Women in Software and Cybersecurity: Kristi Roth

featuring Kristi Roth as Interviewed by Eileen Wrubel

Eileen Wrubel: Hello, and welcome to the SEI Podcast Series, a production of Carnegie Mellon University's Software Engineering Institute. The SEI is a federally funded research and development center sponsored by the U.S. Department of Defense and operated by Carnegie Mellon. A transcript of today's podcast will be available on the SEI website at sei.cmu.edu/podcasts.

My name is Eileen Wrubel, and I am a technical director in the Software Solutions Division here at the SEI. This is the latest installment in our series of podcasts highlighting the work of women in software and cybersecurity. Today, I am pleased to have joining me Kristi Roth. Kristi is a rising senior computer science major at Penn State. This summer she is working as an intern in our group here at the SEI. Kristi, thanks for joining me today.

Kristi Roth: Thank you so much for having me. I am very excited for this opportunity to talk to you and my opportunity this summer as well.

Eileen: Great. Can you start by telling us a little about how you came to find your internship at the SEI and what you are doing so far?

Kristi: I had come across a talent acquisition specialist, Lindsey Mercer is her name. I was able to send her my resume, and we had talked a little bit over the phone. She told me about the SSD [Software Solutions Division], CERT [CERT Division], as well as ETC [Emerging Technology Center]. I got to figure out more so of what I wanted to work on over the summer. She passed on my resume to some technical leads in the SSD because that is where I decided I wanted to be working. I ended up having a couple phone interviews and an on-site interview where I got to meet Lindsey as well as Dan Plakosh, my supervisor for the summer. Then I was able to accept my offer.

Eileen: Can you tell us a little bit about the work that you are doing, or take us through maybe what a typical day is in your internship?

Kristi: Yes. I don't feel like I necessarily get in a big routine of anything necessarily, which I like a lot. Every day I feel like my work is changing because I'm always progressing on each project that I'm working on. But, for the most part, I get to work on my own. I've worked with a couple engineers, such as David Shepard, and as well as Joe Kostial, on both Hasan [Yasar's] and Dan [Plakosh's] team, which has been nice to see both sides because I am not entirely sure where I want to work in software yet, but that's why this has been a great experience for me so far.

I will ask them for help or figure out where I should be going next or how to take on a certain problem, and then I get to go work it out on my own. I get to see my own progress that I'm making each day and see myself reach my goals. It is a really nice experience.

Eileen: Great. I am glad to hear it. Kristi, you are in kind of a unique position working in our Software Solutions Division and having the opportunity to work on projects with two separate teams. I was wondering if you could share for our listeners who might not be as familiar with the work that is going on at the SEI, can you talk a little bit about the type of work that you are doing with Joe Kostial, and then the type of work that you are doing with David Shepard and Hasan Yasar's team?

Kristi: Joe Kostial, he is who I was working with for the most part for about my first two weeks or so, which has been about half of my internship so far, because I have been here about a month. I think it's a really cool experience, because we work with more physical engineering as well, like adding some physics into the coding that we are working on, because we are doing a little bit of embedded systems type of stuff.

The one project we were working on was a gimbal that would have a Raspberry Pi camera mounted to it, and we are trying to figure out angles for a certain direction. Then, as well, we are working on, it's called an inverted rotary pendulum, which sounds a little tricky. I didn't understand it at first when Dan first brought it up to me in my interview. Basically, how a pendulum swings side to side, this one swings side to side in a circle, in order to get itself up and balancing on its own upright, which is kind of a funky little piece of engineering. I really like that because it is hands on as well as I get to do some coding. We are getting to use Arduino and Raspberry Pi, like I said, which is nice to have that sort of balance.

For David and Hasan's team, they work on DevSecOps. I am getting work on some of that as well. I had built a pipeline a couple weeks ago for a continuous integration through Docker and stuff like that as well as Jenkins. Now I am building an Android app to test that to see if I'm able to constantly deploy getting that CICD [Continuous Integration and Continuous Delivery or Deployment] pipeline through.

Eileen: Wow, that is really cool. It sounds like you have gotten a really good breadth of projects, even in a short internship situation. That is great.

So, Kristi, I understand that you are a native Pittsburgher. Can we walk back a bit to your childhood and talk about, so did you excel in math or programming type things when you were younger? How might a young kid listening to this think, *Hey, I'm like that too. Maybe that's a path I want to go down*?

Kristi: Yes, I am from Pittsburgh. I am from the South Hills in Bethel Park, that is where I grew up and still live at today. As a kid, I was more focused on math in general and even just picking things up and doing stuff. I always say that I would pick my Legos over Barbies with my sisters. Even a little quirk, I really do love math, and I love STEM in general. I am very excited to be getting into the field that I'm working in because I know that it is always changing, and I am always going to have a really cool opportunity ahead of me.

One thing I remember I would do when I was a kid that everyone is like, W*ow, no wonder you are in what you're doing*. I used to fall asleep while doing multiplication in my head, like little mental math just to be like, *Oh, learn this, this, and that.* Now it's helpful because I have to know all my powers of two when I'm coding in assembly and stuff like that. It is a little quirk that always reminds me, *I'm going where my childhood wanted me to* type of thing.

Eileen: That's great. I love the story about the multiplication tables lulling you to sleep. Were there any particular people or formative events that influenced you along this path?

Kristi: Yes, I would say really when I realized it… So I had always liked math, I had been put in advanced math classes when I was in elementary school and this, this, and that. Really, the difference that made it for me was in 10th grade, I was taking Algebra II honors with my one teacher. His name is Mr. Oswald. He is a great teacher. He had been teaching math for a long time there. He started teaching an Introduction to Programming class and he was like, *Hey, you are one of my favorite students. Why don't you come try taking this class*? I was like, *Oh, I don't know. Coding isn't really my thing.* Then my junior year I'm like, *Oh, I need to take an elective; maybe I'll just take a typewriting class, I'm not that good.* I was like, *Well, why don't I try programming instead? It's typing and I'm getting more value out of it. Maybe I'll like it. It is with a teacher I know that I like*, all this stuff.

I end up taking the course, and I absolutely love it. I have so much fun with it, I think it is so cool how I can build all kinds of stuff and everything. My first program being Hello World, just like everyone else's. Then onto that I took an AP computer science class my senior year and then made the decision to major in computer science as well. Clearly it is all working out because I

am sticking in this field. I like my internship a lot. I am getting a great degree from Penn State, and I'm having a really good time with it all, too.

Eileen: Well, I am happy that Mr. Oswald started that conversation with you back in 10th grade.

Kristi: As am I.

Eileen: According to the Bureau of Labor Statistics [BLS], computer science research jobs are going to grow by 19 percent by 2026. Right now, women are only earning about 18 percent of computer science bachelor's degrees in the U.S. The BLS talks about how a lot of top colleges are making more efforts specifically to recruit and retain female computer science students. I was wondering if you could tell us a little bit about your experiences being recruited into Penn State, and then talk to us more about your course work and what you are experiencing as an undergrad.

Kristi: I personally didn't notice that much of a difference of me going for computer science at Penn State at least. I think that is probably because we are a part of the College of Engineering at Penn State. We take all those physics and math classes along with all the rest of engineering, and you get accepted as a freshman as to a pre-major. So, we are in the College of Engineering pre-major or you could go into the College of Education pre-major, where you are taking these core math and science classes for other engineers as well.

Before I went up to Penn State for college, I was able to do a SWE stay over, it is called. SWE is the Society of Women in Engineering. They host this with girls that are up at Penn State. They will tour you around, tell you what your classes are going to be like, have all kinds of stuff where you can ask questions to a panel and everything. It is a really a good experience that was nice that they had, which they did reach out to me letting me know that I could do that. Computer science specific, not so much I would say, but women in engineering they did make a difference in that, which I thought was really nice.

There is also an organization called the Association for Women in Computing, called AWC. They will meet once or twice a week. They will help you with course work, or they will have employers come in and talk to us, ask us about resumes and stuff like that, which is another really nice opportunity. Penn State definitely does a good job of including women to stay in their STEM programs, if that's what they decide to go into, which I think is nice.

Moving on, I have had a lot of courses. I have gotten into a lot of my technical courses in the past year that have been really cool. They have been very difficult, but I have learned a lot. I feel like I am really making the right decision for my career as well, which is always nice to know. I have taken a Data Structures and Algorithms class, which I always say is like a math class for computer scientists. We learn about trees and all kinds of stuff, algorithms, and all that good stuff. I have taken an operating systems class, which has been very helpful for a lot of more high-

level stuff that I am learning. We take the same maths as everyone else in engineering, up to Calculus III, physics with kinematics and electricity and magnetism, all that kind of stuff.

I have gotten to take some pretty cool electives that I will get into even more in my senior year, but I have gotten to take an embedded systems class, which has helped me a lot for the projects that I had been working on with Joe Kostial earlier in my internship.

Overall, I have learned so, so much. Penn State has done a great job of putting a lot of responsibility on their students in order to say, *Hey, you are getting from this what you want to get from this. If you are going to put the work in, you are going to get the reward*, which is really nice. But we'll spend hours and hours, me and my friends that I have made in my majors—which is really nice to find friends in your major, I have to say—but, we will spend hours upon hours in the lab working on projects that are coming up. Then, we also have exams on top of it, homework for those classes, lecture prep, all kinds of good stuff, but it's definitely coming out helping me so much on the other end I have noticed. No matter how much I complain about my course load—just because I think that it is a lot, especially in comparison to a lot of my friends that aren't necessarily in STEM, so it can be very overwhelming—I can already see that it's paying off in this internship here and later on in my life, my work ethic, all kinds of stuff, being able to time manage properly, it has really helped out a lot.

Eileen: Wow, I am glad to hear it. You described some peer-to-peer mentoring kinds of activities with the women's organizations on campus. It sounds like that may also help a lot with managing that work load and finding those study resources and finding people to team with and support you. Is that working out well?

Kristi: That's the best part about it, I think, because we have all been in that position before where you walk into… My first class, whenever I was a freshman at college, fall semester, first day, 8 a.m., I walk into this lecture hall that sits about 750 people. I sit down in my seat. I look the whole way down my row, 60 people that way, 60 people this way, both sides. I am the only girl in that row. You just realize, *This is my career. This is what I'm doing. This is the rest of my life*. I've never had a problem with it, but obviously whenever I do go to my outreach activities for the clubs that I am in or get to head out to events that things like AWC are hosting, it feels very good because you know that you want to give that back to someone to reassure them that they should still be going on in this field, that just because you're different, it doesn't mean anything.

Eileen: Great, thanks. We will change it up a little bit. We live in an age of information overload. It is very difficult to unplug. Signals are constantly coming at us. Where do you get your information to stay current or learn about new, challenging things in your field beyond your textbooks?

Kristi: Yes. In my field, I feel like it is very, very hard to keep up because there are so many aspects that have fallen under this umbrella and stuff like that. One thing that I do actually like to use is social media a lot, just like Reddit or even Twitter. LinkedIn, they will keep posts and then like a magazine like *Wired* that has their social media as well. I think it's really nice because all of these companies that I'm interested in, they're constantly keeping us updated on what they're working on and how their projects went and stuff like that, and I think it's a very easy way to stay connected just while you're taking the T in for your ride in the morning to see what everyone is up to. So that's very easy.

I also do like listening to podcasts, such as NPR [National Public Radio], I listen to a lot of their podcasts just because they have so many. I'll look up random science ones. My friends and I are actually very good at keeping contact, letting us know what's going on. *Listen to this, da, da da, da, da. Check out this article*, which is very nice. You do get a lot of connections within all these classes because, since Penn State is such a big school. We have so many students in each of our classes. We make these giant groups and everyone talks in them. It is nice to keep up that way as well, but they give a lot of information, too.

Eileen: So, sort of using your personal networks as filters to figure out which signals you want to pay attention to and which ones you want to boost.

Kristi: Yes, it's especially nice just because I feel as though my friends, they all have similar interests. We were all just talking about a Joe Rogan podcast the other day that we all had to listen to about space because we're very interested in the aerospace field and stuff like that. We will talk about SpaceX launches that we're watching on the live stream at 11 o'clock at night together. It's nice to keep that intertwined with everyone.

Eileen: My daughter and her peer group are now rising juniors and seniors in high school. If you could give advice to a student in that situation that is really starting to look at what they want to be pursuing in school, and they were considering computer science, what advice would you give them?

Kristi: I would personally say go for it, take the major, take a class; it is worth it. If I wouldn't have taken that class my junior year of high school, I wouldn't be sitting here today. I wouldn't be in the major that I am. I would have no idea what kind of world was at my literal fingertips. I am saying just go for that because if it doesn't work out for you, you know that you gave it that chance, and you are going to be able to know whether or not this is kind of what you want to do. I personally believe that coding and just computer science in general, all those types of classes, they are very easy to read on yourself, like whether or not you're going to like it type of a thing, whether you live for the satisfaction of your code running properly and all that kind of stuff. That is a very easy thing to find out about yourself, and I say, why not take a class to figure it out as a

freshman in college or even watching 30-minute YouTube videos at home if you are not sure what you want to do with your life? I think that it is very worth it. I always say it's very mentally challenging, but I do think it is so rewarding.

Eileen: Great. Thank you for sharing that advice.

Eileen: Yes, of course.

Eileen: Thank you for stopping by and joining me today. I am glad we were able to do this.

Kristi: Yes, as was I. I think this was a very nice experience. I appreciate you guys having me on today.

Eileen: Great, it's been a lot of fun. This podcast is available pretty much everywhere you download podcasts, including SoundCloud, Stitcher, Apple Podcasts, and TuneIn Radio. It'll also be available on the SEI website at sei.cmu.edu/podcasts and the SEI's YouTube channel. As always, if you have any questions for us, please don't hesitate to email us at info@sei.cmu.edu. Thanks.