JLPC
future JLESC
PUF (Partnership University Fund) Organization
Activities

JLESC 2014

PUF NextGN Jan 2014

Summer Schools

Workshops

Visits
Partnership University Fund

NextGN:
Preparing for Next Generation Numerical Simulation Platforms
Partnership University Fund

• Under the hospice of the FACE (French American Cultural Exchange) foundation in New York City.
• Managed by the Cultural Services of the French Embassy.
• Funding coming from Private American donors + French government.
• Launched in September 2007.
• Objective: supporting innovative and sustainable partnerships between French and US institutions of research and higher education.
• Extremely competitive (8% AR), top level research.
The members of the PUF Grant Review Committee met on May 20th, 2013 under the co-presidency of Allan Goodman and Christophe Laux, in order to choose the laureates among the grants applications of the sixth call for projects. Altogether, five partnerships were selected and subsequently approved by the PUF Steering Committee and the Board of Trustees of FACE. Two projects were selected in Humanities and will be co-financed by PUF and the Andrew W. Mellon Foundation.

The selected partnerships are listed hereafter (without merit order):

**Quantum Cryptography with Silicon Photonics (CRYSP)**
University of Delaware – Centre National de la Recherche Scientifique

**Preparing for Next Generation Numerical Simulation Platforms**
Argonne National Laboratory – Institut National de Recherche en Informatique et en Automatique (INRIA)

**Advancing the synthesis of ecology and evolution through the integration of mathematical observational and experimental models.**
University of Arizona – Ecole Normale Supérieure

**Partner University Fund**
Grantees 2013
• Lead partners:
  – Inria: Franck Cappello → may need to find another lead for Inria
  – ANL: Marc Snir

• Additional Partners
  – UIUC/NCSA: William Kramer
  – CNRS: Sylvie Joussaume
• Work package 1:

**Algorithms with reduced communications.**

Leaders: Jed Brown (Paul) (ANL), Laura Grigori (Inria, Paris), Bill Gropp (UIUC), Radek Sponpor (CNRS, Paris)

Performance model, conditioning of the Krylov basis, user-defined non-blocking collectives, combine pipelining with TSQR-based Krylov methods

• Work package 2:

**Reducing MPI and Charm++ communication overheads**

Leaders: Pavan Balaji (ANL), Emmanuel Jeannot (Inria, Bordeaux), Sanjay Kale (UIUC), Radek Sponpor (CNRS)

Topology-based mapping model, tools for automatic network discovery, Interpolation based large scale applications modeling, distributed placement algorithms, dynamic remapping
• Work package 3:
  **Reducing overhead of Input/Output in numerical simul.**
Leaders: Robert Ross (ANL), Gabriel Antoniu (Inria, Rennes),
Rob Pennington (UIUC), Yann Meurdesoif (CNRS, Paris)
Characterize I/O, storage, and data analysis requirements, architecture
joining Damaris and IOFSL, new approach to data management, automated
data movement across a hierarchical storage system

• Work package 4:
  **Improve Fault tolerance for numerical simulations by**
  **improving checkpointing protocols and parameters**
Leaders: Rajeev Thakur (ANL), Franck Cappello (Inria), Luke
Olson (UIUC), Marie-Alice Foujols (CNRS)
Fully distributed recovery, Process clustering, fault tolerance algorithms
based on resilient MPI, Algorithm based resilience
• Work package 5:
  **Verification of numerical simulation correctness and uncertainty quantification**
  Leaders: Paul Hovland (ANL), Laurent Hascoet (Inria)
  Adjointsof MPI codes, proving the semantic correctness of the communication adjoints, Derivatives of DAG-based codes, Uncertainty quantification for practical applications

• Work package 6:
  **Improving the performance of numerical simulations on Cloud environments**
  Leaders: Kate Keahey (University of Chicago, ANL), Frederic Desprez (Inria, ENS Lyon)
  Model for VM and storage object placement, user controlled object placement, workflow-based experiments
• Work package 7:

**Performance Metrics, Modeling and simulation at extreme scale**

Leaders: **Marc Snir** (ANL), **Arnault Legrand** (CNRS, Grenoble), **Bill Kramer** (UIUC)

Record, archive, index, analyze and correlate events and logs from the Blue Waters and Mira, Validation of performance modeling methodology, Efficient simulation support (critical path), Scalable and accurate network modeling
• Summer Schools
  – Performance metrics, modeling and simulation at extreme scale.
    The speakers will be: Bill Kamer (UIUC), Arnaud Legrand (CNRS), Laxmikant Kale (UIUC) → Sophia Antipolis
  – Data storage, management and analytics at extreme scale.
    The speakers will be: Robert Pennington (UIUC), Robert Ross (ANL), Gabriel Antoniu (Inria) → ?
  – Fault Tolerance and Resilience at extreme scale.
    The speakers will be: Marc Snir (ANL), Franck Cappello (Inria), Ana Gainaru (UIUC), Yves Robert (ENS) → ?
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<th>Student Exchanges</th>
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PUF NextGN

Progress report

WP8: Management/organization

Kick-off Meeting + Workshop France
Workshop USA
Workshop Summer School France
Workshop USA
Workshop Summer School France
Workshop USA
Workshop Summer School France
Collaborations Continue after the end of the project

WP1: Communication avoiding algorithms
WP2: Reducing communication overhead
WP3: Reduce overhead of I/O
WP4: Improve fault tolerance
WP5: Correctness Verification and Uncertainty Quantification
WP6: Improve numerical simulation on Clouds
WP7: Performance Metrics, Modeling and Simulation
Student exchanges, Faculty exchanges
Joint publications and software
Establishing Joint/dual Degrees / Credit Exchanges

A: Quarterly Audio-conferences, MBM: Management Board Meetings, every 6 Months
Progress report: will be sent every year by July 1st. The schedule considers a kickoff (t0) in July 1st.

Project schedule
Joint Laboratory on Extreme Scale Computing

JLESC
JLESC Purpose

- Establish an international joint laboratory on extreme scale computing
- Making the bridge between Petascale and Exascale computing,
- Following the model of the Joint Laboratory on Petascale Computing (JLPC).

- JLESC initial partners: INRIA-NCSA-ANL (JLPC)
  + Riken Advanced Institute for Computational Science, Jülich Supercomputing Center, Barcelona Supercomputing Center.

- JLESC will also involve computer scientists, scientists and engineers from other disciplines and from industry
Scope and Objectives

- Research topics related to computational and data focused simulation and analytics at extreme scale.
  
  Will produce original ideas, publications, research reports and open source software to address the most critical issues in advancing from petascale to exascale computing.

Research Topics

- Parallel programming models and libraries,
- Numerical algorithms and libraries,
- Parallel I/O systems and libraries,
- Data analytics, graph algorithms,
- Resilience,
- Performance analysis and modeling, and tools.
A 3-day workshop every 6 months with all JLESC partners. The purpose of these workshops is to discuss work performed in the last six months and to plan work for the next six months.

- Researcher/student exchanges. These exchanges take the form of short and long term visits (from days to 1 year or more) at different JLESC partner sites, in order to work on joint projects.
Funding Model

• Each partner institution will provide funding to support the two JLESC activities (workshops and exchanges).

• Each institution allocates an annual budget that is managed locally and controlled both by the local representative (executive) and the JLESC director;

• Concerning the visits, whatever is the selected funding model, a researcher from institution I1 visiting institution I2 will only be supported by money provided by institutions I1 and I2.

• Each party involved in the collaboration will cover its personnel salaries.
Intellectual Property

• We will avoid intellectual property issues as much as possible by producing only joint publicly available publications and open-source software. Institutions participating in the development of software will jointly decide on the license for the software.

Facilities

• An institution involved in JLESC will provide to visitors involved in collaborations: office space and internet access, secretarial support, and make all reasonable efforts to provide them access to its local HPC resources.
• The JLESC will have a director reporting to the steering committee every year. The director will be appointed for 2 years by the steering committee.
• The steering committee will be formed by the leader of each partner institution.
• An executive committee will gather representative of each institution (director of JLESC for this institution)
• The JLESC director will typically be one member of the executive committee.
• A scientific committee composed of external researchers of exceptional caliber will assess the progress and the output of JLESC every year during the evaluation day and suggest/recommend evolutions/adjustments.
Joint-lab in 2014

PUF NextGN
Jan 2014

JLESC
2014

Inria
UIUC
ANL

BSC?
JSC?
AICS?