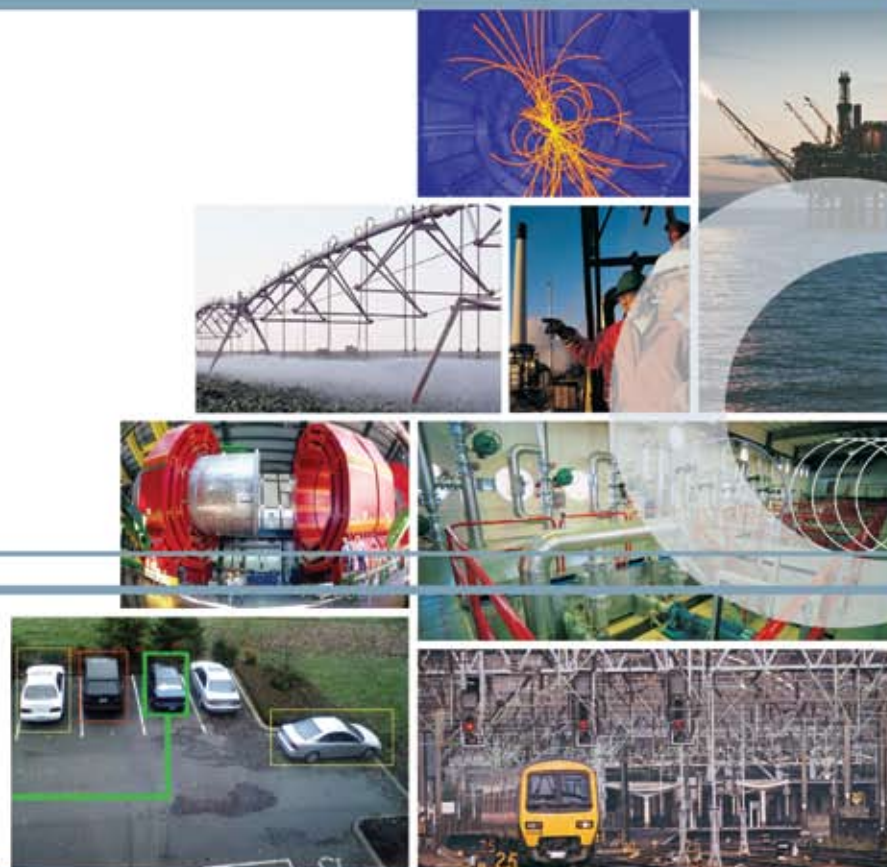


Crossbow Imote2.Builder

Wireless Sensors for Everyone.

Now Develop with Microsoft .net Micro Framework



wireless sensor networks

Crossbow



Imote2.Builder

Wireless Sensors for Everyone.

The Imote2.Builder simplifies and accelerates the design of wireless sensor applications. The developer kit combines two powerful ingredients to create a superior embedded design platform: The Crossbow Imote2 hardware module and the Microsoft® .NET Micro Framework software. Together, they provide developers the industry-leading development experience of Microsoft Visual Studio to create low-power wireless embedded applications.

Imote2.Builder Includes

- 3 Imote2 Modules (**IPR2410CA, pre-programmed with the Microsoft .NET Micro Framework**)
- 2 Imote2 Battery Boards (IBB2400)
- 2 Imote2 Sensor Boards (ITS400CA)
- SDK CD containing both .NET Micro Framework and Crossbow SDKs
- Evaluation copy – Microsoft Visual Studio 2005 CD
(everything required to quickly and seamlessly create robust wireless sensor applications.)

Imote2 Platform

The Crossbow Imote2 platform brings a new level of performance and capability to the processor and radio platform for wireless sensor networks; breaking the computational and memory limitations of current platforms by orders of magnitude and enabling low-power operation for battery-powered sensor network applications.

The Imote2 is aimed at applications involving data-rich computations, where there is a need for both high performance and high bandwidth which require greater processing capability and low-power operation with a low duty cycle to achieve longer battery-life. In applications such as equipment condition monitoring, the Imote2 is capable of performing the complete machine analytics, while using its wireless sensor network strictly for reporting the results of its analysis.

The Imote2 is a modular stackable platform that can be expanded with extension boards to customize the system to a specific application. Through the extension board connectors sensor boards can provide different analog or digital interfaces. The extension board connectors are stackable, enabling a variety of configurations of the Imote2 and additional boards. A battery board is provided to supply system power; alternatively the system can be powered via its integrated USB client interface.



The Crossbow Imote2 Platform Features Include

- Marvell PXA271 XScale® CPU at 13–416MHz
- Wireless MMX DSP coprocessor
- 256kB SRAM, 32MB FLASH, 32MB SDRAM
- Texas Instruments® Chipcon 2420 radio transceiver for 802.15.4-compliant communication in the 2.4GHz ISM band
- Integrated 2.4GHz antenna directly on system board
- Multi-color status indicator LED
- On-board USB client interface with mini-B connector
- Rich set of standard I/O: 3xUART, 2xSPI, I2C, SDIO, GPIOs
- Application specific I/O: I2S, AC97, camera chip interface, JTAG

Crossbow ITS400CA Multi-Sensor Board

The Crossbow multi-sensor board allows developers to start working with actual sensors right from the beginning of the development cycle. It contains digital, calibrated environmental sensors for light, humidity and temperature. In addition, this board features a low noise, digital 3-axis accelerometer which can be used for tilt angle and motion detection. Furthermore, an external connector provides four external 0-3V analog channels with 12-bit resolution and an I2C bus for adding digital sensors. This unique and versatile sensor board plugs into the extension board connectors on the Imote2 platform.



The Multi-sensor Board Features Include

- Dual Temperature and Humidity Sensor (Sensirion SHT15)
- Digital Temperature Sensor (TI TMP175)
- Light Sensor for Visible and IR Light (TAOS TSL2651)
- Three-axes Accelerometer (ST Micro LISL02DQ)
- General Purpose ADC (Maxim MAX1363, 4 x 12-bit channel, 0-3V analog)
- Digital Interface I²C



Microsoft .NET Micro Framework

Microsoft .NET Micro Framework

The Microsoft .NET Micro Framework combines the reliability and efficiency of managed code with the premier development tools of Microsoft Visual Studio to deliver exceptional productivity for developing embedded applications on small devices. The .NET Micro Framework brings a rich, managed-code environment to smaller, less expensive, and more resource-constrained devices. The .NET Micro Framework was built from the ground up to let you build applications using familiar Visual Studio development tools.

With .NET Micro Framework SDK, you can develop your embedded solutions in C# using a subset of the .NET libraries focused on embedded applications. Your development environment is Visual Studio, where you can take advantage of its powerful editing, object browsing, project management, and debugging capabilities. These capabilities are available when using the .NET Micro Framework SDK's extensible device emulation system or on real hardware. The .NET Micro Framework extends Microsoft's offerings for creating embedded systems by providing a managed-code environment focused on small devices. It brings a new level of efficiency and reliability to embedded devices that don't need the advanced capabilities of Windows XP Embedded or Windows CE with the .NET Compact Framework.

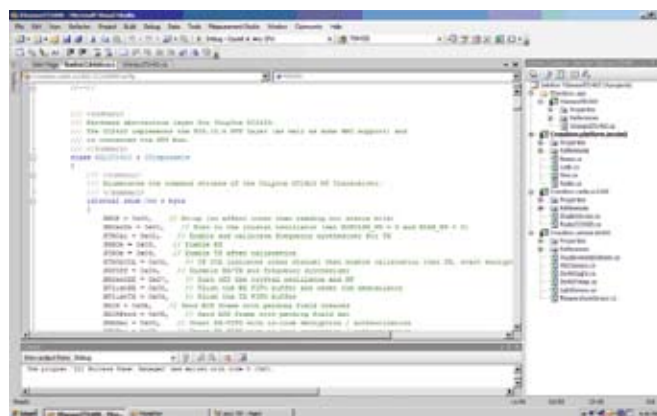
Microsoft .NET Micro Framework SDK

The .NET Micro Framework SDK integrates into the Visual Studio environment, supporting C# development with productivity-boosting features such as on-device debugging, object browsing, and integrated build and deployment. In addition, the Crossbow Imote2.Builder Kit features the following software modules and features, many with full source code:

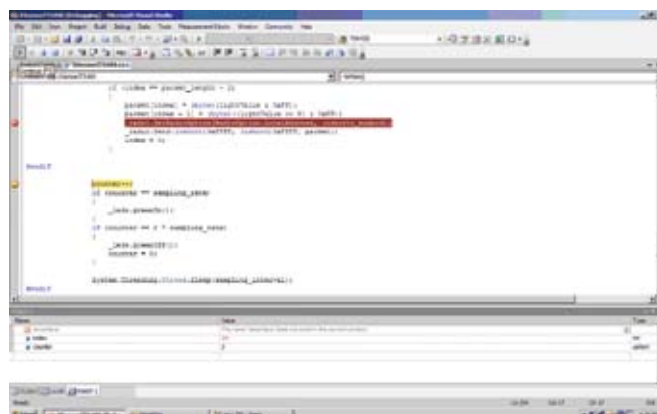
- Drivers for operating all of the sensors and interfaces on the ITS400 multi-sensor board
- Wireless-networking support for a star network topology to enable clusters of Imote2 modules to form a wireless ad-hoc network
- Support for the Imote2 module to serve as a USB-based gateway for pulling rich data from one or clusters of Imote2 modules, via the 802.15.4 radio, into a PC
- Advanced power-management software embedded on the Imote2 to provide consumer-electronics type battery-life via three AAA batteries with appropriate duty cycling of sensor readings
- Sample Imote2 application code for four basic applications, including:
 - Blink**, a "Hello World" application equivalent
 - Send/receive**, for utilizing the wireless communication link between Imote2 modules
 - Sense**, for sampling sensor data with the Imote2 and sending it over-the-air to a PC-based gateway.
 - Accel**, for high-speed sampling of accelerometer data and delivering that data as a real-time stream over radio and USB.
 - Sleep**, a sample application that uses low-power mode to preserve battery-life while sending out periodic sensor data.
- A PC tool for simultaneously visualizing high-speed streaming data from up to three sensors on wirelessly connected Imote2s
- USB drivers for the Imote2 module and locked-down USB boot loader on each module



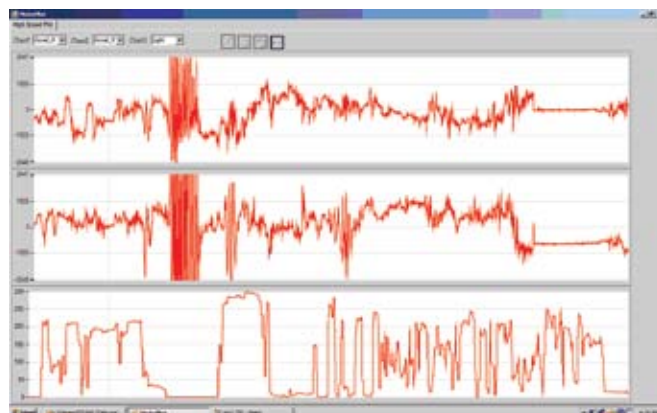
The Imote2.Builder kit includes an evaluation version of Microsoft Visual Studio 2005.



1. Project view of Imote2.Builder showing in this example the hardware abstraction layer for the radio physical layer.



2. Debug view of Imote2.Builder kit, showing ability to perform individual line stepping through code as well as setting breakpoints.



3. Visualization tool for Imote2.Builder kit, showing accelerometer X and Y axes and light sensor in this particular example.



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