



HYPERION RESEARCH

A Quick Update on Exascale Systems

ISC 22

Bob Sorensen

www.HyperionResearch.com

www.hpcuserforum.com

Near-Term US Exascale Plans

Three systems over two years with budget of ~ \$1.8 billion

- **Frontier: DOE Office of Science: Oak Ridge National Laboratory**
 - Slated to be first US exascale system in US
 - ~30MW, >1.5EF, 100 cabinets
 - *Crusher*, partial install (1.5/100 cabinets) currently running code
 - Cray Shasta with AMD EPYC CPU and AMD Radeon Instinct GPUs
 - Full user operations January 2023 (some delay)
- **Aurora: DOE Office of Science, Argonne National Laboratory**
 - **60MW**, ~ 1EF DP sustained
 - 08/21: Polaris testbed system (44PF DP and 1.5EF AI)
 - Cray Shasta architecture with Intel Xeons and Intel Xe GPU
 - Delivery in late 2022, acceptance in 2023 (delayed at least 12 months)
- **EI Capitan: DOE NNSA's LLNL**
 - ~ 2EF
 - Cray Shasta architecture AMD EPYC processors, next generation Radeon Instinct GPUs
 - Fully deployed in 2023

China Exascale Status

The official situation

- **Sunway Pro OceanLight**
 - ~1.3 EFlops Rpeak, ~1.05 EFlops Rmax
 - 35 MW, 38 million cores
 - ShenWei post-Alpha CPU
 - National Supercomputing Center-Wuxi
- **Tianhe-3**
 - Dual-chip FeiTeng ARM and matrix accelerator nodes
 - ~ 1.7 EFlops Rpeak, 1.3 EFlops Rmax
 - NSCC-Tianjin
- **Sugon**
 - Hygon processors (low confidence), may go AMD Zen4
 - NSCC-Shenzhen

China Exascale Status

The unofficial reality?

- **Sunway Pro OceanLight**
 - Up and running since March 2021
- **Tianhe-3**
 - Up and running in last six (?) months
- **Sugon**
 - Potentially delayed
- **No official announcements**
- **No entries for June 2021, November 2021 Top 500 list**
 - Maybe this time around...will find out soon
 - Some hesitancy by Chinese leadership
- **Strong evidence of at least five other Chinese systems that could make top 10 list today**

EU HPC Plans

Exascale plans going forward

- **EU plan calls for acquisition of two exascale systems in the 2021-2024 timeframe**
 - At least one to use European technology: specifically using an EPI-developed processor
 - Additional procurements in Germany in 2024, 2025
 - EU may include 2 additional ES systems in 2023-2026
- **Post Exascale System around 2027**
 - Plans call for integration and deployment of the first hybrid HPC/quantum infrastructure in Europe

	2019 & 2020	2021	2022	2023	2024	2025	2026	2027
HPC Infrastructure	3 pre-exascale + 5 petascale systems	Several mid-range, pre-exascale and 2 exascale systems				exascale and post-exascale HPC systems		
Quantum Infrastructure	Pilot Quantum simulators interfacing with HPC systems (100+ Quantum units)	-----DRAFT-----		QComputer/ QSimulators (NISQ) with Basic HPC integration	QComputer/ QSimulators (NISQ) with Full HPC integration - HPC Accelerators	Prototype QComputers fitted with Error Correction and robust Qbits		

Source: Leonardo Flores Añover, Senior Expert

DG CNECT, HPC & Quantum Technology Unit - European Commission 2021

UK EU Plans

- **UK plans to roll out its first exascale system in 2025.**
- **System will be hosted at Advanced Computing Facility of EPCC, formerly the Edinburgh Parallel Computing Centre, a supercomputing centre based at the University of Edinburgh**
- **Build on current work within Exascale Computing Algorithms and Infrastructures Benefiting UK Research (ExCALIBUR)**
 - Aims to deliver the next generation of high-performance simulation software for the highest priority fields in UK research
 - Stand-alone UK programme with a £46 million investment exclusively focused on exascale software and algorithms
- **Complements on-going UK HPC efforts**
 - Recently stood up ARCHER2, a £79 million effort, (28 Pflop/s HPE Cray EX HPC) resource for UK academic and commercial scientific research
 - On-going DiRAC 3, a distributed HPC ecosystem spanning extreme scaling, data intensive applications, and memory intensive applications across four UK sites

QUESTIONS?



bsorensen@hyperionres.com

Float to the top or sink to the bottom. Everything in the middle is the churn. -Amos Burton, The Expanse