AdaTEST 95

Case Study

Lockheed Martin

Headquartered in Bethesda, Md., Lockheed Martin is a global security and aerospace company that employs about 113,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services.

"AdaTEST 95 has been a great help to us!"

Background

At their Aeronautical Systems plants in Marietta, Georgia, Lockheed Martin were developing the US Air Force's latest air-superiority fighter, the F-22. From a software point of view, the program was especially interesting as it overlapped with the introduction of Ada as the US Department of Defense's preferred language. The sheer scale of the F-22 software development required multiple-location working, with the Display and Mission Systems Software being carried out at Marietta. This software related mainly to the pilot's ability to carry out his mission, including its planning, navigation and the use of situation awareness information.

Mission Control

The software had been assigned a risk-class of 'mission critical' for obvious reasons, and was therefore subject to stringent testing requirements. The entire programme was developed to the DoD 2167A standard, which mandated unit and integration testing. The detailed project software standards had been developed by Lockheed Martin themselves and included high levels of code coverage on all unit tests (100% coverage on Statements, Decisions, Exceptions and Boolean Operators).

The F22 Raptor Undergoing Flight Trials

Evaluation

MaryAnn Tompkins was the F-22 Internal Independent Verification and Validation Manager and assisted in finding a suitable tool which would facilitate the extensive CSU testing. Through an encounter with AdaTEST 95's vendors at a software testing conference, she initiated an evaluation.

The evaluation work was entrusted to Software Engineer, Tad Keely. The software environment for the program was VAX with Digital Ada for host-native testing, and the i960 target processor with a VAX-hosted cross-compiler supplied by ICC. Most of the evaluation work was carried out on the target because this was the area where, at the time, confidence was lowest. Testing therefore had the most to contribute. AdaTEST 95 was supplied to Keely in source form and was installed without any significant difficulty.

The evaluation was largely completed within three months and was a success. The most important criterion was satisfied, in that AdaTEST 95 was shown to be wholly effective in the i960 target environment. Programmers could actually run their code on the target and be able to demonstrate that the units worked as they were supposed to. Occasionally, however, the software (despite being correct at source level) did not work, and AdaTEST 95 was instrumental in showing up some early cross-compiler faults.

A second crucial capability was coverage analysis, which was a determining factor in deciding when unit testing was complete. Finally, given that the software development tools, especially the cross-compiler, were at an early level of maturity, there was a recurring need for regression testing of all units. Each new compiler release demanded that all unit tests be re-run, and this, normally, time-consuming activity could be carried out in a completely automated fashion with AdaTEST 95.

Deployment

Following the decision to purchase, AdaTEST 95 was put to work on the development of the first release of the F-22 tactical avionics. This phase of the program involved around 30 software engineers and generated 85,000 SLOCs. Mike Morton, a senior technical staff software engineer, noted, *"AdaTEST 95 was used for the entirety of the unit testing so far, and there is no doubt that its role has been significant in helping us produce the current release on time and to a level of confidence we can be proud of."*

Conclusions

Morton was acutely aware of the difference that a program of rigorous unit testing can make when integration testing has to be completed under severe time pressure. He repeatedly observed that units presented for trial integration without passing through the earlier level of test were noticeably less reliable than properly tested ones. Furthermore, when properly tested units were integrated it allowed the system testers to concentrate on their main task, which was to ensure that the units all work together as expected and that performance was within design requirements.

The final words go to Morton: *"AdaTEST 95 has been a great help to us. Its use has significantly increased the quality of the software products we are delivering, and it is wholly evident that the use of properly tested software units has led to greatly reduced integration testing times."*

MORE ON AEROSPACE & DEFENCE SECTOR:

Our Sector Briefs provide more information on how AdaTEST 95 was successfully used by other customers in various aerospace & defence projects worldwide.

Sector Briefs can be found on the QA Systems website.

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All case study text has been approved by the customer.
QA Systems acquired the AdaTEST 95 business, taking over all development, support and sales, from IPL in 2012.
AdaTEST 95 is the extension of the AdaTEST tool.

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