



LDRA

Company Profile

Do-178B System & Unit Testing
Source Code Analysis Complexity Metrics
DEF-STAN 00-55 Embedded Systems Testing
MISRA Checking Requirements Traceability Code Coverage IEC 61508

Technological Achievements

‘After conducting a careful industry analysis of existing tools LDRA, in every case, met or exceeded the JSF program requirements for static code coverage and unit testing.’

*John H. Robb, Vehicle Systems Principal Software Engineer,
Lockheed Martin Aeronautics Company*

The LDRA Group of companies is based around LDRA Ltd. which, founded in 1975, is the world’s longest established provider of automated source code analysis and testing tools. The key features of the LDRA tool suite include automated unit testing, code coverage analysis and programming standards checking.

LDRA’s products and services are at the leading edge of software testing technology and many new and ground-breaking testing techniques have been derived from methodologies developed by the company. Through the deployment of LDRA’s tools, companies are able to deliver software applications that are well constructed, documented and tested and, in addition, benefit from significant time, cost and operational savings for their business.

LDRA’s ongoing tool development programme has taken source code coverage to a third level with the introduction of TER3 based on LCSAJ (Linear Code Sequence and Jump) coverage. Developed in the early 1970’s, the LCSAJ has since become an industry standard coverage metric and is fully implemented in LDRA Testbed®. LCSAJ coverage forms a significant part of the Eurofighter Aircraft Testing Standard and the BS7925 Standard for Software Component Testing. LDRA is also accredited with the development of Knot Analysis, which is widely used in the analysis of code structure.

In addition to LDRA’s achievements with the development and implementation of sophisticated code coverage solutions the company is also a world leader in the provision of Data Flow Analysis which, as illustrated by the PET project, has proven to be a powerful means of finding bugs within source code. The European Commission funded the PET project and its aim was to improve software quality through improved testing.



Lockheed Martin Joint Strike Fighter

The project demonstrated that the number of bugs found by static and dynamic analysis techniques is quite large, even in released code. Equally significantly the project provided a full cost/benefit analysis that highlighted the immediate payback that could be achieved on investment in tools and training.

The full report is available at www.esi.es/en/main under PET10438.

LDRA’s strength in the field of Data Flow Analysis enabled the company to further enhance the LDRA tool suite with the implementation of Information Flow Analysis. Information Flow Analysis is a study of the interdependencies of program variables and it forms an essential part of the British Defence Standard 00-55.

Other leading software industry standards for which the LDRA tool suite is able to provide significant assistance include DO-178B and MISRA C. LDRA Testbed was the first test tool to be utilised for certification to the Federal Aviation Authority’s DO-178B standard for both airborne and ground-based systems, providing full support for the structural coverage, data coupling and unit test requirements of the standard.

The Motor Industry Software Reliability Association (MISRA) first published the MISRA C standard in 1998. The standard was originally intended to promote the use of “Safe C” within the motor industry, but has since been widely adopted throughout the software industry as a whole where it is used to encourage good programming practice. The LDRA tool suite is the only tool available to enable static rule checking, complexity and dynamic analysis to ensure compliance to MISRA-C:1998 and the latest release, MISRA-C:2004.

Coupled with LDRA’s work associated with the development and implementation of leading industry standards, the company has for many years provided test tools and test solutions to leading organisations and projects worldwide. Most recently the LDRA tool suite was selected as the preferred tool of choice for the prestigious Joint Strike Fighter project. The project brings together an international team to develop a next-generation multi-role strike fighter aircraft and is the largest defence procurement project to date.

In addition to this latest alliance, LDRA has a long-standing track record for the provision of test tools and test solutions to the defence industry and avionics projects in particular. LDRA tools are currently in use on the following programmes: Eurofighter Typhoon, Nimrod 2000, Eurojet, C-17 Globemaster, F/A-22 Raptor, C-5 Galaxy, Airbus A340/A380.

LDRA Products

LDRA Testbed[®] is a source code analysis and test coverage measurement tool. It is available for analysing all the popular 3GLs and on all popular platforms. **LDRA Testbed** utilises its own proprietary parsing engine, giving ultimate flexibility for tailoring the tool to meet user requirements and take advantage of new analysis techniques.

TBrun[™] is a test harness generator for unit testing. Automatically generating test drivers and harnesses around the unit under test, **TBrun** does not require test scripts or code drivers to be written and managed, reducing test effort by 76%.

TBsafe[™] is an additional module for **LDRA Testbed** which includes Information Flow Analysis, Modified Condition Decision Coverage (MC/DC), Dynamic Data Flow Coverage and Exact Semantic Analysis for analysing safety critical code.

LDRA Services

Through its highly skilled engineers, LDRA is able to offer a wide range of services. These include: the implementation of techniques for the achievement of software quality objectives; testing; validation and verification of software; setting up software quality systems and services; source code audits; and providing key experts to support in-house quality system development.

LDRA's technical experts can undertake software and system reviews which target issues such as portability, maintainability and reliability.



LDRA was an integral member of the committee who developed and launched the MISRA C and MISRA-C:2004 standards. Both this new standard together with the original MISRA C standard are fully supported by the LDRA tool suite.

TBevolve[™] creates a baseline for a system within **LDRA Testbed** and enables Impact Analysis, Hazard Analysis and Change Control Information to be tracked for system maintenance and enhancement.

TBpublish[™] takes the analysis and test results from the **LDRA tool suite** and publishes the results via an HTML index into a self-contained directory for easy navigation and results sharing.

TBaudit[™] offers managers an automatically generated Microsoft Word report, which provides details on programming standards checking and metrics analysis results. **TBaudit** requires **TBpublish**

The above are 'open' products for integration with CASE tools and source code configuration tools.

LDRA Quality

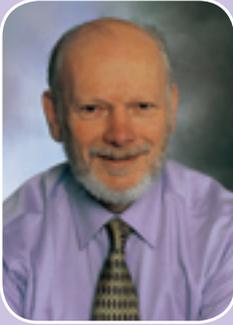
LDRA has an exemplary record for quality dating back to the mid 1970's. More recently, LDRA's quality management system has been approved to BS EN ISO9001:2000/TickIT standards demonstrating LDRA's long-standing commitment to software and management quality.



Since its inception LDRA has been regularly audited for tool qualification purposes.

The British Standards Institute, Federal Aviation Authority, Rolls-Royce, Thales Avionique, Data Systems & Solutions, Sextant and Honeywell, among others, have recently undertaken audits of LDRA in connection with: ISO9000/9001:2000; Def-Stan 00-55; and DO-178B standards.

As an integral part of the LDRA DO-178B Analysis Package, LDRA offer a Tool Qualification Pack and agree to enable clients and certification authorities to audit the **LDRA tool suite** for use in projects.



Dr. Mike Hennell, CEO of the LDRA Group, is an internationally recognised authority on Techniques for Software Analysis.

Involved in this specialist field for over 35 years, he has led 14 research projects in Computer Science and Software Engineering, written more than 70 research papers and participated in three Alvey projects and three EEC projects concerned with quality assurance (two of which - ESPRIT 1258 TRUST and QAKB - he led).

He is an Associate Member of IEEE, a Member of the Executive Board of CSR and on the Editorial Board of Software Testing, Verification & Reliability Journal.

Mike was Professor of Computational and Statistical Mathematics at Liverpool University in England.

Training

LDRA delivers training courses to benefit software developers and testers who are already using or intend to use the *LDRA tool suite*. The core aim is to become familiar and obtain a thorough understanding of all the features of the *LDRA tool suite*, advanced techniques and how to exploit the source code analysis techniques and methodologies it supports.

The topics covered relate to the analysis features of the *LDRA tool suite*, which are static and dynamic analysis using *LDRA Testbed* and unit testing with *TBrun*. Practical workshops throughout the course provide hands-on experience of the topics covered.

Courses can be held at the Technical Centre, Wirral.

Alternatively courses can also be arranged at customer sites and tailored to specific requirements.

Consultancy

LDRA's software analysis and testing consultancy services are flexible and tailored to individual requirements. Consultancy will normally involve discussion of your analysis and testing requirements and analysis of your code. Following this, LDRA will assist in documenting and interpreting your results, and can provide guidance and recommendations concerning ways in which you may improve your development/testing process.



Our Clients Include:

ADA India • Allied Irish Bank • AIRBUS • Alenia Marconi Systems • Astrium • BAE SYSTEMS • Banque Bruxelles Lambert • Bell Helicopter Textron • British Nuclear Fuels • Boeing • Bombardier Transportation • British Airways • British Energy • Bruel & Kjaer • Caterpillar • Crane Aerospace • Danfoss • DASA Daimler-Benz Aerospace • Datel Defence • Den Danske Bank • Dimetronic • Dunlop Aerospace • EDS • Ericsson • ESAOTE • EverReady • Fiat • Ford Motor Company • GB Tech • Graseby Medical Limited • Hamburgische Landesbank • Hamilton Sundstrand • Hindustan Aeronautics • Hispano-Suiza • Honeywell • Intel • LBS West • LITEF • Lockheed Martin • Lucent Technologies • Magic4 • Marconi Communications •

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