Extreme Scale Resilience Home

The Argonne National Laboratory / 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
- MPICH-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)


38. T. Martsinkevich, T. Ropars, F. Cappello, Addressing the last roadblock for message logging in HPC: alleviating the memory requirement using deduced resources, Euro-Par 2015 workshop on Resilience - Resiliency in High Performance Computing with Clouds, Grids, and Clusters, 2015

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


41. L. Bautista-Gomez and F. Cappello, Detecting and Correcting Data Corruption in Stencil Applications through Multivariate Interpolation, FTS 2015 workshop at IEEE Cluster 2015

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


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
58. L. Bautista Gomez, F. Cappello, **Improving Floating Point Compression through Binary Masks**, Proceedings of IEEE BigData 2013
63. B. Nicolae, F. Cappello, **AI-Ckpt: Leveraging Memory Access Patterns for Adaptive Asynchronous Incremental Checkpointing**, Proceeding of ACM HPDC 2013