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Purple L1 Milestone Review Panel TotalView Debugger Functionality and Performance for ASC Purple

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Matthew Wolfe, 12/7/2006

Deliverable

ASC code teams require a robust software debugging tool to help developers quickly find bugs in their codes and get their codes running. Development debugging commonly runs up to 512 processes. Production jobs run up to full ASC Purple scale, and at times require introspection while running. Developers want a debugger that runs on all their development and production platforms and that works with all compilers and runtimes used with ASC codes.

The TotalView Multiprocess Debugger made by Etnus was specified for ASC Purple to address this needed capability..

Criteria

The ASC Purple environment builds on the environment seen by TotalView on ASCI White. The debugger must now operate with the Power5 CPU, Federation switch, AIX 5.3 operating system including large pages, IBM compilers 7 and 9, POE 4.2 parallel environment, and rs6000 SLURM resource manager. Users require robust, basic debugger functionality with acceptable performance at development debugging scale. A TotalView installation must be provided at the beginning of the early user access period that meets these requirements.

A functional enhancement, fast conditional data watchpoints, and a scalability enhancement, capability up to 8192 processes, are to be demonstrated.

Results

Basic TotalView functionality was tested on the ASC Purple machine in August, 2005, both at IBM/Poughkeepsie and at LLNL. Purple SWL tests were run in November, 2005, and contract work with IBM and Etnus continued into 2006.

Basic debugging functionality of the installed TotalView on Purple has been in productive daily use by ASC code teams at development scales since May, 2006. For example, in the month of July, 2006, 679 TotalView sessions were logged on Purple-class machines. TotalView was made available on each of the ASC Purple-class machines before users gained access.

TotalView process control and MPI-related functionality are operational. Memory debugging, a new feature at the time of the Purple SWL baseline TotalView version, has since been significantly enhanced by Etnus through LLNL contracts, and more enhancements are coming. TotalView now detects when it is being run in AIX large

pages, and warns the user. Several AIX and POE problems have been reported to, and fixed by, IBM. TotalView now uses SLURM to more efficiently launch its debugger servers on AIX. Fast conditional breakpoints and data watchpoints are now operational on Purple-class systems.

During scalability and performance testing, TotalView started and stopped 1024 tasks in under 7 minutes. However, TotalView was too slow for most users at higher scales, TotalView memory debugging setup was more difficult on AIX than on other platforms, and TotalView's low robustness during everyday debugging was shown to impact user productivity.

Some performance improvements in basic debugger operations were delivered early in 2006. LLNL is currently in discussion with Etnus to specify a project to increase TotalView's performance and usability to 8192 processes. At LLNL's request, IBM has now implemented a library preload facility in the AIX loader which LLNL has requested Etnus to use to enhance memory debugging usability to match other platforms. LLNL now receives a monthly progress report from Etnus on TotalView bug fixes and enhancements requested by LLNL users. The current ticket list includes five issues for ASC Purple users.

Conclusion

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The successful deployment of TotalView for Purple has met the requirements for the debugger deliverable. ASC code teams have been successfully using the TotalView Multiprocess Debugger for development debugging on Purple-class systems since the debut of these systems at LLNL. TotalView delivers a common user interface across all its platforms (while some platforms such as ASC Purple enjoy additional features), and TotalView works well with the compilers and MPI runtime on Purple. Purple-related contract work with IBM and Etnus has delivered the required functional enhancements, and more memory debugging features are coming. Performance and scalability enhancements for production job debugging, on the other hand, continue to need improvement. LLNL continues to engage the vendor on the issue, and. some performance improvements have been delivered in the past year. Debugger robustness is an ongoing concern. Etnus is now reporting issue status to LLNL monthly, which will benefit addressing TotalView improvement.