Extreme Scale Resilience Home

The Argonne National Laboratory/MCS/Extreme Scale Resilience group covers fault tolerance and resilience for HPC simulations and data analytics at extreme scale

Lead: Franck Cappello, ANL

Topics and people

- **Multi-level Checkpoint / Restart**: Bogdan Nicolae, Leonardo Bautista Gomez (Postdoc now at BSC), Franck Cappello
  - Main project: VeloC (ECP)
- **Lossy compression**, Sheng Di, Franck Cappello.
  - Main projects: EZ (ECP), CODAR (ECP)
- **Silent soft errors/data corruptions detectors and compression**: Sheng Di, Franck Cappello
  - Main project: Aletheia (NSF)
- **Failure characterization and prediction**: Sheng Di, Rinku Gupta, Franck Cappello
  - Main project: Catalog (DOE ASCR)
- **Failure modeling and fault tolerance optimizations**: Sheng Di
- **Fault tolerance protocols**: F. Cappello

Main collaborators: Marc Snir (ANL and UIUC), Jon Calhoun (Clemson), Bill Kramer (UIUC), Thomas Ropars (EPFL), Amina Guermouche (UVSQ), Frederic Vivien (Inria), Yves Robert (LIP), Satoshi Matsuoka (Titlech), Satoshi Matsuoka (Titlech), Mitsuhisa Sato (U. Tsukuba), Osman Unsal (BSC), Leonardo Bautista Gomez (BSC)

Tools and software

- **SZ (Error Bounded Lossy Compressor for floating point data sets)**
- **Z-checker (An lossy data compression assessment tool)**
- **AID (Adaptive Impact-Driven Detection) library for SDC detection**
- **FTI** (operational prototype): Fault Tolerance Interface for multi-level checkpoint/restart (in memory checkpointing, checkpointing on remote nodes, erasure encoding, etc.)
- **HELO/ELSA** (operational prototypes): System event clustering and Failure predictor
- **MPIICH-HFT** (prototype under development): Fault tolerant MPI with hierarchical fault tolerant protocol

Main collaborative activities

- **Illinois-Inria-ANL-BSC-JSC-Riken-UTK Joint Laboratory on Petascale Computing**

Recent Publications (from 2013)

10. W. He, H. Guo, T. Peterka, S. Di, F. Cappello, HW Shen, Parallel Partial Reduction for Large-Scale Data Analysis and Visualization, in the 8th IEEE Symposium on Large Data Analysis and Visualization (IEEE LDAV) in conjunction with IEEE VIS 2018, Berlin, Germany, October 21, 2018.


34. S. Di, F. Cappello, Fast Error-bounded Lossy HPC Data Compression with SZ. IEEE IPDPS 2016


37. L. Bautista Gomez and F. Cappello, Detecting Silent Data Corruption for Extreme-Scale MPI Applications, EuroMPI 2015


40. L. Bautista-Gomez and F. Cappello, Exploiting Spatial Smoothness in HPC Applications to Detect Silent Data Corruption, IEEE HPCC 2015


51. L. Bautista-Gomez, Franck Cappello, et. al. GPUPes: How to Combine High Computational Power with High Reliability (Embedded Tutorial), Design, Automation & Test in Europe, DATE’14

52. S. Di, S. Bouguerra, L. Bautista Gomez, F. Cappello, Optimization of Multi-level Checkpoint Model for Large Scale HPC Applications, IEEE IPDPS 2014


55. L. Bautista Gomez, F. Cappello, Improving Floating Point Compression through Binary Masks, Proceedings of IEEE BigData 2013


59. S. Di, D. Kondo, F. Cappello, Characterizing Cloud Applications on a Google Data Center, short paper, Proceedings of ICPP 2013


