

Building Better Voting Systems

May 12, 2020

Hello, everyone. I'm very pleased to welcome Ben Adida, the executive director of VotingWorks, today. Before we get started with his talk, a couple of updates. So we'll spend the first half of the time with Ben speaking on his own, and then the second half, we'll have a Q&A. We have a couple questions that were sent ahead via Twitter, and we encourage you to submit your additional questions using the Q&A tool. You can upvote questions that you really like. And we hope that you do that so we get to the questions that people are most interested in, in case we have a lot of ones that we can't answer. This webinar, as you know, is being recorded, and the recording will be available afterwards, in a few days, on the BKC website.

So we're very lucky to have Ben here today. Ben is the executive director of VotingWorks, as I said. Most recently, Ben has been working in the Bay Area. He was previously the VP of engineering at Clever, the director of engineering at Square, and the director of engineering at Mozilla. These Silicon Valley experiences bring a strong background in product to his work. But in addition to that, he's worked for many years in the context of elections, privacy, and free software. Ben received his PhD from MIT's Cryptography and Information Security Group, and he is a board member at Creative Commons. And we are looking forward to him cutting through some of the noise on elections. And from now, from here, I'm going to turn it over to Ben.

Well, thanks so much for having me, Berkman folks. I'm happy to be back. I was a fellow many years ago, and-- or an associate, rather, I think, many years ago. In any case, let me see if I can get my slides going here.

All right. So thank you so much for having me, everyone. I am excited to be talking about building better voting systems. And as Liz mentioned, I'm the executive director of VotingWorks. And I am thankful to Berkman for giving me the chance to put on a nice jacket today, which is not something I've been doing recently. So here we go.

So today's talk, I want to tell you a little bit about me and VotingWorks. And I want to immediately tell you that this talk is going to be a little bit US-centric because that's where most of my work is happening and because elections in the US tend to have some complexities that are pretty peculiar to the US. But of course, the principles of what I'm talking about apply to any democracy. I want to talk about what's so hard about voting. And spoiler alert, it's the secret ballot. And I'll tell you why.

I want to talk about how we need computers to vote, but we shouldn't trust them, and how that leads us to paper ballots and risk-limiting audits. And if you don't know what risk-limiting audits are, don't worry, I will gladly explain. I want to touch on vote by mail-- how it increases turnout, how it is cheaper, how there is not much fraud with it, and how it is surprisingly nonpartisan. I also want to mention some concerns that exist with it.

No system is perfect. No election is perfect. But on the whole, my message is going to be that vote by mail is a pretty good solution, especially going into 2020 with the COVID-19 pandemic. And I want to talk about how, in 2020, we're going to need a lot more vote by mail so that we can reduce the in-person voting and make it safer so that the election can run well.

I'm going to try to move fairly quickly through all of this because I want to make sure I get to any questions that you have. And I want to try to just keep it moving. So if we were up on the stage, if we were in person, I would tell you, this slide tells you everything you need to know, you can now go home. You already are home, so why don't we spend a little time digging in?

A little bit about me and VotingWorks. Liz already mentioned a number of things about me, so I'll fly through this. My work on voting started in 1998 with a system called EVOX, which helped to run the MIT undergrad elections when I was an undergrad there myself. In 2006, I got my PhD at MIT on voting systems. And then while I was at Harvard's CRC, just next door, and while I was an associate at Berkman, I created a system called Helios that was an end-to-end verifiable voting system on the web.

And in the last 12 years, it's run more than 25,000 elections, including one election to elect the president of a Belgian university back in 2009, and a whole bunch of other elections. Like all online voting systems-- I want to caveat this right there-- it is great for small elections and private elections. Online voting systems, even as verifiable as Helios is, are not good for public elections. And I'll talk a little bit about that today.

After 2008, I took a break from voting and spent a bunch of time before that and after that building software at scale, leading product engineering teams. And then around summer 2018, I took a look back at voting. I think a lot of folks were starting to think about how they could apply their skills to bridging what is probably the biggest political divide of my generation in this country. And that led me to take another look at the space of voting equipment, realizing that a lot of the work that had been done in the early 2000s simply had not made its way to industry, had not made its way to actual vendors of voting equipment, and decided to try something completely new, and co-founded VotingWorks in late 2018.

VotingWorks, we are a nonpartisan nonprofit. We're a 501(c)(3) here in the US. Our mission is to make US elections secure for all voters. Now, security, if you just have an election that's super secure and nothing else, it's not an interesting election because you don't have the participation that you need. For a US election, for any election to be representative of the people, it needs to be simple to run. It needs to be affordable. This is a key point that folks often forget. You have election officials across the country that can afford to buy equipment maybe every 10 years, sometimes every 15 years. So you're using equipment that is fundamentally flawed and out of date, which is a problem. And it needs to be accessible to voters, including voters with disabilities.

So at VotingWorks, we do two things. One, we make voting machines, and two, we help run risk-limiting audits. On the voting machine front, the way that we do what we do is we use off-the-shelf hardware. We leverage all of the amazing security and reliability work that the multibillion-dollar technology companies put into their hardware, and we leverage that. And we

use open source software. We also produce open source software. Everything we write, everything we build is open source. All that's allowed us to design, build, and deploy our voting machines in under a year. And we were able to, in that time, bring paper ballots back to one county in Mississippi, when most of Mississippi hasn't seen paper ballots in more than 15 years.

Because we leverage a lot of existing technology, we're able to build machines that are a third the price of other systems. That's not a third off, it's 2/3 off. It's 1/3 the price of other systems, which completely changes the game, especially in places like Mississippi, which, frankly, don't have big budgets. But one of the things that's less well understood is that county clerks across the country don't have big budgets. Counties don't have budgets to buy fancy equipment. So again, making equipment that's more affordable is critical.

And then we help run these risk-limiting audits, in particular with this piece of software that's also open source called Arlo. You can find it on GitHub at our GitHub repo at VotingWorks. Our software is going to power five to eight statewide audits in 2020. And I'll tell you what those are. The word audit is boring, let's be clear, but the impact of risk-limiting audits is incredibly important. And I'll dig into that.

So that's more about me and more about VotingWorks. Let's talk about-- oh, let's give you a little bit of an actual visual here. This is the first voting machine that we deployed in the field, in Mississippi. There were 10 of them running in one precinct, and it worked OK. It got the job done, but we learned a lot from it, in particular that it was too heavy and not sufficiently portable. So this is what the system looks like now. Much more portable, easy to pack up. That middle piece there in the briefcase is 15 pounds, 1-5, when you fold it up and carry it. We built this to be easy to set up and easy to transport and easy to use. And of course, always with a paper ballot you see the printer at the end there.

This is what it looks like when we deployed it in a pilot election in Wisconsin, and this is what it looks like in the smallest precinct I've ever seen, in Mississippi. This is a shed that's only used for voting. And if you were there in person, you would be shocked at how they managed to fit that many people in it, because this is obviously a wide-angle shot. And those are our machines that were used to run the election in that county in the presidential primary that happened at the beginning of March. This is a quick snapshot of Arlo, the software that we make available for auditing. And again, I'll talk about that in a little bit.

OK, so let's dig in, because the world obviously is broader than VotingWorks. So what's so hard about voting? I want to start with something that I think most folks who talk about voting don't spend enough time on. And that is that I think voting is magical. If you think about the kinds of things we do as humans, this notion that we come together and we agree that we are going to select our leaders by the will of the people is a fairly unique human activity.

And there's something really deeply inspiring about that to me. And it's what drives me in this space, and I think drives most people who are in this space. But because we don't talk about it enough, I think sometimes too much cynicism gets into the space. We start getting worried about how certain equipment might be flawed, or we start getting worried about how certain election officials might not be doing as good a job as we want them to.

My sense from working with election officials across the country is that they have one of the hardest jobs imaginable, and the amount of effort that goes in to the foundational layer of our democracy, election administration, is really inspiring. And so before we really get into any of the details, the biggest thing I want to leave you with is, if you haven't helped out in running an election, if you haven't actually participated in that process, try. Do it. It's really inspiring, and there's just so much to learn from watching election officials do their thing. Voting, to me, is really magical.

And I think the person who puts it best is Gloria Steinem. This is a quote I love to use. I use it in almost every talk I give now. "The voting booth is the only place that a pauper equals a billionaire and any woman equals a man." Now, that's true. That magic and this equality-- we all know, by the way, that this is aspirational. It's not always perfect, right? But that's what we want. We want the voting booth to be the only place that a pauper equals a billionaire and any woman equals a man. But that is only true if we have a secret ballot. And I want to lean into that to really explain what that means.

What does a secret ballot mean? It means your vote should be secret from the government, of course, from your employer, from your neighbor, from your spouse, even if you would actually like them to know how you voted. What does that mean? Of course, you can tell your spouse how you voted. Hey, honey, I voted for so-and-so. But the point of the secret ballot is that you should be able to lie about that in a way that's believable, right?

So a specific use case for voting is you should be able to be a closet Republican in a deeply Democratic family or employer or neighborhood, and you should be able to vote the way you want to vote without feeling pressure to vote another way, while being able to claim to all these folks that you voted differently, because if that's not the case, then you might be able to sell your vote. And when I say sell your vote, you might be able to do it willingly, or somebody might coerce you into selling your vote, might pay you money or threaten you to vote one way or another. And if you can prove to them how you voted-- in other words, if you don't have a truly secret ballot-- then selling your vote becomes possible. And if selling your vote is possible, we don't really have a democracy.

This is such a critical point about voting, and the critical thing that makes voting so hard, that it's really important to spend some time with it and understand what it means. It's when you walk into that voting booth, it's just you and the ballot, and nobody else. And you should be able to vote your conscience in that space, without answering to anyone else. Even if you want to sell your vote, you shouldn't be able to.

You have to understand that this is a vastly more stringent requirement than health records security, which is often how you hear arguments out there saying, oh, well, I can get my medical record online, why can't I vote online? Well, think about it. Your doctor knows your medical info. That's kind of the point, right, of digital health records, is that your doctors should know your data. Again, completely different from voting, right? In voting, no one should know how you voted. In health care, the security requirements are to secure the channel between you and the doctor. Much easier. Even though it's actually already pretty hard, it's much easier than voting.

It's also vastly more stringent than banking security. Again, your bank knows all your books. That's the point, right? So whenever you hear comparisons of voting security to these other fields, you have to remember a secret ballot is a dramatically different and way more stringent requirement than anything else. So we need your individual vote to be secret from everyone. That's a level of secrecy that no other system has.

But we also need the election result to be trusted by all citizens, which is a level of public auditability that is also stricter than any other system. And it's that tension between the individual ballot secrecy and the public auditability of the system that makes it so hard to run an election well. It's a pretty unique set of requirements. And that's why it's hard, and that's why we get into trouble sometimes trying to implement these systems.

OK, hopefully I've convinced you that that's what makes voting so difficult. Whenever you talk to somebody after this, if the only thing you remember is to say, well, voting is hard because of the secret ballot, I've done my job. That's a pretty good outcome. So let's remember that one. Now, I'm going to keep cruising. Liz, if there are any questions now, I'm happy to take them, but I'm also happy to keep cruising.

Let's cruise, yeah.

Let's cruise. Great. So the next point I want to make is we need computers to vote, at least in the US, but we shouldn't trust them with our votes. What do I mean by that? Well, the point I made previously is that the secret ballot is critical, and the next point I want to make is that, to actually implement the secret ballot, we need a paper ballot.

And the reason for that is that, if there is anything sitting between you, the voter, and your ballot, anything at all-- a machine, an electronic machine or a mechanical machine that mediates between you and the representation of your ballot-- could be a lever machine, where you don't see the recording of your ballot, it could be a phone where you're tapping your vote and it gets recorded on a server-- anything that mediates between you and the recording of your vote is something you have to trust because it is telling you how-- it is confirming to you how you voted.

And so by trusting it, we either break some amount of auditability-- we don't really know if it did its job correctly-- or we put the secret ballot at risk because you have somebody else or another party that is looking at how you voted and potentially taking that into account. So the only medium we know that most voters can verify privately in a booth is paper. That is the ultimate reason why we need a paper ballot. For the secret ballot, for the confidence that your vote was recorded correctly, without any mediation of that verification act.

OK, however, how are we going to count that paper? And in the US-- this may not be true in other countries, but in the US, the notion that you're going to hand count that paper, it's not going to work. It's not going to work at scale at all. Because you might think in your mind, OK, well, ballots kind of look like the thing on the left here, right? This ballot that has one question, five options, you pick one, you make piles at the end, you count the piles, and off you go. And by the

way, there's a number of countries, a number of democracies where that's how elections work. And that's great.

But in the US, ballots look like the thing on the right. That's a San Francisco ballot. Four sheets of paper double-sided, so eight pages, and 20, 30, sometimes 40 contests. Apparently, there was an election in Texas that had 90 contests in 2016. There's a lot of contests in US elections because of the federal structure. With the federal positions, the state positions, the local positions, the county positions, and the propositions, there's a whole bunch of contests that you have to account for. And that is the critical reason why counting by hand is not going to work, because one, you're going to have a lot of errors if you count by hand with such a complex ballot, and two, it's going to take forever.

So we need computers here because what we want is a scanner, a high-speed scanner that's going to be fast, it's going to have fewer errors than hand counting, and it's going to get you election results really fast. We need that computer to lower the error rate and to get those results really fast. However, we shouldn't trust it, because the scanner is just another computer. And the computer could have code errors in it, or it could be malicious. And we need the computer for speed and the ability to not make human errors, but we can't fully trust it.

And the way we do that is we spot-check it with statistics. Basically, after the scanner has done its job, we randomly sample some of the ballots. We check that those ballots were scanned properly. And you plug that into some formulas, you get a risk limit, and off you go. That's called a risk-limiting audit. And the critical thing you should know about risk-limiting audits is they were defined in 2007 by Philip Stark and Mark Lindeman. They, until this year, have only been used at scale in Colorado. Colorado was at the forefront of this. They've been doing it for a few years.

But up until this year, in US elections, we take a whole bunch of paper ballots, because that part it seems we've adopted pretty widely now. There are paper ballots everywhere. We then put them through scanners, and we simply trust what the scanner tells us. That's something that we need to address, and it's one of the things that we're working on at VotingWorks and other folks are working on, too, to help run risk-limiting audits in as many states as possible so that we can use the scanners for speed but we don't have to trust them. So once again, we need the computers, but we shouldn't trust them.

Oh, I'm sorry about that. Let's see if I can silence-- I thought I had silenced everything, but. Ah, good. The risks of doing this from home. That's what happens.

All right. So if you're really in the know on this topic, you know that there is a question around, OK, if you have a paper ballot, should it be marked by hand or should it be marked by a machine? And as you saw the pictures of our machines at VotingWorks, you know that we have what's called a ballot marking device, which is a machine that you use a nice touchscreen interface with, and at the end, it prints a ballot that you verify and cast.

There is a significant debate between those two approaches, hand marking and machine marking. It's not what I want to focus on right now because we have a lot to talk about, but if we have time

at the end, I'm happy to say more. I'm just trying to manage our time and get through a lot of material here. But just know that that is a topic of significant debate right now, and it's not an easy debate. There's lots of issues on both sides.

OK, let's talk about vote by mail. Vote by mail, we now know, with plenty of research, increases turnout. Probably not as much as you might think, but it does increase turnout. It's cheaper, there isn't that much fraud, and probably most surprising is that it is quite nonpartisan, at least in the US. This is some late-breaking research that is linked to an op-ed in the New York Times, but it's a research paper that's linked here at the bottom-- and I will gladly share my slides afterwards with all the links-- that talks about the increase in turnout across all age groups in Colorado when Colorado implemented all vote by mail. So this is not the only study that points that out, it's just the most recent one, a significant increase in turnout from vote by mail. An increase in turnout is a really good thing for a more representative democracy.

Not that much fraud. You hear a lot of press talk about the fraud of vote by mail, et cetera. There has not been that much fraud documented. The fraud that we would be talking about here would be voter fraud, where people are impersonating others. These things do happen occasionally, but they happen incredibly rarely, including with vote by mail. Now of course, when they happen, they get a lot of press. There was such an event in North Carolina pretty recently, and of course we should prosecute those and go after the people who try to defraud an election. But the impact is generally very low, and it is not-- it is something we should pursue, but it's not something that really should be a significant concern in vote by mail.

The part that's less well-understood is vote by mail is nonpartisan. Let's be very clear-- if you listen to the press, if you listen to the politicians, there is this impression that vote by mail simply benefits Democrats. It's not true. There is now a number of studies, including this more recent one from April of this year-- also the link, happy to share-- that shows that, although there is an increase in turnout, there is no discernible effect on either the party vote share or the partisan share of the electorate. And that's really important, because if we're going to change how we vote in any way, especially in light of COVID-19, we need to be mindful that the changes we make are not partisan, that they increase the representation, but that they are not unduly benefiting one party over the other, because otherwise they won't succeed, right?

The good news is, again, there are politicians talking about this either way. This is late breaking reporting from this morning. So you know my slides are fresh because I literally got this in an hour ago. A wonderful article in ProPublica by Jessica Guzman and Mike Spies, or Spies, I don't know how to pronounce his last name. I apologize, Mike.

Even now there are politicians talking about this, across the board, the secretaries of state, be they Republican or Democrats, are expanding vote by mail this year. The folks on the ground realize this is not a-- this is not an issue that is partisan. It's an issue of voter safety, which leads us right into the last point I want to make, which is that in 2020, we simply need more vote by mail, because if we increase vote by mail, we can reduce the amount of in-person voting and make it safer, and ultimately, we have to do that this year.

We have to run an election. That's just how it goes. We have to do it. We've done elections in wartime before. We've done elections during the flu pandemic of 1918. We need to run this election, but we need to do so safely. And so whatever quibbles we may have with vote by mail, and I certainly don't think it's a perfect system. It's clearly the thing we need to expand in 2020, so we still need to maintain some in-person options.

Whoops. Sorry for skipping that too quickly. We need to expand some-- we need to maintain in-person options. But first, we start with an increase in vote by mail. Some data. This is the absentee voting. So some states call vote by mail absentee voting, right? Vote by mail has this connotation that it becomes more of a default. There is also all vote by mail, there is excuse absentee, no excuse absentee, all of these terms refer to some version of vote by mail.

If you look specifically at April 2016 in Wisconsin, you had 10% absentee voting rate. And you look at April 2020, this latest election, which was right at the very beginning of the COVID crisis as far as the public knew in the US. The election was April 7th, with 71% absentee voting. That's crazy, and that's with very little time for people to adjust. There was, as you may know, a lot of controversy around late breaking changes in the rules, but that's an increase we should expect to see in a whole bunch of states that don't have vote by mail in the US, and other than the Western states, most states in the US do not have more than 15% or 20% vote by mail.

Some states have a lot less, so there is a significant increase in vote by mail coming. It's coming whether we like it or not. The voters are going to demand it. The courts will almost certainly overwhelmingly allow COVID-19 as an excuse for states that require an excuse. It's happening, and it's the right thing to keep election safe this year.

So vote by mail is necessary, but also, it's not sufficient. We have to keep in mind that voters make mistakes on ballots, right? They might fill out the wrong bubble, or sometimes, ballots are not received. It happens. The USPS is not perfect, and we also have to consider the voters with disabilities, for whom vote by mail is not really an option, or at least, it's not a very good option.

So we'll also need safe in-person voting. An increase in vote by mail, a maintaining of in-person voting and making it safe. We definitely need that for 2020. So because of this need for vote by mail, one of the things we've been thinking about at VotingWorks is, how do we help? Because the one thing we should be worried about is the providers of voting equipment and voting technology.

It's not easy for them to adapt that quickly to the demand, right? This year, the demand is moving incredibly quickly. So one of things we're working on-- actually, the main thing we're working on other than auditing this year is a new product called the VxMail. And what I want to give you is a sneak preview demo of our system, which again, uses completely off the shelf hardware and open source software, inexpensive for ballot preparation and ballot marking and ballot scanning.

And I'm going to try to play this and skip the part that is me yapping because you've already heard that and go straight to the demo. And here it goes. Oops.

[INAUDIBLE]

Oops. I'm told that you can't quite hear that, so let me actually figure out if I can-- all right, I will-- here you go. What I'm going to do is turn off the sound, and I will simply speak over it. So in the system, we use smart cards to configure all devices. What you have is an election definition that's getting loaded onto this system, and from it, we automatically lay out ballots using best practices so that you can have the right design for a hand marked paper ballot, and this is actually pretty tricky.

There's a number of cases documented in history, where you have a ballot that's poorly laid out, and as a result, voters don't know how to-- might miss a contest, right? So here is-- we use an election definition for the election coming up in Texas in November. These are the real questions, but to be clear, Texas has not committed to using the system yet.

And we're just demoing how marking this like any normal ballots, again, this is a ballot that's printed on an off-the-shelf printer. It's a \$200 printer using standard paper, and then just marked with anything that darkens the bubble. You don't need a number two pencil or anything like that. In this demo, this was-- I guess you'll have to just trust me. This was done live. We weren't testing any predetermined candidates, we were just filling out the ballot as is, and ideally, you look at this, and none of this looks that shocking.

It looks really very straightforward. Yes, this is a ballot. It's not a big deal. If you voted in the US, it makes sense, and then it goes into a standard scanner, and we're just going to do a one at a time to show you, and this is our software running the scanner that processes this and automatically interprets it. And you can see the last ballot, and you can see the read of the ballot is exactly what I marked there.

Again, none of this should be shocking, but you should know that this is all running on off-the-shelf hardware using software that is fully open source and available on our GitHub. That's the key thing. We're going to be showing over the next few weeks how we integrate this into an actual mail management system to actually mail and-- print and mail ballots directly to voters.

So that's it. I wanted to talk to you about a little bit about me and VotingWorks, tell you what's so hard about voting, and tell you that we need computers to vote, but we shouldn't trust them. That's why we need paper ballots and risk limiting audits, and I told you a little bit by vote by mail. The most important thing to take away, it is surprisingly nonpartisan, no matter what the politicians say. And in 2020, we clearly are going to need more vote by mail so that we can make in-person voting a little more rare and safer, and that is my talk, and now, I will see if I can get to the Q&A and maybe stop sharing. See if that--

We have some great questions, Ben. First of all, thank you for that great talk and for the overview both on your work and some of your thoughts on voting and ballots in general. I'm going to start a little bit at the end of what you're saying, because we got a lot of questions about ballots, and so here's two. How do you reconcile-- they're related. How do you reconcile your argument for paper ballots with voter accessibility, examples, oversea voters where airmail might be slow, flying voters who live alone but need to vote absentee, and then-- why don't you go ahead with that one, and then I'll do some related ones.

Yeah, so these are really great questions. I need to chop them up in a couple of different-- couple of different ways. The main reason why we at VotingWorks are building a ballot marking device-- have built a ballot marking device-- is because we want to allow any voter, including the voters with disabilities, including voters with mild disabilities, and this is the segment of voters that I'm particularly worried about.

We always talk about voters with disabilities, and we think, oh, there's just a handful of them, right? But we sometimes forget that ability is a spectrum, right? It's a continuum, and there are a lot of folks that have visual impairments. Millions of American voters have visual impairments, and there's many aging voters that have visual impairments as they get older, of course. So one of the main arguments for machines marking paper ballots is exactly this. It's the ability for voters with any level of ability, any potential impairment to still have a secret ballot, because this is a thing that's poorly understood about the touch screen voting machines of the early 2000s that got such a bad rap and for good reason, because again, they don't they don't have a paper ballot, so there's no real verification.

But the one thing we have to know and have to understand and have to really internalize is that 2000, when those machines were first deployed, was the first year that blind voters got to secret about. Before that, blind voters had to depend on somebody else to vote on their behalf. And that is shocking, at least to me. So one of the main arguments for ballot marking devices and one of the reasons why we've invested so much in them is because it's the main way to provide that paper verifiability with accessibility.

Now, how does a blind voter benefit from the paper? That's a good question. In 2020, the good news is, a lot of blind voters have smartphones that can read paper to them, and that technology has gotten surprisingly good. So that's one of the ways that we want this to happen. A paper ballot is printed, and a voter that is unable to read that ballot it can use their personal device to make sure that the paper ballot reflects their choice.

Now, how do you do that with vote by mail? Another excellent question. Vote by mail tends to disenfranchise voters with disabilities, and the main way that we can solve that is with something called electronic ballot delivery, which we haven't invested in yet, but it's something that we are going to consider looking at, depending on the needs of various states. And that is basically a web page that leads you through the ballot with all the accessibility features including an audio track, and then when you're done, it lets you print your ballot at home and then mail it.

That's how he would do it. And of course, the in-person option is for people who don't have printers or anything like that. I think the question also includes something about overseas voters, and that is a really tricky one. I think electronic ballot delivery is also the best way to do that. It does require mailing that ballots. I know there are folks who argue for potentially doing online voting in those limited cases, and I think in those cases it might be worth considering, but it has to be considered in the context of the tremendous amount of risk that we take once we enable any kind of internet voting.

So it's not a great answer to that one because I think that one is really, really hard. It's just, I don't think we can set aside the dramatic security concerns and scalability of attack against internet voting systems.

Great. Great. All right, so I'm going to go through a little bit more down the vote by mail questions. So doesn't vote by mail make it possible to show someone else how you're voting? It seems to contradict the first part of your talk.

Yeah, it does. That's exactly right, and so I mentioned this briefly that one of the concerns that election security folks, including myself, have is that the vote by mail does erode the secret ballot. It does allow you to prove to your spouse how you voted, and I have long talked about the concerns I have with vote by mail, but that I call subtle coercion.

Subtle, only in the sense that nobody's holding a gun to your head, but still it's pretty bad. So subtle coercion looks like what? Subtle coercion looks like a couple sitting at the kitchen table and filling out their ballots and maybe they have a relationship where one member of the couple tells the other member of the couple how to live, how to do things, is the boss, right? And what happens if when they're sitting there at the kitchen table filling out their ballot.

Is the less dominant member of the couple going to speak up and say, yeah, I want to vote for so-and-so, or are they just going to say you know what? I got the kids to take care of, I got dinner to cook, I'm going to fight this fight. I'll just vote the way my partner wants me to. I'm worried about that. I'm very worried about that, and I don't know how we measure that.

I don't even know how we build an experiment to test for that, right? There are very few experiments that test the secret ballot. The only one that I found in almost 20 years of doing this is one related to the country of Chile, where the secret ballot was implemented for the first time in 1958. So they went from a non-secret ballot to a secret ballot and the outcome was a dramatic sea change. Almost overnight in the makeup of the government.

So I'm worried about this, and I'm worried about how vote by mail does enable this level of subtle coercion. That's why I don't think it's the perfect solution. That's why I think we should be a little bit wary of it. There are ways to solve it by letting people override their vote in person, which some states allow you to do. So you can mail your ballot and then you can go and invalidate in person and change it. Those are some defenses against that, but that's imperfect, too.

So the key take away when you've been in elections for 20 years is there's no perfect system. That doesn't mean you shouldn't strive to do better, but it definitely means you shouldn't walk into any system and ignore the downsides. When we think about vote by mail, it's clearly the solution for 2020, but I'm not an advocate for necessarily making it the default forever, because I think we should look at the pros and cons.

Well, if anyone in our very smart crowd has ideas for Ben on how to actually run an experiment on how to make sure our vote by mail is secure at home and in other locations, feel free to either put it in the Q&A, or I'm sure Ben reaches Twitter so that's a good way to get in touch.

Yeah, I would love that. I think it's something that I've found has been-- it's a tricky topic to engage on, because it either clicks with people and they see, oh, yes, I see the threat, or they go to, I have no evidence of that, right? And the problem with security issues is that you have no evidence of a problem until the problem is blatant, right? And so it's a tough one.

If you have a great-- I think it would be a groundbreaking paper if you could show either way that vote by mail does or does not change-- is or is not an avenue for subtle coercion. Either way, it would be groundbreaking. So if you're interested in that, I'd love to know how we can figure that out.

Cool. We've got some sort of activists, how do I help? How do we do it kind of questions. So one question is, how do community organizers and civic groups do get out the vote? They can't go door to door, and how can we-- they-- help voters adjust to vote by mail. I'm particularly interested in mobilizing young voters who tend to vote at lower rates compared to older voters.

Yeah, so the organizing and get out the vote is-- so one, I see a question also, how do you help contribute? I would say, it's one of the things we haven't quite been able to figure out yet at VotingWorks, because there's so much context required to really help in this area, and we don't have a community manager yet. We probably should figure out how to do that.

If you have any ideas, and if you want to help, just reach out to us at hello@voting.works, or you can find me on Twitter and I'm happy to do that too. Now, the other stuff about organizing for get out the vote and whatnot, I honestly I'm not the expert on that. I focus mostly on election administration. Get out the vote efforts are not my-- I don't have any special knowledge, so I don't think I can give you a good answer.

It obviously seems like a pretty big challenge this year to figure out how you do get out the vote from home, but I don't have anything more than the same thoughts I'm sure you all can come up with. I think there's some interesting questions about risk limiting audits.

Yeah.

What are the-- yeah. So how expensive are they? What are the biggest impediments to having them more widely used, and I'll add to that, how do you think about ways to expand it, whether not only from your point of view, but from more a governmental point of view, and if there are ways that people like us can advocate, what are the things to be advocating for?

Those are great questions. So I didn't have time to dig into them too much, but I am in love with risk limiting audits. They are probably the biggest policy and technical success in election administration in the last decade. Paper ballots being, I would say, the number one in the last 20 years, and risk limiting audits being the number two and the number one of the last 10 years, because, well just because of timing.

So I want to tell you a little bit more about them to understand how powerful they are. To run a risk limiting audit, how powerful they are and what you need to run them. To run a risk limiting audit, what does it look like? It looks like you put a-- the county's tabulate their votes, you get a

result, and then you want a sampling process that's going to randomly sample a certain number of them to go check and see that the scanner did a good job on scanning those ballots, and then you get a certain confidence level that the scanner is not cheating, which is great.

You get the speed and-- its speed and trust, which is really fantastic. So how much work is it? What's really interesting about this is that if you think through the probabilities in the sampling process, it turns out that the number of ballots you have to look at depends mostly on the margin of victory. So if it's a tight margin, you need to look at more ballots to make sure that that tight margin is correct, and if you want a higher level of confidence, you need to look at more ballots. What you don't-- what it doesn't depend on, surprisingly, is how many total ballots were cost-- were cast, sorry.

So if you have 100,000 ballot election or a 10 million ballot election, the number of ballots you need to look at doesn't change. It depends only on the margin of victory and the confidence level you have, which tells you that the right way to run these audits efficiently is to run them at the largest possible scale you have. If you run them at the county level, you're going to have to do the same amount of work for every county, but if you run them at the state level, you have to do that same amount of work you have to do for one county, you have to do it just once at the state level, so clearly you should be running these at the state level, right?

It's so much more efficient to amortize the costs over the whole state. However, there's a challenge. If you sample and run this at the state level, you have to consider the fact that the paper ballots are stored at the county level or at the township level sometimes, which now means you have this complicated workflow and dance you need to manage between the states and all the counties, and that's why you need software to help, right? You need the software to coordinate that workflow, and that's what Arlo is.

The software that we have created and that is-- I forgot to mention, actually is being used as we speak right now in Michigan to run a risk limiting audit for their presidential primary, which is the first time that there is a statewide audit that was not in Colorado. So we're really, really proud of that and that's really critical, and we have a number of other states that are lined up to do it. The really good news about getting risk limiting audits done is that there's widespread bipartisan agreement that this is a really good thing. It's something that doesn't require voters to do anything more. It can be entirely managed by election officials in a public process, and one of the main blockers is having the software to do it, so we're really, really proud that our vote is going to be unblocking a lot of that, and again, it's open source software.

If you want to get it done, just whenever you're talking to election officials, ask them what's the progress on risk limiting audits? Have you heard about Arlo? It's free software you can use, and VotingWorks will help, but we're not the only ones that will help you run one. There is an element of, you do have to work out what's called the custody, the paper ballot custody process that you have, you have to have a really clean process for that.

You have to know where your batches of ballots are stored, you have to know how to find them, because the process literally involves county officials getting together on an audit day, uploading their manifest information about how many ballot batches they have and how many ballots exist,

and then getting audit orders from the states and then saying please go fetch ballot 32 in batches 17 and enter it into the system so that we can make sure it matches the records that are there. So you need to know where to find batch 17, and you need to know-- have a process for looking at that and have a process for a bipartisan audit board looking at that.

So there's a little bit of training and a little bit of workflow and a little bit of process that needs to be implemented, but that's pretty well defined now, and we've got the methods down and folks can be trained. So this is ready for deployment.

There's a follow up risk auditing-- risk limiting audit question that I think is a good one. I understand that the developer of the risk limiting audit says it is not incompatible with ballot marking devices because voters can not actually verify that a ballot marking device marked their ballot.

Yeah.

How do you address that?

Yeah, so what this is addressing. So this gets into the ballot marking device controversy. The debate is this. If you have a machine that prints out your ballot. So first, I'll tell you what this is not about, OK? There is a lot of noise around-- let me backup. You use a computer, a touch screen, a nice little UI. It prints out a ballot, you look at it, you cast it.

That's the model of ballot marking devices, right? To make it easier to scan, most ballot marking devices, in fact, almost all of them and certainly ours uses a QR code on the ballot that is a copy of what's printed on the paper ballot. So there's a human readable text and there's a QR code, and there are a lot of folks that are worried about the possibility that the QR code might not match what's printed on the ballot.

It's true. There could be bugs in the software, there could be malicious software. That means that it prints one candidate but encodes another in the QR code. So there's a lot-- there is some folks that are worried about that, and that then say, well, this is why you can't use these machines. I'm going to be very opinionated and very clear on this, I think that argument doesn't hold water.

The reason the argument doesn't hold water is because it is very easy to audit this after the fact. If you have paper ballots that have a mismatch between what's printed on the text and encoded in the QR code, you can go figure out what happened, and of course, you should default to whatever is the human readable text in those cases. The beauty of it is that when you run an RLA, you're inherently checking that, because when you go fetch the paper ballot to go check what's on the paper, you're not reading the QR code, you're reading the text, right?

So by running RLA, you bypass that entire problem of QR codes that are on the ballot. You're actually auditing that altogether. So if you hear that argument, you can absolutely quote me in saying I dismiss it out of hand. I think it is fear mongering, I don't think it's helpful to the debate. Now, there's a second argument that I think is valid, and I think it's worth continued debate, and

that is the question of do voters even look at the text on the ballot before they put it in the ballot box, right?

Because if they don't, if they print a ballot and they look at it and they don't look at it and they just put it in there, then is that paper ballot a valid-- is there a real act of verification, or are we just trusting machines, right? Now, even if that were the case, I don't think it's quite as bad as if you had paperless voting machines, because once the paper is printed, there is no longer an opportunity to cheat the system, but there is still an opportunity if voters are not checking.

So there's a furious debate right now going on as to how do you get voters to check, can you get enough voters to check, can you get evidence that voters checked. This is a very, very long debate on this, and I'm happy to talk about it some more. I think we've run out of time, but that, I think, is a valid debate.

That, I think, we should engage on it, we should understand it, we should work to make sure that the ballot marking devices that are built for reasons of accessibility, for reasons of ease of managing an election, because the other reason ballot marking devices are really useful is as we move to a world that has vote by mail and what we call vote centers, which are these centers that are the aggregate of many precincts, and thus, voters having ballots of many different styles. Depending on where they live, they might have different questions on the ballot, and the ballots may be in different languages.

LA County, for example, has to support 12 different languages on their ballots. It's much easier to administer an election with a ballot marking device, so that's an advantage of it. And the disadvantage is are voters actually checking the ballot, which, I think, is a critical question. There's some research out of the University of Michigan, a paper by lead author Matt Bernhard under professor Alex Haldeman at the University of Michigan that, interestingly, can be interpreted in two different ways, depending on how you read it.

One way to read it is, oh, my god. People are not looking at their ballots and that's a problem produced by ballot marking devices. The other way to read it is, actually if you nudge voters to look at their ballot, if you find the right nudge, they do, and they do find errors. And so you can read the paper, and you'll see there's both ways of interpreting it. That second part to me is very interesting.

It says that if you can find the right nudge, voters are absolutely capable of finding errors that might be introduced on their ballot. So the question is, how do you find the right nudge? One of the things we're working on and VotingWorks is you may have seen the picture of our system. We actually separate the place where you mark the ballot on the screen and where it gets printed.

You have to walk over 20 feet between the first device and the device where your ballot is printed, and one of the reasons for that is to create a forcing function, where the voter is no longer thinking they're just printing something at a computer. They're actually using a different computer, and we've noticed-- anecdotally-- that, oh, if you've walked 20 feet and you have no screen confirming your ballot, you have a higher chance of actually looking at your ballot and checking-- and checking it.

That doesn't mean that I think the problem is solved, but hopefully, I've given you an honest status of the debate right now, right? Ballot marking devices are significantly easier when they're built well to administer an election, but there is this trust question of, are voters actually verifying the paper ballot, and we need to further investigate that. And I'll say it one more time, the question of the QR code-- in my mind-- is totally bogus, and I'm sure I'll get flamed on Twitter for it, but you just got to go out there and say what you think, so.

All right, we only have a couple minutes left. I want to try to do one more. So we have someone who first asked on the Election Assistance Commission certification. Are you are you certified?

Great. Good question.

And then and then it gets even more interesting in that it says, this seems to be a problem with machine manufacturers have to choose between security and the certification, since the certification process takes so long, and you need to recertify once you do it regular software patch to the system.

Yes.

How do you think we-- are you certified? How do you address this issue?

Great question. We are not yet certified. The EAC certification is a federal certification process. We've started in locations like Mississippi, where the federal certification is not required, because we wanted to build a system that was first for users, voters, and election administrators, and then once we find the right product, then get it certified, because whoever asked the question is correct. Once you certify a system, it's much harder to make changes to it.

We were able to make dozens of improvements to our machine in a matter of three months because we got feedback from voters in a realistic setting, and, of course we met a minimum bar before we went out there. All the elections we've run have run well, but the latest one ran much better than the first one because we were able to get a lot of feedback and improve our product. I think we basically found a loophole in the federal system that allows us to do this.

I think the loophole should be standardized as an approach that makes sense for developing new systems. The bar for deploying system in a single precinct should be low. The risk is low.

You want to be able to try new, more affordable, more secure technologies without having to lock it in and no ability to change it later, right? And the bar should rise as your deployment rises. That's how I hope that the system can be improved. Now, I want to give credit to the folks at the EAC. This is a very difficult problem, right? The question of how do you certify but stay nimble and allow security patches and all that is legitimately difficult, right?

You want voting systems to have a certain quality and security bar, so you have to implement a process, the process is going to slow you down. I'm very optimistic about the newest version of the standard, the Voluntary Voting Systems Guideline 2.0, which are currently being debated, which, I think, will make updates easier, will allow you to certify modules in a system in a

modular way, instead of having to certify a complete system, and I hope-- I don't know if we'll get it in 2.0, but I do hope that this ratcheting up of the bar can be implemented at some point, where the bar is just lower for small less risky deployments and then just scales up as your deployments scale up.

Well, thanks, Ben. This has been absolutely fascinating. A pleasure to have you here, and we really appreciate the time.

Wow. Thank you so much, and if you want to ask more questions on Twitter, I will answer as many as I can. So thanks to everybody.