

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Mathematica™ Developers Conference (06002.01.001)

DATE/PLACE: April 10-12, 2003
Champaign, Illinois

AUTHORS: Scott Painter

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PERSONS PRESENT:

Scott Painter, of the Center for Nuclear Waste Regulatory Analyses (CNWRA), attended the Mathematica™ Developers Conference and the embedded Parallel Computing Toolkit Course. Attendees at the Developers Conference included staff from Wolfram Research, the makers of Mathematica™, and independent developers from North America, Europe, Japan, and Australia who are building technical computing solutions based on the Mathematica™ system. The Parallel Computing Toolkit Course was taught by R. Maeder, the author of the Parallel Computing Toolkit add-on to Mathematica™.

BACKGROUND AND PURPOSE OF TRIP:

Mathematica™ is a general technical computing environment that is widely used by scientists, engineers, and educators in a variety of fields. Mathematica™ is playing an increasingly important role in CNWRA technical work, and is replacing the FORTRAN or C programming language in many applications. The purpose of the Developers Conference is to bring together key staff from Wolfram Research with power users and application developers. Scott Painter attended the developers conference as a professional development activity to learn more about the development of advanced user interfaces and advanced applications within Mathematica™. He also attended a training course that addressed use of the Parallel Computing Toolkit, a Mathematica™ add-on that allows Mathematica™ to be deployed across a small cluster of computers.

SUMMARY OF PERTINENT POINTS AND ACTIVITIES:

The material covered in the presentations at the Developers Conference was roughly split between applications and descriptions of new Mathematica™ features.

Staff from Wolfram Research gave several presentations and tutorials on advanced Mathematica™ interfaces. Recent versions of Mathematica™ have very powerful interface capabilities that allow Mathematica™ to be fully integrated in a technical workflow. Key presentations/tutorials addressed customization of the Mathematica™ front-end for specific applications, development of graphical user interfaces (GUIs) using the Mathematica™ programming language, integration of Mathematica™ with Java-based GUIs, and use of Mathematica™ to deliver technical computing services over the web. All of these interface options have potential applications in support of NRC high-level waste activities.

Several independent developers discussed applications built on the Mathematica™ system. These applications included commercially available Mathematica™ add-ons as well as application systems developed for in-house use in several companies. Several presenters noted a general trend of shifting from FORTRAN and C codes to Mathematica™ for engineering applications, which mirrors the recent experience at CNWRA.

Many of the Wolfram Research presentations focused on new capabilities in Version 5, which is expected to be released in the near future. Stephen Wolfram gave the keynote presentation and discussed the history and future of Mathematica™. Roger Germundsson provided an overview of Mathematica™ development and several presenters filled in the technical details. Of particular relevance is the numerical performance in Version 5. For solutions to sparse or dense linear systems, a key step in numerical solutions to partial differential equations, numerical performance is approaching that of native FORTRAN or C code and is much better than that of the competing MATLAB product. This improved performance in Version 5 makes it feasible to develop simulation software directly in the Mathematica™ system instead of linking with FORTRAN or C code. Attendees were given a beta copy of Version 5 for testing.

The Parallel Computing Toolkit course was offered on the afternoon of April 12. Each of the 12 attendees was given a cluster of three computers, which were used to complete the parallel computing exercises. The hands-on experience with the Parallel Computing Toolkit made it possible to gain a full appreciation on the capabilities and limitations of using Mathematica™ in a grid computing environment.

CONCLUSIONS:

Mathematica™ is an increasingly important productivity tool for scientists and engineers. For those users who are already skilled in the Mathematica™ language, the Developers Conference is a good way learn more about advanced applications and advanced interface design.

PROBLEMS ENCOUNTERED:

None.

PENDING ACTIONS:

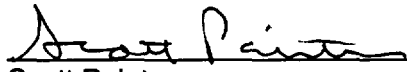
None required.

RECOMMENDATIONS:

The Mathematica™ Developers Conference is recommended for power users and developers who are already skilled in the Mathematica™ language. However, it is not recommended for casual or new users. The training courses offered by Wolfram Research or independent trainers would be more appropriate for those users.

The Parallel Computing Toolkit course is recommended for anyone considering purchase of that Mathematica™ add-on. The course does require familiarity with the Mathematica™ system.

SIGNATURES:



Scott Painter
Principal Scientist

5-1-03
Date

CONCURRENCE:



Gordon Wittmeyer
Manager, Performance Assessment

5/1/2003
Date



Pat Mackin
Director of Administration

5/1/2003
Date