Lawrence Livermore National Laboratory

2011 R&D 100 Award Winner

Lightweight, Scalable Tool Identifies Supercomputers' Code Errors

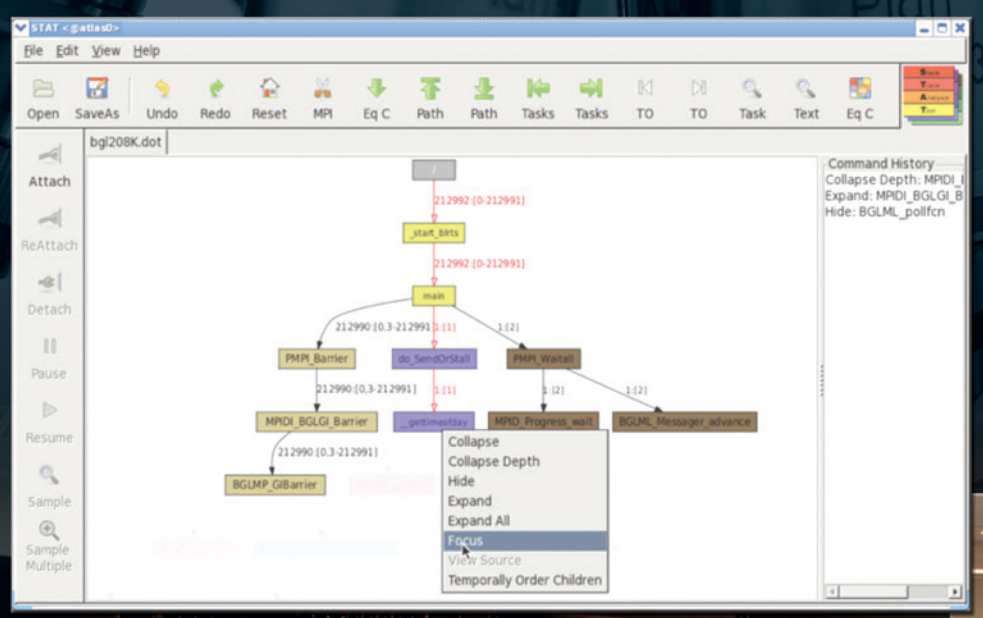
The stack trace analysis tool (STAT) can identify errors in code running on today's largest machines. STAT works by detecting and grouping similar processes at suspicious points in an application's execution. It quickly and automatically identifies anomalies and outliers—processes that cannot be grouped or that behave substantially different—because they often indicate flawed execution. identify a small yet representative subset of tasks on which to apply heavyweight analysis. Its lightweight design allows the tool to maintain interactive response times.

Speed Daemons

STAT offers varying levels of detail in the call stacks, from coarser function granularity to specific source-code line numbers. Because STAT gathers stack traces across the entire application, it provides a global view of what every process is doing. These stack traces are merged to reduce the problem search space, so users can

Pinpointing Problems

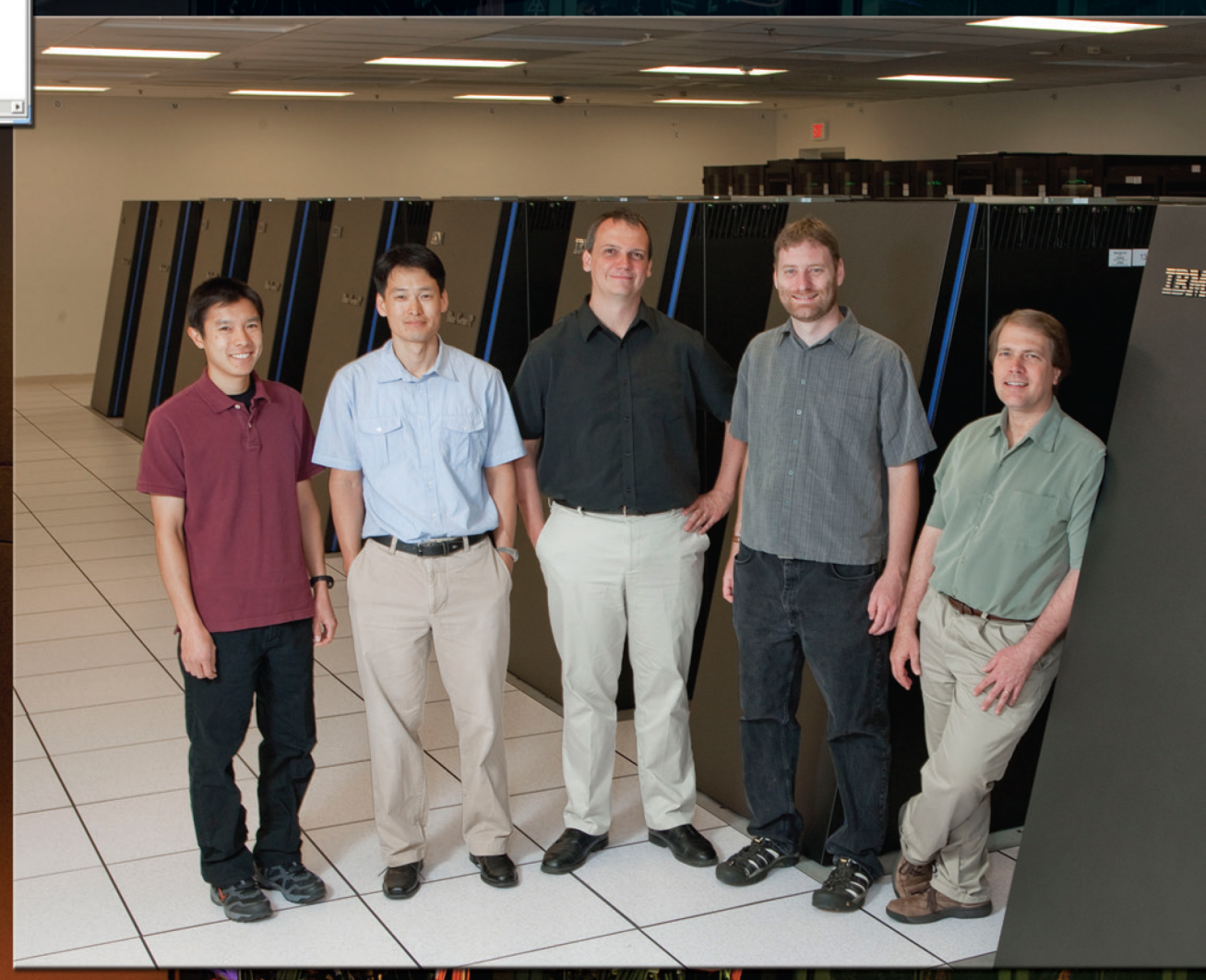
STAT can not only distinguish a process that is stuck in a single location in the code but also pinpoint the exact task causing the hang. The tool also derives the relative execution progress of each application task, which is useful for determining problematic application processes. STAT has run on a wide range of supercomputer platforms, including the IBM BlueGene family of machines and several of the world's fastest as reported by the Top500 Supercomputer Sites list.



The stack trace analysis tool (STAT) includes a powerful and intuitive graphical user interface that allows the user to identify quickly where a bug exists in an application. STAT automatically analyzes the state of the application and pinpoints potential bug locations.

Dorian Arnold, STAT team member from University of New Mexico

Bart Miller, STAT team member from University of Wisconsin



LLNL members of the STAT development team: (from left) Greg Lee, Dong Ahn, Martin Schulz, Matthew LeGendre, and Bronis de Supinski.

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-POST-499891