ALOMA – A FRAMEWORK FOR NEXT GENERATION SEISMIC APPLICATIONS

ALOMA is a runtime environment that helps tackling the challenge of making seismic applications run efficiently on large scaled distributed systems.

As surveys are getting larger and larger, systems have to grow more and more, and developers need to efficiently make use of distributed resources. For most geoscientists, this is way outside their area of expertise and comfort zone. They should be able to focus on the geophysics in algorithms and not have to worry about parallelization, multi-threading, and other challenges in high-performance computing.

This is the fundamental idea behind ALOMA: to free the geoscientists from having to learn about HPC tools and strategies in order to execute their software in a scalable way. To achieve this goal, Fraunhofer developed a system that sits in between the Seismic and the HPC experts. Computer- and geo-scientists together came up with ideal strategies for parallelization, data partition, and failure tolerance in the context of geophysical applications. The heart of ALOMA, its failure tolerant runtime system to execute workflows on distributed systems, was then developed by HPC experts. For its users, the geophysicists and geologists, ALOMA is merely a black box in which they can integrate their latest developments via a well-defined interface. New algorithms and prototypes can be added and tested to production scale within no time.

For production use, existing codes and applications – even in different programming languages such as C/C++, Fortran, Matlab etc. – can be integrated as modules in ALOMA.
Main Features

- Plugin architecture for easy integration of existing algorithms in different programming languages
- Existing legacy binaries without the need for any sources
- Newly developed algorithms for tests on production scale
- Graphical interface to create even the most complex workflows in a user friendly way.
- Automatic generation of parameter GUIs with an expandable Parameter Description Language.
- Parallel runtime environment for seismic applications that parallelizes across cores and sockets.
- Automatic adaption to data dependencies in between modules of a workflow.
- Automatic resource management and tools for execution monitoring.
- Failure tolerant execution with automatic re-scheduling of failed tasks, and automatic adjustment to addition or loss of resources.
- Attach existing visualization tools for graphic inspection of the results.

Sample Applications

- Fast sorting of highly distributed data
- Classic gather conditioning on large datasets
- Stencil algorithms on 1D to 5D data
- Kirchhoff Migration
- Managing of long running RTM workflows
- Adaptive stacking
- Parallelization of Matlab modules
- Parallel version of the legacy Seismic Unix (su) toolkit

GPI-SPACE – At the Intersection of HPC and Big Data

In-Memory Dataflow on Heterogeneous Resources

- Advanced Memory Management
- Data Streaming
- Integration of Legacy Codes
- Fault Tolerant Execution
- Dynamic Resource Management

Seismic Development and Processing Architecture