



Next Generation I/O for the Exascale

Project highlights

The NEXTGenIO project addresses the I/O performance challenge not only for Exascale, but also for HPC and data intensive computing in general. NEXTGenIO is developing a prototype computing platform that uses on-node non-volatile memory, bridging the latency gap between DRAM and disk. In addition to the hardware that will be built as part of the project, NEXTGenIO is developing the software stack that goes hand-in-hand with this new hardware architecture, and is testing the developments using a set of applications that include both traditional HPC (e.g. CFD and weather) and novel workloads (e.g. machine learning and genomics). A key outcome of NEXTGenIO will be a detailed understanding of the wide range of use cases for non-volatile memory in the context of Exascale systems.

Anticipated technologies suggested for inclusion in an EsD project

- Prototype compute nodes with non-volatile memory for I/O and memory operations.
- Profiling and debugging tools that support non-volatile memory.
- Data and power/energy aware job scheduling system that understands non-volatile memory.
- Filesystem (echoFS) and object store (dataClay) for non-volatile memory.
- Library for development of high-level persistent data structures in non-volatile memory.
- Workload benchmark generator (Kronos) and I/O workflow simulator.

All the technologies mentioned above are under development. The tools are well established, but their support for NEXTGenIO is work in progress; a first version of Kronos has been released internally.

How should this technology be used?

All the technologies developed in the project will be integrated into and validated on the NEXTGenIO prototype system. Some components, such as the profiling and debugging tools, or Kronos and the workflow simulator, are generic tools that can be seen as independent of the NEXTGenIO hardware.

Are there any pre- or co-requisite items

Non-volatile on-node memory is a key requirement for certain system software components.

Any extra work/interaction (on top of current project roadmap) needed to make them ready?

For testing and validation purposes, third-party access to the NEXTGenIO prototype towards the end of the project would be beneficial to prove HW and SW technologies.

What information / actions are needed to best prepare for EsD projects?

- Creating a clear picture of the technologies that are being developed.
- Making sure the EsDs are *use case* and not technology driven.