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
- Lossy compression, Sheng Di, Franck Cappello.
- Silent soft errors/data corruptions detectors and compression: Sheng Di, Franck Cappello
- Failure characterization and prediction: Sheng Di, Rinku Gupta, Franck Cappello
- 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), Bogdan Nicolae (IBM Dublin), Thomas Ropars (EPFL), Amina Guermouche (UVSQ), Frederic Vivien (Inria), Yves Robert (LIP), Satoshi Matsuoka (Titech), Mitsuhisa Sato (U. Tsukuba), Osman Unsal (BSC), Leonardo Bautista Gomez (BSC)

Tools and software

- SZ (Error Bounded Lossy Compressor for floating point data sets)
- Zchecker (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)

53. L. Bautista-Gomez, Franck Cappello, et al. **GPGPUs: How to Combine High Computational Power with High Reliability (Embedded Tutorial)**, Design, Automation & Test in Europe, DATE’14
54. S. Di, S. Bouguera, L. Bautista Gomez, F. Cappello, **Optimization of Multi-level Checkpoint Model for Large Scale HPC Applications**, IEEE IPDPS 2014
57. L. Bautista Gomez, F. Cappello, **Improving Floating Point Compression through Binary Masks**, Proceedings of IEEE BigData 2013
61. S. Di, D. Kondo, F. Cappello, **Characterizing Cloud Applications on a Google Data Center**, short paper, Proceedings fo ICPP2013
63. B. Nicolae, F. Cappello, **AI-Ckpt: Leveraging Memory Access Patterns for Adaptive Asynchronous Incremental Checkpointing**, Proceeding of ACM HPDC 2013