Tests at Lr were successful in 2023  
Evaluated Perlmutter in 2024  
Test to exploit GPU's at HPC ongoing



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Transfer tests to the LBL\_HPCS::EOS are shown below  
These SEs have high proximity to the Lr and Perlmutter HPC worker nodes

