MICROCHIP
Academic Program

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Greetings Academics!

Welcome to our second newsletter of 2011. In this edition we have two special announcements that we here at the Academic Program are very excited about.

The first is the launch of Microchip's MPLAB X Integrated Development Environment. Based on the open-source NetBeans platform, our MPLAB X IDE now runs on multiple platforms including Windows® , Mac® and LINUX operating systems. Furthermore, there are some fantastic new features that integrate many existing NetBeans plug-ins. To download simply visit **www.microchip.com/mplab.**

Next is the new chipKIT™ Development Platforms developed and manufactured by Digilent Inc. These platforms introduce 32-bit performance, extended memory and advanced peripherals to the Arduino™ community. Arduino you say? Yes Arduino!! There is now a PIC® MCU solution for Arduino users that is both hardware and software compatible and allows you to use existing code examples, reference materials and much much more. You can visit the chipKIT product pages at **www.microchip.com/chipkit** and **www.digilentinc.com/chipkit.**

For more information on anything Microchip, do not hesitate to contact your Academic team at: **academic@microchip.com.**

As always, visit our Academic Exchange Landing Page at **www.microchip.com/academic** for information on free software tools, general purpose development boards, becoming a Microchip Academic Partner or joining the Microchip community on Facebook, Twitter and YouTube.

Thanks for reading!

Marc McComb, Editor

A New Local Embedded Systems Design Contest for Undergraduate Students

By: Cristian Molder, PhD, Communications and Military Electronic Systems Dept., Military Technical Academy in Bucharest, Romania (www.mta.ro)

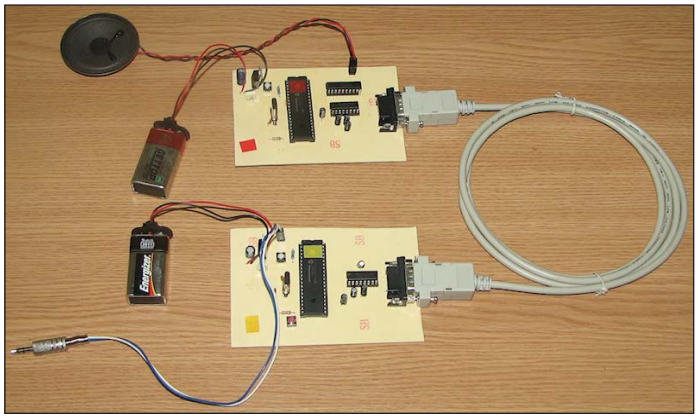
Introduction

The Military Technical Academy in Bucharest is a technical university that trains students to become engineer officers in various domains of electronics and mechanics. At the Communications and Electronic Systems Department, students have the opportunity to learn embedded systems using the Microchip 8-bit family of microcontrollers and are developing communications and mechatronics applications. Moreover, they can subscribe to a robotics club where they can work on robotic projects for their own pleasure or for contests. As the number of students involved in these activities is growing every year, in October 2010 we started a local embedded systems design contest for students who have practical ideas and want to share them with others. Therefore, between October 2010 and February 2011, a few enthusiastic students created individual projects using 8-bit PIC® microcontrollers and peripherals with no imposed subject. All projects were developed using custom-made PCBs. Together with Microchip Technology Romania we evaluated these projects and the results were very encouraging for the future editions of this contest. We'd like to present some of the most interesting ones, in no particular order.

Encrypted Voice Transmission with PIC® MCUs

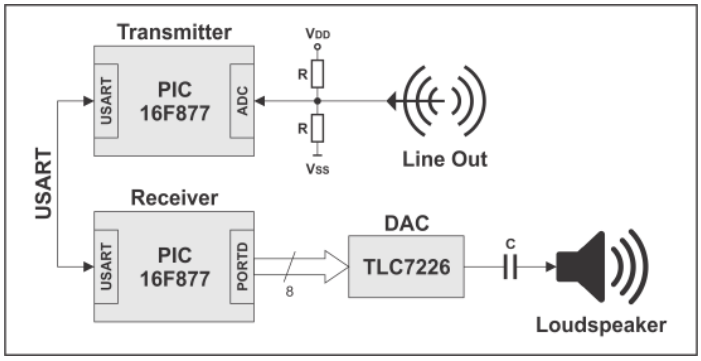
By: Radu Pereteanu (Student)

The project implements a simple voice encryption algorithm that acquires an audio signal from a PC sound board, converts it into a digital signal and encrypts it with a specific algorithm (figure 1). As the audio signal has both positive and negative polarity, a VDD/2 offset must be added prior to the A/D conversion using an R/R resistive divider. Using the internal ADC, the analog signal must be sampled at a sampling frequency of at least 16 kHz as the voice bandwidth is about 8 kHz. Moreover, the sampling frequency must not be too high in order to allow sufficient time for signal processing operations. Therefore, for a PIC16F877 working with the internal clock at 4 MHz, the chosen frequency was Fosc/32=125 kHz. As the ADC module resolution is 10-bit, for fast processing only the first 8 MSB were retained, discarding the last 2 LSB by working only with the ADRESH left justified register.



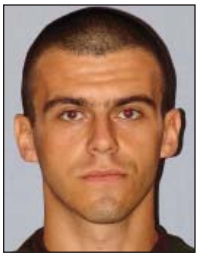
The encryption algorithm is one of the simplest but fastest. During each sampling interrupt, each resulting 8-bit sample is inverted bitwise and sent to the USART module towards the receiving MCU. The USART baud rate must be selected high enough to allow the transmission of each sample under the AD sampling rate. In this case, both USART modules (transmission and reception) work at a baud rate of 28.8 Kbps. The second MCU receives the encrypted bits via USART and send them using an 8-bit digital port to an external parallel input DAC (such as the TLC7226). In order to remove the DC bias from the initial AD conversion, the DAC output is connected to the loudspeaker via a capacitive coupling C.

Figure 1: Encrypted Voice Transmission Block Diagram



Testing reveals clear voice reception in the loudspeaker. Further improvement can be done by implementing more complex encryption algorithms (e.g., 8-cell LFSR) which needs encryption keys and synchronization during transmission. Alternatively, a Microchip MCP4921 DAC can be used with the SPI.

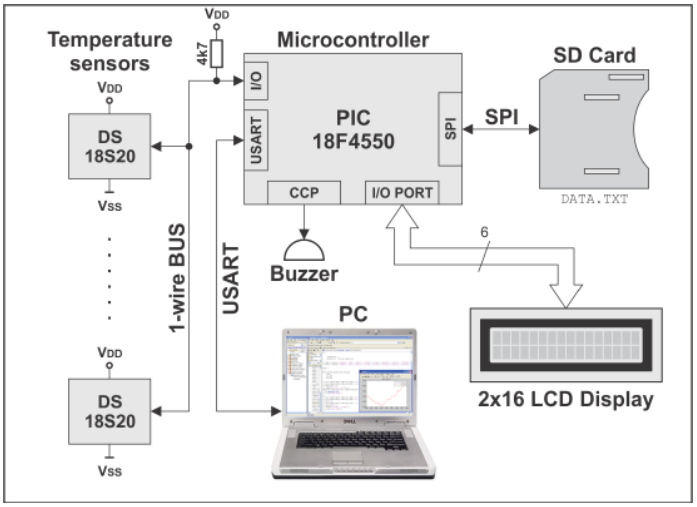
1-wire Temperature Sensor Network
By: Ovidiu Plugariu (Student)



A low-cost temperature monitoring in closed environments such as a chambers or a small depots can be implemented using a sensor network connected using the 1-wire protocol. Such a sensor is the Dallas DS18S20 high-precision 1-wire digital thermometer. Except for the power supply, these sensors require only one wire for communication, being a very cheap solution if no wireless solution required.

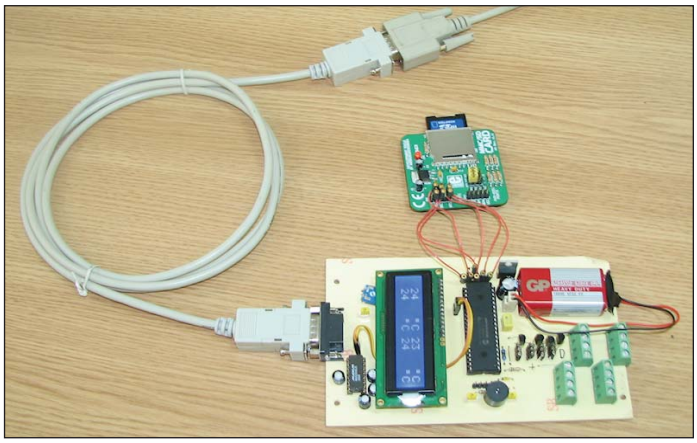
The system includes several DS18S20 temperature sensors connected to a microcontroller using a single bit digital I/O port, an SD card for temperature logging, and a piezoelectric buzzer for temperature alarm trigger. Moreover, the MCU can communicate with a PC via USART in order to display all logged temperature values on PC at user request (figure 2).

Figure 2: Temperature Sensor Net Block Diagram



The 1-wire protocol states that each of the sensors has a 64-bit identification serial number which is stored in a ROM memory. Therefore, each sensor is sequentially interrogated by its own ID. The 1-wire bus requires an external 4k7 weak pull-up resistor as the idle state is high. The sensors can also work without an external power supply. The high bus signal charges an internal capacitor which supplies the device when the bus is low.

The system monitors the temperature by sampling each of the sensors at a preset interval (e.g., every 10 minutes). As periods are created using timers, the MCU can be passed in sleep mode for power saving. If one or more temperatures rise over an alarm value, a PWM signal is sent to the buzzer for alarm signaling. The user can also use a MATLAB GUI in order to instantly access the data saved on the SD card in a suitable text file. The access does not interfere with the system functioning.



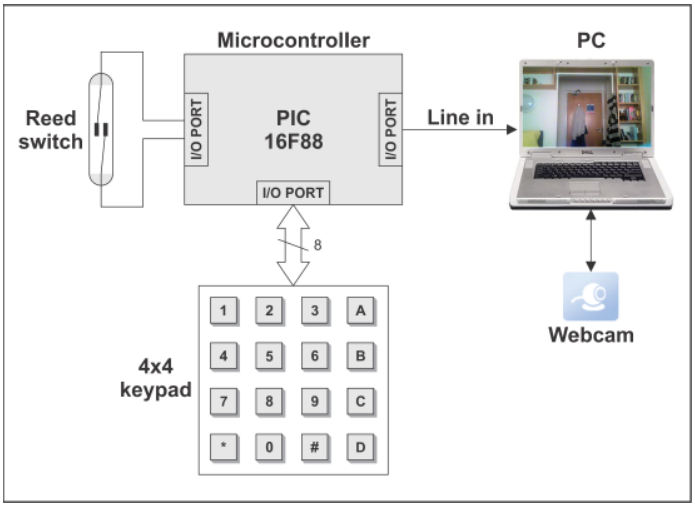
At the beginning of the operation, the MCU initialize a text file ("data.txt") by creating it or deleting all previous content from a previous use. Then, the file remains open in order to append every sampled data. Before the end of operation or before every PC access, the file is closed and, in the last case, reopened if continuous operation is still required. The card can be removed and used on other PCs for data logging. All temperatures are also available on a 2x16 LCD display connected to an I/O port.

The 1-wire bus is connected to the MCU's I/O ports. The serial communication must be configured with 8 data bits, no parity, 1 stop bit and 115,200 bps baud rate for data communications or 9600 bps baud rate for reset and presence detection (see Microchip Application Note AN1199).

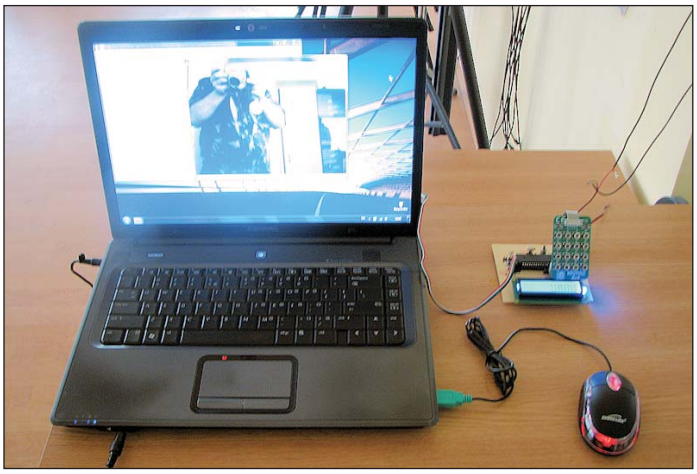
Indoor Alarm System With Video Recording
By: Cătălin-Răzvan Rosu (Student)

Starting with only a low-cost 8-bit microcontroller, a Reed switch with a small magnet, a keypad and a PC with a webcam, a very easy alarm system can be implemented. The system records a video sequence of the area for a predefined duration every time the alarm triggers. The system is very simple and easy to be implemented in every student's room (figure 3).

Figure 3: Indoor Alarm System Block Diagram



A 4x4 keypad is used for used identification. Every time the 4-digit code is wrong or missing, if the door is opened, the magnet mounted on the door opens the Reed switch, which further triggers the MCU to send a digital signal to the PC. As not every PC has RS-232 connectivity, and in order to use a low-cost MCU which is not equipped with USB, the line-in input of the sound card was used to receive a start signal for video recording. The signal can be sent as a simple logical pulse or as a pre-defined pulse code in order to be more robust to noise. All PC software is made using the MATLAB DAQ Toolbox for signal acquisition from the sound card and video recording. The system can alternatively either record a video sequence of fixed length (e.g., 5 seconds) or capture a still picture and save it on the PC.



The Reed switch is one of the simplest variants for door opening sensing, but other solutions can be used, such as a laser barrier or a mechanical contact, depending on the user availability.

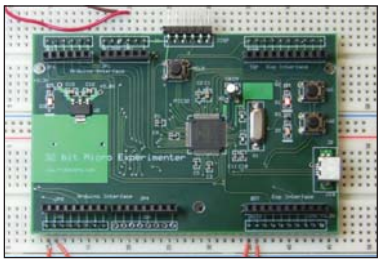
MCU can be powered from two AA batteries (3V) and use power saving features by using an interrupt wake-up from sleep when the door contact opens.

To further reduce the cost of the whole system, a smaller MCU can be used, such as the 12F675. The Reed switch can be connected to I/O ports, while the 4x4 keyboard can be used with an analog input and the internal ADC (see Tip #7 from Microchip Tips 'n Tricks 8-pin Flash PIC Microcontrollers). Therefore, only four I/O pins will be required for the system.

The user can also communicate with the alarm system via a 2x16 LCD display which signals a correct or incorrect code input. This can be optional as the controller must have more I/O ports (such as the PIC16F877) but with a higher cost.

The New 32-bit Micro Experimenter Educational Kit

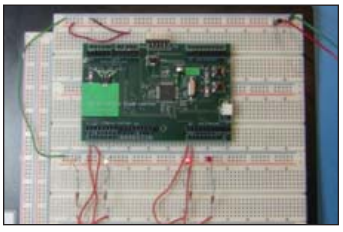
As Featured in Nuts and Volts by Tom Kibalo, Microchip Academic Partner

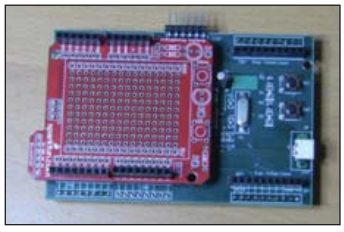


The 32-bit Micro Experimenter is an innovative educational kit solution based upon Microchip's PIC32 microcontroller (MCU). It is the fastest way to learn 32 bit MCUs. The Experimenter was developed by KibaCorp, Inc. (**www.KibaCorp.com**) an Annapolis Maryland based technology company founded by a Microchip Academic Partner. KibaCorp is dedicated to providing innovative training products for the practicing engineer, hobbyist or student. The 32-bit Micro Experimenter (or "Experimenter" for short) is currently offered by Nuts and Volts through their web store at: **http://store.nutsvolts.com.** The Experimenter will be featured in a series of articles in Nuts and Volts Magazine throughout this year. In this series KibaCorp will introduce a whole new level of detailed experiments. Look for embedded web control, use of Real Time Operating Systems (RTOS), USB, speech playback, high speed (100 MHz) Ethernet and high resolution graphics – all of which we have come to expect in today's top end multi-media consumer products.

The Experimenter facilitates prototype exploration and testing of Microchip 32-bit MCUs with other electronics using the convenience of a solder-less bread board environment. In addition to this, the Experimenter also supports an on-board Arduino connection scheme.

Solderless Bread Boarding as well as Vertical Stacking of Adapter Cards





This allows users the opportunity to integrate a number of existing Arduino expansion cards with their Experimenter applications.

Features

- Microchip's new PIC32MX695F512H 80 MHz processor with 512K Flash and 128K RAM.
- Fully accessible 46 programmable I/O and USB
- Free software experiments
- Fully documented step-by-step experiments for USB, embedded web server, graphics, audio, wireless, RTOS and file I/O
- Leverages Microchip's application libraries
- Modular construction accepts plug-in expansion boards (i.e. graphics card, audio board, micro flash, Microchip PICtail™ and 28-pin expansion adapters)
- User push buttons, LEDs and 32 KHz clock crystal
- On board +3.3V DC regulator
- Can be used in Solderless breadboard environment or standalone
- Also supports Arduino compatible interface

Experimenter with Graphics Card Using Microchip Graphics Library

Experimeter Configured for Device USB Configured for CDC, MSD, HID Experiments

Third Party Corner

By: Guy McCarthy, Microchip Third Party Support Manager

In this edition of the Academic Newsletter we feature four of our third party partners: Softlog, Chipino, OpenPicus and Matrix Multimedia. Microchip is pleased to announce that these third party tools are available through our e-commerce site: www.microchipdirect.com.

Softlog Portable Programmers

Softlog has expanded their line of production-quality in-circuit programmers to include two new portable units. The ICP2PORT and ICP2PORT-P service programmers are designed for high-speed field upgrades of embedded applications. Like all Softlog programmers, these units include desirable features such as programmable clock speed (500 KHz to 10 MHz), programmable V_{DD} (2.0V to 5.5V) and Vpp (2.0V to 13.5V), and programmable delay between V_{DD} and V_{PP} (0.1 to 250 ms). The programmers can be powered by batteries (3 AAA), USB, or external power adapter (+9V to +15V, not included).

The portable units include 4 MB of on-board flash memory for non-volatile storage of up to six environments. Three standalone serialization schemes are included, as well as a counter that limits the number of times a hex file can be programmed. Overload protection circuits prevent damage to microcontrollers or the programmer itself in the event of short-circuit or connection to an incorrectly powered device.

All Softlog programmers include a bootloader so the firmware can be upgraded remotely if desired. Firmware upgrades are available for secure programming and PIC32 MCU support. The base model (ICP2PORT) supports all of Microchip's 8-bit MCUs and serial EEPROMs. Model ICP2PORT-P adds support for dsPIC® DSCs and PIC24 MCUs.

Available on microchipDIRECT

Softlog ICP2PORT Production Quality In-Circuit Service Programmer (TPG100009)

Softlog ICP2PORT-P Production Quality In-Circuit Service Programmer (TPG100010)

Chipino Deluxe Starter Kit

Chipino is an electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, students, technicians, engineers and anyone else interested in creating interactive gadgets.

The Chipino base board includes a PIC16F886 MCU, 5V and 3.3V regulators, 16 MHz crystal, reset button and LED indicator. It can be powered from the ICSP™ connector or from an external power supply or 9V battery. I/O headers are designed to accept stackable daughter cards called shields. The Chipino is pin-compatible with Arduino shields.

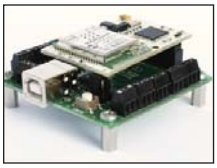
The Chipino Deluxe Starter Kit is perfect for beginners, and includes everything needed to get started programming in C and building simple hardware interfaces. In addition to a fully assembled Chipino board, the kit includes a PICkit 3 programmer/debugger, USB cable, HI-TECH C compiler (by download), MPLAB IDE, the Simple C library by Chuck Hellebuyck, a proto-shield, LED, switch, potentiometer, resistors, wires, sample programs and user manual.

For every Chipino sold, the manufacturer will donate $1 to the American Cancer Society.

Available on microchipDIRECT

Chipino Deluxe Starter Kit (TCHIP001)

Flyport Picus Starter Kit



Imagine using a smart phone web browser to control your next project! The FlyPort Starter Kit is an inexpensive, easy to use platform for developing WiFi-enabled applications. Based on the OpenPicus project from Italy, the kit includes two primary components:

- A FlyPort Picus WiFi module, with PIC24F MCU and WiFi radio module
- A Flyport Carrier Card (aka "Nest"), with USB interface and screw terminals for all Flyport I/O pins

The OpenPicus IDE is available by download, and can import simple or complex websites that include CSS style sheets, Javascript, XML, CGI and AJAX. Imported websites are compressed and integrated into FlyPort projects. The IDE also includes a software framework, which integrates with the Microchip TCP/IP stack and application layer.

The FlyPort Picus WiFi Module (also available separately) sits on top of the Carrier Card to facilitate development. Once an application has been programmed into the PIC24F MCU, the FlyPort can be removed and deployed. Sample applications are available including web servers that report I/O status, temperature and humidity and a network scan application.

Available on microchipDIRECT

FlyPort Picus Starter Kit (TEIK002)

FlyPort Picus WiFi Module (TEIK001)

Flowcode 4 for PIC24 MCUs and dsPIC® DSCs

Flowcode 4 by Matrix Multimedia is an advanced graphical programming language for microcontrollers. Previously available for 8-bit MCUs, a new version has been released that supports PIC24 MCUs and dsPIC® DSCs.

Flowcode supports rapid design of embedded applications using a simple drag and drop user interface. Application logic is created like a flowchart, without writing traditional source code. The application can be tested and debugged in a virtual environment using the included simulator.

When its time to run the tested application on hardware, a single button click generates C code for the application, which is then compiled, assembled, linked and downloaded to your PICkit™ or other compatible programmer automatically. User-supplied C or assembly code is also supported.

Flowcode is shipped with comprehensive documentation that covers all Flowcode functions. Over 30 example files are included with full descriptions. The Student/Home edition has a code size limit of 4K and includes drivers for a wide range of subsystems like LCDs, keypads, 7-segment displays, ADC and PWM. The Professional edition has no code size limit and includes additional drivers for communication protocols including I^2C™, SPI, RS-232, ZigBee® , TCP/IP, etc.

Available on microchipDIRECT

Flowcode 4 for dsPIC and PIC24 Professional Edition (SW500083)

Flowcode 4 for dsPIC and PIC24 Student/Home Edition (SW500082)

Microchip Introduces... Accessory Development Kits for Android™

Microchip's development boards and free software library make it easy to design, develop and debug accessories for Android smartphones and tablets, based on Microchip's 16- and 32-bit PIC® MCUs.

Microchip has announced its Accessory Development Starter Kits for Android™, which enables accessory development for Google's Android platform. Specifically, Android versions 2.3.4 and 3.1 and later include a new framework that allows apps to communicate directly with an accessory connected to a smartphone or tablet, via USB. The kits consist of a development board and a software library, available via free download, which enable the fast and easy development of Android smartphone and tablet accessories based on Microchip's large portfolio of 16-bit and 32-bit PIC® microcontrollers. These microcontrollers feature industry-leading performance, integrated connectivity and eXtreme Low Power technology for the industry's lowest power consumption in both sleep and active modes.

According to the Nielson Company, Android smartphones comprised 40.8% of all smartphone purchases from June to November 2010. This represents a huge potential market for hardware accessories, including automotive, home, fitness/health and business applications. Microchip's starter kits make it easy for designers to quickly design, develop and debug electronics accessories for this large and growing market. In addition to providing the schematics and gerber files for the development boards, the free software library includes a sample application protocol and an abstraction layer, which enables designers to focus on creating the application. The development boards feature a USB connector, an on-board debugger, a programming user interface and standard Arduino connectors, for use with a host of third-party "Shield" expansion daughter cards.

These ground-breaking starter kits help Android accessory designers bring innovative products to market faster. With thousands of potential applications for Android phones and tablets, these kits simplify the entire process for developers to create unique and diverse accessories using Microchips large portfolio of 16- and 32-bit PIC microcontrollers.

Example accessory applications include: automotive (car kits, audio, GPS); home (audio docks, remote controls, data backup); fitness/health (glucose meters, fitness equipment); business (credit-card terminals, projectors).

Availability

Microchip's PIC24F Accessory Development Starter Kit for Android (DM240415) and the PIC32 Accessory Development Starter Kit for Android (DM320412) are expected to be available in the third quarter of 2011.

The software library, which works with both kits, is also available today, via a free download at **www.microchip.com/smartphone.**

Microchip Unveils the New, Open-Source MPLAB® X IDE With Cross-Platform Support for Linux, Mac® and Windows® Operating Systems

At the Embedded Systems Conference in San Jose, Calif., Microchip announced its' next-generation, open-source integrated development environment – the MPLAB® X IDE – with cross-platform support for Linux, Mac OS and Windows operating systems. A host of high-performance features have been added to the new IDE, including the ability to manage multiple projects and tools with simultaneous debugging, an advanced editor, visual call graphs and code completion. And, MPLAB X is unique in the industry with its support for an entire portfolio of 8, 16 and 32-bit microcontrollers – including all 800+ PIC® microcontrollers, dsPIC® digital signal controllers and memory devices.

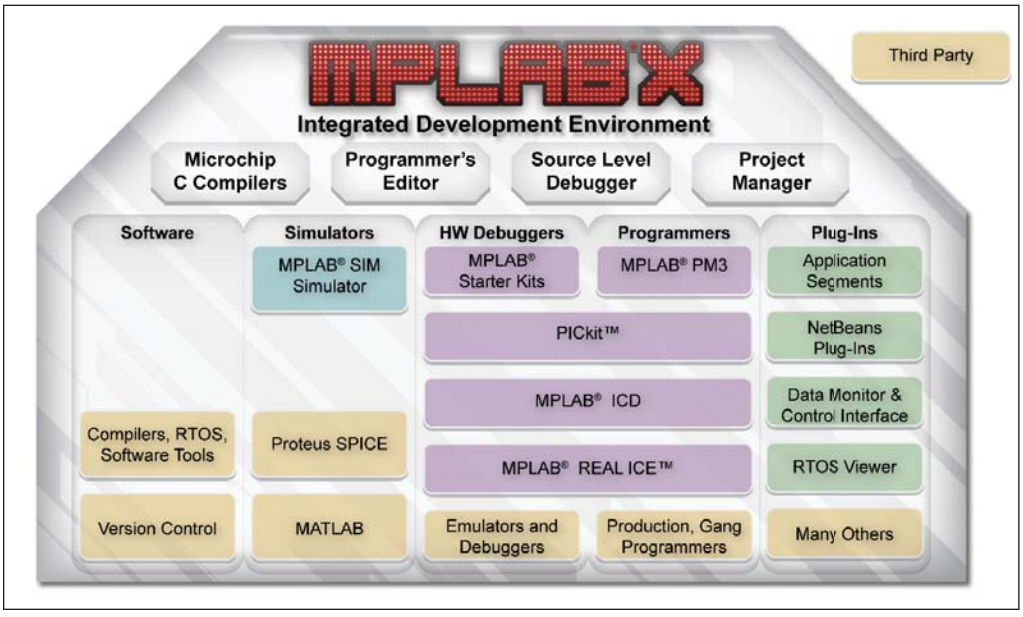
The designers of today's leading-edge embedded applications are demanding an IDE that provides a solid foundation for high performance, user-friendly and flexible development. They also want it to be compatible with a wide range of development tools for a broad and reliable microcontroller portfolio with easy migration, to decrease the learning curve and protect their tool and code investments. MPLAB X provides a single, unified graphical interface for Microchip and third-party tools, including the MPLAB ICD 3, PICkit™ 3 and MPLAB REAL ICE™ debugger/programmers.

By combining the feature-rich MPLAB X IDE with the high-performance and migration-friendly PIC MCU portfolio, Microchip is taking its industry-leading development support to the next level. Now more than ever, Microchip provides embedded designers with the world's most universal, flexible and easy to use microcontroller development platform.

MPLAB X is based on the Oracle Sponsored open-source NetBeans platform, which has an active user community that can contribute a wide range of enhancements and third-party plug-ins. In fact, Microchip customers can take advantage of a host of free NetBeans software components and plug-ins that exist today. Additionally, the NetBeans platform allows MPLAB X users to customize the IDE to suit their individual development needs.

Additional features of the new MPLAB X IDE include:

- Import utility for quick and easy migration of projects from old MPLAB IDE platform
- Code completion and context menus via advanced editor
- Configurable watch window
- Supports multiple compiler versions, simultaneously
- Team collaboration tools for bug tracking and source code control



Click below to view the video.

Download FREE at **www.microchip.com/mplab**

chipKIT™ Platforms Bring MIPS Performance to the Arduino® Community

Microchip's development boards and free software library make it easy to design, develop and debug accessories for Android smartphones and tablets, based on Microchip's 16- and 32-bit PIC® MCUs.

Introduction

On May 23, 2011, Microchip Technology and Digilent Inc. announced the release of two new development boards, the chipKIT Uno32 and the chipKIT Max32. Both of these boards feature Microchip's PIC32 devices that utilize the MIPS M4K 32-bit Core. These two platforms have been developed specifically to introduce 32-bit functionality to a hobbyist/academic community that has exploded over the latter part of the decade centered on an open source prototyping platform called Arduino. This article will provide an overview of this "Arduino movement" and explain how the chipKIT platforms build upon existing solutions. To understand the chipKIT solution, we must first talk about Arduino.

What is Arduino?

The Arduino project began in Ivrea, Italy back in 2005 by founders Massimo Banzi and David Cuartielles. The fundamental concept was to create a package that consisted of both a simple to use programming language in conjunction with very basic hardware based on another prototyping platform called Wiring. Moreover, the philosophy of the project was to ensure that both hardware and software source files would remain open-source and easily accessible by the general public. These would include compiler, libraries and bootloader firmware on the software side, and schematic and other CAD files on the hardware side.

Using a very high level programming language founded in C++, users are able to provide simple commands to develop hardware applications without ever needing to open a datasheet or even know how a microcontroller actually works. User applications developed within the Arduino Integrated Development Environment (IDE) are then downloaded to the selected hardware through a simple bootloader application. This platform does not have debug capabilities so this is essentially a "burn and learn" environment.

Each of the Arduino hardware platforms feature a common footprint for expansion headers that are intended to allow connectivity with a large number of expansion daughter cards called "shields" that have been developed by both the original Arduino team and the community. These shields provide users with the ability to explore different technologies from a common and familiar environment such as motor control, advanced communications such as Ethernet, Wireless connectivity and many more.

The solution quickly became popular with students, hobbyist and even artists. Sales of the Arduino platform continue to grow with a reported 120,000 boards shipped as of February 2010. This has prompted a number of significant distributors including Farnell to create Arduino specific home pages on their websites to meet the increasing demand for these products. Along with the success of the hardware and software, an enormous repository of user submitted/maintained resources including reference materials, code examples, curriculum and much more at **www.arduino.cc.**

The chipKIT™ Solution

Since its inception, the Arduino platform and all of its various hardware boards have been based off of 8-bit Atmel Microcontrollers. However, with the recent release of the chipKIT™ solution, existing users can now take advantage of the power that a 32-bit MIPS-based microcontroller introduces. Microchip enlisted the talents of experienced Arduino IDE developers Mark Sproul and Rick Anderson from the Fair Use Building and Research Labs in Central New Jersey. Mark and Rick spent many months porting software sources files and modifying the existing bootloader within the Arduino IDE so that existing code could be downloaded with no modification onto the PIC32 Microcontrollers populating the boards. In this way, chipKIT platform users are able to fully leverage the vast repository of code examples, reference materials and other resources that were discussed earlier in this article.

For more information or to download software visit: **www.digilentinc.com/chipkit.**
Please visit the chipKIT forums at: **www.chipkit.cc/forums.**

The chipKIT hardware was completely designed and manufactured by Digilent Incorporated, a Microchip Authorized Design Partner for many years (located in Pullman, WA), to be hardware compatible with the existing Arduino boards. Therefore, exiting 3.3V Arduino shields and applications can likely be used with little to no modifications.

Unprecedented Features

Populated with Microchip's PIC32, 32-bit microcontrollers, each chipKIT board brings unprecedented performance, memory expansion and peripheral features to this community for the very first time. These advanced features are further provided at a significant cost reduction to comparable, existing solutions (see Tables 1 and 2).

Table 1: Comparison of chipKIT™ Uno32 with Exisiting Arduino Uno Board (prices shown in USD).

		chipKIT™ Uno32™ (Microchip Solution)	Arduino™ UNO (Existing Solution)
Performance		80 MHz	20 MHz
Core		32-bit	8-bit
Memory	Program	128 KB	32 KB
	RAM	16 KB	2 KB
PERIHPHERALS	PMP/PSP	YES	NO
	RTCC	YES	NO
	Standard Peripheral Highlights	· 16/32-bit Timers · 16/32-bit PWM · 16 ch. 1 Msps 10-bit ADC · 2 x Comparators · 2 x I²C™ · 2 x SPI · 2 X UART (with IrDA® encoder and decoder)	· 8/16-bit Timers · 8-bit PWM · 8 ch. 76.9 ksps 10-bit ADC · 1 x Comparator · 1 x I²C · 1 x SPI · 1 X UART
	Pricing	$26.95	$29.95

Table 2: Comparison of chipKIT™ Max32 with Existing Arduino Mega2560 Board (prices shown in USD).

		chipKIT™ Uno32™ (Microchip Solution)	Arduino™ UNO (Existing Solution)
Performance		80 MHz	20 MHz
Core		32-bit	8-bit
Memory	Program	128 KB	32 KB
	RAM	16 KB	2 KB
PERIHPHERALS	PMP/PSP	YES	NO
	RTCC	YES	NO
	Standard Peripheral Highlights	· 16/32-bit Timers · 16/32-bit PWM · 16 ch. 1 Msps 10-bit ADC · 2 x Comparators · 2 x I²C™ · 2 x SPI · 2 X UART (with IrDA® encoder and decoder)	· 8/16-bit Timers · 8-bit PWM · 8 ch. 76.9 ksps 10-bit ADC · 1 x Comparator · 1 x I²C · 1 x SPI · 1 X UART
	Pricing	$26.95	$29.95

The chipKIT Max32 board features advanced connectivity peripherals, including Ethernet, CAN and USB (Full-Speed Host, Device and OTG). Both the Max32 and Uno32 boards have multiple timers, a 16-channel 1 MSPS Analog-to-Digital Converter (ADC), two comparators, and multiple I²C™, SPI and UART interfaces. Microchip's PIC32 microcontroller is also the highest performance 32-bit microcontroller in its class, featuring the industry-leading MIPS32® M4K® core delivering four times the performance of existing Arduino solutions.

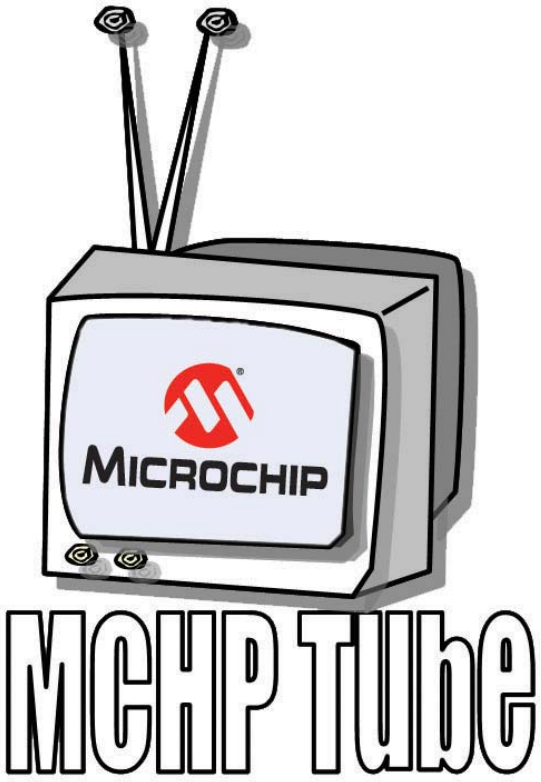
Summary

A tremendous software and hardware engineering effort has been invested to ensure maximum compatibility between the chipKIT platform and existing Arduino shields, applications and courseware. The Arduino programming environment has been modified and extended so that it supports the PIC32-based chipKIT boards, as well as traditional Arduino boards. The Arduino standard libraries have been also been modified to support chipKIT boards and traditional Arduino boards. All of this work has been contributed back to the open-source Arduino community.

Students, educators and hobbyists, with or without electronic-engineering backgrounds are always looking for inexpensive solutions that will enable them to easily integrate electronics into their projects. The chipKIT development platform meet these needs by adhering to the simple to use, open source philosophy of the Arduino community, providing far more performance and functionality than any other Arduino solution at a lower cost.

References:

1. Cuartielles, David (2010-02-17). "Öppnade hårdvaran och skapade Arduino". Metro Teknik: 10. Retrieved 2010-06-20.



Interact with Microchip at"MCHP Tube"

Microchip's Academic Program team has launched a brand new YouTube-based show called "MCHP Tube". MCHP Tube is an online video newscast for all things Microchip with a focus on Academia. Here you'll find the latest information on new products, technologies and software/hardware development tools from both Microchip and Third-party sources.

It will be a monthly show targeting academics worldwide and will be divided into four sections as follows:

Headliners – we will discuss new academic-friendly development resources brought to you by Microchip and our authorized Design Partners.

University Student Project – students can submit a video featuring a student project based on Microchip products.

Ask Microchip – viewers can ask a question and a qualified at Microchip support person will answer it.

Where in the World is Marc McComb? – Marc is Microchip's academic sales engineer and in each edition will talk about new products and tools that are a good fit for academics.

To submit a video on a student project or ask a question for the "Ask Microchip" section, email us at **mchptube@microchip.com.**

You can also visit **www.microchip.com/mchptube** for more information on the show.

MCHP Tube provides the opportunity for Students, Teachers and Professors to interact with Microchip directly!!

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