Q&A: Bet on Tiny

The IoT, drones, glaciers and CubeSats are among the places you might find yourself if you are a tiny device with a full implementation of Linux.

By Anne Fisher, Managing Editor

Gumstix recently announced its first Raspberry Pi Compute Module custom expansion boards in the Geppetto Design-To-Order (D2O) platform. The company's president and CEO, W. Gordon Kruberg, M.D., spoke with EECatalog about the announcement.

EECatalog: Where are you seeing the most interesting ideas incubating?

W. Gordon Kruberg, M.D., Gumstix Inc.: In two categories: First, in corporations where electrical engineers following traditional career paths are designing the next great devices for consumer and industrial or medical markets. And second, within the maker community, a vast number of designers working from their homes, garages, and small offices—what we would call SOHO or Small Office Home Office. These are designers, who love making electronic devices, who've got a soldering iron and some cool components.

EECatalog: What are you seeing happening within the maker community?

Kruberg, Gumstix: More often than not, we see makers contributing some compelling insight and great software running on hardware that they have prototyped in-house. These makers invariably have discovered an application, written some valuable code that requires a specific hardware format, and are contributing new IoT devices and looking for ways to push those to market as rapidly as possible.

EECatalog: Where does Gumstix come in?

Kruberg, Gumstix: Our Geppetto design to order [D2O] system's support of Raspberry Pi is about filling in the blanks for the maker with what it takes to go from prototype or garage-level prototype to a production-ready product in one easy to use online application. Geppetto is really a one-stop design to order tool that provides a maker a rapid and simple path to market.

Hardware is hard! What we've tried to do is to use every available software trick that we know to automate every aspect of hardware development. [At Gumstix] we're software engineers with a deep understanding of architecturally how to go about putting together software systems. Hardware is the content on which we operate.

And the Geppetto system is the visible culmination of the idea that we can use software tools in the hardware design and engineering environment. While our Geppetto system is the front end for this, there are also many back end suites that cover all the different aspects of getting a hardware product to market. We originally did this for ourselves; Geppetto makes it available to all of our customers.

EECatalog: Please take us through some of the highlights on the timeline that we might call "Making Tiny Devices Where Control Matters" and tell us where Gumstix and Raspberry Pi fit in.

Kruberg, Gumstix: When [the first] Gumstix [products] came out in 2004, the alternative was a $1500 or $2500 development kit for PC/104-sized devices. When we launched Gumstix, the market's attitude was "Why would anybody need anything smaller than a PC/104?"

Our bet was that tiny mattered. With a price point of $150 to $200 when we launched, we were at the front end of the curve for cost and power until around 2012. Then Raspberry Pi came out with a 35-dollar product. It wasn't quite as powerful as ours, but for 35 dollars, somebody could get something that ran a full implementation of Linux.

It really blew out the market. Think of who might spend $250 to drive an experiment compared to how many people might spend $35 knowing they might need to go back to the drawing board —it's a whole different market.

So the Raspberry Pi launch was a really important turning point in the development of the Internet of Things [IoT] today: Innovation now comes from the garage. The software that people write for Raspberry Pi can be advanced because it's well supported by open-source tools, toolchains and processes from Linux.

Innovation is now happening at the edge of the Internet, where a Raspberry Pi might sit in a garage and communicate with the rest of the Internet while running cool software—with interesting sensors, detec-

tors and actuators. There is amazing stuff going on.

[The introduction of] Raspberry Pi expanded the community of innovators with something to take to market. This is where our Geppetto D2O support for Raspberry Pi specifically helps makers who do not have experience in bringing a hardware product to market.

With Gumstix' Geppetto design-to-order (D20) tool, users have access to the entire process of design, supply chain integration and manufacturing automation with one online resource.

EECatalog: You are probably not able to predict what will be done with Gumstix development tools in all cases.

Kruberg, Gumstix: Most of the time, Gumstix develops a particularly interesting or new piece of technology or hardware specifically to support software on a tiny device. In house, we are all software engineers and know what we would like to see running on a piece of hardware. Once we put such a tool in the hands of makers or University labs, we have no way to predict what will be invented.

Over the course of the last dozen years we have been incredibly surprised by what people do with the devices we create.

Two different projects in England during 2004 and 2005 serve as great examples of unforeseen endeavors. First, Owen Holland at the University of Essex designed a tiny little helicopter with a Gumstix that communicated wirelessly with a desktop computer in the lab. That was a forerunner of the drone revolution. At the time we thought, "Who is going to use this little indoor helicopter?"

[Yet] it was because our computers were very tiny and ran a full implementation of Linux that we afforded very high-level control in a very small device—that really revolutionized what was going to happen over 2004 in the field of tiny electric-powered autonomous aerial vehicles.

Second, James Coxon was an undergrad student at Oxford in 2005 who wanted to design a weather balloon. At the time, the life cycle of a weather balloon involved launch, ascent, "pop" and return to earth where, with luck, someone might find it and read the little piece of paper inside that said: "If recovered, please call____."

James connected a Gumstix to a camera and cell phone. The weather balloon went straight up, hit 80,000 feet and took a whole lot of really beautiful photos from the edge of space. When it came down, as soon as it got within cell distance, it texted the GPS coordinates and he was able to go out and retrieve it. At the time, 2004, that was revolutionary for a couple of hundred dollars to put that together.

Big picture? We created a tiny full implementation of Linux so that somebody could do whatever they wanted in the tiniest form factor.

Today, we are pleased to be involved in satellites by providing a low cost alternative to an otherwise $100,000 rad-hard computer. By running three Gumstix in parallel for fault tolerance, Gumstix is out in space on tiny little CubeSats doing research.

We've had these opportunities because we're focused on being really tiny, being really supportive of software development and taking the hardware risk out of the equation. By providing this powerful piece of tiny hardware, these makers can focus on all the magic that is theirs, in the application and the industrial design.