

ULFM-MPI Implementation of a Resilient Task-Based PDE Preconditioner

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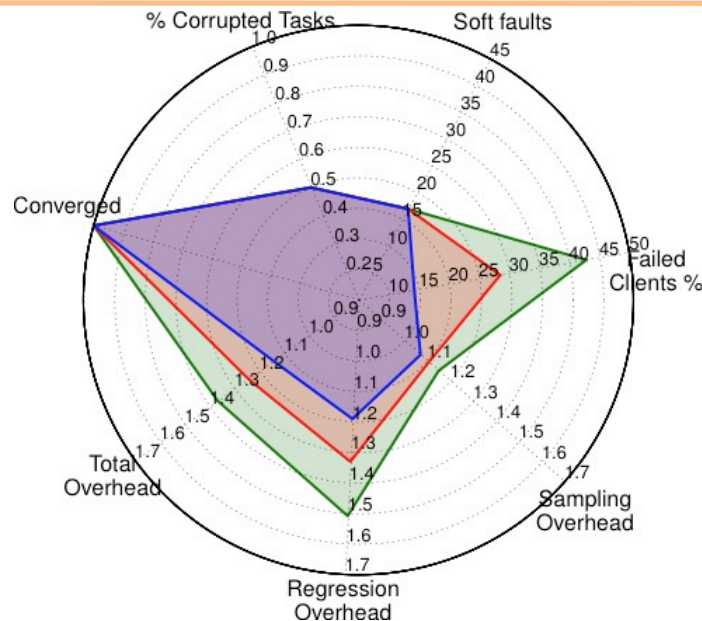
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Objectives

- Demonstrate algorithm-based resilience to silent data corruption (SDC) and hard faults in a task-based domain-decomposition preconditioner for elliptic PDEs.
- Adopting a server-client programming model implemented using the User Level Fault Mitigation MPI (ULFM-MPI) to enable resilience in the presence of MPI processes failing for real.

Impact

- Addressing resilience concerns for future exascale machines.
- Task-based reformulation of PDE solver and the server-client programming model role for heterogeneous machines.
- Quantifying performance of ULFM-MPI for server-client programming model.



Accomplishments

- Demonstrated resilience of the application under simulated SDC using a random bit-flip model and under MPI processes failing for real.
- Quantified overhead of the application with respect to no-fault scenario.
- Weak and strong scaling efficiency greater than 90% up to 115k cores.
- Demonstrated suitability of ULFM-MPI for task-based server-client programming models.

Resilience and overhead analysis in the presence of both SDC and hard faults.

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