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
  - 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 (Titech), Mitsuhashi Sato (U. Tsukuba), Omer Subasi (BSC), 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** (*Fault Tolerance Interface for multi-level checkpoint/restart*) (in memory checkpointing, checkpointing on remote nodes, erasure encoding, etc.)
- **HELO/ELSA** (*System event clustering and Failure predictor*)
- **MPIICH-HFT** (*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)**

• T. Martsinkevich, T. Ropars, F. Cappello, Addressing the last roadblock for message logging in HPC: alleviating the memory requirement using dedicated resources, Euro-Par 2015 workshop on Resilience - Resiliency in High Performance Computing with Clouds, Grids, and Clusters.
• L. Bautista-Gomez and F. Cappello, Exploiting Spatial Smoothness in HPC Applications to Detect Silent Data Corruption, IEEE HPC 2015.
• S. Di, D. Kondo, F. Cappello, Characterizing Cloud Applications on a Google Data Center, short paper, Proceedings to ICPP 2013.
• B. Nicolae, F. Cappello, AI-Ckpt: Leveraging Memory Access Patterns for Adaptive Asynchronous Incremental Checkpointing, Proceeding of ACM HPDC 2013
• M. S. Bouguerra, A. Gainaru, F. Cappello, L. Bautista Gomez, N. Maruyama and S. Matsuoka, Improving the computing efficiency of HPC systems using a combination of proactive and preventive checkpointing, Proceedings of IEEE IPDPS 2013
• M. El Mehdi Diouri, O. Gluck, L. Lefevre, F. Cappello, Towards an energy estimator of fault tolerance protocols, Poster, in Proceedins of ACM PPoPP 2013