

Keil Development Tools for NXP Microcontrollers

NXP LPC900 8-bit Devices

LPC900 microcontrollers are based on a high-performance 8051 core and provide a wide variety of communication ports and peripheral functions in many packages (8-, 14-, and 16-pin TSSOP up to 28-pin HVQFN). The LPC900 family is designed for applications that demand low voltage, high integration, high performance, and low cost.

NXP LPC2000/LPC3000 32-bit Devices

The cost-effective LPC2000 microcontrollers are ARM7-based and designed for real-time embedded applications ranging from industrial control, automotive, and consumer to any embedded application that requires high performance. LPC2000 devices operate up to 72MHz, feature up to 512K on-chip Flash memory and a large set of peripherals including USB, CAN, I²C, SPI, and Ethernet.

The LPC3000 series is ARM9EJ-based and is the only 32-bit microcontroller that provides a vector floating-point co-processor, USB On-The-Go, and a secure SD memory card interface. The devices support Linux, run up to 208 MHz, and operate in ultra-low-power mode down to 0.9V.

Keil Development Tools

Keil makes C/C++ compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for NXP microcontroller families. The μ Vision® IDE integrates all these tools and combines Project Management, Source Code Editing, Program Debugging, and Flash Programming in a single, powerful environment.

Development Tools for LPC900:

- Keil **PK51 Professional Developers Kit**
- Keil **DK51-LPC Low-Cost Development Kit**
- **EPM900 Emulator/Programmer** for LPC90xx - 93xx

Development Tools for LPC2000/LPC3000:

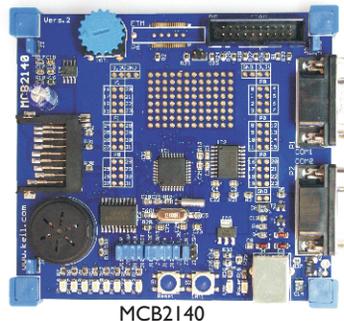
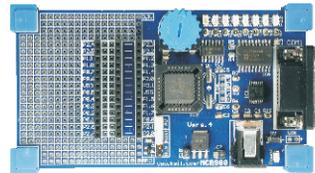
- RealView **Microcontroller Development Kit** for ARM
- RealView **Real-Time Library** for USB & networking
- **ULINK2** USB/JTAG Adapter for debugging/programming

**Keil C51 Supports
LPC900 and NXP 8051 Devices**

**RealView® MDK Supports
LPC2000 and LPC3000 Devices**

**Compiler, Assembler,
Simulator and Target Debugger**

**Real-Time OS with Middleware
for Ethernet, USB, and CAN**

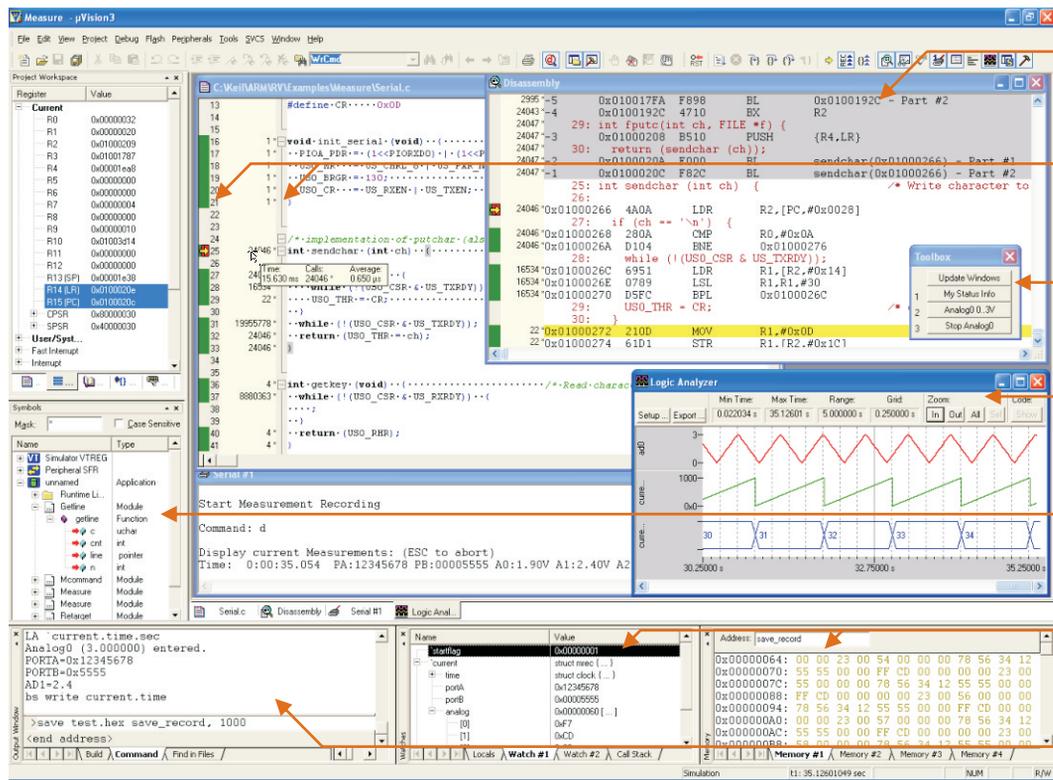


Keil designs and manufactures several evaluation boards (single-board computers) for NXP microcontrollers. These boards come with code size limited tools and extensive example projects that help you get up and running quickly with your own embedded applications.

More information: www.keil.com/boards

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µVision IDE/Debugger - Efficient Program Development



The disassembly window shows trace intermixed with source code.

Code coverage and profiling information display in the source window.

The toolbox contains buttons you define to run commands or debug functions.

The logic analyzer shows changes to variables and signals over time.

You may drag and drop symbol names to other debugger windows.

Memory and watch windows display important program variables.

Enter debug commands into the command tab of the output window.

µVision provides a single environment for editing, simulating, and testing target hardware. The µVision Editor allows you to set simple breakpoints (using the context menu or Editor Toolbar) while creating your C or assembler source.

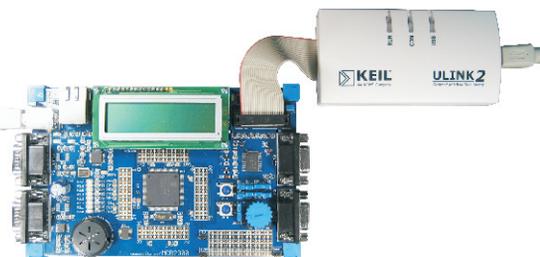
Accurate Device Simulation

µVision simulates a complete LPC2000 microcontroller including the instruction set and on-chip peripherals and provides serious benefits during the software development:

- Simulation allows software testing on your desktop with no hardware environment.
- Early software debugging on a functional basis improves overall software reliability.
- Simulation allows breakpoints that are not possible with hardware debuggers.
- Simulation allows for optimal input signals (hardware debuggers add extra noise).
- Signal functions are easily programmed to reproduce complex, real-world input signals.
- Single-stepping through signal processing algorithms is possible. External signals stop when the CPU halts.
- It is easy to test failure scenarios that would destroy real hardware peripherals.

Target Debugging

The Keil ULINK2 Adapter connects the USB port of your PC to the JTAG port of your target board. When used with µVision, ULINK2 enables you to download programs to on-chip and external Flash, set breakpoints, view memory contents, and single-step through your program.



The Keil MCB2000 Evaluation Boards give you a jump start for your project development. With ULINK2 you may program and debug your application. The Real-Time Agent adds additional features such as on-the-fly variable access in the running application.

Real-Time Library - Efficient Middleware Components

The RealView® **Real-Time Library (RL-ARM)** expands the **Microcontroller Development Kit** with:

- **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, FLASH, or SD memory cards.
- **TCPnet Networking Suite** for network communication using standard LAN and Internet protocols.

RTX Kernel

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. RTX allows flexible scheduling of system resources (CPU, memory, etc.).

TID	Task Name	Priority	State	Delay	Event Value	Event Mask	Stack Load
0	os_clock_demon	255	WAIT_ITV	1			32%
1	get_escape	1	WAIT_DR		0x0000	0x0100	48%
2	clock_task	3	WAIT_ITV	1			36%
3	command_task	1	WAIT_DR		0x0000	0x0100	45%
4	measure_task	2	WAIT_DR		0x0000	0x0001	48%
5	interval_task	2	WAIT_DR		0x0001	0x0010	44%
255	os_idle_demon	0	RUNNING				0%

µVision provides kernel-aware debugging dialogs.

CAN Driver

The CAN Driver provides high-performance functions that transmit and receive CAN messages. The CAN driver interfaces to RTX via mailboxes and memory pools.

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.

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 or on SD memory cards using a FAT file system.

TCPnet Networking Suite

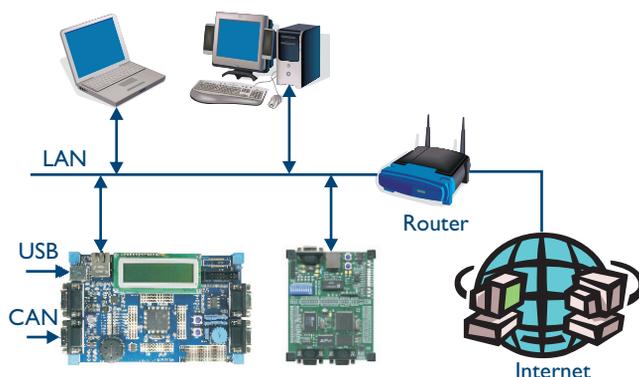
TCP/IP or UDP software layers are easy to implement using the TCPnet Networking Suite. TCPnet provides standard Internet protocols (TCP, UDP, ARP, DHCP) and flexible connections (with Ethernet or UART/Modem).

HTTP Server		Telnet Server		SMTP Client	
CGI Scripting		TFTP Server		DNS Resolver	
TCP	UDP	ARP	DHCP	PPP	SLIP
Ethernet		Modem UART		Debug UART	

TCPnet contains standard protocols and server/client applications. All interfaces are preconfigured for NXP LPC2000 devices.

Template Applications for LPC2000

- **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.



Template Applications are royalty-free and help jump-start your own LPC2000 projects.

Keil Development Tools for NXP Microcontrollers



Keil, An ARM Company, is the world-wide leader in development tools for NXP microcontrollers. Tools from Keil support all levels of developer from the beginner just starting out to the professional applications engineer. Keil offers a wide range of products including evaluation boards, the ULINK USB-JTAG Adapter, and the EPM900 emulator.

For more information, see www.keil.com/lpc.

Third-Party Interfaces

Software Version Control System

PC-LINT
Extensive syntax checking with MISRA support

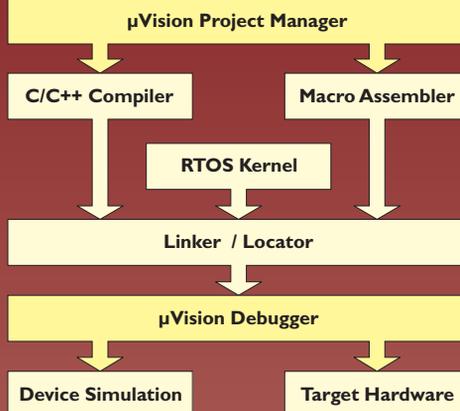
UML 2.0
with iLogix Rhapsody

GUI Library
with Display Simulation

CAN Connector
for Device Simulation

MATLAB/Simulink
µVision Simulation Interface

RealView® Microcontroller Development Kit



RealView® Real-Time Library

RTOS Kernel Source

TCPnet Suite

TCP, UDP, PPP, SLIP, ARP, DNS Resolver, Ethernet, DHCP Client, HTTP Server with CGI, TFTP Server, SMTP Client

Flash File System

USB Device Interface

CAN Interface

The RealView **Microcontroller Development Kit (MDK)** is a complete software development environment for NXP 32-bit microcontrollers. MDK combines the de facto standard ARM RealView Compiler with the Keil™ µVision® IDE/Debugger. Like all Keil tools, MDK is easy to learn and easy to use yet powerful enough for the most demanding applications.

NXP 8-bit microcontrollers are supported with Keil C51, the de facto industry standard 8051 solution. www.keil.com/lpc

The Real-Time Library empowers the feature set of the LPC2000 peripherals. RL-ARM software components are easy-to-use, scalable, and deterministic. www.keil.com/rl-arm



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