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An ARM® Company

Real-Time Library

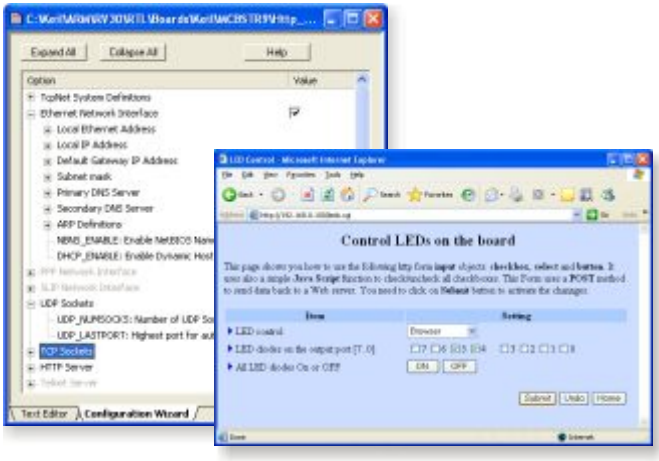
The RealView® Real-Time Library (RL-ARM) solves the real-time and communication challenges of embedded systems based on ARM® powered MCU devices. It expands the Microcontroller Development Kit with essential components for sophisticated microcontroller applications.

Components of the Real-Time Library:

- RTX Kernel, a royalty-free fully deterministic RTOS that meets hard real-time requirements.
- CAN Drivers that utilize RTX mailboxes.
- USB Device Interfaces for standard USB device classes – no system driver development is required.
- Flash File System with a configurable interface for data storage on RAM or FLASH .
- TCPnet Networking Suite for network communication using standard LAN and Internet protocols.

The TCPnet Networking Suite includes:

- TCP, UDP, and ARP communication protocols.
- Ethernet, SLIP, and PPP interface drivers.
- Telnet Server and TFTP Server.
- DHCP Client, DNS Resolver, NetBIOS Name Service.
- HTTP Server with CGI and SMTP Client.



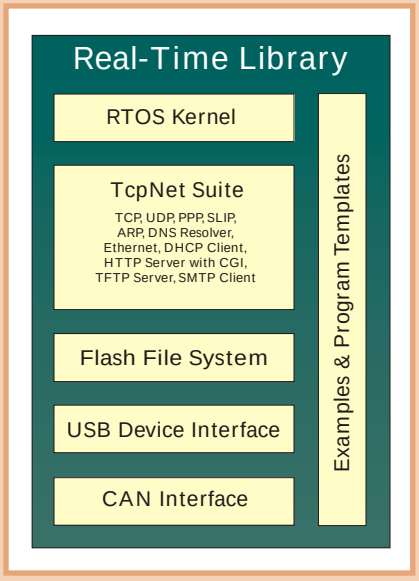
Menu driven configuration files and extensive example projects help you get started quickly.

Deterministic Real-Time OS Kernel

TCP/IP, CAN, and USB Communications

Configurable Flash File System

Ready-to-use Template Applications



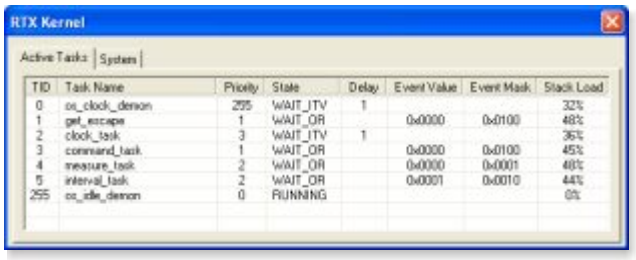
The Real-Time Library (RL-ARM) enriches the feature set of innovative microcontrollers with easy-to-use software components. RL-ARM is scalable and works efficiently on tiny single-chip designs as well as complex systems that require deterministic reaction to time-critical events.

RL-ARM

RTX Kernel

Today, microcontroller applications require simultaneous execution of multiple jobs or tasks. For such applications, the RTX Kernel allows task management and flexible scheduling of system resources (CPU, memory, etc.).

RTX is a full-featured real-time kernel with task priorities, round-robin, preemptive context switching, and support for multiple instances of the same task function. It is royalty-free and is fully integrated into µVision.



The µVision Debugger includes a kernel-aware dialog that displays complete information about all the tasks in your RTX program.

The RTX Kernel runs on the smallest embedded microcontrollers. The memory requirements depend on the number of tasks that run simultaneously and the functionality used.

- ROM requirements: 3.5KB – 5KB.
- RAM requirements: less than 500 bytes. Each task requires additional 52 bytes + stack space.

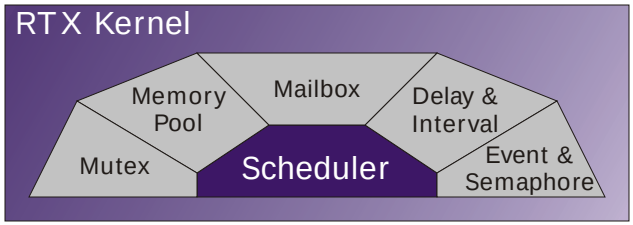
Task context switch is less than 5µs; Interrupt lock-out time is less than 1.8µs (on NXP LPC2000 @ 60MHz).

CAN Driver

The CAN Driver interfaces to the RTX Kernel via mailboxes and memory pools and is composed of:

- a generic software layer that is identical across all supported microcontrollers.
- a hardware-dependent software layer that implements the physical interface to the CAN peripheral. RL-ARM includes support for the Atmel AT91SAM7, NXP LPC2000, and STM STR7xx/STR9xx devices.

The CAN Driver interrupt service routines use the features of the RTX Kernel. This implementation reduces interrupt complexity and provides high-performance functions that transmit and receive CAN messages.



RTX Kernel Function Overview

- Task Management Functions allows you to create and delete tasks. RTX supports 256 task priorities and multiple instances of the same task.
- Task Stacks are allocated from a stack memory pool or can be supplied when a task is created.
- Fast Memory Pool Management allows you to create an unlimited number of fixed size pools while providing fully deterministic allocation times.
- Event Flag Management allows synchronization with up to 16 event flags per task.
- Unlimited number of Mailboxes, Semaphores, and Mutexes are available for inter-task synchronization and communication.
- Time Management and Timer Callback Functions support time delays (interval or timeout) for tasks.

The RTX Kernel can interface to standard interrupt service routines (ISR). Memory Pool Management and Mailbox functions can be used in a ISR. Events and Semaphores can be sent from a ISR to a task.

USB Device Interface

The USB Device Interface uses standard device driver classes that are available with all Windows PCs. No Windows host driver development is required. The USB Device interface uses a generic software layer using RTX Kernel features.

USB Device Driver Classes

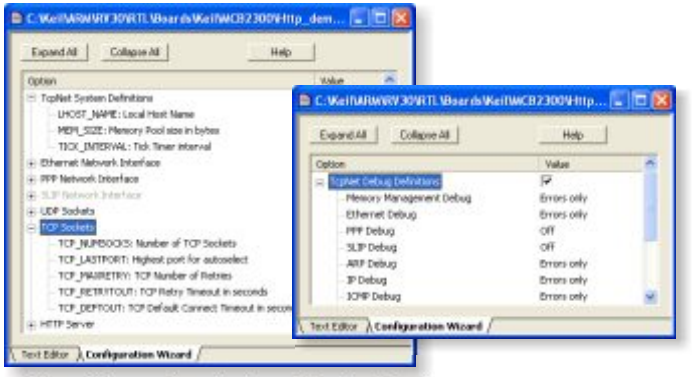
- Mass Storage Device implements a memory device that can be accessed via the file system.
- Human Interface Device implements a generic device that allows all types of data I/O.

Support for other Device Driver Classes will be available soon.

TCPnet Networking Suite

TCP/IP or UDP software layers are easy to implement using the RL-ARM TCPnet Networking Suite. TCPnet provides standard Internet protocols (TCP, UDP, ARP, DHCP) and offers flexible connections (with Ethernet or UART/Modem interface).

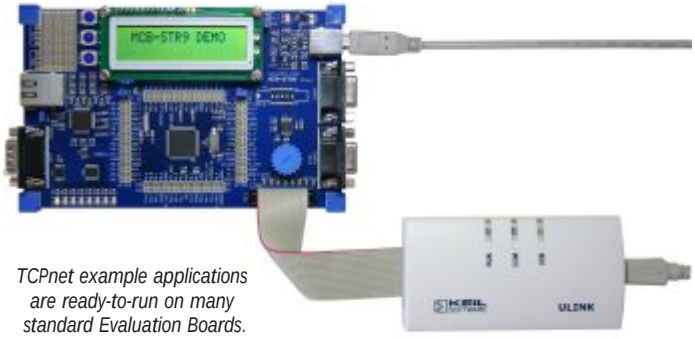
Parameters and the functionality of the TCPnet Networking Suite can be tailored for your software requirements. TCPnet supports a wide range of features from reliable TCP/IP connections to multi-language HTTP configurations. To create highly interactive applications, TCPnet includes a file conversion utility that creates images for a ROM File System from HTML and graphic files.



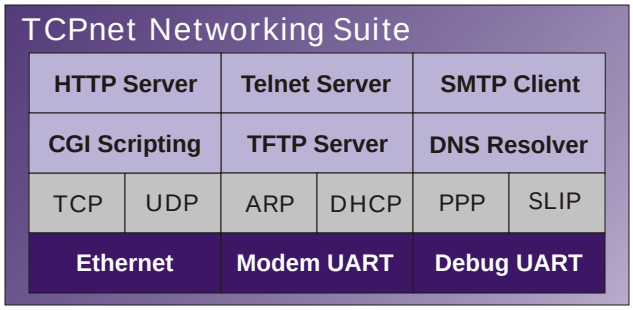
Menu-driven configuration is available for all TcpNet components including the Debug Interface.

Evaluation Hardware

All TCPnet communication interfaces are fully configurable. Ready-to-run template applications are available for popular Evaluation Boards such as the Keil MCB2300, Keil MCBSTR9, Atmel AT91SAM7X, and Phytec LPC22xx.



TCPnet example applications are ready-to-run on many standard Evaluation Boards.



TCPnet Protocol Overview

- TCP (Transmission Control Protocol) is a full-duplex, reliable, connection-oriented protocol between network applications.
- UDP (User Datagram Protocol) is a protocol for sending data packages (with optional checksum) without the overhead or reliability of TCP.
- ARP (Address Resolution Protocol) translates IP addresses to Ethernet MAC addresses.
- DHCP (Dynamic Host Configuration Protocol) configures network parameters automatically.
- PPP (Point to Point Protocol) is used for reliable dial-up modem connections.
- SLIP (Serial Line Internet Protocol) is a simple protocol for data transmission over serial lines.

Flash File System

The Flash File System is designed to be fast, simple, and efficient while allowing you to create, save, read, and modify files. Files may be stored in standard Flash ROM or RAM devices (both may be used parallel). FAT file system support for SD memory cards will be available soon.

Flash File System Function Overview

- File I/O Functions such as fopen, fclose, fread, fwrite, fprintf, and ftell create and access files on the Flash ROM device.
- File Maintenance Functions allow you to rename a filename, provide access to the directory, and format or defragment the file system.
- System Functions are used for initialization.

Real-Time Library - Template Applications

The RealView® Real-Time Library is based on a real-time kernel that simplifies the design and implementation of complex, time-critical applications. It includes an efficient Flash File System, a flexible TCP/IP networking suite, and other essential communication drivers.

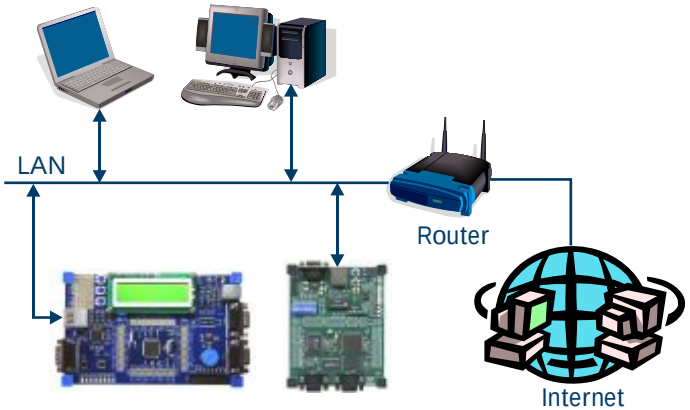
Template applications help you to get started quickly and are royalty-free when used for product development. The RL-ARM components let you focus on the specific requirements of your application.

Included Template Applications

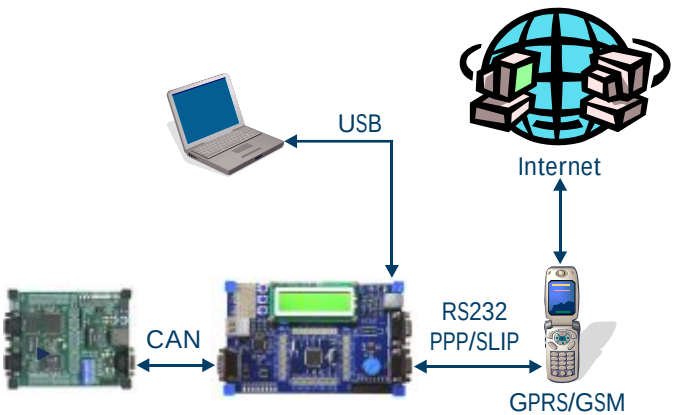
- LED Switch Client/Server uses a UDP or TCP/IP connection with Ethernet, SLIP, or PPP.
- HTTP Server with CGI Scripting supports dynamic Web pages.
- Telnet Server with user authentication.
- TFTP Server supports simple file upload.
- SMTP Client for automated email messages.
- DNS Resolver for IP address resolution.
- RTX Kernel examples that show RTOS features like mailboxes, messages, events, and timeouts.
- CAN Driver implementations for various devices.
- USB Interfaces for standard device driver classes – requires no Windows driver development.

RL-ARM Template Applications are configured for various standard Microcontroller devices and are ready to use with Evaluation Boards.

For more information, refer to www.keil.com/rl-arm.



RL-ARM contains TCP/IP and UDP protocols along with standard Internet applications such as HTTP server or SMTP client.



The RL-ARM component also enable CAN and Modem applications, as well as standard USB devices that avoid Windows driver development.

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