Centre of Excellence in Physics at Extreme Scales

Purpose

The focus of the Centre is computational and data science that stretches enabling technologies to explain how the Universe works at the largest and smallest length and energy scales. Its ethos is that algorithms and implementations, hardware and software, data generation and exploration must evolve together in order efficiently to solve the most challenging physics problems, and that this co-design plays a key role in driving new computing technologies for mass markets.

The Centre brings physicists, computer scientists and data scientists from academia and industry together to develop new technologies to discover new physics.

Scope

The Centre is led by a cross-disciplinary team of physicists and computer design engineers who define and lead work packages that have the prospect of increasing physics capability while achieving market relevance. The resulting shared knowledge, disseminated through meetings, outreach and training activities, is used by the computer industry to guide its development of future products and by physicists to guide their development of community codes that can exploit them optimally.

The first two-year programme of the Centre will comprise the following work packages.

WP1. Community software development and data management

WP2. New algorithms for large-scale simulation and data analytics

WP3. Languages and programming models for heterogeneous architectures

WP4. Energy-efficient processor, memory and interconnect architectures

WP5. High speed data streaming, real-time analysis and data ingest

WP6. Emerging and disruptive technologies

WP7. Dissemination and training

Business Model

The Centre has a distributed hub and spokes structure. The hub provides overall coordination and each spoke leads one or more work package. Each work package has two Co-Directors, a physicist and a computer scientist, the latter typically from industry. Together with the Centre Director and Manager, the work-package Directors form the management committee.

The Centre is a public-private partnership. Institutions hosting the hub and spokes provide space and facilities. Associated computer centres provide computer time and access to data for development work. The EC funds project staff, meetings and training. Companies pay modest

annual subscriptions for access to all research outputs and may make in-kind contributions to projects, although it is not necessary for a company to actively participate in projects.

Next Steps

We seek the following input to the proposed work packages above.

1. Suggested revisions, additions, or deletions to the list of work package topics
2. Suggested sub-topics for each work package
3. Expressions of interest from those interested in leading or contributing to a work package