



“Overall, we reduced our testing effort 83% by using VectorCAST.”

KEY HIGHLIGHTS

INDUSTRY
Avionics

STANDARDS
DO-178B Level A

PRODUCTS

- VectorCAST/C++
- VectorCAST/Cover
- VectorCAST/RSP

DIFFERENTIATORS

- Unmatched level of automation
- Intuitive user interface
- Code coverage analysis

WEBSITE
www.mdstec.com

MDS Technology achieves 83% cost reduction using VectorCAST

MDS Technology is the leading embedded solution company in Korea. Their NEOS™ Real-Time Operating System (RTOS) was originally developed by MDS as a stable and affordable RTOS solution for commercial and defense products. NEOS has been successfully used in a variety of products including navigation and system-on-chip (SoC) applications.



Challenge

MDS Technology decided to develop a version of NEOS for the commercial avionics market. The NEOS-178B project was of the utmost importance to MDS – they needed the best automated test solution available, and they needed a tool that could be qualified for DO-178B Level A.

Solution

By adopting the VectorCAST tools MDS was able to achieve significant time and cost savings. VectorCAST/C++ was used for unit testing in conjunction with VectorCAST/Cover for system testing. In addition, a custom VectorCAST/RSP was created for the MDS PPC Target.

Results

MDS was able to reduce their testing effort by 83% using VectorCAST. They were able to re-execute all test cases automatically to certify the application to DO178B Level A.

“We found information about other test automation tools, but none of them matched VectorCAST’s level of automation and flexibility.”

NEOS Certification Project

When MDS decided to develop a version of NEOS for the commercial avionics market, they contacted a leading consultancy firm in avionics software certification for guidance.

Taeyoung Noh, Software Quality Assurance Manager for the NEOS project at MDS Technology, is responsible for overseeing the development and certification of NEOS-178B™. He explains: “We wanted to do things right. We requested help from HighRely, which is the leading consultancy firm in Avionics software certification. They provided us with valuable advices. And one of them was to purchase the VectorCAST tools to automate testing.”

“Of course, HighRely provided information about other tools that are available in the market. But the Designated Engineering Representative (DER) and consultants were unanimous – VectorCAST was simply the best tool available.”

“We also did our own research. We found information about other test automation tools, but none of them matched VectorCAST’s level of automation and flexibility. This certification project was of the utmost importance to us – we needed the best solution available, which is why we contacted a Vector Software representative and purchased their tools. For this project we used both VectorCAST/Cover for code coverage during system test and VectorCAST/C++ for unit testing and code coverage” says Mr. Noh.

In addition to being the first and only RTOS ever developed in Asia, the The NEOS-178B™ variant has another distinction – it is the first RTOS developed in Asia to ever be deemed DO-178B certifiable. This avionics standard is one of the most demanding in any industries, and reflects the high quality of NEOS™ implementation.

Attaining DO-178B certification can be very complex. The standard includes very stringent requirements for the development and test of software components. Additionally, tools that are used to automate testing and other operations must also be qualified in order to ensure that their output can be trusted.

VectorCAST allows efficient DO-178B Level A testing for NEOS

“We had our work cut out for us” explains Taeyoung Noh. “The NEOS kernel is about 18,000 source lines of code (SLOC) in size. In the first phase, we wanted to achieve Level B certification, which required that all the code be covered for statement and branch criteria. We only had a few months to complete this project.”

With such a challenging schedule, the MDS Development team quickly appreciated the unmatched level of testing automation provided by VectorCAST. “VectorCAST made our job a lot easier. The graphical interface is highly intuitive, and the command-line interface is both robust and flexible, enabling us to perform incremental, fully automated builds and tests. That provided a big boost to our performance”.

“Basically, VectorCAST tools can perform code coverage during high-level test execution and low-level testing. Thereafter, it can pool the coverage results, so you know overall where you still need to work. To our knowledge, this is a property unique to VectorCAST”, says Mr. Noh.

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He continues, “code coverage analysis in VectorCAST is very convenient. The code is colorized to let you know what is covered, what is not covered, and what is partially covered. That helped us quickly come up with additional test cases to reach 100% coverage. Test execution reports are also clear and very suitable to be kept as artifacts for DO-178B certification purposes.”

“Finally, we appreciated very much the tool qualification materials provided by Vector Software. The qualification documents were generated quickly and were well organized. That certainly further facilitated the certification process.”

Performance improvement in numbers

MDS Technology wanted to quantify the efficiency improvement provided by the VectorCAST tools. The MDS Development division calculated the following table based on achieving their DO-178B Level B testing. “

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Complying with DO-178B Level B with and without VectorCAST						
Task	Number of units (approx)	Hours/units with VectorCAST	Subtotal	Hour/unit without VectorCAST (estimation)	Subtotal	Reasons
Low-Level Test Design/Review	700	2.5	1,750	0.5	350	Unit test design, implementation and execution are concurrently automated with VectorCAST environment
Low-Level Test Implementation	700			4	2800	
Low-Level Test Execution	700			0.5	350	
High-Level Test Execution	300	0.05	15	0.25	75	Because of VectorCAST’s premier command line interface, it was very easy to create an entirely automated
Coverage Analysis	18,000	0	0	0.4	7,200	No additional time is required when using VectorCAST to record code coverage and generate reports
Qualification of the Testing Environment	Testing Scripts		80		320	No additional time and hassle is required to qualify the tool – Vector Software provides a turnkey solution
Total			1,845		11,095	Overall, reduction in time and effort is 83%

(High-level test design and implementation efforts are not included in the table)

“Overall, we calculated that we reduced our testing effort by 83% by using VectorCAST” says Mr. Noh. “By itself, this is a pretty impressive record, but then, our project was upgraded to DO-178B Level A, and we were able to easily and automatically rerun all the test cases we previously did, which provided a big boost to our efforts. The VectorCAST ability to generate truth tables and to indicate which test case pairs were missing for MCDC coverage definitely helped us meet Level A requirements on a shortened schedule.”

As a result of Mr. Noh’s team effort, NEOS-178B kernel was deemed certifiable for DO-178B Level A compliance in January 2010.

