Critical Logic & General Dynamics: Streamlining & Saving Money in Mission Critical Applications

ABOUT GENERAL DYNAMICS:

General Dynamics' Advanced Information Systems provides end-to-end intelligence, surveillance and reconnaissance (ISR) solutions to customers across air, land, sea, space, and cyber domains. The mission critical nature of their software development raises the stakes on people, process and technology to deliver their results. A contractor to the U.S. Navy, General Dynamics is involved in various mission critical software development projects under their purview.

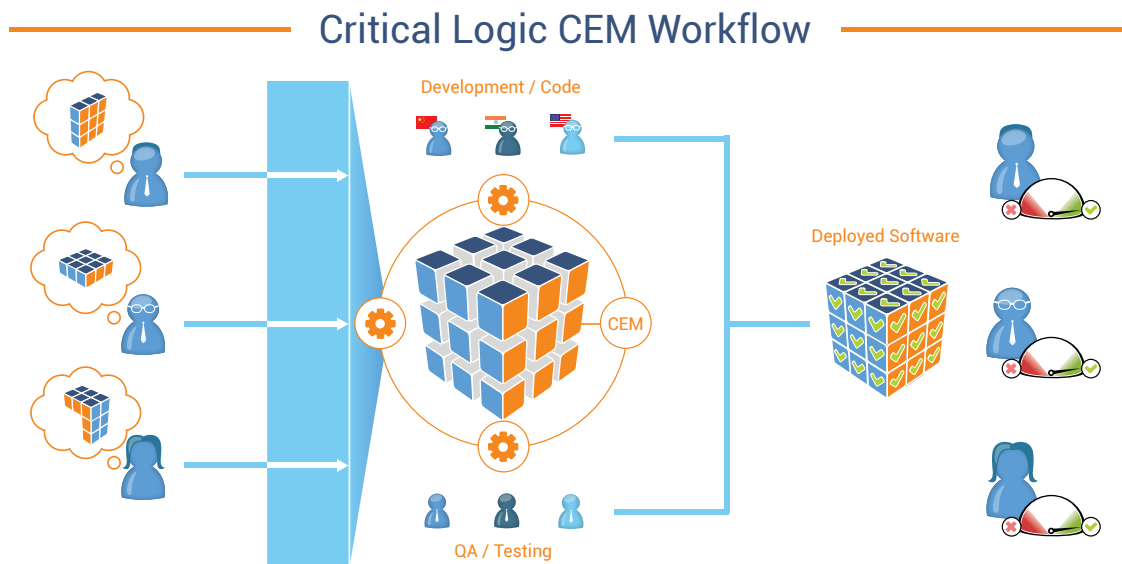**GENERAL DYNAMICS**

THE CHALLENGE:

In 2008, the U.S. Navy was trying to pinpoint ways to reduce testing costs while increasing their mission-critical software quality. Their development process had long been heavy in manual testing, so as part of the cost reduction measures, the Navy instructed General Dynamics to make the switch to automated testing – this was to reduce not only cost but the potential for human error, and to streamline development processes overall. At this point, the Navy was locked in a proprietary system; highly motivated to field open system designs and reduce testing costs for platforms, the Navy began initiatives to move away from manual testing. The General Dynamics team had been working with model-driven development using tools based on the Object Management Group (OMG) standards, UML and SysML, and wanted to extend that to testing for several reasons, not least of which was needing to know when a requirement was completely tested and proving, with traceability, that it was working.

General Dynamics seemed to hit a wall in researching new ways to go about their testing process: most mainstream products are designed for programs with a graphical user interface, not those programs with deeply embedded code that only had a network communications design. With increasing pressure from the U.S. Navy to automate their software development processes, General Dynamics needed a real solution.

Case Study

THE SOLUTION:

General Dynamics was introduced to Critical Logic's model-based solutions in 2009 and the company was immediately attracted to the ideas of automated generation of test cases from models and mathematically based functional test coverage. General Dynamics was impressed by Critical Logic's expertise in setting up automated testing and found the integrated automated test execution offering very attractive.

Critical Logic CEM Workflow

Development / Code

Deployed Software

CEM

QA / Testing

After researching Critical Logic's products, the General Dynamics team decided to take advantage of the full Cause-Effect Modeling (CEM) Platform: Direct-to-Test (DTT) for test case generation and the Test Management & Execution (TMX) product for automated test script authoring. The cause-effect models used in these products demand complete requirements up front, and test assets are generated via mathematical algorithms. Test automation scripts are then generated automatically from the model-based test cases. Using the TMX software, Critical Logic's test engineers create reusable and editable test scripts to cut down on software developer time during testing.

Case Study

THE RESULTS:

General Dynamics was pleased to find several benefits from working with Critical Logic products including a portable automation framework and portability of the models themselves.

When General Dynamics decided to overhaul their test environment and use a different scripting language for test automation – even after all the tests and test scripts had been completed, they worked with Critical Logic to build a new automation framework and abstraction layer that allowed GD-AIS to reuse the models with minimal changes. The test automation scripts were automatically regenerated from the original models into the new scripting language using the new framework. Without the portability of model based test cases and scripts, the cost to rewrite all those scripts by hand would have been astronomical – and they never would have done it.

"The automation framework gives us the ability to easily support many different programs," said Ron Townsen, senior lead engineer for GD-AIS. "We expect the framework to grow in capability over this next year as we add new features to support both networks and consoles."

When it came to developing GD-AIS's modeling and scripting capabilities, the goal was always to bring Critical Logic's tools and skills in-house to their own engineers – and demonstrate that it could scale to other groups and projects within GD-AIS: "This gave our engineers new insights both in how to use the modeling to create better requirements in addition to using our domain knowledge to reduce the costs in our testing efforts," said Townsen.

Not only was General Dynamics able to streamline their internal processes with Critical Logic's software, they saw significant monetary savings as well. Through major improvements in test coverage and efficiencies throughout the testing process, General Dynamics calculated cost avoidance up to $3 million thanks primarily to defect prevention. On a per requirements basis manual test design at General Dynamics is still slightly less expensive, but the reduction in effort through automated execution more than makes up the difference – "up to 15% savings over traditional manual testing" according to Townsen.

Townsen also said that the DTT modeling helped the company save money in early capture of requirement problems in addition to giving them complete functional variation coverage – meeting FAA safety requirements under the modified condition/decision coverage (MC/DC) test coverage criteria set forth in DO-178.

"[DTT], along with the higher quality of model-based testing, gave us the approach we have been looking for," Townsen said. "Especially in areas of complex design and safety critical needs."

Do you see similarities between General Dynamics and your company's areas of opportunities? Get in touch with Critical Logic today to see how we can help you save effort, time and money on your next software development project.

> "[DTT], along with the higher quality of model-based testing, gave us the approach we have been looking for...Especially in areas of complex design and safety critical needs"
>
> **—Ron Townsen**
> *Sr. Lead Engineer , GD-AIS*
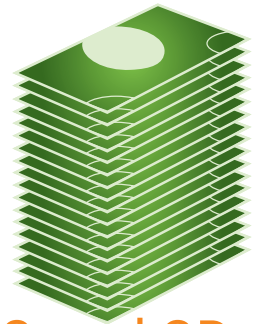
CEM Saved GD-AIS
$3 Million

Case Study