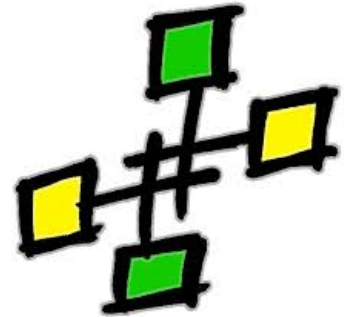


# **OPENSHMEM ANALYZER (OSA)**

**Presented by:  
Dounia Khaldi**



# ACKNOWLEDGMENTS



U N I V E R S I T Y of  
**HOUSTON**

The OpenSHMEM Analyzer is an on-going research project developed collaboratively by Oak Ridge National Laboratories and the University of Houston, with funding from DOD.

# OUTLINE

- Motivation
- Features
- OpenUH Compiler
- Current Analyses
- How to install
- How to use (Demo)
- Conclusion
- Current Work

# 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

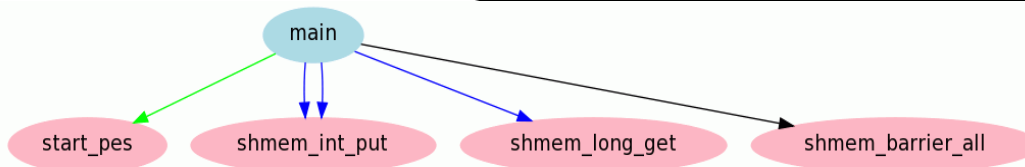
- Open64-based compiler
- Sophisticated intra- and inter-procedural analyses and optimizations
- Existing support for parallel models: OpenMP, OpenACC and CAF

# OPENSHMEM ANALYZER IN OPENUH

Compilation using OpenUH  
uhcc -shmem-analyzer -c



Linker (interprocedural)  
uhcc -shmem-analyzer \*-o



Symmetric Variable Checking

Bounds Checking

Type Checking

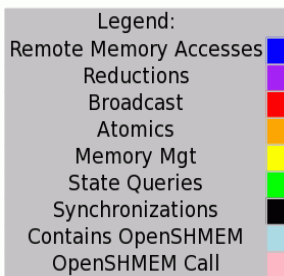
Pointer Initialization Checking

Barrier Matching



callgraph: test-bounds

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 ( $\geq 3.0.38$ )

<http://web.cs.uh.edu/~openuh/download/>

- Packages to Install:

- Code2html
- Graphviz

# HOW TO USE OPENSHMEM ANALYZER (DEMO)

- Hints on preparing programs for OSA
- 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 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 OSA