EPISODE 318

[INTRODUCTION]

[0:00:00.7] ES: Wearables have become more accessible to the public; Snap Spectacles, Google Glass, Fitbit, and Apple Watch suggest a future in which many people will be wearing a smart device.

In this episode, Asta Roseway, research designer at Microsoft Research gives insights into other categories of wearables, like tattoos, scarves, and cosmetics. Asta talked about her work on DuoSkin, a wearable that looks like a beautiful metallic tattoo. We talked about its capabilities and how it was built and why it's still too early for connected tattoos.

We also talked about the intersection between health, wearables, technology, and fashion, and how wearables might look in the near future wearables.

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[INTERVIEW]

[0:02:30.3] ES: Asta Roseway is research designer at Microsoft Research. Asta, welcome to Software Engineering Daily.

[0:02:38.8] AR: Thank you for having me.

[0:02:40.6] ES: You're an expert in the design of wearables, and these wearables go beyond what I see in the news, in the stores, which are rings, watches, and glasses. What was the first wearable that you designed?

[0:02:56.2] AR: The very first one was a matchmaking jacket set. The idea was that one person would have a jacket with a little emblem on it that would turn colors and there would be another matching jacket somewhere. The idea was that kind of based on your interests and what kind of things you were into, like your social profile, it would scrub that data and it would do the same for the other person wearing the jacket. If you had movies in common or you had certain things, those lights would sort of light up.

If you liked Star Wars and I liked Star Wars, then our pins would actually match in the area of films. It's kind of like a way to like, "Hey, I can walk into a room, and who has things in common with me?" Being a bit of an introvert at times, I'm like, "How can technology make this a little bit less painful?"

[0:03:56.3] ES: That product sounds awesome.

[0:03:58.9] AR: Is it out there? I imagine that there — This was in 2010, and so I imagine that we have the equivalent of dating apps and relationship apps on our phone that do that, but the difference is that you're just wearing something and the thing that you wear is what changes. If somebody's close by and you have something in common, and that gets you to talk.

[0:04:28.7] ES: Yeah, I think that's much different. For example, I could walk in into a coffee shop and then see somebody —

[0:04:35.5] AR: Yeah, light up.

[0:04:36.0] ES: Then I can just start a conversation.

[0:04:39.2] AR: Right. I think I had heard something years ago that they were working on conference badges. You know, how we go to these conferences and there are thousands of people and your conference badge might light up if you have something in common with someone else.

I don't know if that's ever happened. If anyone knows about that, I'd be curious. I think it's an interesting concept to imagine that certain people will light up when you walk in, and why?

[0:05:08.4] ES: Yeah. I haven't seen that. The latest thing I saw at a conference at DockerCon last year was a band and you just bump to someone and then —

[0:05:17.6] AR: Okay, like NFC.

[0:05:19.2] ES: Yeah. It adds you their contact information, but not about —

[0:05:23.6] AR: Sure. Sure. Sure, but it's not as intriguing and mysterious. Why is someone so lit up?

[0:05:28.4] ES: Yeah. Cool.

[0:05:29.4] AR: That was my very first.

[0:05:33.5] ES: You have a background in typography.

[0:05:36.6] AR: Yes, and graphic design.

[0:05:38.2] ES: And graphic design.

[0:05:39.9] AR: Yeah.

[0:05:40.0] ES: What was that like studying? Was it in the 90s?

[0:05:44.2] AR: We were chatting a little bit earlier before about this, and when I was in school training, I was kind of on the edge of being between the analog world and design where everything was done by hand and the digital world of design and because of the progress that software was enabling us to do. My training kind of dabbled in both worlds. I had very traditional graphic design professors that were very anti-computer, wouldn't let us use computers for our projects. Then, we had very progressive professors who were just like embracing the new, and the strange, and the different, and really forcing us to kind of work with the toolset, and so I learned both.

I fell in love with the computers, because, as I was saying, when things move through your mind, you want to be able to manifest it almost instantly. I found that when I was doing things by hand, I wasn't fast enough, and my ideas were in and out and I couldn't capture it. When I became more proficient with the tools, with the software that I was using, I just found that I was being able to manifest in real time, and that just paved the way. I never looked back after that, so I loved it.

Graphic design has the basic principles of visual design, right? You learned symmetry, you learned balance, you learned composition, you learned how to set a scene, you learned how to tell stories in the abstract, and all of things are still applicable even today in my job.

[0:07:25.9] ES: I can definitely relate to some of that, because last year I started learning how to draw.

[0:07:31.9] AR: Did you?

[0:07:32.7] ES: Yes.

[0:07:33.6] AR: That's fantastic.

[0:07:34.6] ES: I started with the pencil and a paper, and then a friend recommended a tablet. I bought the tablet and I didn't use it for a year until recently, and I discovered so much power that the software gives you, especially with working with a lot of layers and undo.

[0:07:51.8] AR: Oh! The undo is the best part, right? Where you're just like, "Ah! ctrl+z. I'm back." Yeah.

[0:07:58.5] ES: You worked on DuoSkin, which for those that aren't familiar with it, it's a wearable that looks like a really beautiful metallic tattoo. I loved it. I wanted to ask you, what are the capabilities of this tattoo?

[0:08:17.6] AR: Right. We have, basically, three capabilities. First is input. The second is output, and the last is communications. When we say input, we enable people to be able to touch their tattoos, and we use capacitive touch to generate a signal on your skin, and it tells the system that something is happening, and you can use that to control other things in your environment, or on your phone. For instance, if I slide my finger down my tattoo, I can use that to scroll through apps on my phone, or you can imagine pairing it with a light in your house.

The imagination — It can go anywhere, really. In the very beginning stages, you can just imagine a very simple gesture. As far as output, we used thermochromic pigment. For those that don't know what thermochromics, it's a color changing element that when heat is applied to it, it will turn a color. It's a pigment.

I think you're probably not born in the 80s, but in the 80s, they had these cheesy shirts that had thermochromic pigment on it so that it would turn color when you get hot, when you heat. It was funny, because everyone who seat in certain spots, there's rainbow color, so that didn't work out. In our case, we applied thermochromic pigment on top of our tattoos. When we apply a little bit of current through a battery, we can change the pigment.

The idea is that in the future, the body art that we have could be alive, could suggest things to us, could notify us of things. We thought though color variation that that was an interesting start.

[0:10:04.9] ES: Is the amount that you need to — The amount of current, is it safe enough to —

[0:10:11.7] AR: Safe is a relative term. Currently, because thermochromics require heat, heat requires a lot of power. We're looking at least a minimum five-volt battery, which is pretty hefty if you think about it.

It's not exactly ready for primetime, but that's not to say that there aren't other color changing mechanisms that we can explore that can bypass some of the limitations we have with power, and we did that with some chemical stuff, using chemistry to create natural color change.

[0:10:49.4] ES: I've definitely seen something like that in toys where if you apply something cold, it turns purple.

[0:10:54.8] AR: Exactly. Exactly. It's already out there, it's just a matter of pairing it correctly.

[0:11:00.8] ES: Yeah. For building this tattoo, were there any specific technological breakthroughs that enable this to be prototyped?

[0:11:12.3] AR: On-skin tattoos are not new, they've been around for the last, maybe, five years or more, and that primarily came from the medical industry where they're detecting heart rate, or slight elevations in sweat levels, and temperate, and those are the real breakthroughs. What we did is we wanted to take the concept of a tattoo, but in a more of an urban context, a more of an — You're just out every day, it's nonmedical. I think the biggest contribution we made with our research on DuoSkin was probably just using gold metal leaf, or metal leaf as a conductive material.

Gold leaf is something you can find at any craft store, and that was the big aha, because anyone can go get this material and create their own conductive tattoo. We thought that that was the lightning rod for us, because we know that these other tattoos are being fabricated, but you can't access them, or they're hard to get. We thought, "What is we can just open the doors

and enable anyone to create their own functional tattoo and do it in the way that works for their personal style?

[0:12:29.8] ES: When manufacturing a tattoo that enables you to connect with other devices, how can you ensure that this tattoo, if you're going to start mass producing it, how can you ensure that it will work in different people, because some people sweat more than others and things like that?

[0:12:51.2] AR: First off, the notion of the tattoo is it's just temporary and the lifeline might be as long as 24 hours, if that, and then you just peal it off or wash it away. The robustness has not been designed to be longstanding. In terms of different skin and pH levels, that is something that we have yet to explore, because just our first round was, "Can we even realize this technology? Can we get it to work?" Then, perhaps the next wave would be like, "Okay. Let's deploy X amount. Let's see how these can survive out in the wild."

When it comes to anything with skin, it has to be safe. There are challenges to that as well and making sure that what you're putting on people's skin is okay.

[0:13:42.9] ES: What are some of the other medical purposes that can be used for —

[0:13:48.9] AR: For the DuoSkin work?

[0:13:50.6] ES: Or in general, like —

[0:13:51.6] AR: Yeah. When you think about it, I think we're right on the edge of some really big breakthroughs in this area, whether it's hybriding medical tattoos with chemistry, or how ever these things are going to be paired together. For instance, L'Oréal, came out with a UV patch. Did you know about that patch?

[0:14:13.9] ES: No. What is that patch?

[0:14:15.2] AR: It's an NFC patch, it's like a sticker that you stick on your skin. It has pigment. It has like an ink pigment on it that turns color as it gets exposed to UV and you pair it with your phone and you can see how much UV exposure you're getting.

They haven't come to market yet with it, because they have their own hurdles to pass when it comes to anything on the skin. The concept and the notion of wearing something on your body that is very, very light weight that could just give you some indication that something is happening is out there and it's coming. I'm not a psychic, but I will say within the next couple of years, we should see things on the market for that. I think cosmetics might be the way it's happening.

[0:15:05.5] ES: Do you see wearables being more closely embedded in the human body? For example, I'm excited for contact lenses. I wear contacts, but some contacts where I can see things.

[0:15:18.3] AR: I think it's inevitable, because the real world is messy and you want these things to kind of just integrate into your person without being cumbersome or slowing you down in any way. Any kind of thing that you're putting on your head, if it's too heavy, it's going to give you headaches. It's just natural that we would eventually want something that would be almost invisible that gives us and augments us in a way that we have these powers, that we can see beyond, we can get messages before things happen.

I think it's always just been human nature to just refine, refine, refine, and the technology around wearables including batteries and materials are becoming smaller and smaller and smaller just by nature. It just seems inevitable that it will eventually be — They've even been talking about pills that you can swallow that will do tracking and scanning of your intestines. You can digest your wearables too. Yeah, I would personally love to see a future where I'm augmented with extra intelligence, but it's not super obvious.

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[INTERVIEW CONTINUED]

[0:18:10.5] ES: Let's talk a little on the technology side of the current wearables. For example, how important is Bluetooth?

[0:18:21.0] AR: Bluetooth, for now, is probably the best bet to enable your wearable to talk to another device, or anything else, another system. It requires power. Again, the reason why wearables aren't even more prevalent today is because of the power issue. Bluetooth requires quite a bit of power and it requires a battery to be on all of the time. Now, there are cases where the device can turn off the Bluetooth and just be a local device until it's needed to be something more, and that saves battery.

We're also exploring ways that we can get around that barrier through field communications, NFC technologies, there's low powered WiFi research going on at the University of Washington. These other sort of ways to trickle power and communication is definitely something that we will see in the next couple of years. For now, Bluetooth is something that you can pair with most anything, with a brain and just say, "Okay. Go."

[0:19:30.3] ES: The DuoSkin tattoo, what was that connected to?

[0:19:34.2] AR: Okay. We had sort of two modes; one was a passive experience, and that was using NFC technology. In my case, I would have this antenna design on my arm with an NFC chip. If I pass my phone near it, I can actually program my phone to do something, maybe ring a friend, or send an image, or play some songs. That's near field, and that's passive, does not require any power.

The second mode is the one that's a little bit more power hungry, and that is enabling me to actually touch my skin and control things in my environment. That requires at least a 3.5 volt or higher, because we pair that with a capacitive board in an Arduino and through Bluetooth. Again, we're kind of in the same realm of current wearables today, but our hope is that we can eventually sneak around those constraints, 'cause nobody really wants to wear a big batter on them. I certainly don't.

[0:20:34.7] ES: What were some of the things you were able to control with your tattoo? You mentioned the NFC, but in the other case ,was it — You made your phone do something?

[0:20:46.4] AR: Yeah, we paired it with a music app that enabled you to kind of scroll through your songs if you wanted to. We haven't done it yet, but I really wanted to pair it with lights in the room, 'cause you just — Like, "It's magic." That's something that Disney might want to do. Are you listening Disney?

No. Initially, just with mobile.

[0:21:09.0] ES: We talked a little bit about health, and I've seen this a lot in the news, big companies investing some effort in health and health apps. Another project that you worked on is called MoodWings. Can you explain what MoodWings was?

[0:21:28.0] AR: Okay. I worked in the area of effective computing for the last four years. Essentially, we're just looking at signals that come off your body that could infer certain states, whether you're in a stress state or not. There's a lot of research going on currently around being able to really refine what those signals mean and if they mean that you're happy or you're sad.

The basic notion of it is, “Can we sense and pick up from your signals that you are in a certain state of mind, or a state of physiological?” MoodWings essentially — What I found as a designer, as somebody who thinks about the experience that somebody has with technology, was that I found the experience of looking at your signals to be a bit daunting. It wasn’t obvious to me what was really going on.

I was sitting in my backyard and I was thinking about all of these signals and how do I make this easy for people to understand, and then a butterfly landed on me and completely just threw my whole thought cycle out the window, because I was like, “Oh my God! A butterfly.” I thought, “What if it was that easy? What if by looking at this butterfly and the way it’s flapping its wings, that that could tell me if I’m stressed out or not?” That’s kinda how that came to be.

It was complete random, but I thought, “Let’s just pair it with something people understand.” People, we do understand biomimicry. We understand if a dog is angry or in an attack mode. If the hair bristles, we know, or if we see the teeth, we know.

Borrowing on that, we paired the signal with the flapping of the wings to let people know that if the butterfly starts to flap more, then you’re stressed, elevating that. It was an interesting experience, for sure.

[0:23:28.8] ES: I definitely like this idea, because the wearable is basically a butterfly that flaps the wings more depending on what you’re feeling, versus, for example, what we currently have, our apps, that give us a number, “You walked 1,000 steps,” but what is the action that I have to take on that, or “Your heart rate was — I don’t know. A certain number.” What does that really mean?

[0:23:55.5] AR: What does that mean? Yeah.

[0:23:56.5] ES: Yeah.

[0:23:57.6] AR: I think, also, I was feeling a little bit kind of burned out by mobile apps. If I have to look at another mobile app, I’m going to throw my phone over the cliff. I’m thinking how can

we just do something radically different. When people see things move, physical things move, it captures your attention and it makes you pay attention.

We explored that, and we also explored an actual crystal that we turned colors depending on what state we can assess you were in. You would have this crystal on your desk, and if it turned red, it would infer that you were entering a stressed state. If it turned green, you were in the flow.

To me, it was more just raising awareness of your own internal patterns, because we can often not know that things are going on inside of us, because that's just — We've become used to it. If we have systems around us that say, "Hey, something is going on with you. This is not healthy." Then, it helps us become more aware of these really quiet signals going on inside of us.

[0:25:11.4] ES: How can you measure stress? For example, for MoodWings, if I want the wings to flap more when I'm becoming more stressed. What are some of the metrics that can help determine if I'm stressed or not?

[0:25:27.7] AR: There's kind of like two basic signals that we start with. One is the galvanic skin response, and that measures the sweat on your skin. We measure it right from your risk and the palms — You know how they say when you have sweaty palms, it's very revealing. We take that and that sort of infers like your arousal level. The more you're sweating, the stronger the signal because of the sweat and the conductivity, and it infers that your arousal level is going up, and we paid that with a heart rate sensor.

We take — It's called heart rate variability and it's measuring the distance between your heart signal, the spikes in your signal. If the distance between the spikes is consistent, it means you're stressed, because you're in automatic mode. The variability is, is if I'm not stressed and my heart signals will be kind of off and different every time.

We map those two signals together and then we can sort of roughly get a quadrant that lets us know, "Okay. Arousal level is high. Heart rate variability is on, so that means probably stressed." It's not 100%, but it's a good basic foundation for understanding state. We use that to sort of say, "Okay. Now, drive the wings faster."

[0:26:52.0] ES: Are there other scenarios where a product like MoodWings can be useful, for example, in the medical field?

[0:27:00.6] AR: One of the things that I always fantasized about and I never got to, was putting it in schools. Imagine every kid could have a butterfly on their desk, and the butterfly flaps to show engagement, like a child is engaged, or maybe — Trying to encourage positive traits rather than calling out the negative ones. I would love that, and how might that make the kids want to be engaged by powering their butterfly?

[0:27:36.3] ES: I love that idea.

[0:27:37.4] AR: Me too. Me too. This is part of why we do these things, because we can only have so much perspective on it, but who knows how someone else could take something like that and create a brand new experience from it? Education was one that I personally wanted to do.

[0:28:00.1] ES: Yeah. Also, like you said, some children are shy, others are not, and the teacher might not have a clue. Then, in childhood, there are a lot of important experiences that map for later on.

[0:28:14.9] AR: Absolutely. Another scenario you asked about possibly in the health arena is PTSD. People come back from battle and they have episodes and their caretakers don't know when those episodes will happen, if they get triggered. You can imagine having a wearable, let the caretaker know that there's an episode that will be starting soon, heads up. Just that difference. That little — Even if it was 30 seconds. Just give them a chance to be able to handle it, would be amazing, right?

[0:28:52.0] ES: Yes. MoodWings, like you mentioned earlier, the idea came when you were in your garden, you were outside. Is a lot of your work inspired by nature?

[0:29:03.0] AR: Yeah, actually. Nature is an amazing — It's an amazing force to be reckoned with, and the intelligence is beyond anything we're capable of recreating. I find a lot of

inspiration in just the natural rhythm of things, like, the bees go over here and they do this, and then the flowers were designed for the bees to come. It's all designed. It's beautiful. I would like to think that that was where I was getting a lot of these from, because I think we inherently connect with nature. We come from nature.

[0:29:37.8] ES: It's certainly easier than a nap, for example. I have a cat, and when you brought up the dog example, I'm like, "I can tell when she's happy, when she's scared just by how her fur is behaving, the tail, and things like that, and I didn't have to —

[0:29:52.1] AR: It's nonverbal. I think a lot of these kind of experiences, especially when you're trying to communicate something to a user, is it doesn't have to be verbal, be nonverbal. That lends itself to being universal, 'cause you transcend language. Everyone around the world can read when a dog is upset. That's powerful.

[0:30:17.2] ES: Let's talk now about the process of building a wearable and prototyping. How do you start?

[0:30:26.0] AR: Oh! So many different ways. It really depends on what the vision is, and that will sort of dictate what your material sets are, how much power is required, and how you want it to be on the body.

A lot of times, when you're putting stuff on the body, you want to be mindful of things that could be rigid, or hard, or uncomfortable. You have to be aware. If you are connecting power to it, that power can run hot, even just batteries being used can run warm. We try to take all of those things into account.

In the case of the tattoos, we were inspired by what was already out there in the world. The jewelry tattoos were the inspiration point, and it was our task to try to mimic that aesthetic, but also layer a functionality to it.

In the case of another project we worked on called LightWear, which his essentially wearable light therapy for seasonal affective disorder. We explored several kinds of formed factors that would — Whether we were putting the light therapy into hats, or glasses, or scarves and we ran

studies to sort of get an idea of what was working or not working, because fashion is really personal, and you can't make a one size fits all. We were very interested in, "Well, who's attracted to what formed factor? How is that — How would they wear it?" Most of our male participants wanted hats. Whereas most of our female participants preferred scarves. These are things that informed the design, "Okay. Who is our audience?"

[0:32:11.4] ES: Which is why it's important to have diverse teams.

[0:32:14.0] AR: Absolutely.

[0:32:15.1] ES: Yeah.

[0:32:15.6] AR: Because, again, one size does not fit all. When it comes to anything our bodies, we're all very personal about it. You want different perspectives so that everything could be accounted for, and just, "Do I feel comfortable with things showing on my skin?" Some people don't.

[0:32:35.2] ES: The most common wave to get that light therapy, is it those lights that are just standalone bright lights?

[0:32:44.2] AR: Yeah, there's a light box that you can get that cast a blue light spectrum. When you have seasonal affective disorder, which primarily happens in the winter and in very extreme — I think it's latitudes, right? We're up in Seattle and we don't get sun for three months at a year, and that can affect your circadian rhythm, which basically dictates your metabolism and your melatonin, and people can fall into depression, and they can get very moody, they can overeat, they can get depressed.

The blue light tricks the brain into thinking that it's sunny outside, and the notion is, is that if you sit in front of this box for 30 minutes every morning, your brain will start kicking in and your circadian rhythm will get back on track. We found that the box was very limiting and you can't move around with it, you're stuck behind it. How can we take that light, put it into wearables so that people could be mobile with it and then it would increase the odds that they would actually

use it. We took the same light spectrum and we integrated it into fiber-optic fabric to cast the light out, for the scarf, and then with other LEDs for hats and glasses.

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[INTERVIEW CONTINUED]

[0:35:37.2] ES: One thing that I also liked about this is, as you mentioned, the box is hard to move that light. If I'm wearing the scarf and then we're talking, we're having lunch for 30 minutes and then there's light, you'll benefit.

[0:35:50.3] AR: You'll be fashionable, right? The thing is, is — What's interesting is that — This is something I can't answer yet, but is fashion a possible vehicle to override the stigma that we have around conditions? For me, personally, when is it in front of a light box, I feel a little bit like, "Oh, God! I'm judged," because I'm in front of this light bulb? Who wants to be in front of a light box? Nobody.

Can fashion override that? Because if I put this on and I feel good and I look good and the odds of me using it and not feeling embarrassed by it are tremendous. I think we're going to see a lot more of that in the future where there's a lot of interesting hybriding of fashion and health.

[0:36:41.4] ES: I definitely agree with that.

[0:36:43.2] AR: I think the athletic community is already working in that space.

[0:36:48.3] ES: Last question, what do you see improving in the next 10 years in the wearable space, or what would you like to see get better?

[0:36:58.9] AR: Part of the motivation behind DuoSkin was to work on wearables that were more sustainable and less of a burden on our material resources. I had been reading this really disturbing article that basically said that we've used that 50% of our natural resources as of today. When you think of where we're going to be in 2050, it's pretty alarming.

For me, personally, I would love to see wearables become super efficient with energy, and that includes energy harvesting to be powered. We need to work on components that are not standard off the shelf that require huge amounts of power, and we need to be super mindful, like, "Where does that waste go? Can it be recycled? Can I reuse it? If I wash it away, is it going to be okay?"

I know that sounds a little bit like I'm a little bit — Little hippie at heart, but we can't afford to be wasting more plastics and batteries into our ecosystem, we just can't. This whole luxury of being able to buy a phone every couple of years, it's troubling, because it's not sustainable. For me, I hope our wearables and our technology will raise the bar and get to the next place where it can better fit into our ecosystem, and to the health of the planet, and to us as well.

[0:38:30.8] ES: Yes, and it actually reminded me of what you said earlier, the athletic community is embracing a lot of wearables. I did see a pair of shoes, I think, from Adidas made of — Was it recycled plastic?

[0:38:43.4] AR: I think so. I think I know what you're talking about.

[0:38:45.1] ES: The shoes look beautiful.

[0:38:46.5] AR: Yeah. Why not? Right?

[0:38:49.0] ES: Yeah, it looks good.

[0:38:51.3] AR: It's sustainable.

[0:38:53.0] ES: Exactly.

[0:38:53.8] AR: Absolutely.

[0:38:54.2] ES: Yeah.

[0:38:54.8] AR: I think — Yeah, we are seeing those trends in the athletic world, and I'd like to see that extend itself into the rest of the world.

[0:39:03.1] ES: Yes. Definitely.

[0:39:03.7] AR: Where you could have something beautiful be made of cork, right?

[0:39:08.3] ES: Asta, thank you for coming on the show.

[0:39:10.6] AR: Thank you for having me. I'm sorry I had a cold, everyone, but I'm getting better.

[0:39:15.9] ES: Thank you.

[END OF INTERVIEW]

[0:39:21.6] JM: A few quick announcements before we go. Software Engineering Daily is conducting our annual listeners' survey, which is available on softwareengineeringdaily.com.

You can click on the survey link. The survey really helps us understand our listeners and gives us data that we can show to advertisers that help get us better sponsorship deals.

Also, the Software Engineering Daily community has started working on Mineranker. This is an open source newsfeed platform. We are trying to democratize the idea of a newsfeed so that the only newsfeeds in town are not necessarily Twitter, or Facebook, or any other centralized newsfeed. We'd like to make it possible for anybody to make a newsfeed.

You can check out the Mineranker Project at mineranker.com. You can check out and implementation of Mineranker at softwaredaily.com. You can find links to all of these stuff at softwareengineeringdaily.com. There, you can also find a link to join our Slack group to follow us on Meetup for future meet ups and other information.

Thanks again for listening.

[END]

