

E4S AND SDK EFFORTS

The large number of software technologies being delivered to the application developers poses challenges, especially if the application needs to use more than one technology at the same time. The Software Development Kit (SDK) efforts identify meaningful aggregations of products within the programming models and runtimes, development tools, and data and visualization technical areas, with the goal of increasing the interoperability, availability, quality, and sustainability of the software technologies being developed in the ECP while improving developer productivity for both the software and application development teams. The resulting SDKs are packaged and delivered through the Extreme-Scale Scientific Software Stack (E4S) (<https://e4s.io>).

The forthcoming exascale systems require a sustainable, high-quality software ecosystem, and the ECP is chartered with delivering such an ecosystem that will continuously be improved by a robust research and development effort, deployed on advanced computing platforms, and broadly adopted by application teams and software developers to accelerate their science. The E4S and SDK efforts support a set of activities focused on establishing community policies aimed at increasing the interoperability between and sustainability of software technologies developed by the ECP and coordinating the delivery of those products through the E4S.

The Programming Models and Runtimes SDK effort identifies meaningful aggregations of products in this technical area. It provides the software infrastructure necessary to enable and accelerate the development of exascale applications that perform well and are correct and robust while reducing the cost of both initial development and ongoing porting and maintenance.

The Development Tools SDK is a collection of independent projects specifically targeted to address performance analysis at scale. The team actively works to leverage techniques for common

and identified problem patterns and create new techniques for software quality assurance related to performance analysis tools while also supporting advanced techniques such as autotuning and compiler integration for upcoming heterogeneous architectures.

The Data and Visualization SDK focuses on the delivery of efficient data management and storage libraries, services such as checkpoint/restart, monitoring, code coupling and compression, and an efficient in situ visualization and analysis pipeline. The goal is to improve deployment and usage of I/O and analysis capabilities.

The Software Ecosystem SDK effort manages the release and testing of the E4S and ensures that the software technologies within E4S can be either built from source via the Spack package manager or used via pre-built container images. Application developers can build only the subset of the software technologies needed for their specific application. This effort also fosters collaboration between software technologies and interacts heavily with the Hardware and Integration (HI) focus area to facilitate software product installation at the Facilities.

Progress to date

- Version 0.2 of E4S was released, which contains 37 full products from across the software technologies and can be either built from source via the Spack package manager or used via pre-built container images.
- The Dyninst package from the Development Tools SDK was used as a pilot project for the continuous integration workflow using GitLab proposed by the HI focus area. Integration with the Dyninst GitHub source repository was successful, which was a key step in ensuring interoperability with the most popular source control platform.
- The Data and Visualization SDK addressed numerous interoperability issues among major I/O, data, and visualization products.
- The Software Ecosystem SDK team is building lines of communication and working relationships with other SDK efforts and HI staff to jointly define approaches for software deployment and testing and are effectively communicating the definition and purpose of as well as approaches used for the SDKs and E4S.

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