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SPEAKERS

Paul Cutler, Scott Shawcroft

P Paul Cutler 00:01

Welcome to the CircuitPython show an independent podcast with the people in and around circuit Python. I'm your host, Paul Cutler. This week on Episode Six. I'm joined by Scott Shawcroft. Scott, thanks for being on the show.

S Scott Shawcroft 00:12

Thanks for having me.

P Paul Cutler 00:13

I was listening to a podcast you were on last year on the real Python podcast where you mentioned that you had gone on show until a few times before you had the opportunity to join Adafruit. It was a really cool story. How did that happen?

S Scott Shawcroft 00:25

I worked at Google for almost six years. And I decided that I was done with that. And so I took about a ended up being about a year, but I wasn't really into drones at the time. So I did, I taught myself PCB layout and PCB manufacturing, and all this stuff. And then I ended up porting an open source flight controller software to the flight controllers that I was making. I started going regularly to show and tell to show that off because I was also watching a lot of like, ask an engineer, and desk of Lady Ada has to learn the tips and tricks for doing electronics manufacturing. Sure. So at some point, I started just like going on and being like, today on show and tell him and talk about motors, or I'm going to talk about speed controllers, or flight controllers, and kind of chronicle all of that as I was going along. And then I actually did like one manufactured batch for macro fab, and started selling it. But I quickly realized that like to do a business, there's a lot more than just the engineering side. And I really am like, My strength is in engineering. And I really had no interest in doing like Product Market Fit analysis, and

product design, and marketing and all of that other stuff. So I was keeping track of like, I had set aside a certain amount of money to basically burn through. And I knew that I was like coming to the end of my time to not being employed. And so we started to look for jobs. And so I literally went on show and tell one of those weeks and said, Hey, I'm looking for a job. And you know, Phil is really welcoming. So he had like, gotten my info before and like blogs, some stuff up that I'd shown before. And so the next day, I got an email just sitting here in the office and got an email from so just two sentences that said, Hey, do you want to do stuff with us? Yeah, and they were like, well, we have a particular project in mind. Is that, okay? I'm like, yeah, and then they were like, Hey, there's this micro Python thing. And we'd like to experiment with getting it on our boards. And I hadn't heard of micro Python. Okay, I done Python for ages, like I did started doing Python. I like 2005. So like, I'd done a decade of Python by this point. It always been my tool that I really liked. It was never really my day job to do Python. And it's still not really my day job to do Python. But it was a really good fit. Because not only did I have all this experience with Python, but I also spent the last year learning all of this embedded stuff. And so at the same time, I was getting kind of burned out on the quadcopter stuff. But I really learned that I liked hardware, and I liked embedded a lot. So it was like, perfect timing for me. And it worked out really well.

P Paul Cutler 02:58

That's awesome. So that was just over five years ago. Is that correct?

S Scott Shawcroft 03:02

Yeah. That was like August of 2016. So yeah,

P Paul Cutler 03:06

as you think about the last five years, what are some of the biggest changes you've seen, you know, starting from scratch to now? Or maybe I can rephrase that and say, what are the accomplishments you've done in those five years that you're most proud of?

S Scott Shawcroft 03:19

Yeah, I mean, I think it's important to say that we didn't start from scratch at all, right? Like micro Python was two years or maybe even three years old at that point. And Damien and all of the other contributors to micro Python had done an awesome and continue to do an awesome job with micro Python. So we're, we're very much standing on the shoulders of giants. There was a few things that I brought kind of in that fall of 2016, that I think, have really over the last five years shown that they were the right calls, one was really focusing on USB. So actually, for the first three versions of the circuit, Python, we had ESP 8266 support as well. And that was good in its way. But we really had to narrow down and say like, we're just going to do USB. That was really good call. And we continue to do really well with like, keyboard mouse support and from circuit Python, for example. So really focusing on USB has really been a great call. And then the other thing that we did in that fall that that kind of we started with was we chose to have a different layout internally to our source code so that we can know that our hardware

API's were identical across all the boards, because my argument at the time and continues to be that like, I'd seen Adafruit really succeed in Arduino because they had built all of these drivers and examples on top of this uniform API that Arduino provided. So it made a lot of sense to me to really push to have what became circuit Python also have that really pretty strict API to build on top of as well. And we've seen just that the API that we ended up with has been really really versatile and has actually the core of it has not had a lot of changes since then. Oh, that's awesome.

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Paul Cutler 04:58

So speaking of you USB for the first time in a long time some of the USB requirements are changing where it doesn't have to have a physical USB port is, is that the change? Yeah, that's

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Scott Shawcroft 05:09

definitely fast forwarding five years. One thing that I've wanted to do for the last few years in particular is support a wireless workflow. So I kind of think of a workflow is like, how do you actually program circuit Python, right. And we had focused really narrowly in circuit Python four down to the USB stuff. And we're very strict until seven where we relaxed it to include BLE BLE, as Bluetooth low energy, it's a very common protocol that the phones and tablets and computers and laptops in particular can speak. And so by supporting a BLE workflow, what we're doing is we're allowing people to use phones and tablets in particular, to program their their device. So that's, it's well worth the risk. But our I'm definitely foreseeing that we're going to have to do a lot of messaging and marketing around like, this is not the circuit Python you think. And we Yeah, Fillmore and I were just talking about, like, how we can make it clear which version of circuit Python you're actually dealing with.

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Paul Cutler 06:06

That makes sense. I I'm embarrassed to say that just a couple weeks ago, I got to the last ate a box and started setting up the glasses that came out around Halloween. And I just wanted you know, I put it on Twitter I had it's had the text scrolling across, it said welcome to the circuit Python show. And when I went to do that, it's like connected via BLE, and I grabbed my iPad and typed the text in on my iPad. I'm like, Oh, my goodness, this is cool. Nice. So we're gonna be that's gonna make it so much easier for people that are new to hardware or new to circuit Python to actually get involved and get their hands on it. Start programming. Yeah, I

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Scott Shawcroft 06:43

mean, that's my hope. The other thing that we did, the technical things I just talked about were things that happen kind of in that fall, and then in the spring was really when we had to make a decision about where are we going to try to upstream everything? Or are we going to kind of establish ourselves as something separate. And obviously, we chose to be something distinct. Separate is maybe not the right word. But that's when we settled on the name circuit Python,

we decided that we would keep this going ourselves for the longer term. And also it gives that Brandon gives us the very clear of like, this is what you can expect from circuit Python. And this is what is compatible with circuit patcher.

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Paul Cutler 07:19

So you mentioned upstream, how many of the things that you work on today, do you actually push back upstream that they accept,

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Scott Shawcroft 07:27

it's not a lot, there's not a lot that goes kind of back upstream, where our repository is structured very differently for like most of the work in both micro Python and circuit Python, is port work meaning like supporting particular chipsets. And because we have a different hardware API, it's really hard to upstream that work, where you will see some stuff kind of flow from circuit Python back into micro Python is, is more like we find bugs in the Python core. Sure. And the way that that works is it's not really it's not usually a pull request from us, it's more like an issue saying like, hey, we found this issue, here's our copy of how we fixed it. And then they may or may not do it that same way. But at least they know about the issue then, right? Like we talked with the micro Python folks like we're friendly with them. So they let us know the things they're excited about. And we let them know the things that we've done. The bigger examples like compressing error messages. So like we did that in circuit Python first in order to save space. And at the same time, we did translations, so we can get a French version of circuit Python that will have error messages in French, and other messages in French, for example. But in micro Python, they chose to do a different approach, or they do compression, but they don't do translation.

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Paul Cutler 08:42

Speaking of localization, how many languages is circuit Python translated to

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Scott Shawcroft 08:46

today? I think it's over 10. But the quality of those will vary. So if a particular message is not translated, it will still show up in English. And we try to have the core messages about like, hit Ctrl, D to reload. Like we try to have those translated before we'll turn it on. Okay. But yeah, we're always looking for remote folks who speak other languages, because that is not my strength, or mine.

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Paul Cutler 09:07

I have so much respect for people who can write documentation or contribute code in multiple languages. So you mentioned a lot of the work is around porting the different pieces of hardware, you spent the last couple of months of 2021 porting it to the Raspberry Pi single

board computers, right, some of the biggest challenges and actually bringing it to a full blown computer and not just a microcontroller.

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Scott Shawcroft 09:31

It was very different. So I've been really interested in supporting the Raspberry Pi proper, the Broadcom chips, because they have really good HDMI support. So whenever we're working on something, it is a question of like, what does this new chip provide us that we can't get in other chips? So Raspberry Pi's everybody's got one they're usually not being used to run my experience. And so it was like, Hey, this is how in circuit Python I can get access to a display and you You'd always or you could already do that with Blinka. But you still have all of the setup from Linux. And so I was really interested in this idea of like, blowing people's minds. So taking something that you would just put Linux on, and make it so that you don't need to put Linux, you can get more of similar of an experience to what circuit Python has a microcontroller. So that's why I did it. And the challenge was different, somewhat different, because there is a lot of differences in the, in the way that the CPU actually works. How it handles interrupts, it's, a lot of them are multi core, although we're not using the multiple cores. And there's memory mapped unit that doesn't exist in in microcontroller land as well. So there was a lot of the CPU side to do. And then the peripherals are actually like, not great. So the peripherals were actually like, not as good as as the ones that you'll find on a microcontroller. So figuring out how to get those to work, okay. was some of the challenges as well. So I'm, I'm happy where it's at. But there's definitely more work to do there.

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Paul Cutler 10:57

There always is. Yeah. So when you mentioned the HDMI support, is it truly just plug and play? you flash it to the card? Or you flash your SD card? Yeah, plug in the HDMI cable, plug in your power? And it boots right up to A to the repple?

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Scott Shawcroft 11:12

Yeah, yep, yeah. So just like all of our displays, if there's a if the board has a built in display, you'll see the terminal on the screen. That's true for the Raspberry Pi boards as well. One of the caveats with Raspberry Pi's is that they don't always have the USB plugs for to act as a USB device. So you'll want to check the Learn guide I made for like, which of the many USB connectors on those boards is the one that you want. But for example, on the PI for the USB type C that you use for power actually can act as a USB device as well. So that's where you'll get your circuit pi drive. And you'll get your circuit Python serial. And in fact, it's just USB and we use the same USB stack. So you can actually do the HIV stuff that you can do, you can do the middle stuff that you can do, because it's all the same code. So

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Paul Cutler 11:59

it's almost like we're back to the 80s When I was a kid, because I'm old, and you would take those Commodore 6060 fours or a trs 80 and play it right into the TV. Yeah, you're just programming. You're right. It's like you have basic, now you just have circuitpython sort of

base, I've actually

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Scott Shawcroft 12:14

experimented with how you can edit Python code, like you can edit basic on those computers. So where you put the line number, and then the line of code that goes there, Oh, neat, I experimented with that. It's something I'd love to do. And in fact, the Commodore 64 is definitely one of my inspirations for this, the Raspberry Pi release the pi 400, which is actually a keyboard with a PI four inside, right. And probably the next thing I work on when I circle back to that is going to be getting the keyboard working, okay, so that we can literally have that like circuit, circuit, Python 64 experience or whatever you want to call it. So where you can edit directly, we're just

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Paul Cutler 12:49

going full on Retro between your work on that. And later. Jeff appeler working on floppy disk support.

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Scott Shawcroft 12:55

Yeah, I didn't know they were gonna do that. But I'm pretty excited by it. My I have an uncle that has a bunch of eight inch floppies that he wants to archive. So I keep asking them when they're going to get to eight inch.

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Paul Cutler 13:07

Nice. Hey, it's Paul, we'll get you back to the show. In just a moment. I wanted to say thank you for listening. If you liked the show, please hit the subscribe button, write a review or tell a friend. You hear that a lot. But it really does help for other ways to help the show visit circuitpython.com/support. Now back to the show. So now that you've wrapped up your Raspberry Pi work, you've started working on the ESP 32 boards. Is that correct?

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Scott Shawcroft 13:30

Yeah, so particularly, we have existing support for the ESP 32 s two, which is the first expressive board that has native USB support. So we're really excited about that that was the first time we could actually put circuit Python on a Wi Fi native board. Because the other previous chips did not have native USB, then therefore couldn't show up is the circuit pi drive we all know and love. And since then they've come out with the ESP or they're they're kind of coming out with the ESP 32 s three, which is kind of a newer, beefier version of the s two. And it also has B Bluetooth low energy in it. So this will be the first chip that we have circuitpython support that can do Wi Fi and Bluetooth. Oh, that'll be really neat. At the same time. Yeah, I'm

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Paul Cutler 14:16

P Paul Cutler 14:10

very excited about it. So can you bring that experience that we were talking about earlier that I brought up with the glasses, the BLE here on a right on an ESP chip, then

S Scott Shawcroft 14:25

that's the hope. Yeah, we're not there yet, because it's not done. One thing at a time I'm working on implementing it. But yeah, that's the hope is that we'll be able to do we'll be able to do the BLE workflow. You may have seen that we're also supporting the, the ESP 32 C three, which is does not have native USB, but it does have bluetooth, does have BLE and it's their first RISC five core, which is what people have been kind of excited about today.

P Paul Cutler 14:54

And for those that might not know the RISC five is RISC five is like

S Scott Shawcroft 14:59

the eight API to the, to the processor. So there's this notion of instruction set architecture, which is like what the numbers mean to the CPU basically like the what the data in terms of commands actually means to the CPU. So it's not necessarily the CPU design itself. But it's the API that you use to use the CPU. But the nice thing about that is that's the API that like compilers produce code for. And so the benefit of having a open so RISC five is open standard, license free. So anybody can implement a CPU core. And if they implement that CPU core, whether it's open or closed, they can use all of the toolchain compiler infrastructure that have been built upon that API. So I think people get more excited than they should. Because the reality for somebody like me writing software is that you're really just using a different compiler. But on the hardware design side is pretty neat, because you're gonna get a lot of different implementations of CPUs that can all use the same existing infrastructure.

P Paul Cutler 16:02

So what is the benefit for the makers? For RISC? Five? Yeah,

S Scott Shawcroft 16:06

I think it's probably just a few cents and cost, right. So every, every ARM core, or extensa, core is a licensed core. And that will add a little bit of cost to chips. The other thing is that like, because there are open risk five cores, if you had an FPGA design that you were doing, you could just plop that in and use that as well. That makes sense. But I don't expect a lot of people to be doing FPGA design, probably not

P Paul Cutler 16:29

at this point. Now, in your spare time, you've been working on a website at WP dash law.org

at this point. Now, in your spare time, you've been working on a website at wp.dash.law.org focused on Washington State. Yeah, what spurred your interest in local politics.

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Scott Shawcroft 16:39

This story kind of starts last year, I am obviously a very technical minded person. And one of the things that is pretty common in the different states here in the US is that some states have laws that prevent public entities from providing internet to people, community broadband, community broadband, there's a great podcast called Community broadband bits from the Institute for local self reliance, if people want to go down that rabbit hole, lots and lots of awesome people around the country who are doing municipal broadband and related things to get people primarily Fiber Internet, but not always. And so in Washington State, we had to had a law that prevented public utility districts import districts from providing internet to folks. And last year, there was two different bills that got passed by the legislature to remove those restrictions. And one of them was more permissive than the other one. And so that got me kind of like more involved in this process of figuring out like, hey, there's these two bills that are going to get rid of this. But one is only like, public utility districts, and one is like cities and counties and public utility districts and port districts and stuff. So there was some drama around that because both bills passed. And they both went to the governor, which is the next step after it goes through the legislature. And the governor signs them concurrently. One in each hand. This is not the gun, which is not the government's job. The governor's job is to pick. Oh, I see. Okay, and so there was actually a lawsuit, the secretary of state whose job it is to order the laws. And the order matters for precedents if there's overlap. So the Secretary of State had to file a lawsuit said, Hey, do I actually have the right to pick and if I have the right to pick, what they did was they went by the order it was passed from the legislature, which turned out to be a good thing, because the more progressive one was passed second, or first or whatever, the better one is.

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Paul Cutler 18:39

Okay, good. That was my next question. That's good to hear.

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Scott Shawcroft 18:42

So yeah, so as of July in Washington here, there's no longer this limitation. So public utility districts can provide retail service to customers rather than just wholesale to other entities. So that's really good. And that got me more involved in promoting public broadband, throughout the state. And there's a lot of money coming in the US here for more broadband. And so as I learned more about how the legislature works, I got interested in collecting public data and trying to repost it and share it with people to make it easier to understand and potentially like better crosslinked than the existing public resources are so for example, like look at a bill see who sponsors it and then go to a page that said not only says this person is on these committees, and has these bills, but also like got the their last campaign they got this much money from these top donors for exam,

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Paul Cutler 19:40

which is good to know and that should be public.

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Scott Shawcroft 19:43

And it is publicly available, easier to access. But like those two worlds, the legislative world and the campaign finance world are very two different websites right now. And so like, I haven't done it yet, but my intention is to like kind of like, make voila or Somebody mistook it for a different name while ledge left for like, legislator, thumb, like, I just bought the domain. And I might switch it to that we'll see. But kind of making that kind of a one stop shop for like all the information about the campaign stuff and all the legislative stuff. And

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Paul Cutler 20:15

one of the benefits, I think that you're doing on the site is that your reformatting a lot of the text, that's, that's difficult to read for the average. Yeah,

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Scott Shawcroft 20:23

a lot of it is, if you go on the on the regular site, a lot of it's in PDFs. And I don't know how good of a job they do making those PDFs accessible. But they do have a website where you can get XML copies of all of the bills as well. And they don't do any sort of formatting. And the thing that bothered me the most was some of the sections of the law include a lot of nested lists, like deeply nested, like four levels, sure. And they don't intend than in the actual copy of the law. And so it's just like, how are you going to know like, whether you're three deep or whatever. And so Markdown is great for this. So one of the first things I did was, I was converting the legal text, the revised code into markdown as a way to format it better. And actually did like the very first version of this website was actually a Git lab instance that I was running. Because I really wanted like the Git workflow for laws. So I could do like, Who do I blame for this? Like, you know, Git has blame, right? So you can see the history of different components of the law. But I'm not really a sysadmin. So this current version is just a GitHub repo with Markdown that gets converted to HTML and then statically served well, that's great

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Paul Cutler 21:39

work. I mean, I think the the key theme there is accessibility, whether it's accessibility to get broadband or accessibility to understand what the laws that are being passed, and who is supporting them. Yeah. And

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Scott Shawcroft 21:50

also one of the main things that I'm trying to do with like the, so there's like a two year cycle to making laws and, and I have this like landing page where it's like, here's all the laws for this biennium, which is the two year cycle. And here are the ones that are coming up for

committee. So when you can actually do it? Well, it's executive action or public hearings. So like trying to be more involved in actually giving testimony, when there's public hearings, you know, for or against bills.

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Paul Cutler 22:18

That's great work. Thank you. Yeah,

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Scott Shawcroft 22:19

I'm nerding out on that. Like, one of the things that between all I do as I use the, the things I do usually involve a lot of learning. So always looking for new topics and new things to learn in and how the law is made is one of them.

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Paul Cutler 22:34

I can I can relate to that passion for learning. It's one reason that we're here today and listening to a podcast. Yeah. So the next question I have for you is one that I is a segment that I call turn the tables. I'm a big vinyl record fan. I've been asking all the questions, here's your chance to ask a question of me. I was a

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Scott Shawcroft 22:49

little worried that there would be duplicates on this, but I was curious just how you found circuitpython. And how you got into it.

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Paul Cutler 22:55

I attended a Microsoft conference a year or two back. And I've been working on learning Python these last couple of years. And they had a Python workshop as part of it. I think it was probably pi Khan. And if you completed a couple of this tutorials that Microsoft put together, they give you a \$50 Adafruit gift card. So I bought that circuit playground Express, and it said in my drawer for probably a good six to eight months before I got it out. And then I did and like everyone else who starts playing around with circuit Python, you realize how easy it is to do some of these things with the various sensors, the NeoPixels built in. Then I came across a project that I was really interested in speaking of vinyl records where someone had used a Raspberry Pi to actually put NeoPixel strips. And when they wanted to go get a record, the NeoPixel would light up on where the record is on the shelf, which got me thinking, Okay, what other projects can I do? So my office is on the other side of where my record player is. So now I'm working on a project with circuit Python that will display the elbow Mart on my desk, even though the record is you know, 1520 feet away. So that's kind of how, you know, one thing just led to the other and, you know, like all the other makers out there, you can always do it better. And I keep learning and you know, just like we talked about, I have a passion for learning. And it was a, I had been learning Python. And now I'm learning circuit Python, which has just been a great experience.

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Scott Shawcroft 24:19

Yeah, and those things are, like, a lot of the things you'll learn do apply across them, which is awesome.

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Paul Cutler 24:26

So last question, I like to ask all of my guests, you're gonna start a new project that uses a microcontroller. Which one are you reaching for? And why?

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Scott Shawcroft 24:35

Well, for me personally, I'm very excited for the ES three. I was like up late last night thinking about the Bluetooth things that I could bridge to Wi Fi and so I'm pretty excited about that. Of course it doesn't work. Yeah, well one thing and and most of my projects I get excited about and then I do the thing I needed to do and I like lose interest after I've learned all the stuff I need to need to make it happen but oh don't actually make it happen.

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Paul Cutler 25:01

I know that feeling very well. Yeah, the new ESP 32

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Scott Shawcroft 25:05

s three I'm very excited about the RP 2040. With the PIO is really interesting too. There's lots of good options, I think I wouldn't really reach for a SAM D 21. The m zero kind of the first chip that I that Adafruit brought me in for. However, I have one on my desk that I'm using every day, because it's literally just doing a touch sensor. So when I do like capacitive touch, it sets a pin high and like, it's how I, I have the setup where if I put my hand on my trackball, it changes what my keyboard does. And so I just have the Sandy 21. That's a is my hand on the trackball, and if it is set this pin that then makes like, pretends my keyboard has a particular key pressed, which then changes the layer of everything that it's doing. And that allows me to do left hand trackball, right hands just mouse mouse clicks. So I don't actually have to do mouse clicks on my trackball, I can do it on the other hand, well, that's awesome. But my left hand do all the moving. Well, that's all I have for this episode. Thank you for being a guest. Thanks for having me. Thanks for doing this podcast.

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Paul Cutler 26:08

It's my pleasure. We'll talk to you soon. Thank you for listening. This has been episode six of the circuit Python show with guest Scott shockcraft. Recorded January 27 2022. That's a wrap on season one. Thank you to everyone who has subscribed left a review told a friend or

supported the show your support has meant a lot and I'll be back soon with new episodes. Visit [circuit Python show calm](#) For show notes and more. And until next episode, stay safe.