RTEMS

Qualification Data Packages (QDP)

for safety-critical space projects

The real time operating system RTEMS is well established in the space domain. Our tailored Qualification Data Packages turn RTEMS into an ESA qualified platform for your next critical space project.

What is RTEMS?

RTEMS is a professional Open Source „hard" real-time OS with high flexibility. It has minimal resource demands and provides maximum performance, particularly on small and medium-size systems. It is available for a broad range of processors and provides all common interfaces and drivers for embedded systems. Originally designed more than 25 years ago for military applications the single-core version was enhanced with an SMP multi-core version in 2015.

Open Source
- Code transparency
- Independent in use

NASA
Perseverance
Mars Rover

Safety Qualifiable
- ECSS Space qualified (Cat.C, tailored Cat.B)
- Automated Test Suite
- 100% code and branch coverage

E&K Automated
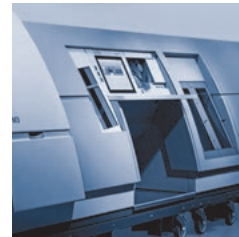Guided Vehicles

Well established
- Continuously developed for over 30 years
- Broad range of BSPs, interfaces and drivers
- Used in various industries

BMW
high speed
data logger

Multicore Performance
- Symmetrical Multiprocessing (SMP) using 2 to 24 cores
- High performance
- OS operating with less than 100KB of memory+

G+D high-performance banknote processing system

Why QDP? A case study.

Suppose you are starting a project for the European Space Agency (ESA) with RTEMS being chosen as the OS platform. Usually ESA requires the software development to be compliant with ECSS standards (ECSS-E-ST-40C and ECSS-Q-ST-80C Rev.1). From the ECSS point of view, RTEMS is a reusable software component in your software development. The QDP contains a set of documents which show that the RTEMS feature set of the QDP was developed according to ECSS software development standards and has been verified on your hardware to be fit for use in criticality category D, C or B (without ISVV). The ECSS software development standards contain requirements also present in IEC 61508, ISO 26262, DO-178, DO-330, DO-333, and the Galileo Software Standard (GSWS).

In projects unrelated to ESA, ECCS conformity is normally not required. QDPs are yet very valuable for such projects. The QDPs contain a detailed functional specification with associated validation tests. The tests will execute on your hardware with the test results getting evaluated and reported in a document. This will provide you a high degree of confidence that the operating system works flawlessly. The test report contains performance data which can be used to estimate the expected runtime characteristics of the application.

What do QDPs include?

The QDPs are a complete Software Development Kit (SDK) tailored for your specific hardware. The key element is a set of ECSS-specific documents such as:

- Software Requirements Specification (SRS)
- Interface Control Document (ICD)
- Software Verification Report (SVR)
- Software Product Assurance Milestone Report (SPAMR)
- Software Validation Specification (SVS)
- Software Validation Report

The validation tests are run on your target hardware and the validation report is generated from the obtained test results. The QDPs contain the source code of all components (including the cross-compiler) required to develop applications using RTEMS on your target hardware. The tools and the deployed RTEMS for your hardware are provided as a binary distribution. Documentation for RTEMS and example programs are included to help you getting started with your application development.

Our range of RTEMS qualification services

- Qualification Data Packages (QDPs) for various architectures, SoCs, Modules and On-Board Computers (OBC). See also:
  https://www.embedded-brains.de/rtemsapp/qualification-data-package/

- Extensions of Qualification Data Packages (QDPs)
  - POSIX API (mutex, semaphore, condition variables, threads, message queue)
  - OpenMP
  - lwIP
  - Device Drivers (e.g. CAN, SpaceWire, MIL-STD-1553
  - NASA cFS
  - Event recording and Eclipse Trace Compass
  - Others

- Qualification Support for application software
  - Specification
  - Validation
  - Test Exceution
  - Preparation of ECSS Documents

- Qualification Support for application software

Tailored QDPs and their benefits for customers

- QDPs are adapted to customer requirements
- Source synchronization with RTEMS community in RTEMS community git repo
- Customer specific improvements and extensions
- RTEMS code bug tracking
- Gnu Toolchain bug tracking
- Long term maintenance
- Fast Development / Qualification Cycle

About embedded brains

About us

embedded brains, headquartered in Puchheim near Munich, is an owner-managed company specialized in customised software and hardware development for high-performance single- and multi-core systems.

Our RTEMS Support Services

As the main contributor for RTEMS in Europe since 1997 we are providing efficient and professional services to a constantly growing number of customers. Using our deep experience with RTEMS will save you time and help you to focus on your development.

- Training
- Software Engineering
- Board Support Packages (BSPs)
- Qualification Services for various architectures
- Extensions of Qualification Data Packages (QDPs)
- Qualification Support for application software

embedded brains driven RTEMS activities since 1995

1995:	First system development based on RTEMS
2005:	First RTEMS class in Munich
Since 2005:	Adaption of RTEMS to many architectures and controllers
Since 2006:	Member of the RTEMS steering committee
2012:	Integration of USB support
2014:	Integration of improved network stack with IPv6 support etc.
2015:	Development of RTEMS SMP support (for ESA multicore SPARC)
2017:	Hypervisor concepts and testing for space industry
2021:	Space qualification for RTEMS SMP (ECSS)

Contact us

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More value for your projects

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