

Mitsubishi Electric Adopts Development Testing to Enhance Customer Satisfaction

Coverity® Static Analysis selected as solution of choice in Car Navigation System Development



Business Overview and Challenge

Mitsubishi Electric's Sanda Works manufactures car navigation systems, car audio systems, and other electronic and information equipment for automobiles. Sanda Works is one of the top innovators in the car navigation field. It is the first company in the world to commercialize a modern car navigation system - employing GPS positioning data and map matching technology to show the vehicle's location on a map display. This system was first installed in the Mazda Eunos Cosmo in 1984. Besides car navigation systems for the aftermarket, which are sold to auto parts and accessories retailers, Sanda Works also delivers navigation systems' OEM products to major automakers in Japan and overseas for installation within the production line.

In recent years, an enormous volume of software code has resulted from the sophistication and extension of navigation systems. Given this growth, adopting development testing to quickly discover defects in source code, as it is being written, has become increasingly vital to ensure the quality of the software, without impacting delivery schedules. Using static analysis tools has gained attention as a means to improve the efficiency of embedded software development. However, a static analysis tool with low defect detection accuracy can end up creating more trouble and take up more time than it's worth. Implementing a reliable solution is essential.

In addition to the growing sophistication of Sanda Work's car electronic equipment software, the sheer market growth, due to the number of new car models, has led to an increase in code required to integrate the software into the various models. As vehicles are now being shipped with pre-installed car navigation systems, this has introduced new development challenges to support the market expansion. Ichiro Tanaka, staff manager of the Administration Section of Sanda Works' Car Multimedia Engineering-A Dept, reveals the following problem with car navigation system development:

"Car navigation systems today are connected to the Internet and have become the car's information terminal, handling information on traffic congestion, parking spaces, and electronic toll collection among other things. So much more software is required compared to the conventional navigation systems that simply displays the location of a vehicle on a digital map and provides route guidance. And because navigation systems are pre-installed in more models and vehicle grades, this requires additional integration development, causing an increase in the level of software development time, skills and effort."

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Yoshinori Tsujido

Staff Manager of Car Multimedia Engineering-A Department

On top of Mitsubishi Electric's strict quality requirements, the automobile industry has stringent regulations about the quality, reliability and performance of parts and electronic equipment used in vehicles. “A car that reaches the market with a defective navigation system has to be recalled, which results in high costs and lost reputation and trust in the automaker. But with delivery deadlines shortening, we realized it was going to get more difficult to set aside time for careful checks within each process,” says Mr. Tanaka. Providing high quality products while meeting time to market can clearly be an agonizing trade-off.

Solution Evaluation

Previous to implementing Coverity Static Analysis, Sanda Works had introduced a static analysis tool to achieve improvements in both software quality and development speed. Yoshinori Tsujido, Staff Manager of Car Multimedia Engineering-A Dept, Software Design-A Section, who is responsible for software development, explains, “The first static analysis tool we introduced detected an enormous number of defects and it was hard to know which we should focus on first, or how to deal with them. In the end, our software engineers would spend a whole month verifying if they were real.” He adds, “But we knew the value of static analysis because we realized human code review had its limits--there were always some bugs we couldn't detect with manual reviews, even if we did spend time on design review.” But due to the inefficiency of the previous static analysis solution, the situation worsened and engineers felt they would be better off without using static analysis. The frontline developers were growing increasingly disgruntled about having to use static analysis tools to verify programs once they had been written.

Because Sanda Works believed in the value of static analysis, they recognized the problem they faced was due to the high false positive rate. Conducting additional research, Sanda Works found that Coverity had a strong reputation in the industry for providing high defect detection accuracy. “We decided to adopt Coverity Static Analysis because of its extremely high defect detection accuracy and defect management features that other tools did not have,” says Mr. Tanaka.

He also notes, “The aim of introducing Coverity was to shorten development time. The amount of software development time spent on testing had increased dramatically in recent years, and so the idea was to reduce that time and in doing so, shorten overall development time. This was also consistent with the idea of front-loading, which involves solving problems as far upstream as possible in order to lower the burden of development as a whole.”

From the development point of view: “I think the visual interface is very well done. Conventional static analysis tools only show you where the problems are located and you are required to think about why they are defects. But Coverity Static Analysis tracks the defects to the core of the problem and it is very easy for developers to see its root cause as related information is attached, which is very useful,” says Mr. Tsujido.

Coverity Deployment Benefits Realized

“The amount of source code is rapidly increasing in size and yet we are maintaining consistent quality. I don't know where we would be now if we didn't use Coverity Static Analysis,” says Mr. Tsujido. “80 to 90 percent of bugs found by previous static analysis tools we used were false positives, but results produced by Coverity Static Analysis are very accurate. It is much easier to plan our development cycles now.”

With more accurate results, even the more experienced engineers are now using it. “Highly skilled engineers see Coverity Static Analysis is everything you could ask for in a tool. Even beginners can see how good it is. I also expect that the accurate analyses provided by Coverity Static Analysis will assist engineers in developing skills to design software without critical defects like memory leaks,” says Mr. Tanaka.

In terms of management, a major benefit is the Coverity® Integrity Manager, the defect management interface and workflow. “We are able to compare individual components in terms of the number of defects identified and quality issue patterns, so we can deliver feedback for improving development processes and job procedures. In just over a year, we’ve managed to gather data that we can apply to future development. Also, while other static analysis tools merely find the defects, Coverity Static Analysis leaves a record of the process, which is a very effective management feature,” says Mr. Tanaka.

He continues: “Returning to the point I made about front-loading, we have always calculated the percentage of bugs found in the software development process that are fixed by completion of the coding. Since implementing Coverity, that percentage has clearly improved by at least five to ten percent. Such an improvement upstream benefits the efficiency and speed of the entire development process.”

Additional benefits have been discovered by Mr. Tanaka since implementing Coverity Static Analysis. Triaging defects is easier because users can pinpoint the exact location of a defect within the actual code and view the number of occurrences of the defect across projects, code streams and versions. Coverity also provides reports to let users view and track defect history and resolution status at the branch level, the project level, and across multiple projects, which is critical in making better decisions, and in measuring developer productivity and quality improvements over time. Since these features are provided out-of-the-box in Coverity Integrity Manager, management no longer has to waste time creating custom reports.

About Coverity

Coverity is the trusted standard for companies that have a zero tolerance policy for software failure, problems, and security breaches.

Coverity’s award-winning portfolio of software integrity products enables customers to prevent software problems throughout the application lifecycle.

Conclusions

As we move into an age of hybrid and electric vehicles, the role of car navigation systems as the information center for vehicles will continue to increase. Sophistication of systems will result in more software, making the reliability of navigation systems as an information center even more critical. Use of Coverity Static Analysis in the design and development for this kind of value-added product will only continue to increase in necessity. Mitsubishi Electric Sanda Works is an innovator in adopting Coverity as part of their development process. “The ultimate purpose of using a static analysis tool is to improve customer satisfaction. Static analysis tools ensure quality and delivery performance beyond what humans can achieve, allowing allocation of more time to activities that only humans can perform,” says Mr. Tanaka.

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