

**Annual Report for Period:** 11/1998 - 10/1999**Submitted on:** 01/14/2000**Principal Investigator:** Fox, Geoffrey C.**Award ID:** 9872125**Organization:** Syracuse University

Data Parallel SPMD Programming Models from Fortran to Java

**Project Participants****Senior Personnel****Name:** Fox, Geoffrey**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Carpenter, Bryan**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Majoreffort in design and implementation

**Post-doc****Graduate Student****Name:** Zheng, Qiang**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Research in HPJava and Parallel Compilers

**Name:** Ko, Sung-Hoon**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Research in Java MPI bindings

**Name:** Lim, Sang**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Resesearch in parallel Java Compilers

**Name:** Lee, Han-Ku**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Research in Parallel Compilers

**Undergraduate Student****Organizational Partners****Other Collaborators or Contacts**

We have collaborated extensively with the Java Grande Forum in developing proposed bindings of Java with MPI. This MPI subgroup is led by Vladimir Getov from Westminster College in London UK

Our work on parallel Java has learnt a lot from HPF and especially work of Ken Kennedy at Rice University Houston. Mark Baker from Portsmouth (England) and Xiaoming Li from Peking University have been significant collaborators

## Activities and Findings

### **Project Activities and Findings:**

We have focussed on two areas. Most important is the new HPJava framework for data parallel programming in Java. We have made good progress here and the HPJava translator now operational on simple programs. Next year we will optimize, make robust, generalize, add full semantic checking. One feature of our approach is the binding to multiple libraries started with work on Global arrays earlier 1999, and included work on mpiJava -- MPI binding for Java. The latter is released code and we have discovered interesting issues for further research and study in Java Grande community.

### **Project Training and Development:**

Java is a rich environment for data parallel programming supporting novel approaches which address difficulties found in pure message passing and HPF.

### **Research Training:**

A tutorial has been developed and is currently being given in Beijing for group led by collaborator Xiaoming Li from Peking University. This tutorial can be found at <http://www.npac.syr.edu/projects/pcrc/HPJava/beijing.html>

### **Outreach Activities:**

Java Grande Forum <http://www.javagrande.org> is related and very succesful community activity

## Journal Publications

Bryan Carpenter and Geoffrey Fox and Sung Hoon Ko and Sang Lim, "Object Serialization for Marshalling Data in a Java Interface to MPI", *ACM 1999 Java Grande Conference, ACM Press*, p. 1, vol. , (1999). ) Published

Mark Baker and Bryan Carpenter and Geoffrey Fox and Sung Hoon Ko and Sang Lim, "mpiJava: An Object-Oriented Java interface to MPI", *International Workshop on Java for Parallel and Distributed Computing, IPPS/SPDP '99 San Juan, Puerto Rico*, p. 1, vol. April, (1999). ) Published

Jarek Nieplocha and Bryan Carpenter, "ARMCI: A Portable Remote Memory Copy Library for Distributed Array Libraries and Compiler Run-time Systems", *3rd Workshop on Runtime Systems for Parallel Programming (RTSPP), IPPS/SPDP '99, San Juan, Puerto Rico*, p. 1, vol. April, (1999). ) Published

## Books or Other One-time Publications

Guansong Zhang and Bryan Carpenter and Geoffrey Fox and Xinying Li and Yuhong Wen, "The HPspmd model and its Java Binding", (1999). *Book*, Published

Editor(s): Rajkumar Buyya

Collection: High Performance Cluster Computing Volume 2

Bibliography: Prentice Hall

## Web/Internet Sites

### **URL(s):**

<http://www.npac.syr.edu/projects/pcrc/HPJava>

<http://www.npac.syr.edu/projects/pcrc/npacWork.html>

### **Description:**

First Web Site is the research sponsored by this award. The second is some relevant background material

## Other Specific Products

**Product Type:** Software (or netware)

### **Product Description:**

mpiJava MPI support for Java

### **Sharing Information:**

Freely available for Download

### **Contributions**

#### **Contributions within Discipline:**

We have demonstrated key principles of linking MPI with Java. We have developed a new approach to data parallel programming building on experience of HPF and MPI but exploiting features of Java

#### **Contributions to Other Disciplines:**

#### **Contributions to Human Resource Development:**

4 Graduate Students have been actively involved in project at Syracuse.

We have extensively involved students in the ACM Java Grande conferences which were initiated from this research several years ago.

#### **Contributions to Science and Technology Infrastructure:**

#### **Beyond Science and Engineering:**

### **Special Requirements**

**Special reporting requirements:** None

**Change in Objectives or Scope:** None

**Unobligated funds:** less than 20 percent of current funds

**Animal, Human Subjects, Biohazards:** None

### **Categories for which nothing is reported:**

Organizational Partners

Contributions: To Any Other Disciplines

Contributions: To Any Science or Technology Infrastructure

Contributions: Beyond Science or Engineering