

LDRA coverage

LDRA NEWS FROM THE WORLD OF TESTING

Autumn/Winter 2007

Issue No.10

Leveraging the LDRA tool suite for in-vehicle software (or electronic) platform development



Denso Corporation Headquarters, Kariya, Aichi, Japan

The Client

DENSO, a leading supplier of advanced automotive technology, systems and components for all the world's major automakers, operates in 32 countries and regions with more than 112,000 associates.

The Electronic Systems Business Group incorporates two divisions developing and manufacturing engine ECUs and other integrated circuits or electronic devices for automotive control systems in order to promote synergistic development of both software and hardware.

Project Requirements

For DENSO an essential requirement of the software that they develop is that it must be of high quality and also demonstrate high dependability in the field.

In addition DENSO look to optimise the code size, thus maximising resource saving and real-time performance in the limited target hardware environment in which they operate.

"LDRA has the ability to work with Limited Target HW due to demands for cost reduction and downsizing"



Convertor and Battery

These target development requirements are typified by AUTOSAR where the demands are rigorous for the software platform field.

The software platform needs are becoming increasingly important for next generation technology. There are also plans for the adoption of safety integrity standards in the automotive market as has been the case in the aerospace industry. Both of these factors will be of greater significance to developers of automotive technology systems in the future and DENSO are currently leading the way with research and development in this area.

The Benefits

Akihito Iwai, Project Manager DENSO Japan, commented:

"We have taken advantage of LDRA's software analysis techniques to improve the quality of our software platform.

The LDRA tool suite is used as a benchmark for other third-party and similar software platform products."

He continued by saying DENSO have been able to:

- "Systematically quantify the sophisticated quality metrics.
- Effectively use the graphical and intuitive analysis reports, especially



Akihito Iwai

the dynamic analysis reports of the tool, which have unique unparalleled characteristics.

- Extend and integrate the tool chain through integration with other third-party tools."

Through the deployment of the LDRA tool suite DENSO have been able to apply a uniform set of analysis techniques and standards for each software platform which has, in turn, provided significant cost and time savings for current and future projects.

"The LDRA tool suite is used as a benchmark for other third-party and similar software platform products"

The Future

The LDRA tool suite has assisted DENSO in leveraging analysis and testing. This has proven to be beneficial as DENSO have been able to make use of the techniques, which have previously been successfully utilised by industries such as aerospace to bring these to the automotive industry.

DENSO are now looking to develop the techniques further and bring more software testing processes to the automotive industry.

Contact LDRA and discover how you too can harness the power of the LDRA tool suite and develop better, more reliable software.

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LDRA Setting the Standard in Programming Standards Checking

Background

Before the advent of high-level programming languages everything was hand-crafted in machine code, using slow, torturous processes. Because of this, great care was taken to ensure the code was correct, as corrections took a long time to implement.

The introduction of higher-level programming languages and better program-entry methods ended this tedium. Well, that was the theory. In reality, people started to find that they had programs that didn't work as expected and effort simply moved from coding to fault-finding.

Numerous organisations and authors analysed the defects that appeared in a wide set of programs and realised that many had common failure causes. This information allowed for the production of guidelines, the aim of which was to prevent, or make detectable, the issues that may lead to the introduction of defects.

Why carry out programming standards checking?

It is often claimed that following a particular set of rules or programming style guidelines will help programmers quickly read and understand source code conforming to the style as well as helping to avoid the introduction of faults.

The programming style used in a particular program may be derived from the coding standards or code conventions of a company or other computing organisation, as well as the preferences of the author of the code.

In languages such as C and C++ there is potential, due to their inherent flexibility, to write software which is undefined, unspecified, or implementation-dependent. To ensure portability and avoid unexpected results, programming

standards try to ensure that there is no reliance placed on compiler or platform-specific constructs. It is also important to avoid unreachable or infeasible code as this is often indicative of a defect, and will at the very least impact upon maintainability. Certain language constructs are known to be a source of common errors and these can be prohibited. Other issues such as complexity and testability, which are measurable, also have a bearing on the quality of software.

Bearing these thoughts in mind we will look to see how coding / programming standards checking has developed and how LDRA can assist you with this process.

Overview

LDRA has been continually developing *LDRA Testbed*[®] (part of the *LDRA tool suite*) since 1975 and an important feature of the static analysis capability of the tool suite is to make developers' and testers' lives easier.

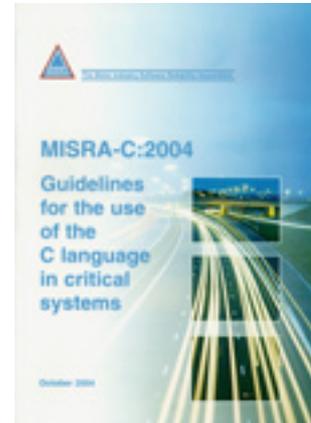
This has been a key driver in the development of the super-set of 650 (and growing!) static analysis rules which are available within *LDRA Testbed*. LDRA has the ability to automatically apply a

“650+ available rules”*

comprehensive set of programming standards to a single source file or a complete system. These standards are available for the C and C++ languages and include customer-defined standards as well as industry standard coding rules such as:

- **C Standards** - MISRA C, MISRA-C:2004, HIS & GJB (Chinese Military Standard)

*These rules are in addition to the compiler syntax rules.



- **C++ Standards** - JSF AV C++, High Integrity C++, MISRA C++ & LM Train Control Program (LMTCP)
- **Ada Standards** - SPARK Ada subset & the Ravenscar Profile

Although peer review is still a relatively rare activity people still have to be a maintainer of code written by someone else. A lot of time can be absorbed trying to decipher code that is not easy to understand. It is amazing how a few minor style differences can make reading code that much slower.

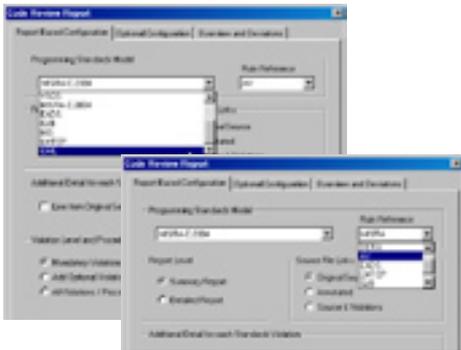
Code analysis tools, such as *LDRA Testbed*, provide an easy way to check your code against a set of standards as it is being written. This is a significant step forward in promoting the adoption of standards, since it makes it easy for developers to police themselves.

LDRA Testbed applies a pre-configured set of rules to a piece of code and points out any violations of the coding rules. Setting the rule set to check against is very easy, simply select the relevant standard from the drop down list for each individual standard.

First and foremost, standards specify a common format for the source code and comments. More importantly,

a well designed standard will also detail how certain code should be written, not just how it looks on screen. More important than the reasons for having a standard is actually adhering to it consistently. Having a coding standard documented and available means nothing if developers are not using it on a regular basis.

Software coding standards are language-specific programming rules that greatly reduce the probability of introducing errors into applications, regardless of which software development model (V-model, iterative, waterfall, extreme programming etc) is being applied to create the application.

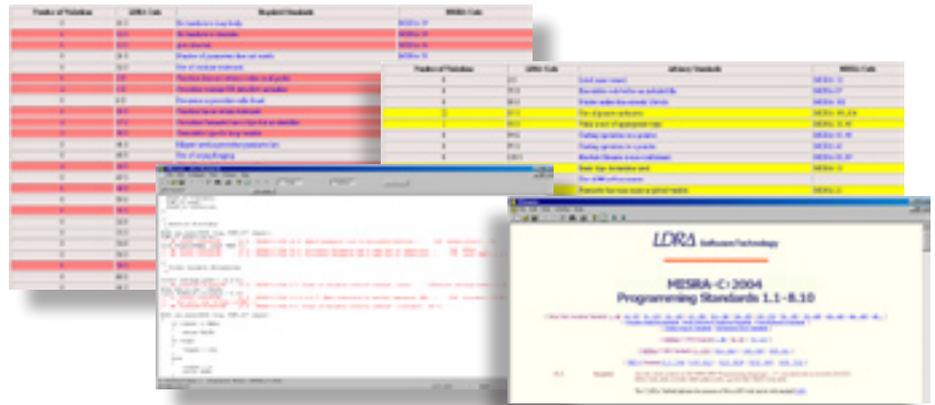


Programming Standards Checking with *LDRA Testbed*

One of the key components of *LDRA Testbed* is the provision of both static and dynamic analysis of software. Programming coding standards enforced by the *LDRA Testbed* static analyser, which encompasses those required by a wide range of different industry sectors. The aerospace and automotive industries have been using such standards for a number of years and we are now seeing the uptake of such analysis techniques broadening into other industries.

MISRA Checking

The Motor Industry Software Reliability Association (MISRA) standard has gained wide-spread acceptance in the motor industry. It is also used in a large number of other industry areas as a basis for implementing good practice when



creating code for safety or business critical systems.

MISRA-C:2004 has been extensively revised by industry and tool vendors working in partnership. As a leading supplier of MISRA compliance software analysis tools LDRA participated in this collaborative exercise and has extended its proven tool suite to encompass the new and revised standards of MISRA-C:2004, as well as the soon to be released MISRA C++.

“LDRA has 98% exemplar suite compliance”

In support of the MISRA-C:2004 guidelines, there is now an exemplar suite, specifically produced by MISRA to provide examples of compliance, and non-compliance, for each of the (tool verifiable) rules.

- MISRA-C:2004 comprises 21 sections, and consists of 142 rules (of which 14 are acknowledged by MISRA as being not tool verifiable). The verifiable rules are tested in the suite by almost 700 non-compliances, of which 675 are intended to highlight a particular rule violation. The others are examples of crosstalk between rules, i.e. some program defects may violate more than one rule.

- The C version of LDRA Testbed static analyser provides support for all of the tool verifiable rules in MISRA-C:2004 and currently reports 659 of the 675 non-compliant rule violations in the exemplar suite, giving LDRA approximately 98% tool compliance.

The Future

Over time, the guidelines from various sources (current best-practice) were brought together and enhanced to produce sets of comprehensive Programming Standards, such as MISRA-C and JSF AV C++. These “collections” benefit from wider adoption, as, once learnt, they can be used for many, diverse projects. Additionally, tool support is more mature as a large number of practitioners leads to a rapid convergence between expectation and enforcement.

There are a number of exciting developments within the MISRA committees, which will see a MISRA C++ standard released in early 2008, as well as work which is starting on MISRA C version 3 with an intended publication date of 2010.

If you would like to find out more about the functionality mentioned please contact info@ldra.com.

We would be pleased to arrange an on-site or web-based presentation for you.

Further expansion of the LDRA Distributor Network



LDRA are pleased to announce that a new partnership has been forged with G-Tek (Geliştirme Teknolojileri) of Turkey which will see G-Tek distributing the LDRA tool suite in this region.



G-Tek Geliştirme Teknolojileri (Turkey) www.g-tek.com.tr

G-Tek was founded in 2006 to support Turkish companies in the embedded market space with good quality product offerings, start-up services, training and consultancy in these areas. G-Tek's product offerings extend from RT-UML, SysML to RTOS and automated unit & system testing solutions with complementary services related with these products or the concepts behind them.



Liverpool world famous as a centre for trade, sport and music is also the home of LDRA. With its beginnings in Liverpool University in the 70's LDRA was formally registered as a limited company in 1975, making it the longest established provider of software testing tools.

2007 is the 800th birthday of the city of Liverpool and during its growth it has had a major influence on world events. This was summed up well by Tessa Jowell, Culture Secretary;

"Liverpool will become a cultural beacon for the world. Capital of Culture is a wonderful accolade. It is fabulous. You are a wonderful city. I am so glad you won."

Liverpool is already well known around the world for maritime heritage, architecture, music, literature, the arts and sport. The Capital of Culture title will place the city even more firmly on the global map.

The city's influence in sport can be seen in the two Premier League Football Clubs, Liverpool and Everton with fan bases across the world. The eyes of the racing world turn to Liverpool each year to watch the unique spectacle of the Grand National at Aintree.

Perhaps LDRA's influence is not so obvious. However, with a commitment to innovation and the development of techniques to make software used in safety and operational critical situations as diverse as error free as possible. LDRA has seen a growing worldwide customer base benefit significantly from the class-leading tools that the company develops and markets.

We are proud of the Liverpool's heritage and 800 years of achievement and wish the city and the people of Liverpool every success for a Capital year in 2008.

Tool Integration News



LDRA are pleased to announce that we are currently working on further developments with the LDRA tool suite and the Freescale integrated development environment (IDE) CodeWarrior.

selextion

Selextion is a niche recruitment consultancy focussing on professional appointments. Formed in July 2001, the company has developed through forming effective, long-term strategic partnerships with an impressive range of clients.

The Selextion team is multi-disciplined, with many years' through-the-line experience in a variety of industry sectors. We work, in the main, on a retained basis and have a proven, high success rate when working in a campaign situation. Our rates are competitive and are weighted, for the most part, on successful completion of an assignment. This weights the risk of the assignment heavily on us in order to establish a long-term relationship of trust and, most importantly, delivery.

Whether recruiting for single key appointments or large-scale projects encompassing entire teams, our specialist consultants are able to recommend and execute the most appropriate method of sourcing candidates in a discreet and professional manner. This will usually be through a combination of contingency file search, advertised selection, and/or executive search.

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LDRA Training

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Newsletter Contributions

Contributions from our readers are welcome. If you have any comments or stories that you feel are relevant to the world of software testing please contact us.