Rational software

Safety-critical software development for C using IBM Rational Rhapsody software.

Highlights

■ *Help improve productivity with out-of-the-box compliance with many MISRA-C coding standards.*

■ *Reduce cost by finding defects before certification.*

■ *Help improve time to market by leveraging approved certification evidence.*

■ *Mitigate risk by using proven expertise from training and consulting services.*

DO178B- and ARINC 653-compliant solutions

The failure of software in safety-critical systems can result in the loss of life, limb or property. To promote safety, this software must be certified after meeting stringent coding standards, like the FAA's DO-178B or Europe's EUROCAE ED-12B. Uncovering a software problem during certification may create delays and increase costs. To deliver quality, you must verify that architecture and systems requirements are correct early in the development lifecycle.

IBM Rational® Rhapsody software can help improve the communication of requirements through UML model-based development, which abstracts complex requirements graphically. With IBM Rational Rhapsody software, you can validate software early in the life cycle through design execution and generate code through a complete framework. IBM offers certification evidence and services to help you improve your safety-critical systems developments.

IBM Rational Rhapsody software in C safety-critical object execution framework

Framework-based code generation utilizes a framework library to provide common implementations of UML modeling elements such as statecharts. In the IBM Rational Rhapsody Developer for C++, C, and Java™ toolset, this framework is the object execution framework (OXF), which provides a set of advanced features and common functionality to support a diverse set of users. The OXF is a modified version of the standard OXF specifically designed to address the needs of users with safety-critical concerns. The safety-critical OXF meets many MISRA-C 1998 coding standards to support certification efforts. Only the aspects of the OXF that require certification are included in the safety-critical OXF.

IBM Rational Rhapsody software can help you:

• *Promote design reuse by isolating high-level behavior from target-specific details.*
• *Validate early on a host prior to target hardware availability.*
• *Re-target application rapidly to changes in hardware.*

Feature	Benefit
Out-of-the-box compliance with many MISRA-C coding standards	Helps ease the effort of meeting software guidelines
A model-driven approach helps you identify defects before certification	Reduce costs and improve productivity by focusing certification on proven design
Approved DO178B certification evidence	Improve time to market by demonstrating compliance
Proven expertise from training and consulting services	Mitigate project risk and improve the chances of success

DO178B certification evidence

To help with certification, IBM can provide the following documents/ evidence for the safety-critical OXF:

- *Requirements*
    - *Development and implementation requirements traceability*
- *Source files*
    - *Traceability*
    - *PC-Lint results*
- *Design components*
    - *Traceability by source code*
    - *Traceability by function*
- *Test procedures/results/reviews*
    - *Functional testing*
    - *Traceability*
    - *Review functional test*
    - *Summary functional test*
- *Coverage analysis*
- *Traceability*
- *Control coupling results*
    - *OXF map check*
    - *OXF*
    - *OXF control coupling analysis*
- *Documentation*
    - *Process plans and standards*
    - *Software configuration management plan*
    - *Software development plan*
    - *Software design standard*
    - *Software plan addendum*
    - *Software quality assurance plan*
    - *Software requirements standard*
    - *Software verification plan*

- *OXF project documents*
  - *Project profile*
  - *Software accomplishment summary*
  - *Plan for software certification*
  - *Software test plan*
  - *Software design document*
  - *Software requirement specification*
  - *High- to low-level traceability*
  - *Software lifecycle environment configuration index*
  - *Software configuration index*
  - *SCI tables*
  - *Requirements traceability*
- *OXF white papers*
- *Customer documents*
- *Tool qualification*
- *SQA audits*
- *Problem reports*

OXF customization, training and mentoring services

To deliver high-quality systems, a project must meet its requirements.

IBM has years of expertise assisting customers in delivering projects of all sizes in a variety of industries. With its in-depth knowledge, IBM can help your team mitigate project risk by providing guidance throughout your product lifecycle. IBM can also provide safety-critical OXF training, customization services to tailor the safety-critical OXF, as well as mentoring and guidance to ensure effective use of the safety-critical OXF.

Specifications

The safety-critical OXF installs over a standard IBM Rational Rhapsody software installation and includes the necessary source and makefiles to rebuild the safety-critical OXF library. In addition, supporting artifacts are provided in the form of Rational Rhapsody software property files, code post-processing utilities for the software generated code, PC-Lint artifacts including batch files, and test models with test vectors for the safety-critical OXF to facilitate certification.

Systems requirements

The safety-critical OXF provides the operating system abstraction layer (OSAL) services for the following real-time operating systems (RTOS); however, the framework is highly customizable and can be modified to support other targets.

- *Green Hills Integrity ARINC/APEX*
- *Green Hills Integrity 178B*
- *Wind River VxWorks 653 ARINC/ APEX*

For more information

To learn more about how IBM Rational Rhapsody software can help you develop safety-critical software in C, visit:

ibm.com/software/rational