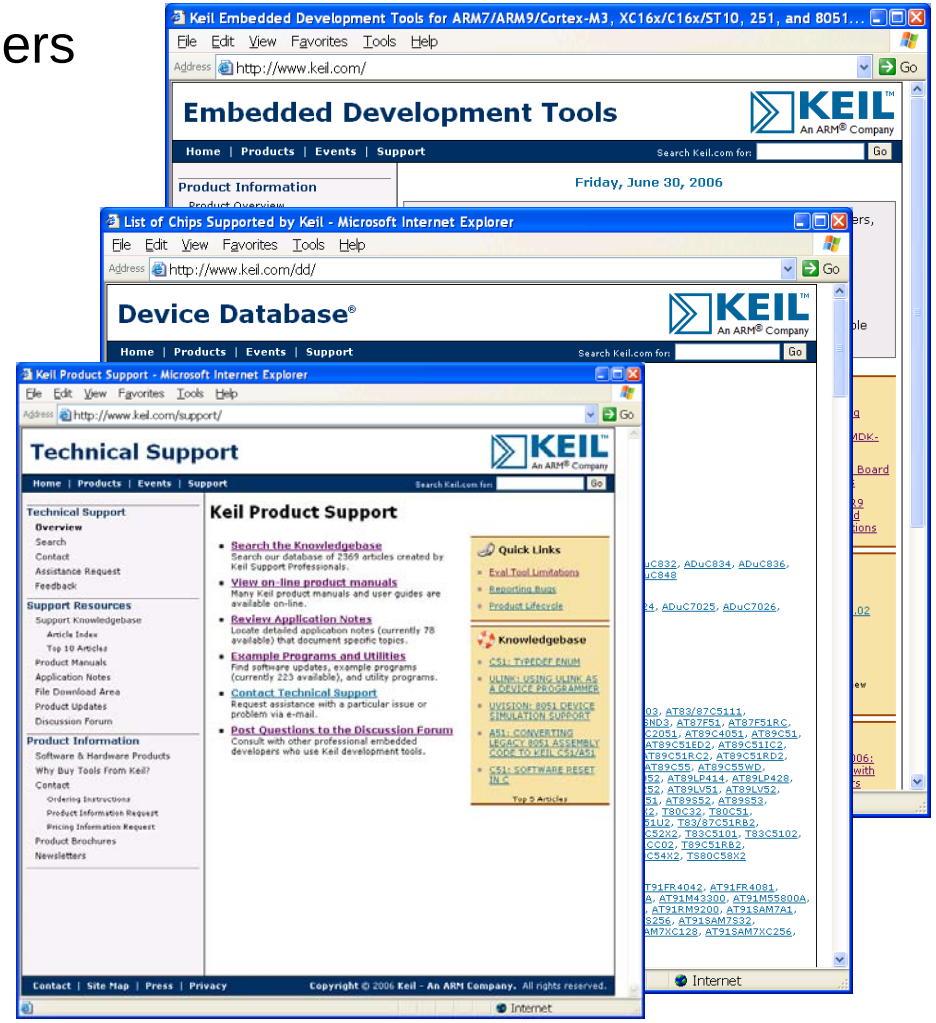
Development Tools
for ARM-Powered Devices

MDK-ARM Microcontroller Development Kit
ULINK Adapters
Evaluation Boards

Keil Microcontroller Tools

- Leading supplier of MCU development tools
  - ANSI C/C++ compilers, Debuggers
  - Device simulation
  - Middleware components
- Extensive Device Database
  - >1,600 8/16/32 bit MCUs
- Established support
  - Web support portal
  - User group structure
  - Global distribution network
- Huge installed base
  - 100K+ users world wide



KEIL Tools by ARM

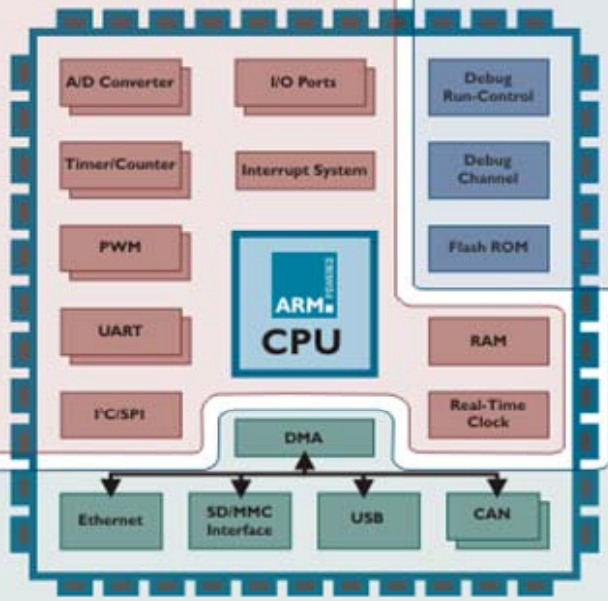
Software Development Tools

Microcontroller Development Kit

CMSIS COMPLIANT

Complete software development environment for Cortex-Mx and ARM7/9 microcontrollers

Easy to learn and use, yet powerful enough for the most demanding embedded ARM application



ULINK USB Adapters

On-the-fly debugging and Flash programming via JTAG or serial interface

MDK-ARM
Microcontroller Development Kit

- ARM C/C++ Compiler
- RTX RTOS Kernel Library
- µVision Device Database & IDE
- µVision Debugger & Analysis Tools
- Complete Device Simulation

Examples and Templates

RTX and Real-Time Library

Fully featured real-time kernel

Library of middleware components to speed up software development and solve real-time and communication challenges

RL-ARM
Real-Time Library

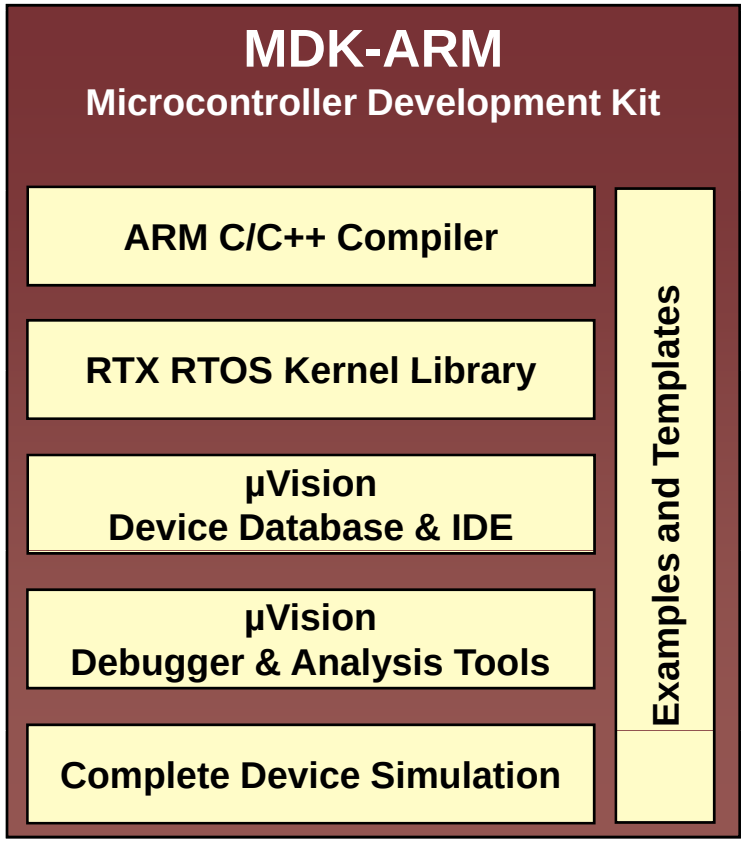
- RTX RTOS Source Code
- TCPnet Networking Suite
- Flash File System
- USB Device Interface
- CAN Interface

Examples and Templates

KEIL Tools by ARM

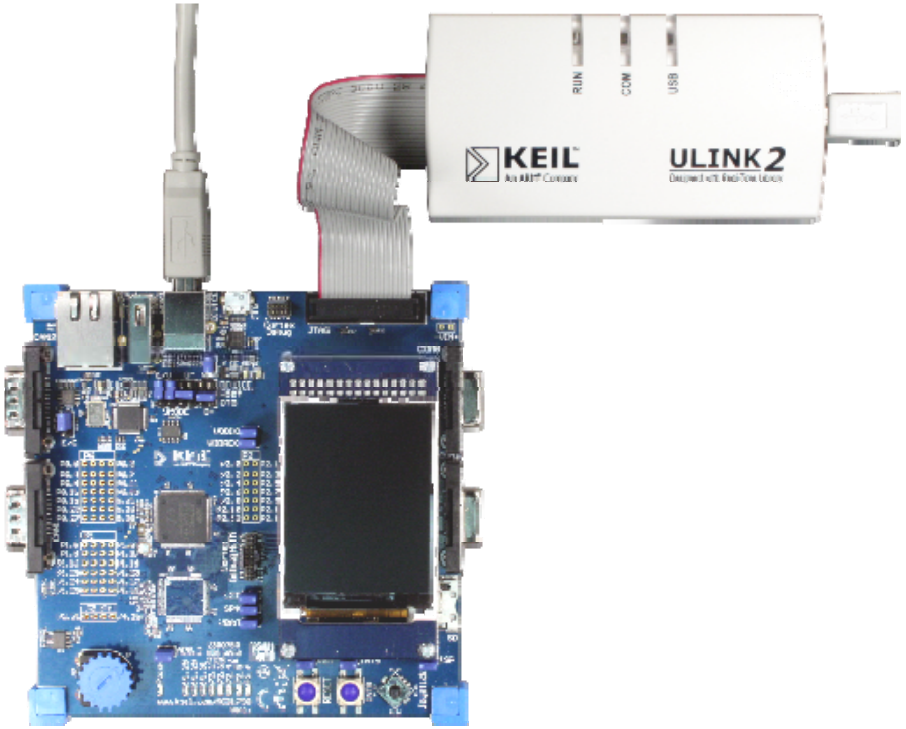
MDK-ARM

- Complete software development environment
  - For ARM7/9 and Cortex-Mx devices
  - Easy to learn and easy to use
- Industry leading technology
  - ARM Compiler
  - Keil µVision IDE / Debugger
- Complete device support
  - ARM7, ARM9, Cortex-Mx MCUs
  - Start-up code & Flash algorithms
  - Complete device simulation
  - Board support packages (BSPs)
- RTX Real-Time Kernel
  - Efficient RTOS Kernel for small systems



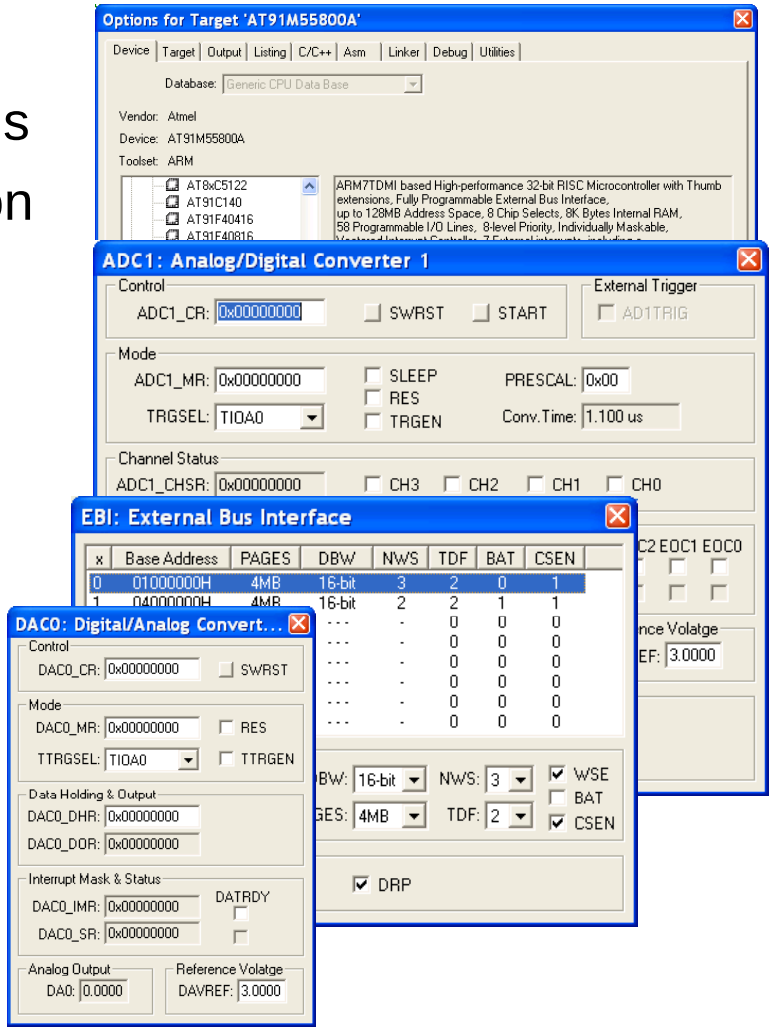
Hardware Components

- Range of evaluation boards and debug hardware
  - Verify application running on hardware target
- ULINK family of USB Adapters
  - Debug and Flash programming
  - JTAG and SWD support
  - Hi-Speed Streaming Trace
- Evaluation Boards
  - ARM7, ARM9, & Cortex-M3
  - Luminary, NXP, ST, & Toshiba



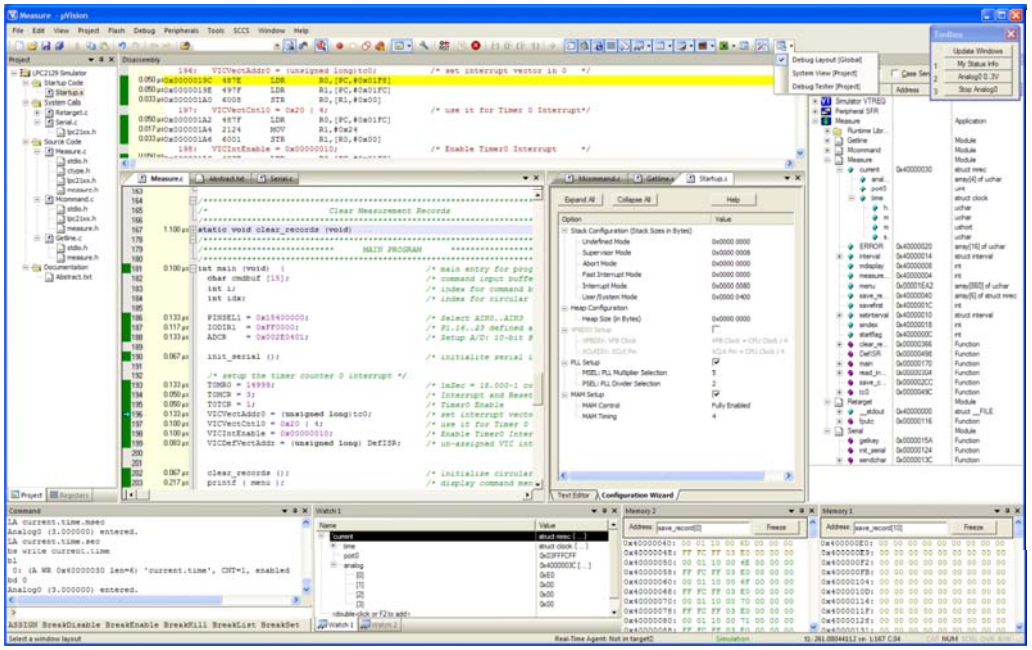
MDK-ARM supports MCUs

- Out-of-the-box support
  - >490 ARM MCUs
  - Start-up code and configuration wizards
  - Flash Algorithms and debug information
  - Examples and Templates
- Complete device simulation
  - Not only a processor simulator!
  - Includes On-Chip peripherals
  - External signals and I/O



µVision4 IDE

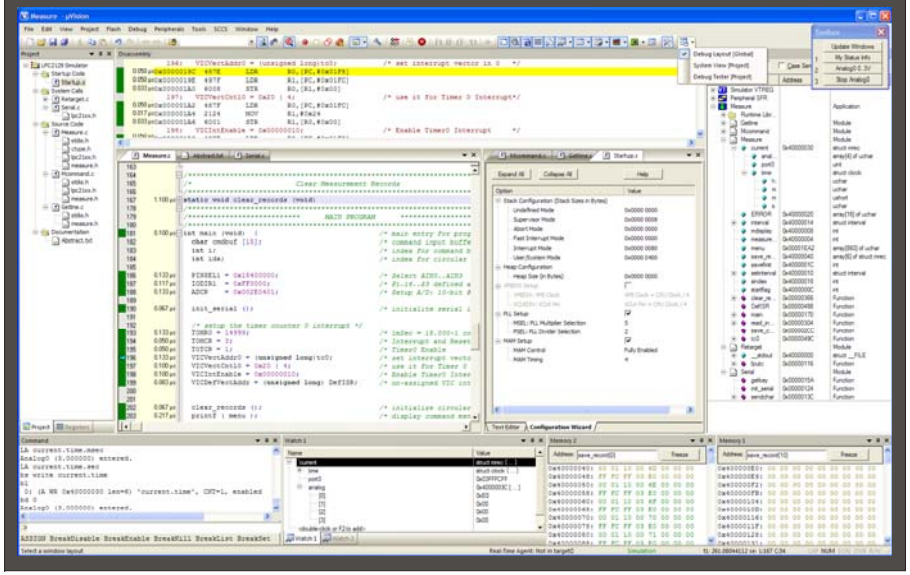
- Industry-leading IDE for MCU and smartcard devices
  - Common to ARM, C166, and 8051 platforms
  - Includes target device configuration and Device Database
  - High speed simulation
    - Instruction Set
    - On-chip peripherals
  - Source code editor
  - Project debugging
  - Flash programming



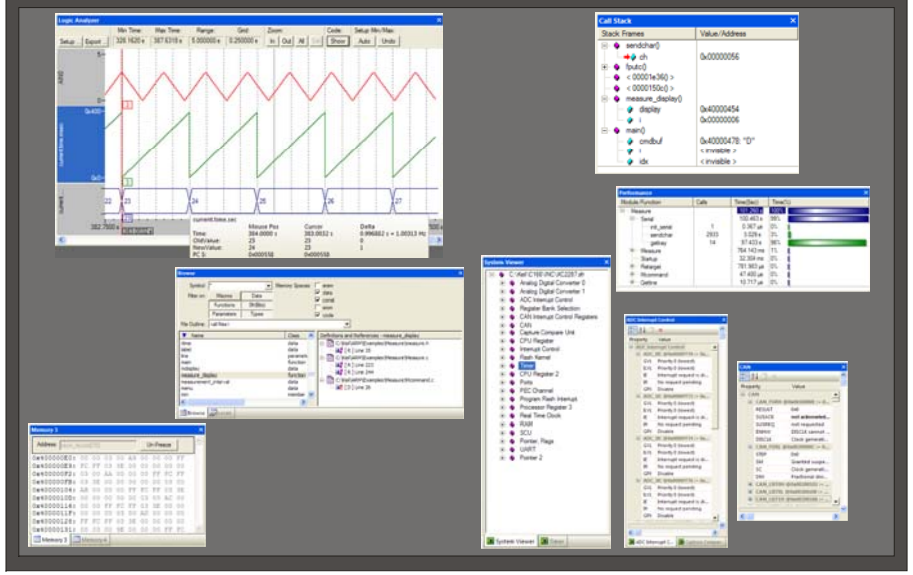
µVision4 IDE and Debugger

- New Features
  - Flexible windows management system
    - Multi-monitor support, docking windows, tabbed groups
  - System Viewer Windows
  - Debug restore views
  - Multi-project workspace

Monitor 1

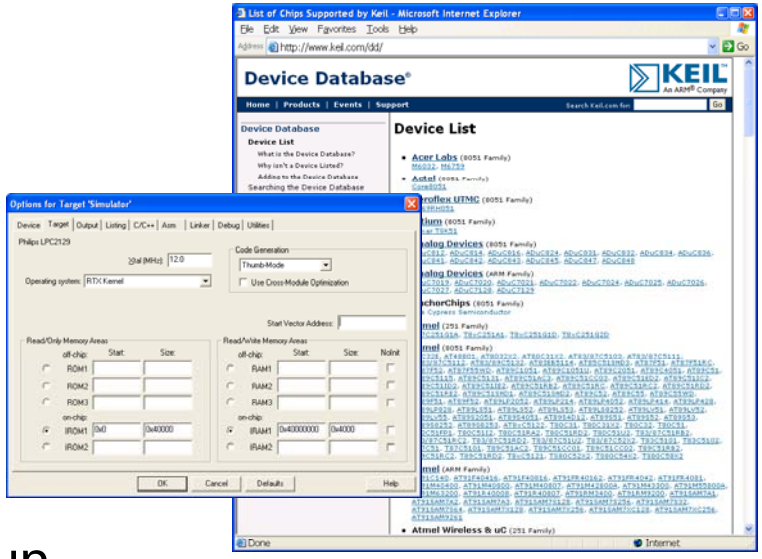


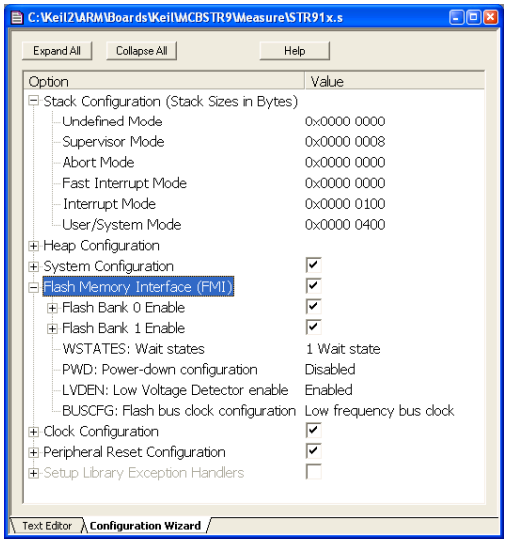
Monitor 2



µVision4 Ease of Use

- Device Database
  - Enables quick selection of device
  - Online with parametric search
  - In µVision for easy project creation
- Device Configuration
  - Available for all devices
  - Effortless device setup for stable start-up
- Examples and Templates
  - Fast out-of-box experience
  - Base for user project
  - BSPs for numerous boards





Microcontroller Development Kit

4 STEPS…

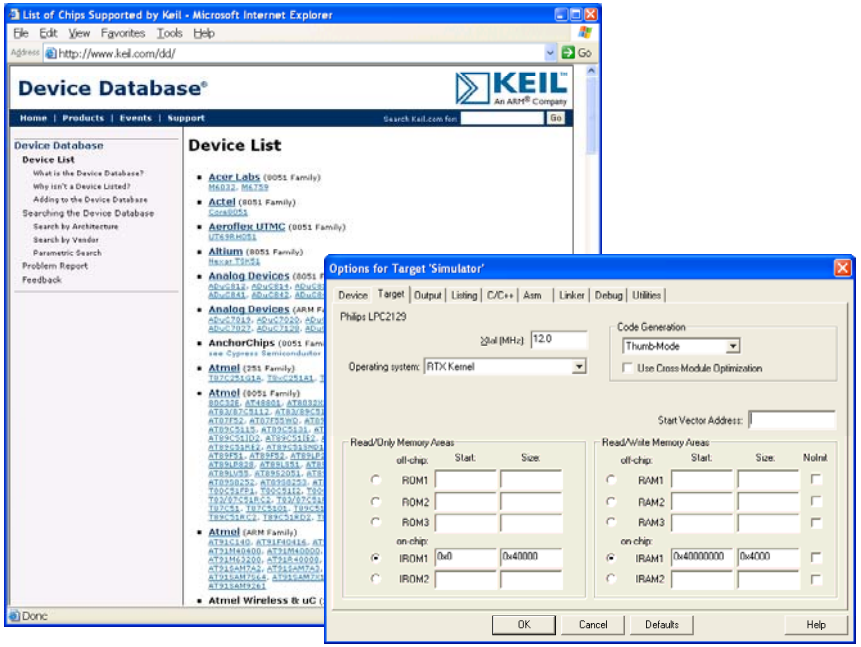
Create Program

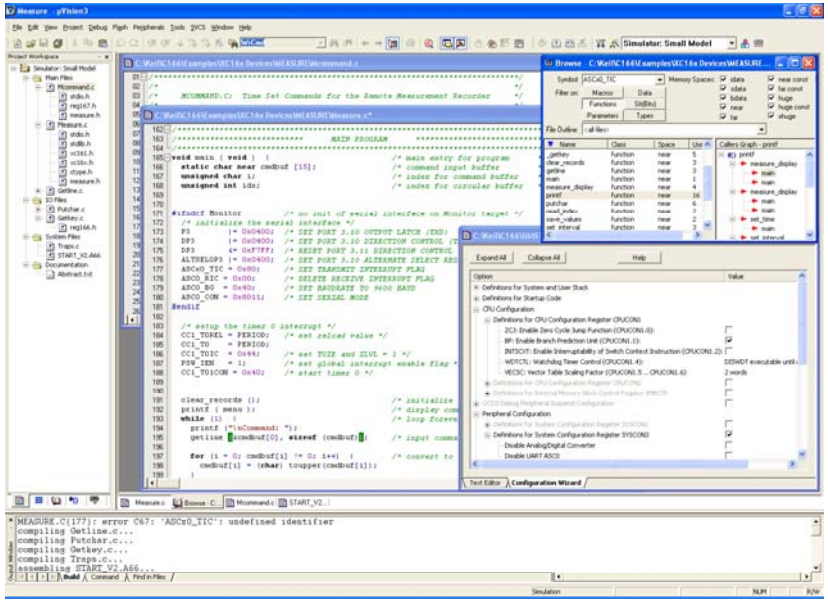
Step 1: Select Device & Specify Target Hardware

Step 2: Configure Device & Create Application Code

Device Database on Web & µVision. simplifies Chip Selection and Setup

µVision includes Project Manager and Editor and Debugger



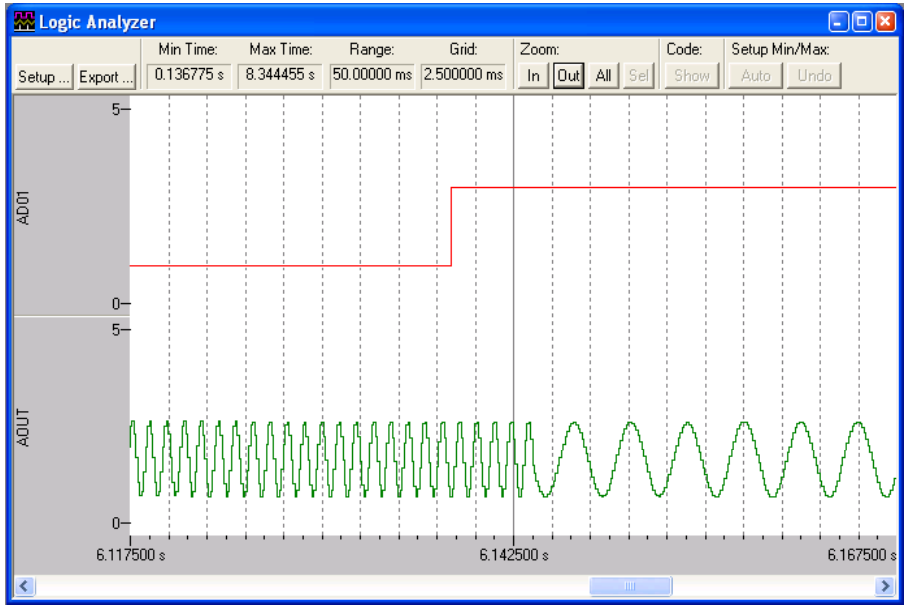


Program Testing

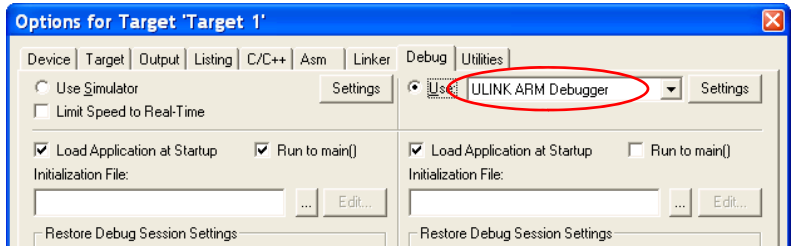
Step 3: Analyze Program with µVision Device Simulation

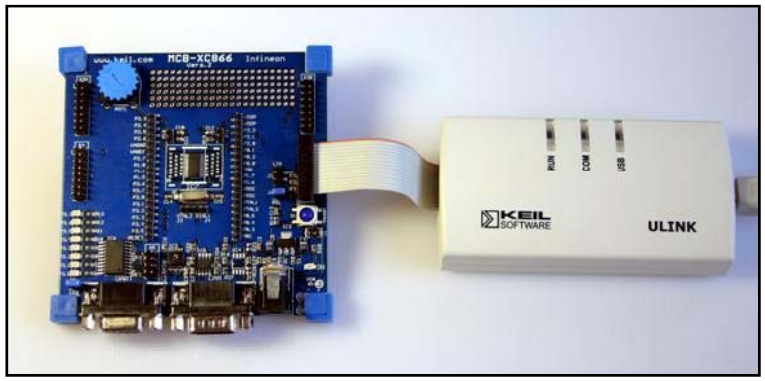
Step 4: Flash Download and Final Testing in Target Hardware

Debugging via µVision Debugger and Device Simulator



Flash Download and Target Debugging via ULINK



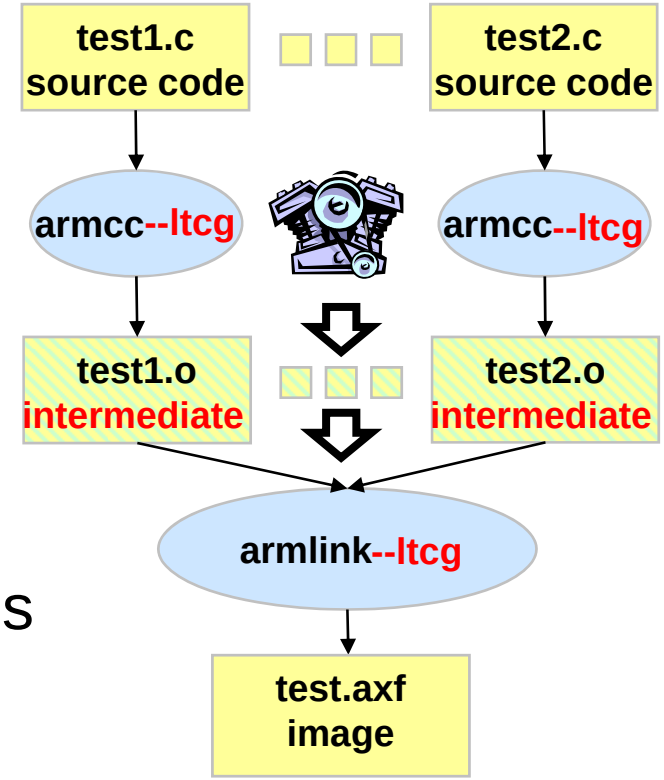


ARM Compilation Tools

- Best-in-class compilation tools
  - Enables applications to run faster
  - Reduces system cost
- The ARM Compilation tools contain:
  - Highly-optimizing ISO C/C++ compiler
  - Supports ARM, Thumb and Thumb2 Instruction sets including FPU
  - Full C and C++ run-time library support
- The ARM Compiler Advantage
  - Smaller, Faster Code

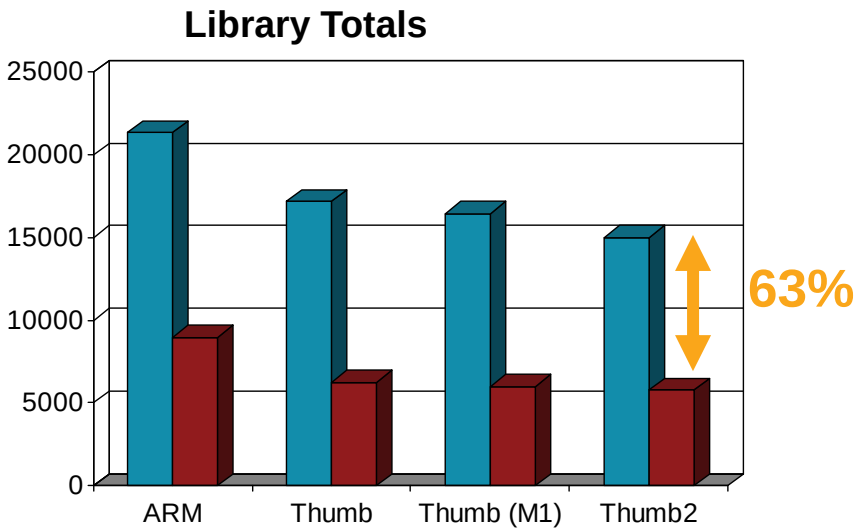
ARM Compilation Tools v4.0

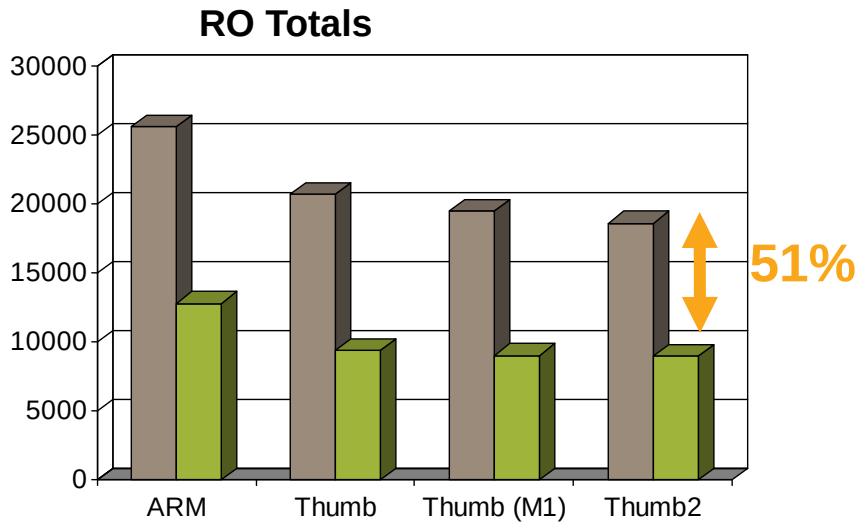
- New link-time code generation
  - Compilation of code at link time
  - Applies optimizations across files
    - In-lining, shared literals, cross-jumping
  - Fits into normal build process
    - Just add --ltcg command line option
  - 5% better code size and performance
- Includes MicroLib optimized C Libraries
  - Superset of standard ARM C Library
  - Optimized for embedded applications
    - Minimal overhead for un-used OS functionality
    - Un-used functions removed from memory footprint
  - Faster system bring-up
    - Most functions initialized at point of use



MicroLib – Optimized for Embedded

- Reduces system code size by 50% to 90%



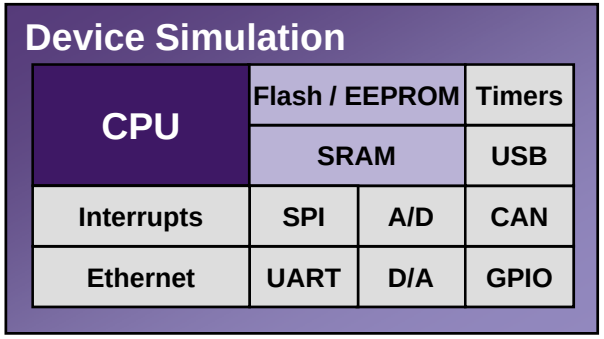


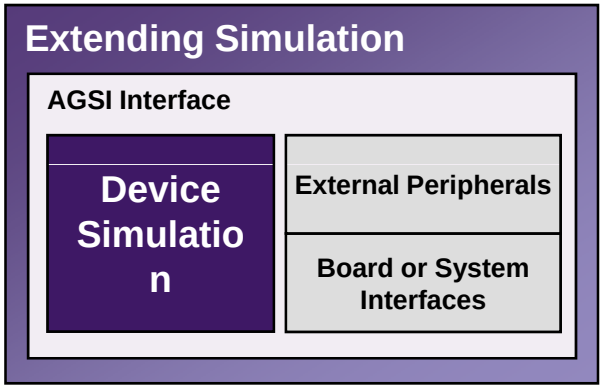
Processor	Object		Standard	MicroLib	% saving
ARM7TDMI	ARM	Library Total	21,352	8,980	61%
		RO Total	25,608	12,816	51%
ARM7TDMI	Thumb	Library Total	17,156	6,244	57%
		RO Total	20,129	9,348	50%
Cortex-M1	Thumb	Library Total	16,452	5,996	64%
		RO Total	19,472	9,016	54%
Cortex-M3	Thumb-2	Library Total	15,018	5,796	63%
		RO Total	18,616	8,976	54%

Based on Dhrystone 2.1 Benchmark

µVision Device Simulation

- All components of target device are simulated
  - Code can be run on entire device
  - Complete simulation of target
- Fast Instruction Set Simulation (ISS)
  - On-chip peripherals
  - ADC, DAC, EBI, Timers
  - UART, CAN, I2C, Interrupts, etc.
  - Includes external signals and I/O
- Dialog Boxes
  - Complete access to peripherals
  - Read and write
- Extension for user defined Hardware
  - Application Note 154 - Implementing DLLs for User-defined Simulation (AGSI)

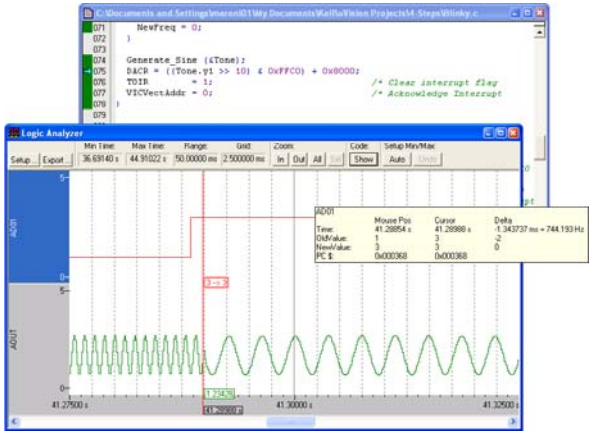


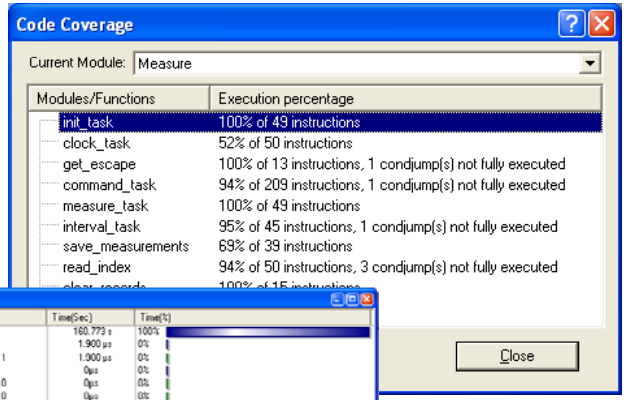


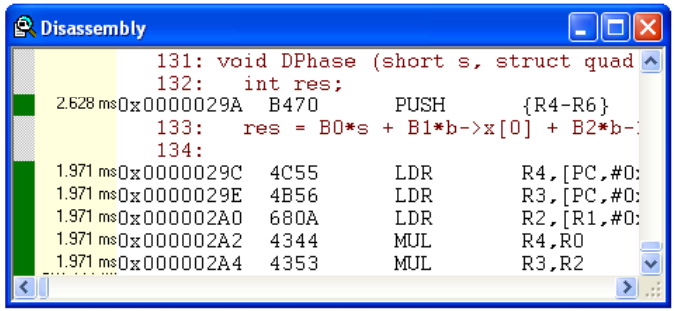
http://www.keil.com/appnotes/docs/apnt_154.asp

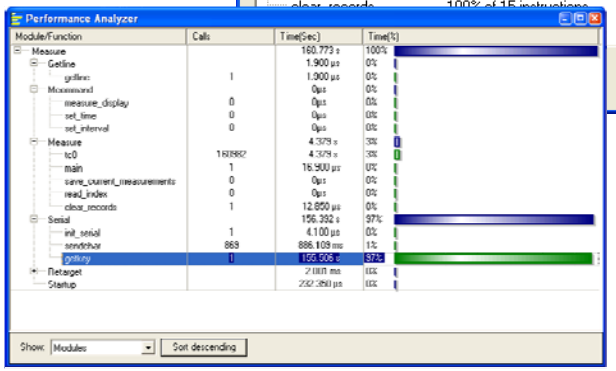
µVision Analysis Tools

- Logic Analyzer
  - Allows signals to be monitored graphically
  - Timing analysis of internal variables & I/O pins
- Code Coverage
  - Execution statistics
  - Color-coded instruction status
- Execution Profiling
  - Detailed timing statistics
  - Determine where most time is spent



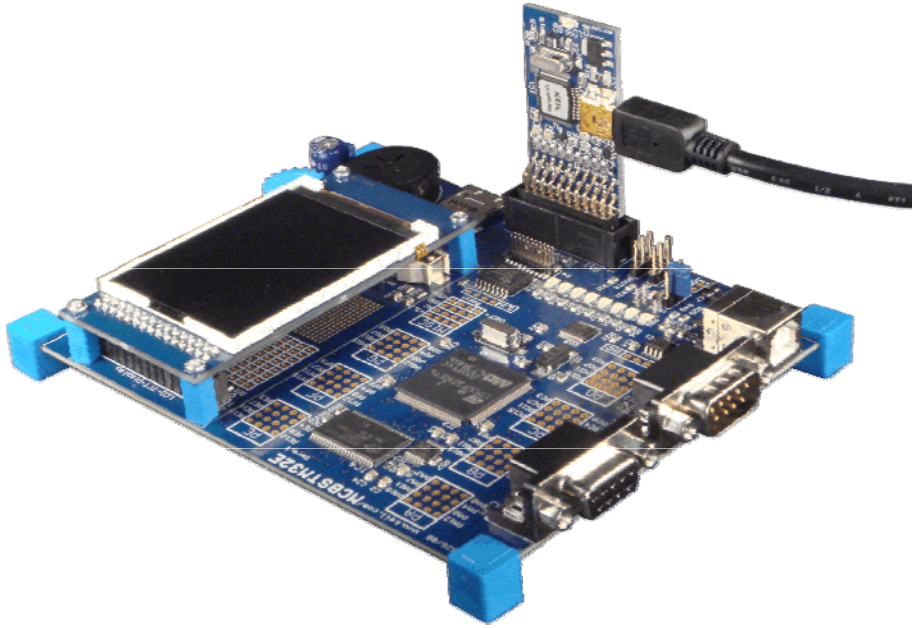






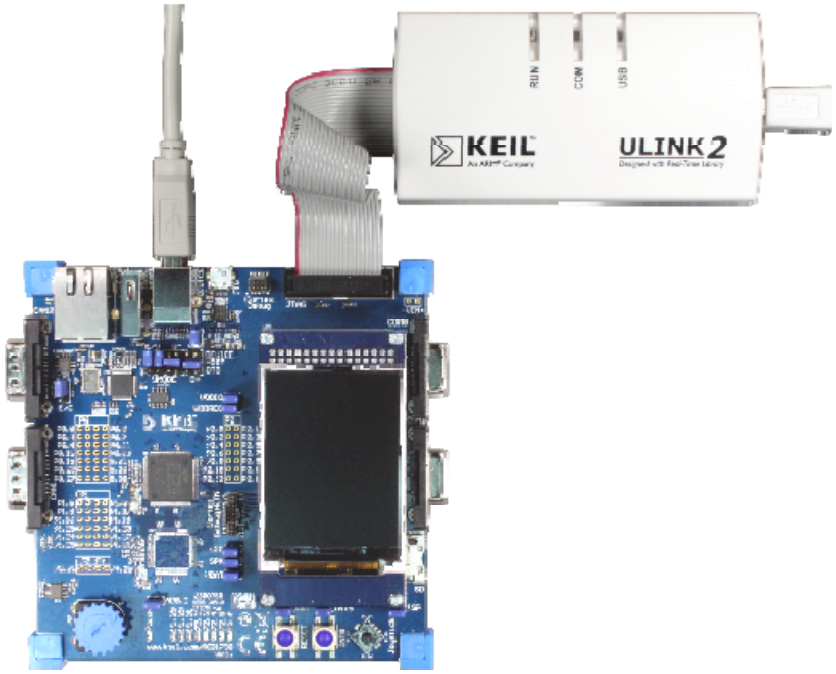
STM32E Starter Kit

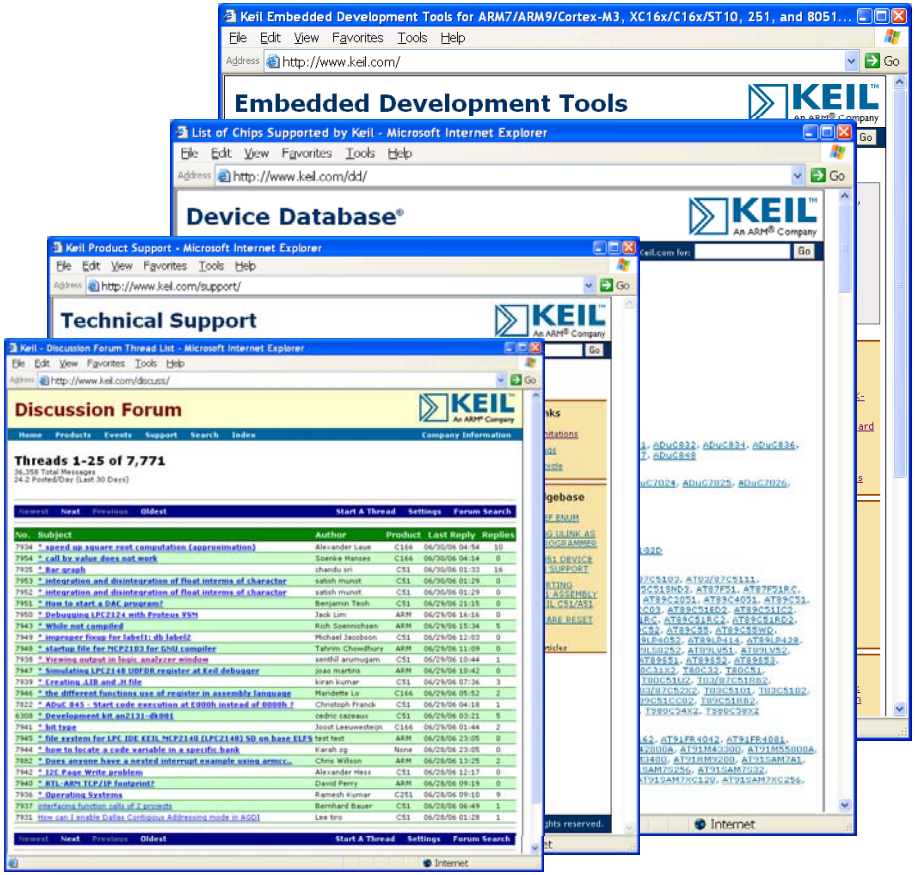
- ST STM32 family
- Features
  - QVGA display
  - Joystick
  - USB device interface
  - Speaker for Analog output
  - External memory
    - 8MB SPI Flash, 1MB RAM
  - ETM instruction trace
  - Serial Wire Viewer
- Includes ULINK-ME adapter
  - MCBSTM32E



MCB1700 Starter Kit

- NXP LPC1700 family
- Features
  - Color QVGA LCD
  - Ethernet 10/100
  - USB Host/OTG
  - CAN and Serial ports
  - Micro SD card interface
  - Speaker for analog output
  - Joystick
- Includes ULINK2 adapter
  - MCB1760U



Get More Information

- Customers use www.keil.com on a daily basis to obtain
  - Program examples
  - Latest technical information
  - Application Notes
  - Program Examples
  - Device Database
  - Support Knowledgebase
  - Discussion Forum