

Cloudy with chances of microcontrollers

Lucio Di Jasio, Microchip Technology

Embedded control developers now have a new cloud-based tool which includes a huge number of supported devices as well as integration with rapid development tools. It will be exciting to see how the embedded community uses it and how embedded control will change in the era of the cloud.

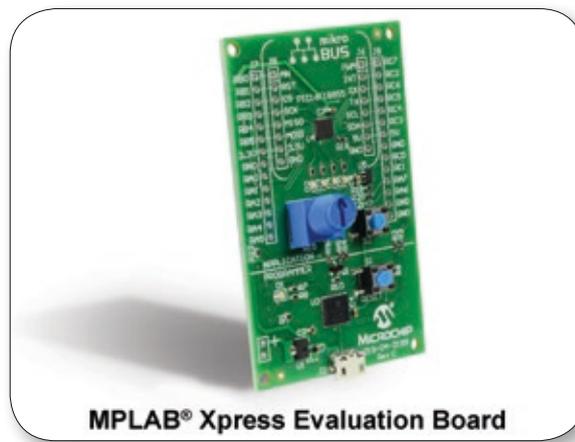


Figure 1. MPLAB Xpress evaluation board

■ In the past few years, several integrated development environments (IDEs) have moved to or been created first in the cloud. But while this was perhaps natural for web application development (using Javascript, HTML, CSS, PHP...) and later for more general computing (Java, Python, Ruby...), the embedded development industry has been lagging behind. Perhaps this is because of the target system in embedded applications being intrinsically more physical, or perhaps it is because of the excessive hype surrounding the term cloud, but anyway developers have been greeting cloud product announcements with either apparent indifference or cautious scepticism. These reactions come from two opposing points of view. There is a generation that is entering the workforce today that has lived its entire life connected. For them being online is part of the natural order of things. Vice versa, a service or tool that is not available around the clock, everywhere and from any computing platform, represents an anomaly.

The other perspective comes from a more pragmatic group, perhaps still representing the majority, that is wondering what kind of benefits could be had by moving the development environment to the browser. They have many concerns about security and performance and they need proof and reassurance before they can accept any such new technol-

ogy. For this group the greatest motivation could actually come from the realisation that modern IDEs have grown to become very powerful but also very large and complex objects. They need frequent updates and careful maintenance.

For example MPLAB Xpress - which is based on the Netbeans open-source IDE project - covers thousands of different microcontroller models and is updated on a monthly cycle, requiring a download of approximately 400 Mbyte. The C compilers that plug into it - MPLAB XC compiler suite - have a less frequent cycle but require approximately 100 Mbyte on top of that. Adding a few more plug-ins can quickly take the tally beyond the half-gigabyte quota.

On top of that is the time spent to perform the actual installations and general maintenance. Anyone who runs a small lab in an educational environment or supports a team of professional developers knows how much work is required to keep it all up to date and in good shape. In such environments there are also great concerns about the permissions management required to install applications on shared computing equipment. When adopting a cloud-based tool-chain, all that work turns into a simple online login. Instantaneously, the most up-to-date revision of each compo-

nent of the tool-chain - or a selected archived one - becomes available to the user inside a browser. But being online can add a totally new dimension to the embedded development experience. Once an IDE is virtualised, projects can move quickly from workstation to workstation and work started in one office or class can move to any new (work) location. Sharing and communicating among close or geographically dispersed teams becomes more natural in addition to being easier to set up and maintain.

With the recent launch of the cloud-based MPLAB Xpress IDE, Microchip has given a strong signal to the embedded development community. While perhaps not the first to offer editors and compilers in the cloud, the new web based tool-chain is perhaps the most complete from a hardware and software support point of view. In fact, from the get-go it includes support for around 400 microcontroller models and is claimed to be soon expanding to cover the entire portfolio of 8-, 16- and 32-bit products, potentially including more than 1000 unique devices.

As per the software debugging capabilities offered, the list includes support for online simulation but also direct access to in-circuit debuggers and programmers. Most importantly the long list includes a novel rapid

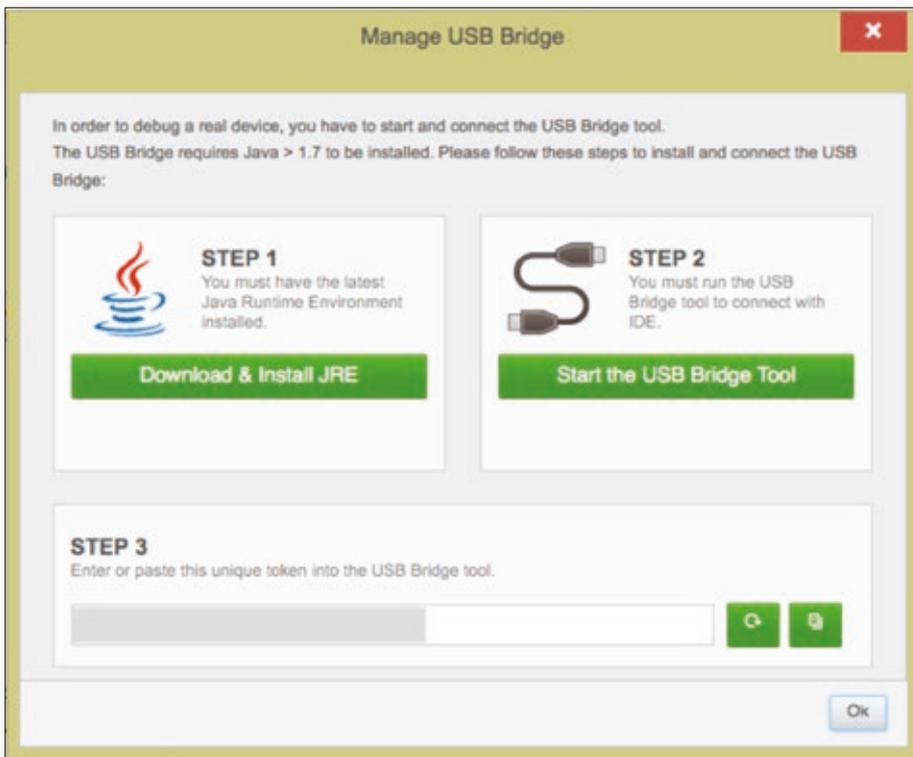


Figure 2. MPLAB Xpress

development tool named MPLAB Code Configurator, which lets expert and novice designers save the many long hours spent studying the device (datasheet) and/or its peripheral libraries (API reference) documentation and focus more on the creative part of their applications.

The important consequence of making a complete development environment accessible through a simple web login is that effectively what used to be a tall barrier of entry has been flattened to the ground. There is virtually no commitment required to give a new micro-

controller a try. Even the actual act of logging in is spared to those that choose to take the system for a quick and practically anonymous test-drive! Testing a new feature, be it a microcontroller peripheral or a new rapid prototyping software tool, is only a few mouse clicks away.

However, MPLAB Xpress is not a toy or a beginner's-only tool. Both the user interface and the underlying tools have been made to look and behave exactly like the real desktop equivalent – the two are often indistinguishable. This means there won't be a second

learning curve if or when the user decides to graduate from the cloud to the desktop. In fact, the cloud tool is equal in capabilities to its desktop alter ego and a project transition between the two is not only possible but seamless.

When thinking about a development environment that requires constant presence online, many will be immediately worrying about the speed and bandwidth and resulting cost of the connection. But most modern cloud tools are based on AJAX technology. That means they make the most use of the browser ability to run code locally – asynchronously and using Javascript, hence the A and J part of the acronym – so the application (AX) can be very responsive and does not require every single keystroke to be sent up to a server on the other side of the planet. File transfers do occur, but only when a file is saved or opened for editing. These are typically small text files (.c, .h, .hex) that are easily surpassed in number and size by the average images and ads loaded by a browser when accessing any modern website. When compiling the application code instead, the server is working entirely on the local copies and the process is surprisingly fast. In fact, in the daily experience it is common to observe how the cloud compiler can regularly outperform a laptop, the more so as the project complexity and size increases.

The concerns about security of cloud applications are a very delicate subject. Large corporations are spending enormous amounts of money in advertising to convince us all that data – or code in this case – are perfectly safe once in the cloud. The best arguments so far from the two opposite sides go more or less like this. Doubters: if there is sufficient value or motivation, attackers will eventually find a

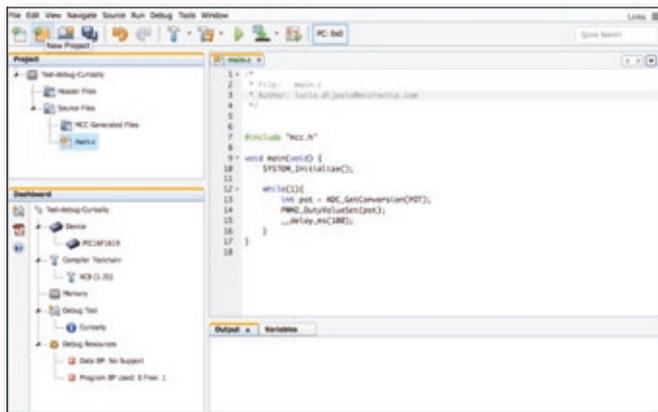


Figure 3. A USB bridge to standard Microchip programmers and debuggers

way in. This is a rule that is generally true for all things, and includes any private corporation code vault too. Believers: companies that provide cloud services are also very motivated and in the best position to put very specialised resources – human and equipment – to work to keep the data secure. These are probably far superior to the resources that the average business organisation IT department can afford.

MPLAB Xpress adopts advanced encryption technology – the same used by the best online banking systems – to protect connections and each user’s sensitive data and applications. In the end, in the coming years each of us will be exposed to this technological dilemma and we

will have to make the choice whether the risks will be greater than the benefits offered by a multitude of new cloud services.

The MPLAB Simulator has been included in the online tool-chain providing basic debugging capabilities, but most users will want to use hardware prototyping and debugging tools. Various paths are available. For example, the MPLAB Xpress evaluation board offers the latest PIC16F18855 general-pur-pose microcontroller that sports what is per-haps the largest selection of core independent peripherals to date. The evaluation board connects to a host PC, Mac or Linux computer as a USB mass storage device and allows the user to simply drag and drop an application execut-

able (.hex) file to programme the target. This has the advantage of not requiring any driver installation. The board also automatically registers with the host computer as a virtual serial port (USB-CDC) allowing any terminal programme to connect directly to the target PIC microcontroller UART. Windows users will need to install a small (.inf) file to enable this feature the first time; Linux and Mac users get a free pass instead. A USB bridge, launched as a Java plug-in, can be used to connect to Microchip universal hardware programmers and debuggers such as the PICKit3 or the PICDEM Curiosity. This option opens the door to the entire set of Microchip and third party demonstration boards and of course any user custom board. ■

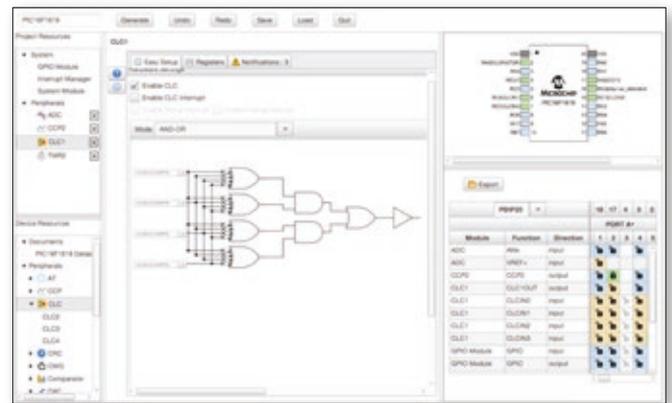


Figure 4. MPLAB Code Configurator 3.0 in the cloud