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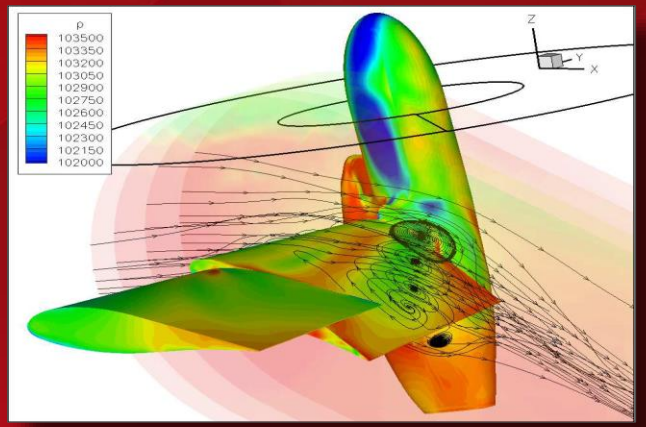

elsA on XEON-Phi

The Fujitsu Parallel Application Lab

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Fujitsu Systems Europe

elsA Project

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Project context

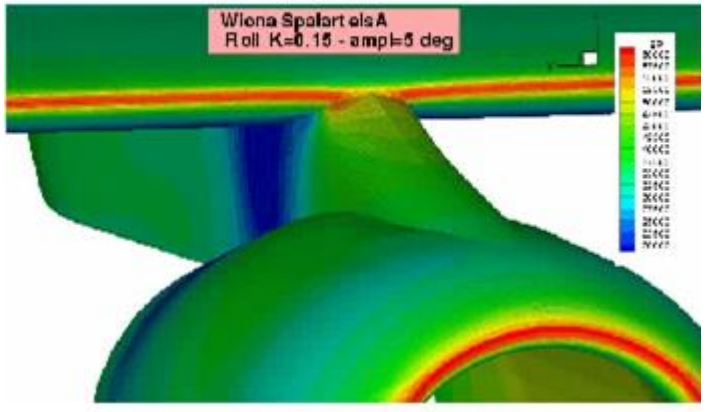
- Partnership between Intel, CERFACS, ONERA, Airbus and Fujitsu
- The goal is to focus on “real world” industrial applications
- The target is to prove MIC technology efficiency as a truly production oriented platform

What is *elsA*?

- ***elsA*** is the ONERA software for complex external and internal flow simulations and for multi-disciplinary applications involving aerodynamics, including aerodynamics, aero-elasticity, aero-thermic and aero-acoustic coupling
- ***elsA***is used for the design of Aircrafts, helicopters, turbomachinery, missiles, launchers, air intakes, nozzles, propulsive jets
- ***elsA***is based on Fortran and C++ source code (about 850000 source lines), hybrid programming model MPI+OpenMP

XEON-Phi Environnent

- The XEON-PHI is used as normal compute node, ie. a parallel file system client is running on it as well as batch system (Torque), no offload mode at the opposite of traditional GPGPU approach



elsA profile on XEON-Phi

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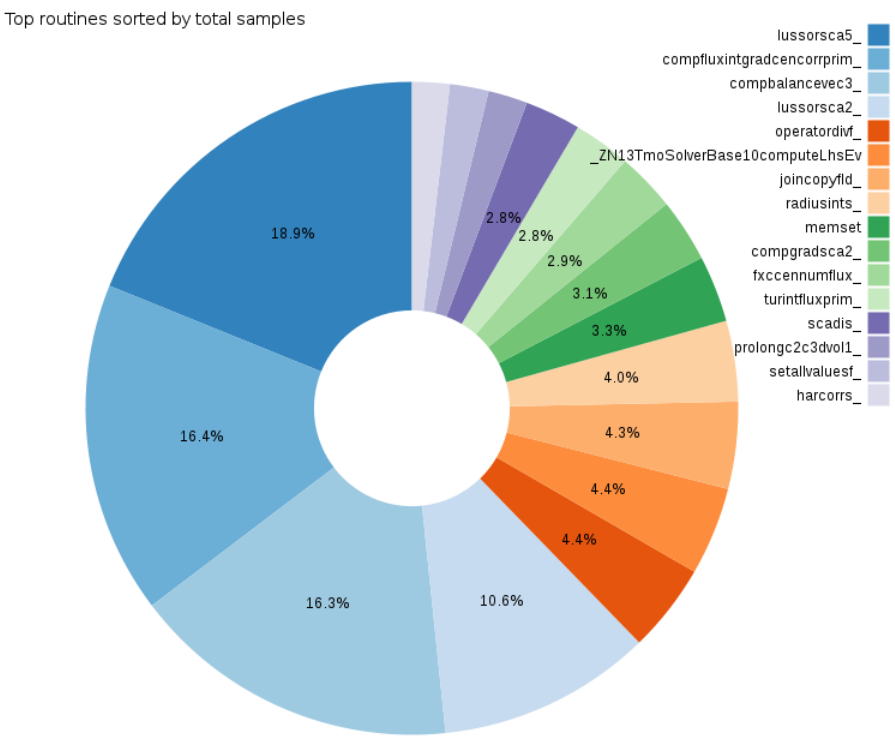
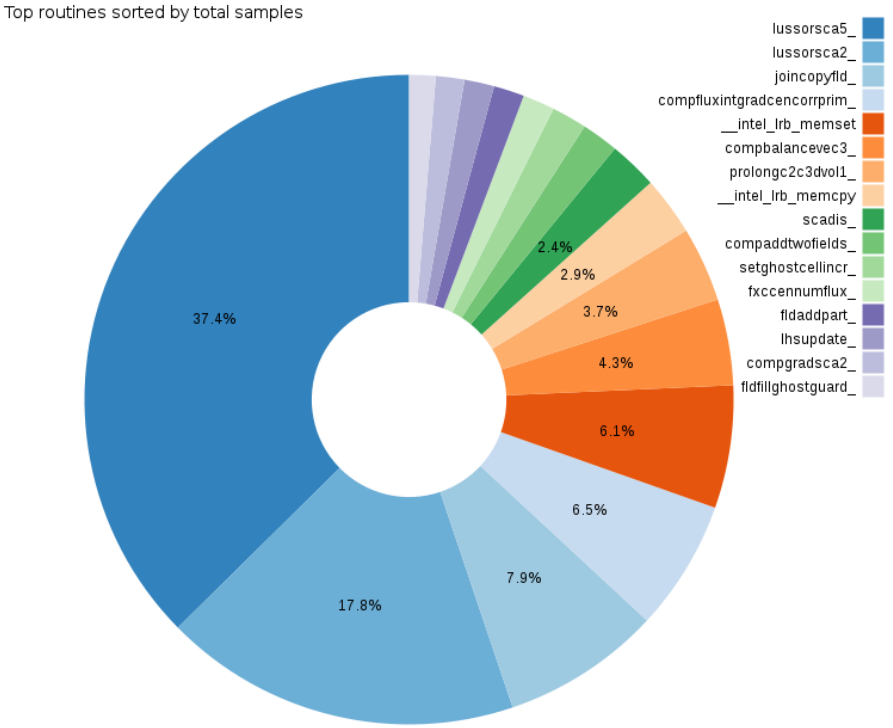
As is



After tuning



Performance figures

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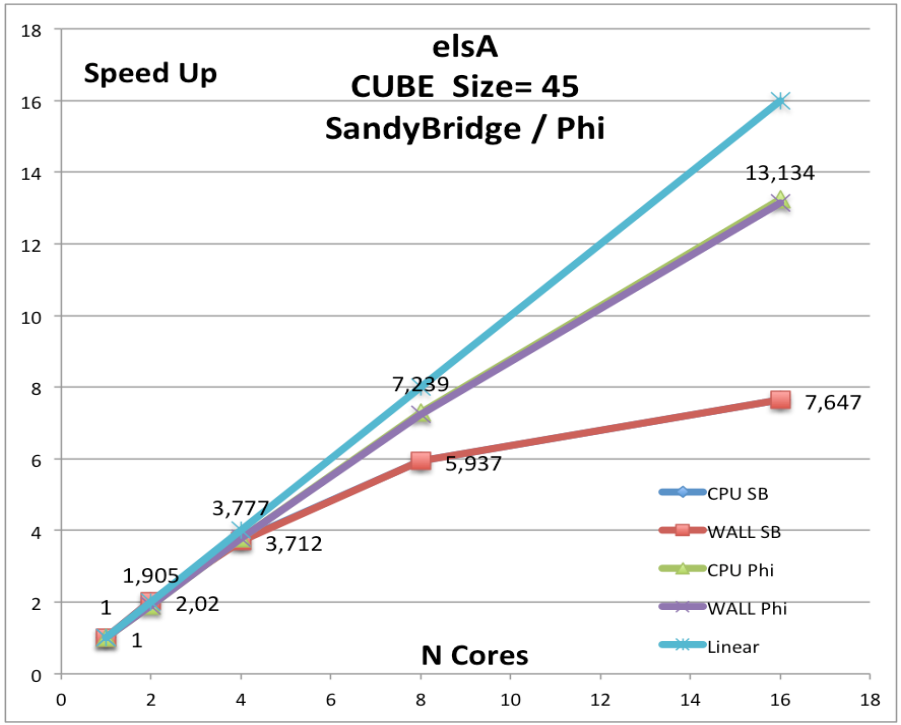
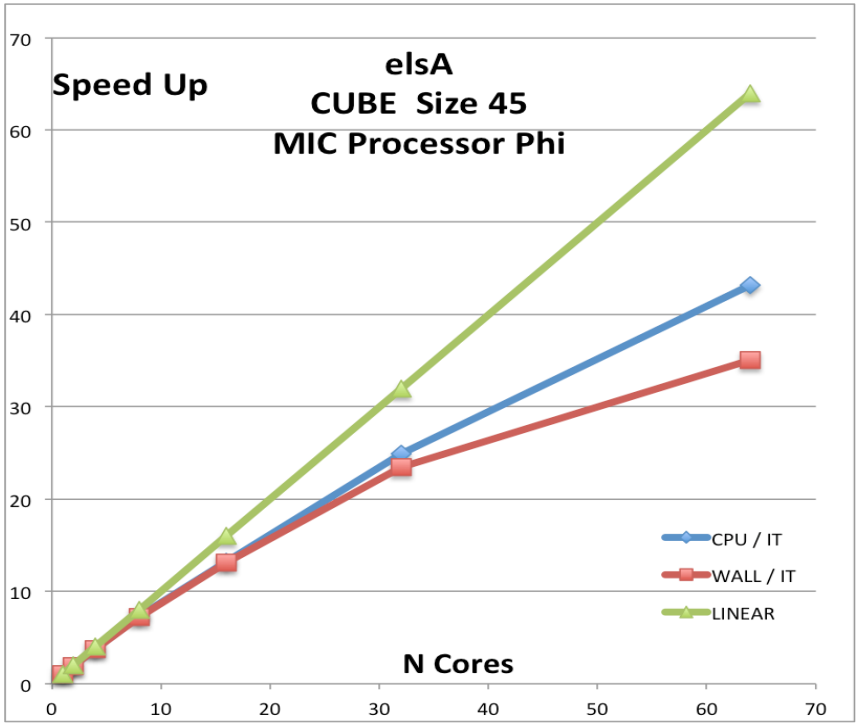
- Sandy-Bridge / XEON-Phi



- XEON-Phi



Current results

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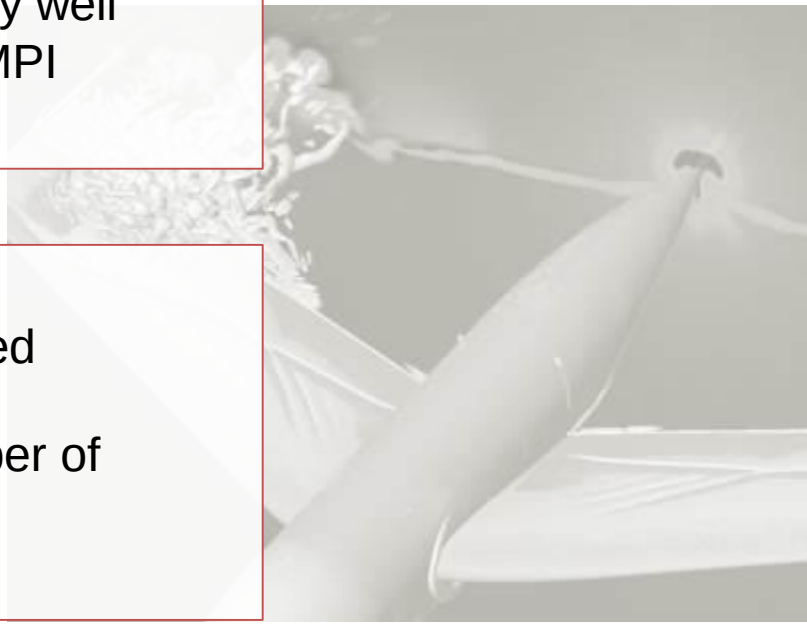
Preliminary Conclusions

- elsA is running as fast on a single XEON-PHI as on two sockets Ivy-Bridge
- The integrated parallel file system works very well
- Running mixed Sandy-Bridge / XEON-PHI MPI application is even mode efficient



Next steps

- Focus on better multi-threading with improved prefetch in cache
- Minimize IOs impact when using large number of MPI processes
- Be ready for KNL…!

Making key applications ready for next generation supercomputer

FUJITSU PARALLEL APPLICATIONS LAB

What is the Parallel Application Lab ?

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The lab' is running as part of Fujitsu Systems Europe activities in south of France (Toulouse) since 1996. Its mission is to be a center of excellence in parallel programming, from mastering key technologies to providing consultancy and customer support world wide

- Past and current activities
  - Deep involvement in technologies development (Fujitsu MPI-2 and related performance analysis tools were developed in Toulouse)
  - Investigation of new HPC solutions like XEON-PHI, parallel file systems and new interconnect technologies
  - Port, adapt and tune large industrial applications on Fujitsu platforms (SPARC or Intel based), sustain Fujitsu benchmark activities
  - Provide direct support and consultancy to end users
- The team
  - Multi-disciplinary team of experts covering most of scientific computing aeras including computer science, mathematics, computational fluid dynamic, climate and weather forecast, life science, physics and astrophysics.

Some On-going activities

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Study and tuning of numerical models

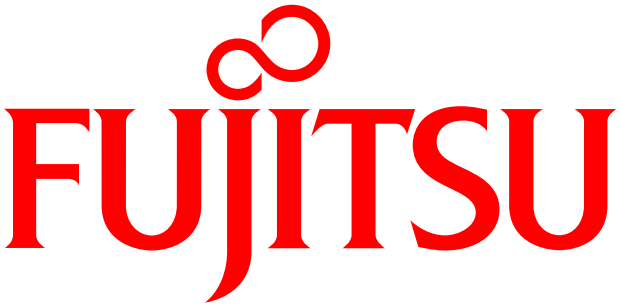
- Weather forecast and climate modeling: Unified Model from UK-Met and Harmony from HIRLAM Consortium and COSMO
- Life science and multiple integrated cores technology evaluation with NCBI-Blast, GROMACS, …
- Deep imaging for oil exploration

Architecture for small and medium sized cluster

- Resource optimization and performance tuning toward best ratio price/performance for SMEs and small to medium research groups
- Smooth Integration of parallel file systems inside compute nodes
- Integrated solution with “PHI as a node” concept, running batch system on XEON-PHI and use it as normal Linux based diskless node

Integration and application on boarding for HPC-Gateway

- Development and tuning of complex workflows for Fujitsu HPC Cloud
- Integration of application to the web based HPC-Gateway for end users



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