Analog and Digital Discovery Tools Address the Demands of Professional Engineers

In the not-so-distant past, electronic products and systems were primarily created by medium to large design houses, which could afford to have dedicated teams for analog design, digital design, and test and verification. Furthermore, these companies could afford to equip their teams with a cornucopia of expensive design and verification tools.

Oftentimes, there were special tools dedicated to certain tasks. In the case of the analog domain, for example, one tool would be used to generate arbitrary waveform functions while another would act as an oscilloscope, a third would function as a spectrum analyzer, and so forth. Similarly, in the digital realm, one tool might be used to generate digital logic test patterns, while another would act as a logic analyzer. Design and test engineers from both disciplines would also require access to variable power supplies.

Things have changed. For example, many of today's systems are significantly more complex than their predecessors, including the fact that they may boast various buses, networks, and protocols (e.g., SPI, I^2C, UART, CAN, parallel). Furthermore, the widespread proliferation of embedded systems and the ubiquity of the Internet of Things (IoT) has led to the emergence of countless small companies entering the field. In many cases, teams comprising only a couple of engineers are envisaging and developing state-of-the-art products that could have dramatic effects on industry and society. However, this means the same engineers have to span multiple engineering disciplines. It also means that, in many cases, they are resource limited and not in a position to spend tens or hundreds of thousands of dollars on design and test equipment.

Fortunately, there is a solution. Tools that were originally targeted at engineering students and educational facilities, hobbyists, enthusiasts, and makers have evolved into accurate, dependable, and reliable devices that can handle the demands of professional engineers. In this whitepaper, two such tools will be introduced—Digilent's multi-function Analog Discovery and Digital Discovery instruments—along with examples of their deployment to address real-world design and test tasks.

Introducing Analog Discovery 2

Digilent's Analog Discovery 2 is a USB oscilloscope and multi-function instrument that lets users measure, visualize, generate, record, and control mixed-signal circuits of all kinds (Figure 1). Developed in conjunction with Analog Devices and supported by the Xilinx University Program, Analog Discovery 2 is small enough to fit in one's pocket, but powerful enough to replace a stack of lab equipment, providing engineering students, hobbyists, and professional engineers the freedom to work with analog and digital circuits in nearly any environment.

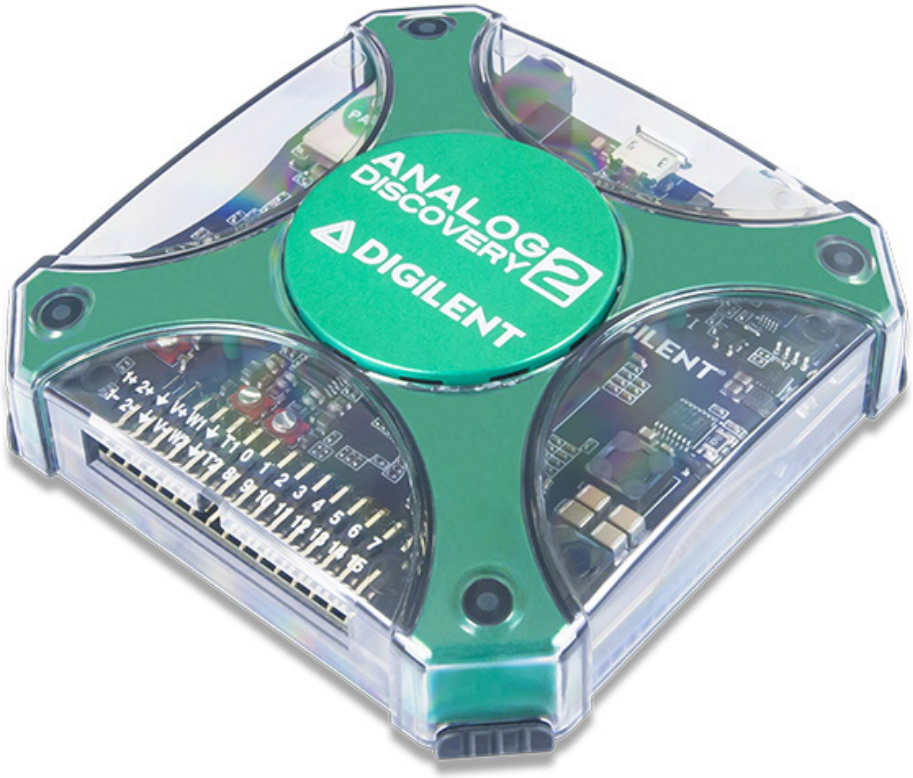

Figure 1. Analog Discovery 2 is a USB oscilloscope and multi-function instrument that allows users to measure, visualize, generate, record, and control mixed-signal circuits of all kinds. (Image source: Digilent)

The analog and digital inputs and outputs can be connected to a circuit using simple wire probes; alternatively, the Analog Discovery BNC Adapter and BNC probes can be used to connect and utilize the inputs and outputs.

Driven by the free WaveForms software, which is Mac, Linux, and Windows-compatible, Analog Discovery 2 can be configured to work as any one of several traditional instruments, including an oscilloscope, waveform generator, power supply, voltmeter, data logger, logic analyzer, pattern generator, static I/O, spectrum analyzer, network analyzer, impedance analyzer, and protocol analyzer.

Figure 2. Digital Discovery is a combined logic analyzer and pattern generator instrument that was created to be the ultimate embedded development companion. (Image source: Digilent)

Introducing Digital Discovery

Digilent's Digital Discovery is a combined logic analyzer and pattern generator instrument that was created to be the ultimate embedded development companion (Figure 2). Designed to optimize channels, speed, and portability, Digital Discovery's small form factor facilitates easy storage while providing a suite of advanced features to allow you to debug, visualize, and simulate digital signals for a wide variety of embedded projects.

Digital inputs and outputs can be connected to a circuit using simple wire probes or breadboard wires; alternatively, the Digital Discovery high-speed adapter and impedance-matched probes can be used to connect and utilize the inputs and outputs for more advanced projects.

Also driven by the free WaveForms software, which is also Mac, Linux, and Windows-compatible, Digital Discovery can be configured to work as any one of several traditional instruments, including a 32-channel digital logic analyzer, a 16-channel pattern generator, or a programmable power supply.

Automation and Scripting

One of the capabilities many professional engineers require is that of automation, which -- in this context -- refers to the ability to extend a system's capabilities. The WaveForms Software Development Kit and scripting interface provides the ability to write custom or automated tests on the Analog Discovery 2 and Digital Discovery, while the script editor—which uses JavaScript—lets the user write scripts for the same purpose.

For example, Digilent's application engineers have used the script editor to decode VGA signals and convert them into a PNG format in order to test a video interface. One customer used the WaveForms Software Development Kit to write an entire Audio Test Application that allowed them to create tests specific to their design testing needs. Furthermore, Digilent recently published an example using the Raspberry PI to take data from the Analog Discovery Studio and push it to the cloud, effectively connecting the Analog Discovery 2 to the cloud.

The Software Development Kit is available in C++, Python, and other older languages. There's also a software development kit written by a customer that uses Java. Digilent offers support for the Analog Discovery 2 in LabVIEW and MATLAB, allowing users to interface the Analog Discovery 2 with all of the libraries and functions available in those languages.

Summary

The widespread proliferation of embedded systems and the ubiquity of the IoT has led to the emergence of countless small companies. In addition to the fact that the same engineers have to span multiple engineering disciplines, in many cases they are resource limited and not in a position to spend tens or hundreds of thousands of dollars on design and test equipment.

Fortunately, tools that were originally targeted at engineering students and educational facilities, hobbyists, enthusiasts, and makers—tools like Digilent's Analog Discovery 2 and Digital Discovery—have evolved into

accurate, dependable, and reliable devices that can handle the demands of professional engineers. Furthermore, these tools aren't just for engineers who design and test products in the comfort of the lab; they are also of interest to engineers working in the field and include industrial environments such as factories and oil refineries.

Since Analog Discovery 2 and Digital Discovery are lightweight and small enough to fit in one's pocket, they are ideal for engineers and technicians who spend time roving around a huge industrial complex or traveling to a remote location to work on-site or in the field.

Software development kits (SDKs) for programming with Python and C++, a toolkit for programming with LabVIEW, and MATLAB support for the Data Acquisition Toolbox all provide professional engineers with the features and functions they need to perform their increasingly demanding jobs.