- embedded brains GmbH (±10 employees) provides customized software and hardware development for high-performance single and multicore systems.

- We are specialized in developing smart and innovative system designs, both self-marketed and as a service to various industries.

- Our services include concept development, engineering and programming as well as system implementation, testing and evaluation.

- The embedded brains team advises and supports companies from different sectors such as space, aerospace, automotive, production systems, and telecommunicartion.

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Real-Time Operating System for Multiprocessor Systems (RTEMS) originally developed in the late 1980s for the US Military to provide hard real time resource assignment. Since 1993 available as Open Source software.

Widely applicable

- Deterministic performance and resource usage
- Multitasking and Multiprocessor capabilities
- Small Memory footprint
- Fast Boot time
- Available for 10+ CPU families

Performance and flexibility

- Supports open standards like POSIX
- Highly configurable with unused features left out by linker
- Efficient 64bit internal time representation
- Event-driven, priority-based, preemptive scheduling
- Intertask communication and synchronization
- Priority inheritance and priority ceiling
- Responsive interrupt management
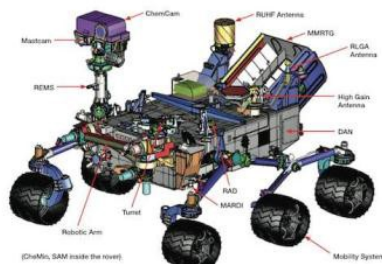- Dynamic memory allocation

Open Source - Commercial Grade Software

- Free software, no restrictions or obligations placed on application code
- Open source code for OS, support components, tests, documentatio and development environment
- Test coverage is openly reported
- More than 50% of users are professionals
- embedded brains offers professional training and support

Service and Support

As the main supporter in Europe we provide the full range of customized RTEMS Services

- RTEMS core development
- RTEMS driver development
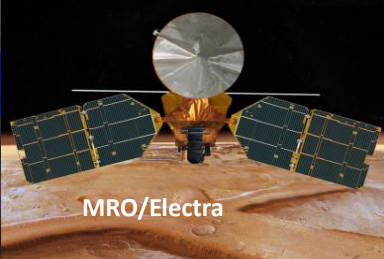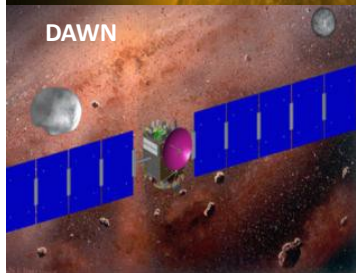- RTEMS porting services
- RTEMS project support
- RTEMS training

Embedded With

RTEMS™

www.rtems.org

embedded brains
brains for your products

RTEMS Application examples

Solar Dynamics Observatory

Curiosity

ARTEMIS

RBSP
Radiation Belt Storm Probes

Galileo IOV

DAWN

MRO/Electra

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Milkymist

Planck

TECHNIC 1

Avenger

MMS
MAGNETOSPHERIC MULTISCALE
NASA GODDARD SPACE FLIGHT CENTER

LISA Pathfinder

Proba-2

Herschel

ST-5

Images Credit: NASA and ESA
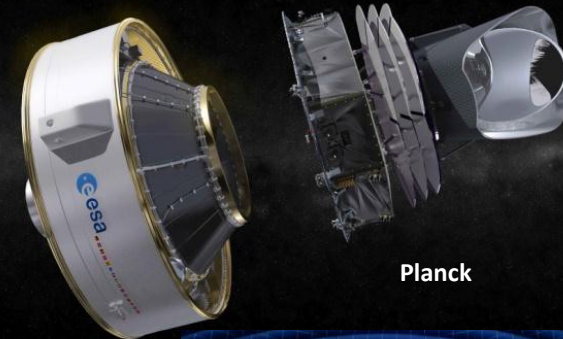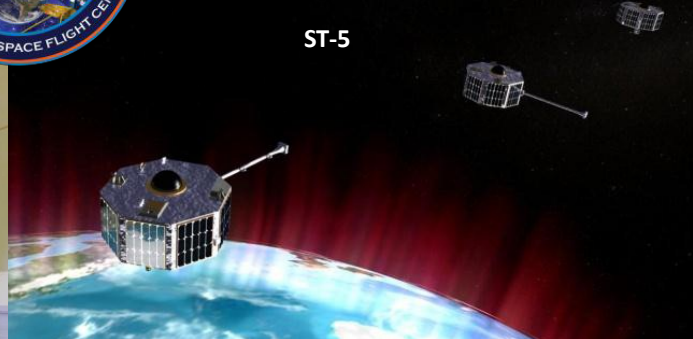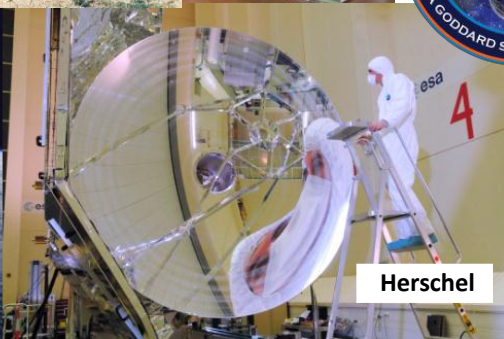
RTEMS SMP Features

- Clustered scheduling
  - flexible link-time configuration
  - fixed-priority scheduler
  - job-level fixed-priority scheduler (EDF)

- State of the art locking protocols
  - O(m) Independence-Preserving Protocol (priority inheritance)
  - Multiprocessor Resource Sharing Protocol (MrsP, priority ceiling)

- Lock-free timestamps

- Scalable timeout support

- Operating system core uses fine-grained locking

- C11/C++11 thread-local storage

- OpenMP 4.5 (GCC, libgomp)

- APIs
  - RTEMS Classic
  - POSIX threads
  - C11/C++11 threads

Hardware Implementation

- GR740 (LEON4 SPARC V8)

- GR712RC (LEON3FT SPARC V8)

- NXP QoriQ (e.g. 24 processor T4240)

- Xilinx Zynq

- Altera Cyclone V

- *everything else, we can do it*

ECSS SW Qualification

Challenges:

- Qualification of an Open-Source Software

- Nonlinear behaviour of Real Time OS combined with SMP

- Dynamics of using shard resources (e.g. Memory)

Embedded With RTEMS™

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