Benchmark for AMR Based Unstructured Communication

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Background

- CLAMR - Collection of AMR mini-apps
- L7 communication library
- Performance anomaly amongst MPI Implementations
  - MVAPICH2 stuck waiting on requests
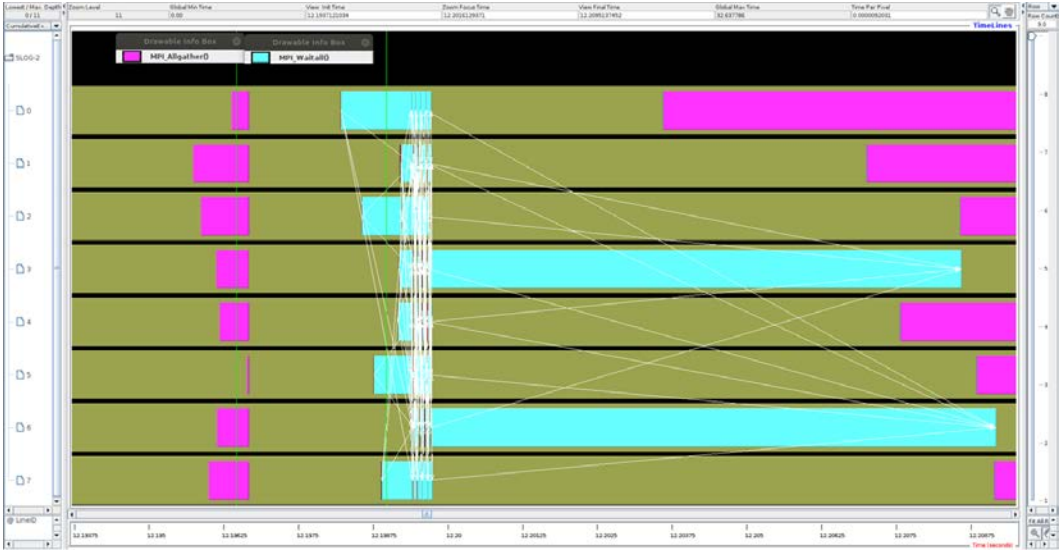 - Introduction of MPI_Barrier improves MVAPICH2 performance

|	Min (s)	Medium (s)	Max (s)
MVAPICH2	0.4611	1.0801	9.3026
OpenMPI	0.2565	0.4076	0.5316
MVAPICH2 w/ Barrier	0.3218	0.4595	0.5910
OpenMPI w/ Barrier	0.3205	0.4522	0.5785

L7/CLAMR Observations - Tracing

CLAMR-OpenMPI

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L7/CLAMR Observations - Tracing

CLAMR-MVAPICH2

L7/CLAMR Observations - Tracing
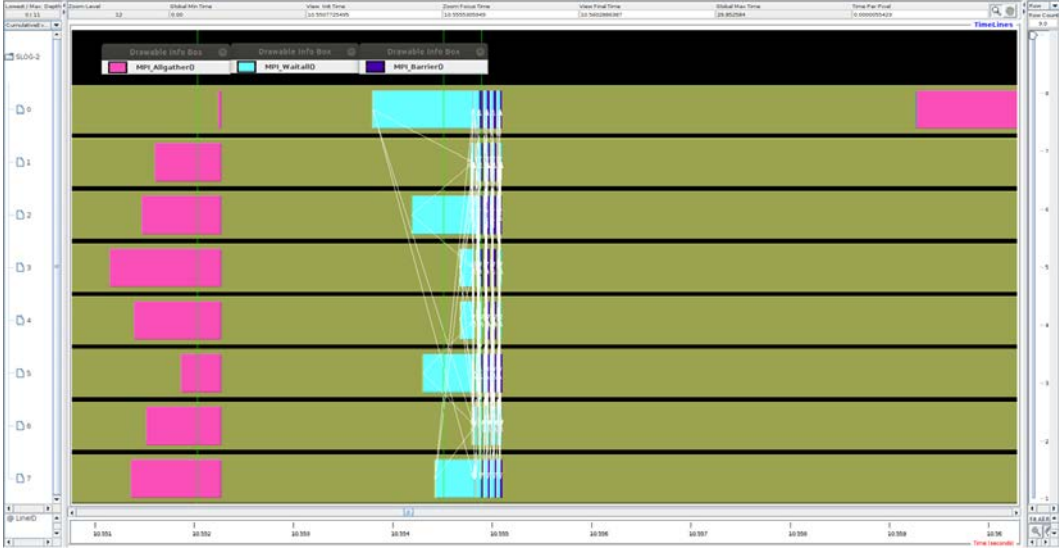
CLAMR-MVAPICH2 w/ MPI_Barrier

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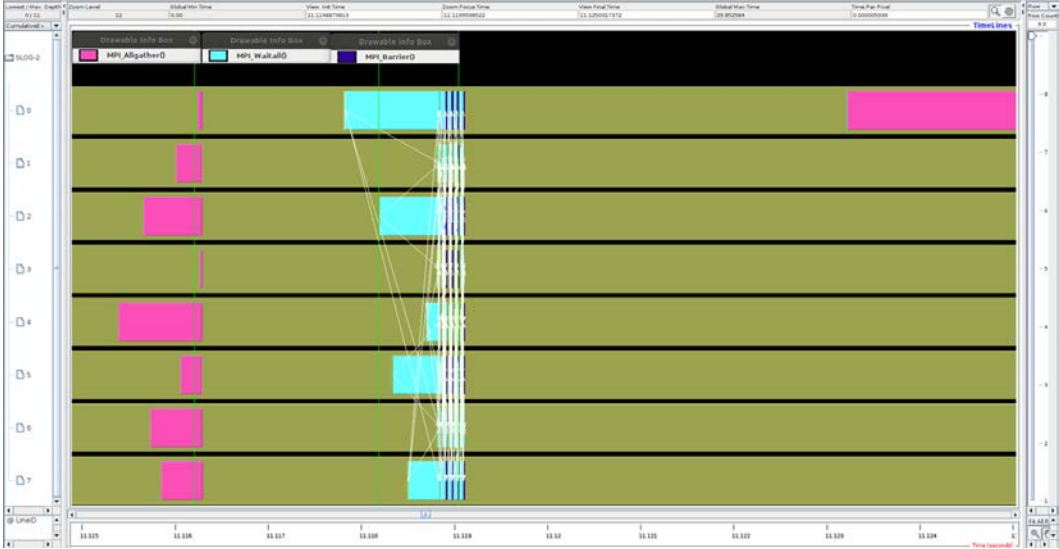# L7/CLAMR Observations - Tracing

CLAMR-OpenMPI w/ MPI_Barrier

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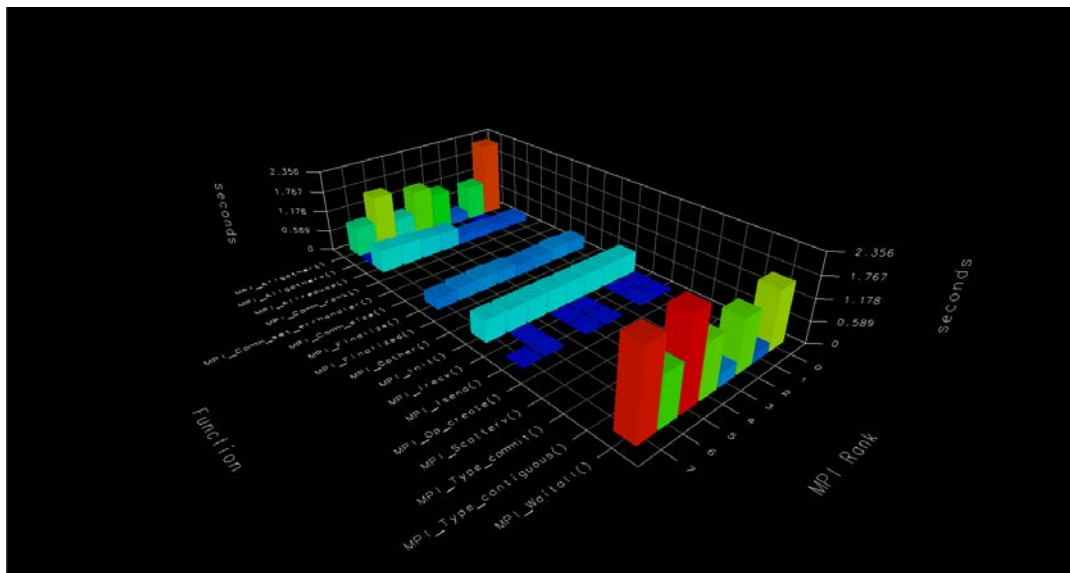THE UNIVERSITY OF TENNESSEE CHATTANOOGA

L7/CLAMR Observations - Profiling

CLAMR-OpenMPI Profile w/ Paraprof

L7/CLAMR Observations - Profiling

CLAMR-MVAPICH2 Profile w/ Paraprof

Benchmark

- Work-in-progress benchmark
- Motivated by observed performance anomalies
- How well an MPI implementation performs unstructured communication
- Goals:
  - Observe MPI's performance in unstructured communication
  - Find unexpected performance anomalies

Use Cases

- Aims to test these different cases:
    - Various ordering of non blocking MPI calls and synchronization primitives (or lack thereof)
    - Different sizes of messages when performing unstructured communication
    - Performance of unstructured communication in different runtime environments (single-node, multi-node, etc)
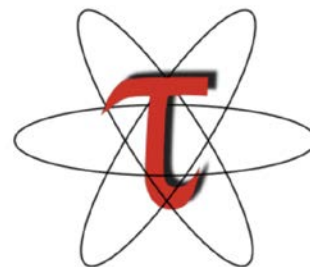- Compare performance data between different MPI implementations

Requirements

- L7 will be used as the facilitating library for performing unstructured communication
- The benchmark will have the option of introducing a synchronization primitive (MPI_Barrier) within the code before/during/after nonblocking communication
- The benchmark will provide Min/Median/Max times for regions of interest

Analysis Tools -- Profiling and Tracing

- Caliper
  - Source code annotations
  - Region profiling
- Tau
  - Paraprof - profiling
  - Jumpshot - tracing

References and Acknowledgements

References

- Caliper: https://computing.llnl.gov/projects/caliper
- CLAMR: https://github.com/CUP-ECS/CLAMR
- L7: https://www.sandia.gov/~rfbarre/l7.v1.ug.ps
- TAU: https://www.cs.uoregon.edu/research/tau/home.php

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