

## **RTEMS Symmetric Multiprocessing Optimization and Improvement for LEON Multi-core**

The open source Real-Time Operating System for Multiprocessor Systems (RTEMS) is a multi-threaded, single address-space, real-time operating system with no kernel space / user-space separation. RTEMS uses a modified GPLv2 license with an exception for static linking. It exposes no license requirements on application code. Originally, RTEMS was a pure uni-processor operating system with support for heterogeneous computing via message passing. The Symmetric Multiprocessing (SMP) configuration started as a proof of concept using a giant lock, but in this contract the system internals were completely overhauled providing a state of the art and performant feature set. The RTEMS interpretation of real-time on SMP is the support for clustered scheduling with priority based schedulers and adequate locking protocols (such as OMIP and MrsP), with the aim to enable schedulability analysis under the sporadic task model. A key enabler for the smooth development process was the creation of a comprehensive test suite which is basically the specification of the RTEMS functionality. The first RTEMS release with production ready SMP support, resulting from this activity, is now available on the ARMv7-A (e.g. Altera Cyclone V, Raspberry Pi 2, Xilinx Zynq), PowerPC (e.g. QorIQ P1020, T2080, T4240) and SPARC (e.g. Cobham Gaisler GR712RC (LEON3FT dual core) and the GR740 (LEON4FT quad core)) architectures will be RTEMS version 4.12, which will be officially released in Q2-2017.