Welcome to this web seminar, “An Introduction to Microchip Development Tools.”

My name is Darrel Johansen and I’m a manager in the Development Tools group at Microchip.
The centerpiece of our tool set is the software Integrated Development Environment, or “IDE.”

MPLAB IDE has enjoyed many years of evolution, tracking Microchip’s popular catalog of microcontrollers and digital signal controllers.

This presentation will cover these topics:
- A look at MPLAB and its components
- An MPLAB IDE overview
- MPLAB’s hardware components, including MPLAB Starter Kits and Demonstration and Evaluation Kits
- And finally, we attempt to answer the question, “Why use Microchip Tools?”
To reach the largest possible audience, MPLAB IDE runs on 32-bit Windows computers,

… has many hardware and software component tools

… and is free. It can be downloaded from our website.

The components of MPLAB are hardware and software tools that assist in the creation, design, and implementation of embedded systems using Microchip microcontrollers.

The MPLAB Integrated Development Environment can be viewed as a platform for the rest of the Microchip Technology toolset.

Using a singularly straightforward graphical user interface for design, debugging and programming helps you get applications finished FAST.
MPLAB’s Programmer’s Editor is for writing and editing source code.

The editor recognizes C programming constructs and automatically uses different colors to identify comments, labels, and reserved words to help you quickly spot syntax errors.

It has advanced features such as bookmarks, block indent, brace matching, and block comment/uncomment.
The Source Level Debugger drives software or hardware debuggers as your application executes.

The capabilities of the software or hardware debugger may differ slightly among the various debugging tools, but breakpoints, stepping through code, and access to variables and registers are the same.

This provides an easy learning curve when switching from a simulator during early development to an in-circuit emulator when the hardware is functional.
The Project Manager lets you create and associate source files with the compilers, assemblers, librarians, and linkers to build your final application.

All the language tools operate seamlessly when you build a project.

Click on compile or link errors to bring up the source code window in the Programmer's editor on the line with the error so you can quickly fix the problem and rebuild it.

Breakpoints and single stepping through your code uses your original source files, so the Editor, Debugger, and Project Manager work together to help you fine-tune your application.
Software components for MPLAB include both free and for-sale versions of Microchip compilers for PIC microcontrollers and dsPIC digital signal controllers.

These are optimized, ANSI compliant compilers that integrate directly with the Project Manager.

MPLAB IDE provides graphical dialogs to set up memory models, optimizations, and control compiler preferences.
Many Third Party vendors also provide software development tools that can be integrated into MPLAB IDE.

Check our website for a directory of these manufacturers of software and hardware tools.

These tools include real-time operating systems, language compilers and lint checkers.

Third party version control systems are easily integrated into the MPLAB IDE, so all your editing can be done here.

Third party components in this diagram are colored light orange.
MPLAB IDE and Components

MPLAB C Compilers
Compilers, RTOS, SW Tools
Version Control

Simulators
MPLAB SIM

MPLAB IDE includes free simulators for all PIC microcontrollers and dsPIC digital signal controllers.

Simulators are software programs that mimic the operation of the microcontroller, simulating PIC and dsPIC instruction execution, responding to stimulus events on pins or registers, to verify that code is operating as expected.

With a simulator you can test and debug much of your software before the hardware is ready. You can also measure the duration of code execution to help you evaluate and optimize your routines.
A couple of Third Party simulation tools is listed here.

Labcenters Proteus combines fully interactive, mixed-mode SPICE circuit simulation with detailed hardware level models of the PICmicros to simulate and debug complex digital and analog designs.

Device blocks for dsPIC devices allow MathWork’s MATLAB to be used as an additional tool extension.
Hardware debuggers can halt program execution in the application, so you can inspect internal registers and single step through code in a prototype or final hardware.

In-Circuit emulators can measure code execution times, halt on complex series of events to find subtle bugs, and can trace the execution of code as your application executes at full speed, so you can track program flow.

Microchip offers In-circuit emulation with MPLAB REAL ICE.

Programmers are the last link in the chain.

Programmers are used to embed the finished code into the PICmicro or dsPIC so that the target application can run on its own. At that point, the development system tools have finished their work, and you can begin evaluating your application as it operates in its final form, completely separated from the development environment.

Microchip’s top-of-the line programmer is MPLAB PM3.
Combining capabilities of both hardware debuggers and programmers are in-circuit debuggers, or ICDs. These have many of the tools found in more expensive emulation systems, while providing programming features as well.

The low cost PICkit does hardware debugging and programming on a budget. While not as powerful as in-circuit debuggers and emulators, code can be run and halted and registers examined and modified to fine tune an application, and the final circuit can be programmed using Microchip’s In Circuit Serial Programming interface.

MPLAB Starter Kits offer very low cost, easy to use application demonstration with built in hardware debugging and reprogramming facilities.
Third parties also offer emulators and hardware debuggers that work with MPLAB and a wide range of programmers, from large gang programmers, to budget systems for hobbyists.
MPLAB IDE can be expanded with other associated tools to be incorporated on the MPLAB desktop.

Application segment tools such as motor control development, bootloader, a sophisticated data monitor and control interface, RTOS viewers, and other components can be a part of the MPLAB development desktop.
Let's take a quick look at MPLAB IDE.
MPLAB’s desktop looks like many other Windows applications.
Pull-down menus at the top allow access to all the features of MPLAB.
Toolbars provide quick access to the most common functions with easily identifiable icons.

The debug section of the toolbar allows running, stopping, single-stepping and resetting the processor with a simple click of the mouse.
At the bottom of the MPLAB desktop, the status bar displays the current operating debug tool, the processor supported, and important debug information such as the Program Counter, processor flag status at breakpoints, and system clock frequency.
In a typical debugging session, you have immediate view of all the information on your project set up.

You have instant access to all source files in order to edit your code; and while debugging, you can see data and code in your application in various formats to help debug and optimize your design.

Breakpoints and single stepping can be done in source code windows, in machine code views, and in mixed C and assembly views.

Trace buffers record and analyze your code so you can view and track program flow.

Data and Watch windows display selected variables, arrays, and structures from your source code. Current I/O, variables, arrays, structures and register contents are seen at a glance.

The color keyed editor make source code debugging easier. You can set breakpoints with the click of a mouse in your source code, hover the cursor over the name of a variable to see its value, and customize your watch windows to view and modify registers and memory.
Additional Software Tools

- Filter Design for dsPIC
- TCP/IP stack
- dsPICworks
- MATLAB device blocks
- RTOS
- Libraries
- More to come!

Other free tools are available that work in conjunction with MPLAB. These are available for download from our web site. Digital filter design is made easy with our Filter Design package for the dsPIC devices.

A TCP/IP stack is available for connectivity applications

dsPICworks provides a variety of 32-bit floating point or 16-bit fractional signal generators, has powerful arithmetic and digital signal processing tools, such as FFT, convolution and correlation, sample rate conversion and digital filtering. It can display data in a variety of formats, as charts, graphs and with 3 dimensional plots. Files can be imported and exported to MPLAB.

A host of software libraries exist for C and assembly language programming.

And more software is coming. Check our website for the latest information.
We’ve briefly discussed the Project Manager, Programmer’s Editor, Language Tools and Simulator as the major software components of MPLAB IDE.

This section will introduce some of the hardware components.
PICkit 3 is one of our most affordable hardware debug system.

It’s low cost makes it a perfect tool for school labs, hobbyists or developers on a tight budget.

It is USB connected and powered, connects to the target with a simple 2 wire interface, is very low cost, but offers full speed real-time emulation with standard MPLAB debugger functions such as run, halt, single, step and breakpoints. It also can be used as a programmer for most Microchip Flash devices using the In Circuit Serial Programming protocol.
The MPLAB ICD 3 price/performance is a great deal, and can be used to develop for most any application using 8-, 16-, and 32-bit PIC microcontrollers or digital signal controllers.

MPLAB ICD 3 debugs and programs all of Microchip 8-, 16- and 32-bit Flash microcontrollers and digital signal controllers.

It's high-speed USB interconnect provides power to the unit, and robust clock and data line protection. A Test Interface Module is included to verify that all lines are operational.

It has standard MPLAB debugging features, complex breakpoints, plus a stopwatch, and for selected devices, up to one thousand software breakpoints.
MPLAB® REAL ICE™

- Complex breakpoints
- Real time data watchpoints
- Stack/WDT/sleep breakpoints
- Optional high speed (LVDS) interface

MPLAB REAL ICE provides the ultimate solution for hardware debugging.

Providing complex breakpoints, real-time data watch points, trace facilities, and an I/O interface to synchronize with other instrumentation, MPLAB REAL ICE provides features that were traditionally provided only by very expensive hardware.

Its high speed interface can be used where interconnections to the target require long cables and very low noise.
Here is a graph showing Microchip’s hardware debug systems, from the lowest cost PICkit 2 through the PICkit 3, MPLAB ICD 3, and MPLAB REAL ICE. These debuggers provide a continuum of tools for almost any budget. All devices perform basic debug functions, all offer 2-wire programming of devices in-circuit. Features and performance improve as you go from left to right in this chart.
MPLAB Starter Kits offer simple demonstrations and interactive learning for dedicated applications.

These easily hook up to the PC and run interesting demos right out of the box with no programming required.

MPLAB Starter Kits offer built-in debugging and programming, to provide a learning experience for the novice, or to get a professional quickly up to speed with a new technology.
MPLAB Starter Kit Series

- Requires only PC with USB port
- Simple “out of the box” experience
- Helpful tutorials
- Custom MPLAB install and environment
- Integrated debugger and demo
- Low-cost

Each starter kit requires only a USB connection for power and communication, so they are easy to set up.

The demonstration activates immediately upon connection to the PC offering simple “out of the box” use.

Included are tutorials, projects, source code, and a custom version of MPLAB that is automatically loaded with projects to demonstrate the technology.

MPLAB Starter Kits have integrated debugging and programming so that you can single step through the demos to understand the code – you can even modify the code to see what effect it will have on the demonstration. There is no need to buy an additional hardware debugger or programmer for use with the starter kits.

Starter kits are very low-cost, aimed at bringing the technology to you as affordably as possible.
A host of demonstration boards are available for quick prototyping, testing and evaluation.

- PIC MCU
- PIC24 MCU
- dsPIC DSC
- PIC32 MCU
- Connectivity
- Analog and Interface
- Security
- Memory
- Automotive Reference Design
- mTouch

A wide range of Demonstration, Learning, and Proof of Concept PC boards are available to jumpstart an application built around standard hardware. These systems come complete with firmware, source code, schematics, and reference designs that can be used as models for your design, and as a starting point for exploring development with Microchip devices.

These systems usually provide breadboard areas for you to add additional custom circuitry. The firmware can be modified in MPLAB and reprogrammed by MPLAB’s other hardware debugging and programming tools, such as MPLAB ICD 3.
So, in summary we’d like to answer the question, “Why Microchip Tools?”

Microchip has long been noted as having a strong commitment to Development Tools.

Without good tools, embedded systems design can be frustrating. Our tools have these advantages:
Why Microchip Tools?

- High quality: ISO 9000

The Development Systems group is dedicated to high quality.

Our processes are certified to ISO 9000 and are audited yearly to ensure that our quality improvement process is helping us produce and maintain robust tools.
Why Microchip Tools?

- High quality: ISO 9000
- Quick delivery

We have quick delivery.

Order tools through your local distributor, via the internet, or buy on our web site. Most software tools can be downloaded immediately.
Why Microchip Tools?

- High quality: ISO 9000
- Quick delivery
- Free technical support

Microchip has free technical support.

No credit card fees are required for support.

Our staff of corporate application engineers has years of experience with embedded systems designs.

We also maintain web conferences where users can post questions and get help from their peers and Development systems engineers.
Why Microchip Tools?

- High quality: ISO 9000
- Quick delivery
- Free technical support
- Quick “no hassle” replacement

If a tool develops problems, we have a quick turn around service authorization request program.

Our goal is 48 hour turn around.
Why Microchip Tools?

- High quality: ISO 9000
- Quick delivery
- Free technical support
- Quick “no hassle” replacement
- Our tools, our silicon, our issues

Because Microchip makes the tools for our silicon, you are assured that there will be no “finger pointing” when and if there are problems.

The” buck stops here” and we’re dedicated to solve your problems and assist you in getting your design out the door.
Why Microchip Tools?

- High quality: ISO 9000
- Quick delivery
- Free technical support
- Quick “no hassle” replacement
- Our tools, our silicon, our issues
- World class - affordably priced tools

Last, our tools are world class, yet still reasonably priced.
An Introduction to Microchip Development Tools

Why Microchip Tools?

- High quality: ISO 9000
- Quick delivery
- Free technical support
- Quick “no hassle” replacement
- Our tools, our silicon, our issues
- World class - affordably priced tools

Quality * Availability * Support * Service * Value

For quality, availability, support, service, and value, Microchip Development Systems provide a cost effective solution for your embedded design projects.
If you haven’t already done it, now is the time to get started with MPLAB IDE.

Simply go to our web site at www.microchip.com/mplab to download your free copy of MPLAB software.

This is the end of our presentation.

Thank you for your time.