

You Can Do It. Bug Can Help.

Open-source hardware developer Bug Labs offers a game-changing solution for upstart gadget makers.

By JESSE ASHLOCK



Bug's starter kit, the BUGbundle, includes a Linux-based hub with four portals and four modules to attach onto it. Six more modules are available for purchase separately.

SHORTLY AFTER SEPTEMBER 11, Peter Semmelhack, the New York-based founder and CEO of Bug Labs, began thinking about how great it would be if he could give his wife and young child a wireless GPS locator that would send him updates of their whereabouts during emergencies. No such device existed, and he couldn't figure out a way to hack one together. He found himself facing the same challenges that confront most entrepreneurs with a great idea for a new consumer electronics product: having to source parts suppliers, hire an electrical engineering firm, and spend a ton of time and money just to develop a working prototype. Rather than doing all that, he decided to build a toolkit for dreamers like himself. "When we got started, the notion was that we were going to target the early adopters of the world, software engineers who were frustrated that they had no hardware skills," he explains.

The idea was to build a modular, open-source electronics system which, like a Meccano set or a box of Legos, would allow users to quickly assemble various kinds of gadgets with assorted—even esoteric—functions. For instance, that GPS locator could be almost instantly transformed into a GPS-enabled MP3 player that would know when you're in the office, gym, or subway, and play the appropriate music for each. Semmelhack approached ECCO Design in 2006 to collaborate on the project, and he found an enthusiastic partner in president Eric Chan. "This was the holy grail," says Chan.

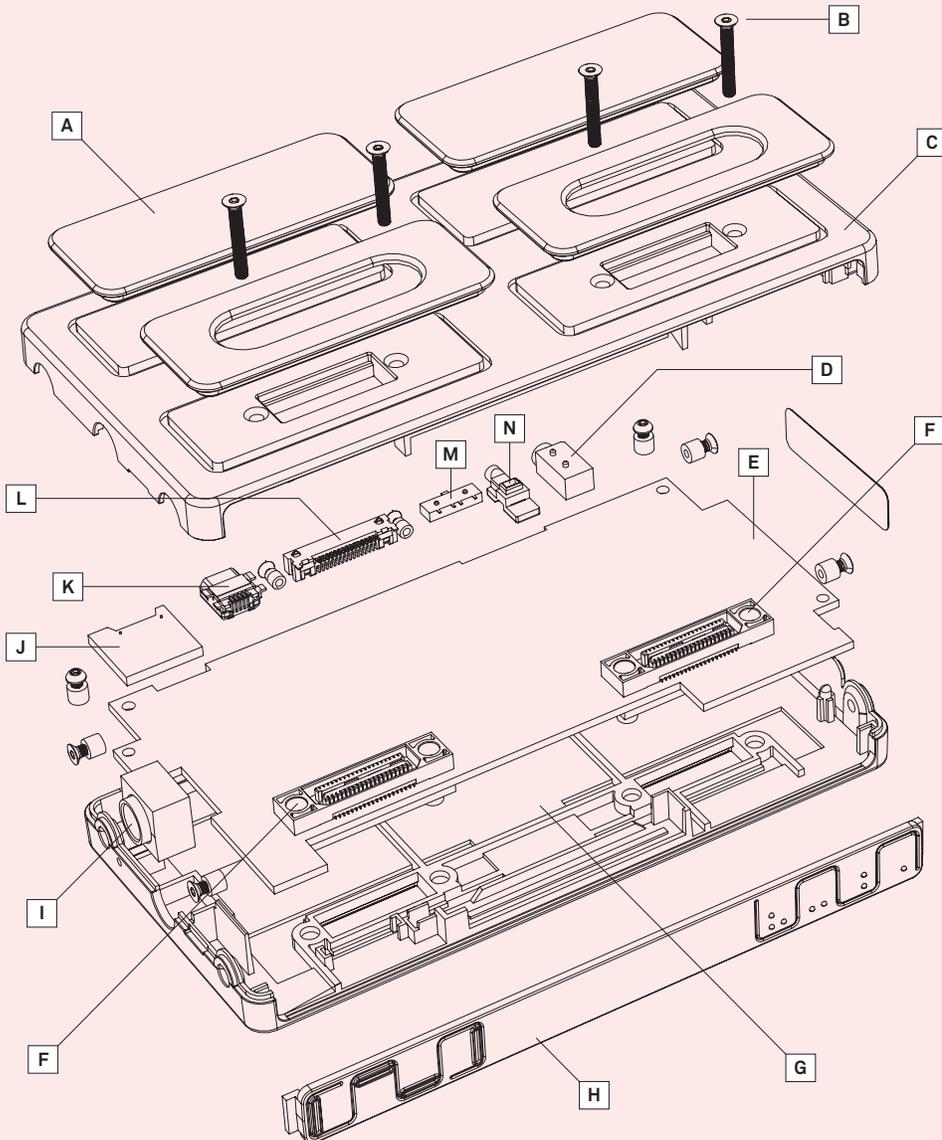
Beginning with an early prototype that was nothing more than a set of wooden blocks, ECCO worked with Bug on hardware design, often relying on a group of tech-savvy volunteer product testers for feedback. The work

led to the BUGbundle, launched early last year, which consists of a small Linux-based computer called the BUGbase and up to 10 application modules, including a camera, motion detector, GPS receiver, and audio player. Users can snap the desired modules into four portals on the base, write a piece of software with Bug's open-source development kit Dragonfly—or load a pre-existing program from Bug's community site BUGnet—and almost instantly have the device they want. More application modules are planned, but one of the existing ones, the BUGvonHippel, is designed with hackers in mind: It allows you to splice on anything with wires, sensors, or a USB 2.0. "We're trying to do for the world of hardware what's been available for the world of software for a long time," explains Semmelhack.

The early adopters Semmelhack had in mind have flocked around Bug, forming a thriving developer community that has found uses for the product ranging from personal helper (a GPS-based alarm clock that wakes you up before your stop when you fall asleep on the train) to social tool (a peer-produced pothole-mapping project in Kenya that uses GPS and an accelerometer). Educators who see it as a creative problem-solving tool to help students learn have also shown interest. But the biggest audience has turned out to be enterprise, which represents more than half of Bug's sales. The company's business clients, which include the global consulting firm Accenture and various equipment manufacturers, see Bug as a way to bring new gadgets to market more quickly and cheaply while reaching a broader range of consumers. It represents a potential shift in a consumer electronics industry that's become even

more reliant on "hits"—as Chris Anderson called them in his 2006 best-seller *The Long Tail*—than the record business. Companies devote most of their attention to mass-market products at the "head" of the distribution curve—the iPhone and iPod, the BlackBerry, the PSP—because developing niche products is prohibitively expensive, typically involving electrical engineering firms, parts suppliers, and contract manufacturers that often require certain volume commitments. As a result, end users with specialized electronics needs—the shipping company seeking a specific fleet-management solution, the healthcare provider in need of a monitoring device for rare conditions—either don't get the devices they need, or can't afford them,

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because manufacturing costs get passed along to the consumer.

Bug changes the equation, providing entrepreneurs a rapid means of building a functional prototype that they can use to demonstrate proof of concept to venture capitalists. “We have a saying that, for certain applications, the prototype is the product,” says Semmelhack. Once a venture capitalist offers backing, the entrepreneur can use more Bugs to test the product, further saving costs and showing third-party vendors that a market exists. “The tagline we’re using is, ‘You can get it to market twice as fast, at half the cost,’”

Semmelhack adds. “And we’re probably not doing ourselves justice, because I think you can do it way faster and way cheaper.”

From this perspective, Bug is less a product than a platform for innovation, a way to help fledgling companies toiling in garages—like Google was a decade ago—design the gadgets of tomorrow. Bug’s form factor was driven largely by the recognition that hardware hackers would be encouraged to replace enclosures and to transform the look of the product entirely. “Our brand identity is going to be based on the community,” Semmelhack says. “It’s not based on a piece of hardware.”

The strength of that community-driven outlook was on display last January when the design consultancy IDEO conducted one of its signature “deep dives” to rethink the user interface of the BUGbase. Rather than keeping the session swathed in secrecy as it ordinarily would, IDEO opened the process to a public blog, welcoming feedback from the Bug community on its CAD renderings, animations, sketches, and observations. The ideas received some criticism, but most of the chatter came from Bug users explaining how changes to the UI would help them use the product better and from vendors sharing information about cutting-edge materials like e-ink displays. The feedback helped IDEO develop five design concepts—including an e-ink display mounted over a set of push buttons and a color LCD touchpad—that will help guide the development of a new iteration of BUGbase, which Semmelhack says will be out before the end of the year.

Chan thinks the approach is one that designers would do well to heed in our age of customization. “Maybe the design ego needs to step back,” he says, and take into account the user’s vision for a product. In the introduction to his 2005 book *Democratizing Innovation*, MIT economist Eric von Hippel (the Bug module’s namesake) observes, “A growing body of empirical work shows that users are the first to develop many and perhaps most new industrial and consumer products.” Opening up the design process to the community can help make designers smarter and products better. “We’re not going to do it alone,” Semmelhack says, “but open-source and community-based innovation is the way a lot of thorny problems are going to get solved.” ★

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A. Base island B. Screws (each base uses 10 user-accessible screws)
 C. Upper housing D. Power jack E. PCB (printed circuit board) F. Module connector G. Lower housing
 H. Faceplate I. Tripod insert J. MicroSD card slot (2GB MicroSD card comes standard)
 K. Mini USB slot L. Cradle connector (allows access to ethernet, serial, USB, audio,
 and power) M. On/Off switch N. Power indicator

clockwise from
top left Bug's 10
currently available
modules include a
GPS unit, a 3G data
transmitter, an LCD
screen, a camera,
the BUGvonHippel
breakout board, a
motion detector and
accelerometer, and
a speaker.

