

Industry:
Hardware/Software

Organization:
Rockwell Software

URL:
www.software.rockwell.com

Description:
Rockwell International Corporation is a \$7 billion electronic controls and communications company with global leadership positions in industrial automation, avionics and communications, and electronic commerce. Rockwell Software is the leading brand of software technology that helps automate factories and integrate them with the rest of the enterprise. This includes programming, human-machine interface, communications, information systems, process monitoring and control, and Internet technologies.

Business Problem:
Rockwell Software wanted to automate its regression tests, and with more than one million test points needed a proven effective automated testing solution.

Rational Solution:
Rational Suite PerformanceStudio

- Key Benefits:**
- Ensured end-user satisfaction by determining requirements from use case models
 - Performed automated regression tests covering over one million test points
 - Accurately determined what percentage of the application under test was being exercised with integrated code coverage analysis
 - Shortened overall project lifecycles by building test scripts — based on requirements — as the application was being built
 - Developed a process for automatically executing a number of test scripts against a variety of applications on a distributed network of test computers

Rockwell Software Automates the Automation with Rational Suite PerformanceStudio

If you ever have an opportunity to tour a modern factory or production facility, you will likely be amazed, or at least intrigued, by the vast array of machinery working together with flawless timing. Even if you do not see these complex systems in person, most everyone has seen video of conveyors, dispensers, fillers performing their intricate tasks, and wondered what or who is controlling them. The brains behind these elaborate systems are often a set of industrial computers called Programmable Logic Controllers (PLCs) and Small Logic Controllers (SLCs).

In West Allis, Wisconsin, Rockwell Software develops software that helps engineers design and build systems using PLCs and SLCs. With millions of dollars of equipment and the safety of plant workers on the line, there is zero tolerance for bugs in their software. Andrew Krebs, the Test Manager for Rockwell Software's Design Automation Group is well aware of the high standards the software must live up to, and is responsible for thoroughly testing every release of Rockwell Software's RSLogix family before it is shipped. While Rockwell Software places a strong emphasis on product quality, they still face the same time-to-market pressures and rapid release cycles that confront the entire software industry. To ensure their products are delivered on schedule without compromising quality, Rockwell Software uses Rational Suite™ PerformanceStudio® throughout the entire development process.

Rockwell and the RSLogix Family

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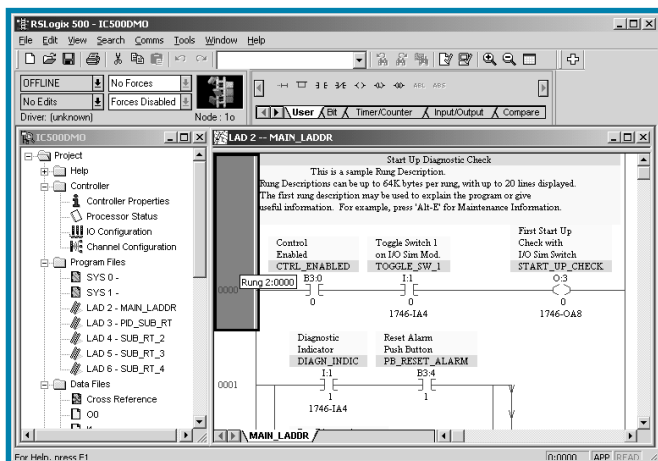
Rockwell Software's RSLogix family of ladder logic programming packages helps industrial control engineers maximize performance, save project development time and improve productivity. This family of products has been developed for the Microsoft's Windows® operating systems. Supporting Allen-Bradley's SLC 500 and MicroLogix families of processors, RSLogix 500 was the first PLC programming software to combine unbeatable productivity with an industry-leading user interface. RSLogix 5 is the newest addition to Rockwell Software's RSLogix Family, and supports the full range of PLC-5 products. RSLogix offers superior diagnostics, reliable communications and an intuitive user interface featuring drag-and-drop editing for industrial controls programmers and developers at any level of expertise.

Like a Visual Studio® for industrial controls developers, RSLogix allows engineers to drag-and-drop instructions and code ladder logic for PLCs and SLCs. The instructions are inserted into the PLC or SLC, which then runs the machinery. RSLogix features true runtime diagnostics and editing while on line, enabling developers to debug and diagnose any problems with the machinery at any time.

Rational Suite PerformanceStudio From Start to Finish

Rockwell Software uses Rational Suite PerformanceStudio at every stage of their development cycles, which are typically 6-months long. In the design phase, analysts use Rational Suite PerformanceStudio's industry-leading visual modeling tool, Rational Rose®, to design and build the models and use cases. Use cases describe the system under development from a user's perspective, and help ensure that the application meets the end-user's requirements fully. Once the use cases have been defined, Rockwell Software's team begins





Rockwell Software uses Rational Suite PerformanceStudio to automatically verify over 700,000 individual test points in RSLogix 500.

to establish functional requirements for the application using the award-winning Rational RequisitePro®. Rational RequisitePro is an integral part of Rational Suite PerformanceStudio and every member of the Rational Suite family. Its intuitive Microsoft Word interface allows analysts and managers to easily create and maintain requirements documents, which are linked to a database such as Oracle, Microsoft SQL Server, or Microsoft Access, so that requirements can be prioritized, organized and queried to generate clear, concise project status reports.

In the development stage, Rockwell Software's developers use Rational Purify®, another Rational Suite PerformanceStudio component, to quickly locate and eliminate run-time errors such as buffer overruns, memory and other resource leaks, and memory access errors. Developers save time and effort by accessing Rational Purify directly from their development environment, Microsoft Visual Studio. By providing developers with immediate feedback, Rational Purify enables them to find and fix run-time errors themselves before submitting code for more thorough testing.

Rational Suite PerformanceStudio also includes the Rational Unified Process™ — an easy-to-use, Web-accessible knowledge base that details time-tested best practices of software development. Throughout the project lifecycle, Rockwell Software's team uses Rational Unified Process tool mentors to better understand how all the tools in Rational Suite can be implemented to support proven software engineering methodologies. "Our process is very similar to Rational's, and we use the Rational Unified Process as our information database," Andrew notes.

While Developers Build the Application, Testers Build the Scripts to Test It

Andrew and his team of 13 testers start developing tests as soon as they know what requirements and what features will be implemented for the next release. Once the requirements are defined in Rational RequisitePro they are imported into Rational Test Manager, and then assigned to individual testers. Managers at Rockwell Software have established a goal of automating 50% of their regression tests for each product — fully half of the tests used to verify baseline functionality must be automated. Andrew adds, "In order to do that, we have to determine which requirements will be included in the release, and how many test cases are going to be extracted out of that — basically our documentation phase. The documentation phase is going on while the product or the new features are being defined and implemented. We interview the developers to come up with test cases for each software requirement. Since they are interrelated, we use Rational RequisitePro and establish baseline functionality through an attribute within RequisitePro. And then through that attribute we can select which parts of the application are candidates for automation for this regression. We encapsulate those, and push them into the Rational Test Manager, which tells each person on the team what they are supposed to do in terms of automating tests for specific functionality or features. The task then is to get all those test cases developed prior to a regression. A regression for us is locked down — you do not develop any more, you do not build any more — you just test and run all the scenarios against that product. So, as the developers are creating the product, the testers are creating all the automated tests."

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Step One: Automated Regression Testing

Rockwell Software's RSLogix 5 and RSLogix 500 are true object-oriented programs developed in Visual C++ using Visual Studio from Microsoft. Between the two applications, there are currently more than one million test verification points, over 700,000 on RSLogix 500, and over 300,000 on RSLogix 5. Clearly, without automated testing, Andrew and his team would be spending quite a few weekends in the office. Instead, they use Rational Robot to automate their regression tests, and check every one of those verification points automatically. "We develop all of the tests through Rational Robot, our key programming tool under test. There are very few components that we do not use Robot for. We typically write all of our scripts, but Robot's script recording is fantastic for shortening the learning curve, and for developing tests for less complex areas of our application. Out of all the functional testing tools I've ever worked with, Rational Robot is the best, because I don't have to maintain the scripts every time a developer changes something," Andrew notes.

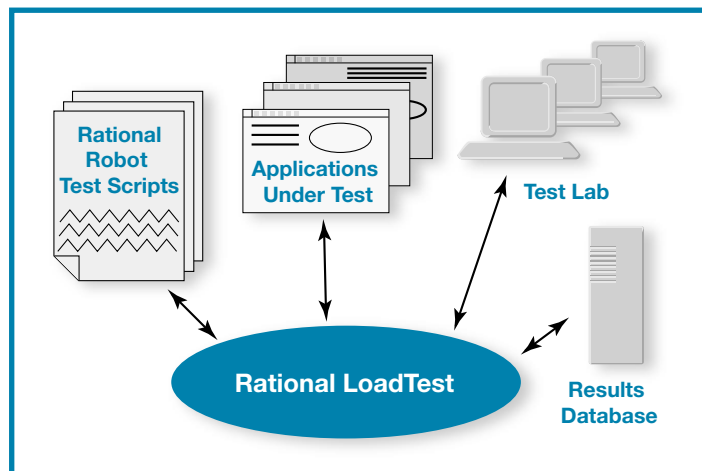
Regression testing is often tedious and time-consuming. As Andrew says, "File Open, always opens a file. No matter what, it doesn't change. The most stable pieces of the application are the baseline functionality. Testing those kinds of things can destroy the testing team because, if you are constantly having to go back and manually make sure that File Open still brings up the file open dialog box, you are just wasting time." By automating regression tests, testers are free to tackle more challenging testing problems.

Step Two: Automating the Automation

The testers at Rockwell Software have taken the next logical step in automated testing: they are automating the automation by developing intelligent scripts that can determine what environment they are executing in, and perform tests on an application based on a simple set of rules. Andrew explains, "We believe automating the automation is the way to go. Let's say you have created an automated script. That script will have dependencies — for example the operating system, or a particular software configuration — and the script must be started manually. What we do is actually automate that process. Our scripts are pushed to a platform that they do not know about, running on a computer that they do not know about, to test software that they know little about. The scripts have to determine what the environment is and what application they will test, prior to performing the actual tests."

Rational LoadTest is the last part of the puzzle for automating the automation. A cornerstone of Rational Suite PerformanceStudio, Rational LoadTest combines unparalleled simplicity, accuracy and scalability in performance testing with built-in support for scheduling tests in a distributed testing environment. Andrew describes the process, "Rational

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Rockwell Software's Automated Testing Process: Rational Suite PerformanceStudio's Rational LoadTest runs test scripts against applications on available workstations, and saves all results in a SQL database.

About Rational Software Corporation:

Rational Software Corporation (NASDAQ: RATL), the e-development company, helps organizations develop and deploy software for e-business, e-infrastructure, and e-devices through a combination of tools, services, and software engineering best practices. Rational's e-development solution helps organizations overcome the e-software paradox by accelerating time to market while improving quality. Rational's integrated solution simplifies the process of acquiring, deploying, and supporting a comprehensive e-software development platform, reducing total cost of ownership. Founded in 1981, Rational, one of the world's largest Internet software companies, had revenues of \$572 million for its fiscal year that ended in March 2000, and employs more than 2,600 people around the world.

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LoadTest takes all of our scripts, and all of the products to be tested, and queues them up against all the machines and resources we have available. It takes control of the whole software test regression at that point. When a tester completes a script, he places it in the script regression folder, and our system will run it. It is automatic, we dump it there, Rational LoadTest discovers it, adds it into the scheduler, and through our priority schema it sets it up and runs the test."

When Rockwell Software testers develop an automated script, they send it to their automated lab which has anywhere from 23 to 40 computers ready for Rational LoadTest to use. They have even set up a camera, so you can see the lab in action at <http://www.software.rockwell.com/funstuff>.

Andrew continues, "Scripts do not need to be assigned to a specific application. Each script calls into a library and passes several flags to it — this is the product I want to test, this is the area that I'm testing it in, these are the requirements in Rational RequisitePro I'm testing against; provide it to me please. Rational LoadTest takes all of our automated scripts, builds a schedule and then runs the schedule according to when we tell it to run it."

The automation does not end there. The results from the scripts are also handled automatically. "All the test results are logged in real time to an SQL database in the lab that collects data from all the scripts. Not only does each script have to figure out what platform it is running on, what the processor is, and how much memory the system has, but it also has to report everything that it is doing along the way. As a manager, I could be in the Bahamas, hook up my laptop, go to our private Web page, and see what product is where in its testing cycle. Every two seconds the page is updated. If the system is running seven test cases per second, within a few minutes I'll know how quickly we're moving through the test plan of 300,000 cases, and I can estimate when the test phase will be complete," Andrew says.

And, as the scripts are performing their tests, Rational Suite PerformanceStudio's integrated code coverage analysis tool, Rational PureCoverage[®], is running at the same time. The testers use Rational PureCoverage during regression testing to measure exactly how much of the application under test is being verified by the regression tests.

Looking Forward To Continuing Success

With all the success Andrew and his team have had using Rational Suite PerformanceStudio, he is understandably enthusiastic: "I think people make a mistake by limiting automation just to do automated test scripts. We as testers and as companies, have to stop looking at what we're doing today, and saying 'We're being successful'. We have to look down the road and ask 'What does Rational supply that will make me more successful tomorrow than today?' We should take Rational's technology and apply it, to push us to the next level. And that's what we do every time we install a new Rational release — that is exactly what we do with it. We try to take advantage of everything Rational provides." Considering all of the powerful tools, features and resources that Rational Suite PerformanceStudio offers, that is a substantial undertaking, but one that is well worth the effort.

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