**Problem / Motivation**

The shift from sequential to parallel and distributed computing is of fundamental importance for the advancement of computing practices. Unfortunately, this makes debugging truly challenging, leading to incorrect simulation results.

- Almost all large-scale parallel scientific simulation programs are written using MPI (Message Passing Interface)
- Earthquake Simulations
- Molecular Dynamics
- MPI programs are sophisticated and difficult to verify
- Visualization of verification results is important
- Few integrated graphical debugging and analysis tools exist

**Approach / Solution**

Of particular importance will be the efficient dynamic verification of such parallel applications. This calls for running actual MPI applications under a formal verification scheduler to exercise all relevant interleavings.

**Future Work – Added Integration of Distributed Analyzer of MPI Programs**

DAMI is the first dynamic formal analysis tool for MPI programs that guarantees scalable coverage of the space of MPI non-determinism through a decentralized algorithm based on Lamport Clocks.

- Currently working on integration of DAMPI into GEM
- Scales to 1000s of processes
- Fortran support
- Verify locally through GEM with ISP
- Verify at scale on a cluster through GEM with DAMPI

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