Java for High-Performance Network Computing

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This is the proceedings of the third of a set of workshops studying the use of Java in large scale computations. The previous meetings were at Syracuse (December, 1996—see *Concurrency: Practice and Experience*, 9:6, June 1997) and Las Vegas (June, 1997—see *Concurrency: Practice and Experience*, 9:11, November 1997). Each time, we have seen a doubling of attendance (50–100–200) and increasing richness and depth of the associated papers. We can divide the current papers into a few broad areas.

Firstly, there were a set on compilers or other language processors [1–3]. Here, there was, in fact, a reduction in attention from the previous meetings. We expect, however, that this is just a temporary blip for there is tremendous interest in improved performance from interpreted or compiled Java.

Parallel computing was discussed from several points of view—message passing, shared memory, distributed shared memory, and data parallel [4–7]. However, this activity is still limited by the need to get good sequential performance.

Thirdly, we can discuss by far the largest group—that devoted generally to distributed computing of various forms [8–23]. The interest stems both from the importance of the field and Java's natural capabilities with applets, RMI (Remote Method Invocation), object serialization, and socket library support providing powerful basic tools. The particular field of distributed event simulation had three papers [12,16,17] devoted to it.

Another class of papers used Java to build computing environments and tools [24–27]. Three of these focussed on visualization which is, of course, also natural in Java with its excellent user interface support.

Finally, and in the long run most importantly, there were the set of papers on applications and core algorithms [28–34]. These were accompanied by performance studies [10,11,35], which are critical to finding those areas that limit Java's usability.

We believe that Java could perform a dominant language for what we now call Grande applications, and hope that these workshops and other activities help to advance this cause.

[1–3]

Yelick, K., Semenzato, L., Pike, G., Miyamoto, C., Liblit, B., Krishnamurthy, A., Hilfinger, P., Graham, S., Gay, D., Colella, P., and Aiken, A., "Titanium: A High-Performance Java Dialect"

Krall, A., and Probst, M., "Monitors and Exceptions: How to Implement Java Efficiently"

Demaine, E. D., "C to Java: Converting Pointers into References"

[4–7]

Getov, V., Hummel, S. F., and Mintchev, S., "High-Performance Parallel Programming in Java: Exploiting Native Libraries"

Carpenter, B., Zhang, G., Fox, G., Li, X., and Wen, Y., "HPJava: Data Parallel Extensions to Java"

Bik, A. J. C., and Gannon, D. B., “A Prototype Bytecode Parallelization Tool”

Karl, H., “Bridging the Gap between Distributed Shared Memory and Message Passing”

[8–23]

Gray, P. A., and Sunderam, V. S., “Native-Language-Based Distributed Computing Across Network and Filesystem Boundaries”

Thiruvathukal, G. K., Thomas, L. S., and Korczynski, A. T., “Reflective Remote Method Invocation”

Hirano, S., Yasu, Y., and Igarashi, H., “Performance Evaluation of Popular Distributed Object Technologies for Java”

Breg, F., Diwan, S., Villacis, J., Balasubramanian, J., Akman, E., and Gannon, D., “Java RMI Performance and Object Model Interoperability: Experiments with Java/HPC++”

van Halderen, B. A. W., and Overeinder, B. J., “Fornax: Web-based Distributed Discrete Event Simulation in Java”

Keren, A., and Barak, A., “Adaptive Placement of Parallel Java Agents in a Scalable Computing Cluster”

Judd, G., Clement, M., and Snell, Q., “DOGMA: Distributed Object Group Metacomputing Architecture”

Ferrari, A., “JPVM: Network Parallel Computing in Java”

Cowie, J., “JTED: Parallel Discrete-Event Simulation in Java”

Bizarro, P., Silva, L. M., and Silva, J. G., “JWarp: A Java Library for Parallel Discrete-Event Simulations”

Zhu, J., Törö, M., Leung, V., and Vuong, S., “Supporting Universal Personal Computing on Internet with Java and CORBA”

Sarmenta, L. F. G., Hirano, S., and Ward, S. A., “Towards Bayanihan: Building an Extensible Framework for Volunteer Computing using Java”

Chandy, K. Mani, Rifkin, A., and Schooler, E., “Using Announce-Listen with Global Events to Develop Distributed Control Systems”

Baratloo, A., Karaul, M., Karl, H., and Kedem, Z. M., “An Infrastructure for Network Computing with Java Applets”

Caromel, D., Klauser, W., and Vayssiere, J., “Towards Seamless Computing and Metacomputing in Java”

Takagi, H., Matsuoka, S., Nakada, H., Sekiguchi, S., Satoh, M., and Nagashima, U., “Ninflet: A Migratable Parallel Objects Framework Using Java”

[12,16,17]

van Halderen, B. A. W., and Overeinder, B. J., “Fornax: Web-based Distributed Discrete Event Simulation in Java”

Cowie, J., “JTED: Parallel Discrete-Event Simulation in Java”

Bizarro, P., Silva, L. M., and Silva, J. G., “JWarp: A Java Library for Parallel Discrete-Event Simulations”

[24–27]

Raje, R. R., Boyles, M., and Fang, S., "CEV: Collaborative Environment for Visualization Using Java RMI"

Jain, L. K., and Abbot, M., "DOVE: Distributed Objects Based Scientific Visualization Environment"

Akarsu, E. Fox, G., and Haupt, T., "DARP: Java-based Data Analysis and Rapid Prototyping Environment for Distributed High-Performance Computations"

Ki, B., and Klasky, S., "Scivis"

[28–34]

Boisvert, R. F., Dongarra, J. J., Pozo, R., Remington, K. A., and Stewart, G W., "Developing Numerical Libraries in Java"

Souder, D., Herrington, M., Garg, R. P., and DeRyke, D., "JSPICE: A Component-based Distributed Java Front-End for SPICE"

Jacob, M., Philippsen, M., and Karrenbach, M., "Large-Scale Parallel Geophysical Algorithms in Java: A Feasibility Study"

Schwab, M., and Schroeder, J., "Algebraic Java Classes for Numerical Optimization"

Gladychev, P., Patel, A., and O'Mahony, D., "Cracking RC5 with Java Applets"

Glossner, J., Thilo, J., and Vassiliadis, S., "Java Signal Processing: FFTs with Bytecodes"

Weber, A., Küchlin, W., and Eggers, B., "Parallel Computer Algebra Software as a Web Component"

[10,11,35]

Hirano, S., Yasu, Y., and Igarashi, H., "Performance Evaluation of Popular Distributed Object Technologies for Java"

Breg, F., Diwan, S., Villacis, J., Balasubramanian, J., Akman, E., and Gannon, D., "Java RMI Performance and Object Model Interoperability: Experiments with Java/HPC++"

Yalamanchilli, N., and Cohen, W., "Communication Performance of Java-based Parallel Virtual Machines"