

Java Grande

(a.k.a. High Performance Java)

Panels at SC98

Friday November 13 1998

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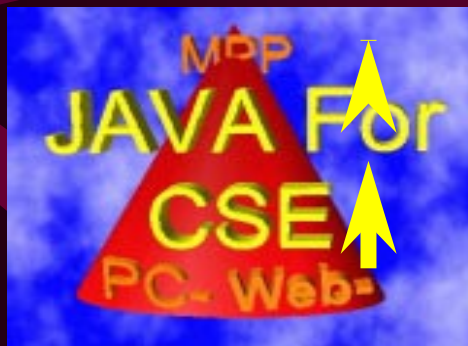
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<http://www.npac.syr.edu/users/gcf/jgfpanelsc98>



Java Grande Panel I

- **8.30** Introduction to Java Grande and the Panels, **Geoffrey Fox**, Syracuse University
- **8.45** Report from the Numerics Working Group of the Java Grande Forum, **Ron Boisvert** NIST
- **9.05** Report from the Applications and Concurrency Working Group of the Java Grande Forum, **Dennis Gannon**, Indiana University and NASA Ames
- **9.25** Compilers and Performance of Java, **Marc Snir**, IBM
- **9.40** Linear Algebra in Java, **Cleve Moler** , The MathWorks

Java Grande Panel II

- **10.30** Building Libraries in Java, **Jack Dongarra**, University of Tennessee and Oak Ridge National Laboratory
- **10.40** Lessons from C++, **John Reynders**, Los Alamos
- **10.50** Application Experience in Oil Industry, **Siamak Hassanzadeh**, Sun Microsystems
- **11.00** Java Benchmarks, **David Henty**, Edinburgh Parallel Computing Center
- **11.10** MPI for Java, **Vladimir Getov**, Westminster University England
- **11.20** Java Framework for Computing Services (Desktop Access to Remote Resources), **Gregor von Laszewski**, Argonne National Laboratory
- **11.30 -12.00** Discussion

What is Java Grande?

- Use of Java for:
- High Performance Network Computing
- Scientific and Engineering Computation
- (Distributed) Modeling and Simulation
- Parallel and Distributed Computing
- Data Intensive Computing
- Communication and Computing Intensive Commercial and Academic Applications
- HPCC Computational Grids
- Very difficult to find a “conventional name” that doesn’t get misunderstood by some community!

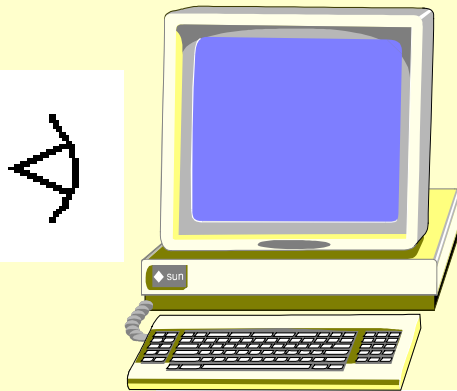
Java Grande Process: Approach and Activities

- We have had several conferences with **50-->100-->200** attendees
 - Syracuse **December 96**
 - Las Vegas **June 97**
 - Palo Alto **February 98**
 - Southampton (Europe) **September 98**
 - Next one just before **JavaOne** next year (**June 99**)
- Topics of conference papers:
 - **Applications; algorithms; benchmarking; compilers; Java-based programming tools; parallel computing (tightly coupled) and high performance distributed computing**
- “Spun off” **Java Grande forum** to promote needed community standards and activities.
- Must be proactive because Grande computer market is **perhaps 1% of total computing market** -- not Sun's highest priority

Why is Java Grande Worth Looking at?

- The **Java Language** has several **good** design features
 - secure, safe (wrt bugs), object-oriented, familiar (to C C++ and even Fortran programmers)
- Java has a very good set of **libraries** covering everything from commerce, multimedia, images to math functions (under development at <http://math.nist.gov/javanumerics>)
- Java has best available **electronic and paper training** and support resources
- Java is rapidly getting best **integrated program development** environments
- Java naturally **integrated with network** and universal machine supports potentially powerful “**write once-run anywhere**” model
- There is a large and **growing trained labor force**
- **Can we exploit this in Grande Computing / computational science?**

**1) Java Applet for
User Interface and
client data analysis**



Java Grande

**Data
Base**

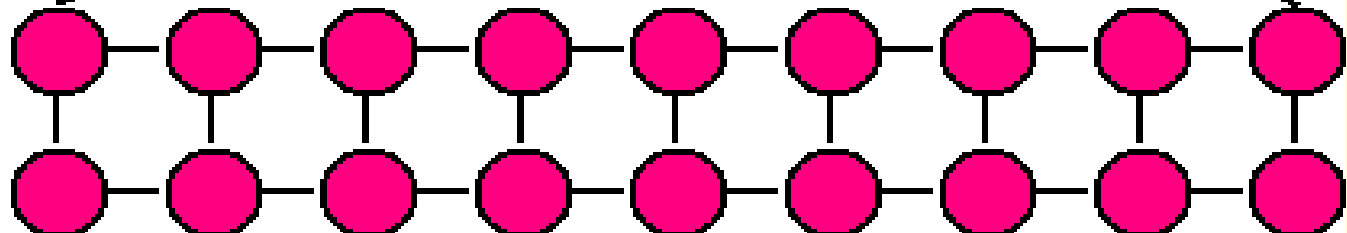
Rendering

**Detailed
Simulation**

**2) (Grande
JavaBean) Java
in Middle
Server Tier
Manage
components of
distributed
system
Provide
Commodity
Services**

**3) Java as parallel or
sequential computing
programming language**

Compute Server



What is Goal of Java Grande Forum?

- Java has potential to be a better environment for “**Grande application development**” than any previous languages such as Fortran and C++
- The Forum Goal is to develop **community consensus and recommendations** for either changes to Java or establishment of standards (frameworks) for “Grande” libraries and services
- **These Language changes or frameworks are designed to realize “best ever Grande programming environment”**
- **First Meeting Mar 1 Palo Alto at Java 98 -- 200 Attendees set Agenda -- 30 permanent people and further meetings May 9-10, Aug 6-7**
- **Public Discussion SC98 Orlando November 13 (3 hour panel)**
- **<http://www.npac.syr.edu/projects/javaforcse>**
- **<http://www.javagrande.org>**

Two types of Things we are doing

- **1) Most important in the near term -- encourage Sun to make a few key changes in Java to allow it to be a complete efficient Grande Programming Language**
 - floating point, arrays, complex etc.
- **2) As a community, recognize that sometimes standards are more appropriate than creativity and pool results of experiments to produce a Java Grande framework covering libraries and computer access**
 - Fiscally important fields such as **databases**, have established such standards -- we should follow their example
- **1) requires us to work with the computing mainstream --**
2) is internal to community

Activities of the Java Grande Forum I

- Two major working groups promoting standards and community actions
- **Numerics:** Java as a language for mathematics led by Ron Boisvert and Roldan Pozo from NIST
 - **Changes in Java controversial handling of floating point** which currently has goal of reproducible results but this leads to non optimal accuracy
 - Addition of **Complex** types or classes
 - **Lightweight classes** and **Operator overloading** -- enables implementation of complex as a class
 - **“Fortran rectangular multidimensional arrays”** -- Java naturally has “arrays of arrays”
 - **High quality math libraries** with **agreed interfaces** -- **FFT, Matrices, Transcendental functions**

Activities of the Java Grande Forum II

- **Distributed and Parallel Computing** led by **Dennis Gannon** and **Denis Caromel** (INRIA, France)
 - **Performance of RMI** (Attractive Java distributed object model - “remote method invocation”)
 - **Performance of Java runtime** (the virtual machine VM) with lots of threads, I/O, memory use
 - **Parallel Computing interfaces** including **Java MPI** binding
 - Development of universal (Condor, Globus, Legion UNICORE WebSubmit ..) **Java interface to computing resources** -- enables seamless computing (easier than metacomputing!)
 - **Special seamless computing meeting at Argonne October 98**
- **Development of Grande Application benchmarks**
 - **<http://math.nist.gov/scimark>**

Where are we now?

- Both working groups have made substantial progress
 - **Numerics** and **Concurrency** working groups have preliminary reports -- Our suggestions for floating point submitted to Sun
- We are initiating Community actions
 - Help us collect **Java Grande benchmarks**
 - Work with community on **standard classes** and **libraries**
 - Participate in **seamless computing framework** (desktop access to remote resources)
 - **Stress Java and Java runtime** (the VM) with large applications -- where are performance problems?
- Note **European involvement has been excellent** so far
- Now is a good time for full international community to comment on and participate in activities

What should you do as a Java Grande believer?

- **Don't need to rewrite existing codes in Java!**
- **Rather use Java freely at client and middle tier**
- **One can wrap existing codes as CORBA or Java distributed objects**
- **Conduct suitable experiments in using Java in complete Grande applications**
- **Make certain your interests are represented in Java Grande Forum**
- **Retrain your staff in Java Web and distributed object technologies**
- **Put “High Performance Grande Forum compliant” Java support into your RFP's for hardware and software**