THE OPENSHMEM ANALYZER

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OUTLINE

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MOTIVATION

- Library vs. Language
- Common errors
  - Porting existing codes to OpenSHMEM
  - OpenSHMEM specification allows unaligned barriers
- Necessity of compile-time approach for large scale executions
- Implementation of OpenSHMEM-aware compiler within OpenUH

FEATURES

- Supported input languages: C and C++
- Source code analysis and correctness checking capabilities
- Verification at compile time that all OpenSHMEM library calls are using the appropriate classes of data as required by Specification 1.0
- Graphical and textual display of analyses for the source program
- Intra-and Inter-procedural analysis using IPA phase of the OpenUH compiler.

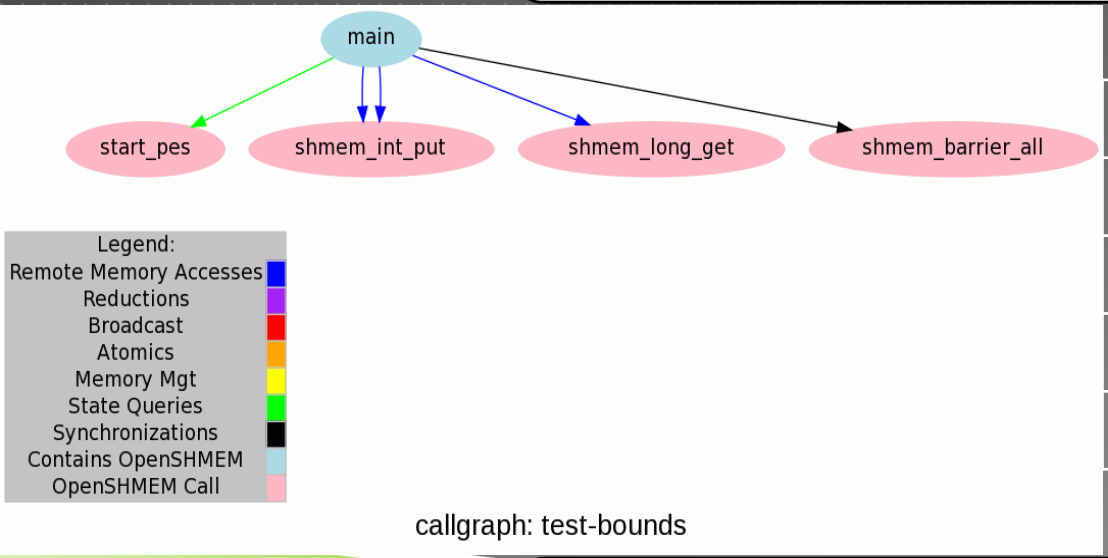
OPENUH COMPILER

- Open64-based compiler
- Sophisticated intra- and inter-procedural analyses and optimizations
- Existing support for parallel models: OpenMP, OpenACC and CAF

OPENSHMEM ANALYZER IN OPENUH

Compilation using OpenUH
uhcc -shmem-analyzer -c

Linker (interprocedural)
uhcc –shmem-analyzer *.-o



callgraph: test-bounds

- Symmetric Variable Checking
- Bounds Checking
- Type Checking
- Pointer Initialization Checking
- Barrier Matching

Enabling parallel optimizations:
message vectorization, communication/
computation overlap...

CURRENT ANALYSES

	Collective Operations	RMA Operations	Synchronization Operations
Symmetric variable checking	X	X	X
Bounds checking	X	X	X
Type checking	X	X	X
Pointer initialization	X	X	X
Barrier matching			X

HOW TO INSTALL

- The project website for the OpenSHMEM Analyzer
  - http://www.openshmem.org/OSA
- Install OpenUH (>= 3.0.38)
  - http://web.cs.uh.edu/~openuh/download/
- Packages to Install:
  - Code2html
  - Graphviz

HOW TO USE OPENSHMEM ANALYZER (DEMO)

- Hints on preparing programs for OpenSHMEM Analyzer
- Visualization of results and manipulating graphs
- Demo videos are here

http://web.cs.uh.edu/~hpctools/openshmem

CONCLUSION

- Work in progress
- Starting point for
  - Complete semantic awareness of OpenSHMEM in the compiler
  - A comprehensive analysis and optimization framework for OpenSHMEM

CURRENT AND FUTURE WORK

- Improving interprocedural analyses
- Extending OpenSHMEM Analyzer to PGAS using the Parallel IR of OpenUH
- More analyses such as data race detection
- Developing optimizations based on OpenSHMEM Analyzer

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