Streamlining new designs and expanding design possibilities

By Conrad Electronic

The latest embedded microcontroller design solutions and tools are not only helping to accelerate innovative embedded designs, but are also creating new ways for creative ideas to become marketable end products.

Making design tool technology more intuitive delivers immediate benefits to established companies by reducing new product development cycles and allowing the efficient delivery of end-products. It also enables inventors and design engineers who are less familiar with the fundamentals and benefits of the latest technology to work effectively and provides them with a shorter path from abstract idea to tangible product. Today’s electronics industry must take advantage of tools to aid both efficiency and speed if it is to maintain a high-pace of technological progress.

Enablement ecosystems supporting microcontroller development are achieving significant advances in terms of simplifying design and lowering barriers that prevent projects from starting, such as the cost of tools, the need for low-level software such as the BSP and sample code, and building a suitable prototype board. As today’s microcontroller vendors must compete strongly to encourage design starts, a growing variety of general-purpose and application-specific evaluation and development kits are becoming available at prices as low as €20- or even less.

To realise the new generation of kits, some semiconductor vendors have collaborated with established tools vendors. STMicroelectronics, for example, worked with Hitex to introduce its ComStick evaluation kits for exploring the networking capabilities of microcontrollers such as the STM32 or STR9 families. The ComStick contains a complete microcontroller board in a USB-stick form factor, and comes with software support including a Hitex IDE for debugging and programming, a C compiler, a web-server application for embedded networking, and evaluation programs.

Alternatively, ST’s Discovery Kits provide access to more of the features and capabilities of STM32 microcontrollers based on the ARM® Cortex™-M0, M3 or M4 core. The boards can be USB powered or connected to an external supply, and contain the microcontroller, indicator LEDs, pushbuttons, and an extension header for adding extra components and modules such as proprietary application-specific hardware. The STM32F3 Discovery Kit for Cortex-M4 devices, for example, costs less than €20 and also features on-board MEMS motion sensors.

Atmel AT90USBKEY
The Atmel AT90USBKEY is another example of a low-cost USB-connected development kit that allows developers to run programs on Atmel’s 8-bit AVR series or AT90USB microcontrollers. Atmel also provides the low-cost AVR Dragon kit, which allows full emulation in real time of the digital and analogue peripherals integrated in sub-32KB versions of the MEGA-AVR and TINY-AVR microcontrollers. The kit is capable of programming any MEGA-AVR or TINY-AVR device.

Some low-cost or free IDEs are also offering enhanced features that help simplify and speed-up development. Microchip’s latest MPLAB® X IDE, for developing with PIC® microcontrollers, is an example. The latest version is based on an open-source platform, whereas the earlier MPLAB versions were developed fully in house. This allows Microchip to extend and update the tool more quickly than before, to respond to user requirements and add extra features. MPLAB X also provides optional one-click operation for building the application, connecting to hardware, programming the target and opening a debug session or running the application. The MPLAB IDE can be downloaded free of charge, and is provided with Microchip development tools such as the PICkit express debugger.

**Microchip’s latest integrated environment for developing with PIC microcontrollers**

For applications requiring performance or connectivity comparable to that of a desktop PC, but significantly lower power consumption and cost, the Raspberry Pi is perhaps the most highly publicised platform to have emerged recently. Although conceived with an educational goal to encourage younger users to engage actively and practice programming computers, as home PCs have become expensive, complex and not disposed to experimentation, the low-cost board has been adopted enthusiastically by many other developers. It is proving an economical and effective computing platform for various applications such as low-power productivity devices, interactive museum exhibits, or basic robots.

The principle driving the Raspberry Pi project, and the emergence of similar platforms such as the BeagleBoard Foundation’s BeagleBoard series based on TI processors containing the ARM Cortex-A8 applications processor, is to ensure the accessibility of programmable computers. This can help people to quickly acquire the skills they need and motivate them to develop their ideas into fulfilling solutions or even marketable products.
The Arduino platform is another initiative that brings together easy-to-use hardware and software for microcontroller-based applications, and offers value to professional developer communities. Arduino is designed with interactive applications in mind, as boards come with integrated sensors and are able to control devices such as lights or motors. The boards are open-source and extensible, based on Atmel’s ATMEGA8 and ATMEGA168 microcontrollers, and even offer the opportunity for hand assembly to help minimise costs for developers. Cross-platform flexibility allows use of a variety of operating systems such as Windows, Linux or Mac OS X. Care has also been taken to ensure that the Arduino software environment is easy to use for beginners while also allowing flexibility for more advanced users. The language can be expanded using C++ libraries and, because it is based on the AVR C language, users are free to work in AVR C or indeed to add existing AVR C code directly in Arduino programs.

Arduino is designed with interactive applications in mind

These are just a few of the latest generation of platforms now helping to sweep away the traditional model for embedded development; a model that has prevented countless promising ideas and projects from getting off the ground, particularly those conceived by individuals without the training or facilities to produce their own hardware. Getting rid of such restrictions now means the global electronics industry can benefit from the ideas of a much larger pool of creative minds. The role of distributors such as Conrad will be to maximise access to the latest enablement solutions and support customers to identify the best platforms to meet their objectives.