Java Grande
(a.k.a. High Performance Java)
Panels at SC98

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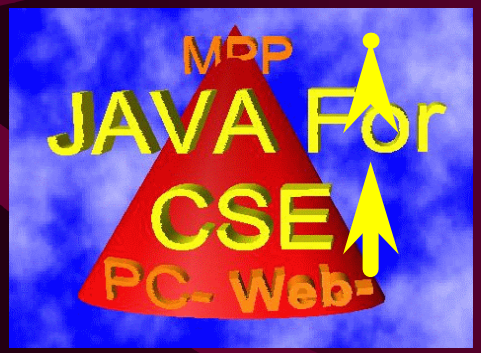


http://www.javagrande.org
http://www.npac.syr.edu/users/gcf/jgfpanelsc98

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, Westminister 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!

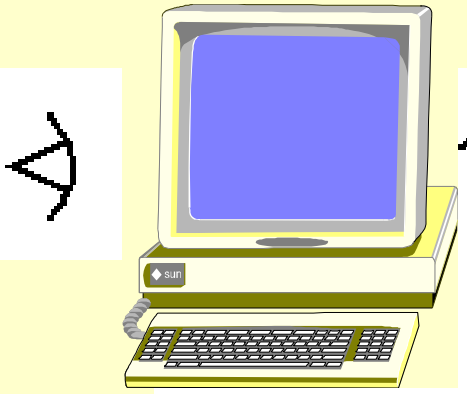
Java Grande Process: Approach and Activities

- 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

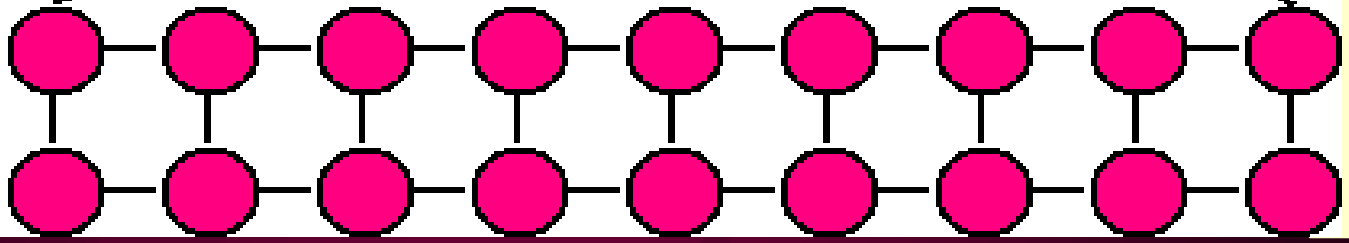
Rendering

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