

Voting in 2004:
A Report to the Nation on America's Election Process
Tuesday, December 7, 2004
Room SD-G50, Dirksen Senate Office Building

Panel 4: Machines

MOD: I'd like to get started. Again, I'm Wade Henderson, the Executive Director of the Leadership Conference on Civil Rights. And I will serve as the moderator of our next panel, which will be on the topic of voting machines. Now, prior to the enactment of the Help America Vote Act, the widespread problems with punch card machines and hanging chads stood out perhaps more than any other issue in the minds of the public when it came to the topic of voting and election administration. In the two years since the enactment of HAVA, the topic of voting equipment continues to draw attention like no other issue. And once again there were widespread concerns in the 2004 election about whether voting equipment was working and counting votes properly. The only difference being that recently the focus of public attention has now shifted to newer types of machines such as touch screen and optical scan systems.

Here to provide some critical perspective on how voting machines performed in the 2004 election are four very

distinguished panelists, and I'll introduce them a (unint.) and then urge each one to either speak from their seat or to take the podium as they see fit. David Dill, immediately to my left, is founder of verifiedvoting.org. David is a professor of computer science at Stamford University. To David's left is Dean Heller, the Nevada Secretary of State, especially appreciate Dean's effort to be here today. David Jefferson, to Dean's immediate left, is the chair of the California Secretary of State's Technical Oversight Committee, and he's a member of the state's voting systems and procedures panel. And finally, my colleague and friend, Ted Selker (ph.), Associate Professor at the Massachusetts Institute of Technology. Please join me in welcoming David Dill to the podium.

DAVID DILL

MS: As others have observed, the fact that we had a reasonable margin in a Presidential election has led the media to broadcast the message that the election went fine. And while I don't know that the election went horribly, I think that there were some very serious problems, and we should take that as a warning that those problems should be fixed before the next election which may not go so well. At the Verified Voting Foundation, helped build a computer system

along with computer professionals for social responsibility which has been mentioned a couple of times, called the Election Incident Reporting System.

Our goal from this was to capture the reports that we knew would be pouring into the election protection project so that we could learn from the election and be able to fix those problems in the future in addition to helping people dispatch lawyers and whatever more effectively on election day. We've collected something like forty thousand reports due to these efforts, and they're all available on the web for you to peruse at your leisure at voteprotect.org, and I encourage you to go talk a look. You'll learn about what really happens in elections that way. Of these forty thousand reports, maybe eighteen hundred were about equipment problems, and about nine hundred of those were about electronic voting problems.

So, I'll summarize briefly some of the things we saw there and also some of the reports I've seen in the press since then. First of all, one of the things that is not widely reported in the press is that there were certain hotspots

where voting machine failures contributed to disenfranchising voters. One of those was New Orleans.

On election day, I was hearing from the people who were manning the phones that the switchboards were just lighting up with reports from New Orleans. If you look through the election reports, you see page after page of reports. No machines in the precincts are working. There are not enough paper ballots. No one can vote. Those are quotes. There were similar problems in Pennsylvania in particular places, namely Philadelphia and Mercer County.

At the Roberta Clemente (ph.) Recreation Center, the comment in Philadelphia was the machines are not working. People are leaving in droves. In Mercer County, the comment was electronic voting machines are not working, none of them. People are leaving in droves. So, we can see these are not isolated individual comments from precincts. They're actually pages of these things, and if you have a precinct where the machines are down for ninety minutes, all of the machines are down for ninety minutes and people are leaving in droves and you receive one

report, you know that the reports you're receiving are only the tip of the iceberg.

However, the problems were not limited to the hotspots. There were widespread problems, and there were some particular kinds of problems that I'd like to highlight because we really don't know what's going on in these cases. Particular kinds of problems were votes being registered on the machines for the wrong candidates. So, this happened all over the country, and it happened with several different kinds of equipment. The reports are from people who noticed on a confirmation screen or whatever before casting their vote, and they went back and sometimes with several tries managed to correct their votes. We have no idea how many people didn't notice that votes were being registered for the wrong candidates and just cast their ballots anyway. And this is very hard to study imperially because there's no independent way to check what the machines did.

Another problem that we observed was contests missing from the ballot. In a typical situation, a voter would return to his or her house or car and look at the returns from the

election or look at their sample ballot and realize there was an important race that they hadn't had a chance to vote on. We don't know why this happened and we won't be able to tell by looking at the election returns how many votes were affected by that phenomenon. These problems really need to be looked into because we just don't understand them and we can't measure them.

Something is obviously wrong, and it also raises the question of what might be happening that we don't know about. We've had mechanical failures, electrical failures, software failures with the machines. We've had phenomenon that seemed to be funny, all across the country, that we can't really explain. As a computer scientist, given how little I can see about what's actually happening inside these machines, we have to ask what other problems might be occurring.

On the subject of press reports, there are a lot of them. I'm in a situation where people email me stuff and I look at news on the web to see what's happening around the country, and there are a lot of different problems. But the worst problem in the country was in Carteret County,

North Carolina, where over forty four hundred votes were simply lost forever due to a machine configuration error or if you're me, design error in the machines that allowed this to happen. It looks like a new election will have to be held in Carteret County for the agricultural commission race because of this particular problem. There are other serious problems in the country with other types of equipment but they didn't have to have new elections because they had ballots that they could go back and look at to figure out what happened.

Finally, I'm in a position where I receive a vast number of emails and communications of various kinds sometimes from reporters about theories of election fraud. This is not necessarily something that's widely reported in the press, but if you're involved in the sort of things I'm involved in you hear a lot about these things, the stolen election. It is very difficult to respond to these theories. I would very much like to be in a position of debunking them. Unfortunately, it's so hard to see into what actually happened in the election that it's hard to get the evidence one way or the other for or against these theories.

I'll note that because of things that were published on web recounts were actually rapid for in individual counties in New Hampshire and Florida, which pretty much settled the question about election fraud in those counties at least for most people. There wasn't serious election frauds so far as we could tell. The statistical anomalies that were observed were simply anomalies that were explained by other means. In many other places we will never be able to resolve these theories. Thank you.

MS: Thanks, David. Our next presenter this afternoon is Dean Heller, Nevada Secretary of State, please join me in welcoming to the podium.

DAVID HELLER

MS: Thank you, appreciate it. Thank you. It certainly is a pleasure to be here. Contrary to popular belief, the most difficult thing I did this year had nothing to do with voting machines, by getting my eighteen year old daughter to vote. And I'll tell you how I did it briefly. Four years ago - she's a sophomore in college right now with Arizona State University - but she was a sophomore in high school at the time. So, I pulled her out of her drama class and brought her over to the (unint.) office with me and I wanted her to watch her dad cast some votes because I

do feel that if parents and grandparents got their children and grandchildren involved in the process by taking them to the polling place you would see them participate at a greater number between the ages of eighteen and twenty five.

So, to prove it to myself I took my daughter out of school and walked over there, and we went to the ballot, and she was intrigued. At the time of course it was a punch card system in Carson City. Lots has changed. But needless to say as we were going down the ballot there was a gentleman in the booth next to me that was very uncomfortable that two people were standing in a voting booth together. And you could tell he started him and hawing and we were going to the ballot. In fact one of the ballot questions was whether or not they needed more technology at her high school and which she needs to see because this is what changes people's lives, direct questions on the ballot. But this gentleman sitting next to me or standing next to me was really uncomfortable that two people were standing in the voting booth together.

Finally, he turned to me and said you can't have two people in the voting booth together. I said this is my daughter. She's sixteen years old and I'm just showing her how the process works, and he went back to his punch card. And we went a little bit further in the ballot and finally I could tell he just had it and finally he turned me and said, sir, I don't know who you think you are but as soon as I'm done here I'm going to the Secretary of State's office and I am complaining. So, I chuckled, and my daughter looked up at me like now what are you going to do, and I reached in my pocket and handed him my card. I said I'll be there in ten minutes. And she voted this year and I was very proud of that, and again that was statistically the most improbable thing that would have come to task during this election cycle and I'm real pleased with that.

To go back to voting machines here for just a minute, I want to go back to 1996 election. It was a race between Harry Reed and John Enson. John Enson was a sitting congressman at the time. It was a close race, six hundred thousand votes cast and it was determined by about four hundred votes. And John Enson at the time asked for a recount because he had lost the election by that count, had

to put up the money. And so, we started the process of a recount. Now, we had electronic voting machines in Clark County, Las Vegas. It was the only county that had the electronic voting machines, but they had no paper trail attached to it.

So, as the sixteen of other seventeen counties started their recount process whether it was optical scanning or punch cards, Clark County called us back in about thirty minutes and said it's done. Says you want another one all we have to do is hit the print key again. I'll do ten recounts for you. I'll just keep pushing this button, just keep printing out the results because they're exactly the same. So, that was the beginning of the issue. Of course Senator Enson was very uncomfortable. Now Senator Enson was very uncomfortable at the time. I was very uncomfortable at the time, but there wasn't anything that I could do to change what was going down in Clark County.

I guess I could have gone to the legislature and asked him to kick out the eighteen million dollars worth of machines that they had down there, but the lobbying efforts would not have worked. The county commission would have come

down. It would have been very, very difficult. But fortunately through the help of the America Vote Act and the funds that were available through Congress we were able to make a substantial change in Nevada. And it all started back in December of last year when I made three announcements. One was to get rid of all punch card systems in the state of Nevada. I decertified all punch cards, no punch cards in that state.

Second, we went with electronic voting machines in all seventeen counties so that there were no difference in machines from one county to the next. I thought there was some equality issues and frankly some serious legal issues of states that have voting machines that have different margins of error from one county to the next. Frankly, that hasn't been addressed, and I'm surprised at this point, one voting machine statewide. And finally, the third announcement was all those new voting machines must be attached with a voter verifiable receipt.

The difficulty of making that decision was there was no such thing as an electronic voting machine with a voter verifiable receipt. In fact, I recall specifically Debolt

(ph.) in the registrar's office in (unint.) County when I asked them if... in fact they gave me a great deal. We'll replace all the machines statewide, in fact even the ones in Clark County for this particular cost. And I asked them if they could attach a voter verifiable receipt or a printer to them, and they said that they couldn't, and I said how come. And they said because nobody's ever asked for it before. And I asked them how many of your ATM machines, how many receipts do you produce out of your ATM machines every day. And he said hundreds of thousands.

So, if you can produce those kind of receipts out of an ATM machine every day, how come you can't put a printer on the side of this voting? And they said again because nobody had asked and said they could not have one ready or prepared by this next election. So, I was very fortunate to have a vendor that did step up. I want you to know my five minutes is up, but there is a voting machine in the lobby back there.

For anybody who has not had a chance to see this (unint.) voting machine with the printer attached to it, I will tell you regardless of a recount or problems in the election

before they can canvass the results of their elections to their county commissioners, the clerks and registrars in our state, they must take three percent of their machines and check manually every one of the votes cast against the electronic voting machine to make sure that that machine has been programmed accurately. That way we can prove to our voters that their vote is accurate and that we can be accountable to the voters. So, I'll be here to answer any additional questions that you may have and thank you for having me here today, thanks.

MOD: Dean, thank you. Because Nevada is the only state with a statewide system of electronic voting machines with paper we certainly do want to hear your comments and hopefully there will be questions at pose that will help flush it out. Our next presenter this afternoon is David Jefferson. David is the chair of the California Secretary of State's technical oversight committee, and he's a member of that state's voting systems and procedures panel, and we really appreciate David coming all the way from California.

David, thank you.

DAVID JEFFERSON

MS: And a computer scientist I might add. I'm one of the computer scientists active in this subject. So, what I

want to report to you today is about a particular testing program, electronic voting machine testing program that we've instituted in California that's known as parallel testing which really doesn't describe what it's talking about. Most of the testing that is done for voting machines is for the purpose of looking for bugs for the functionality or to make sure that it conforms with the election codes of the various jurisdictions in which the machines are used. But parallel testing of the kind we do is for a very different purpose. It is to specifically look for malicious code in the voting machines, not bugs, not errors, but actual fraudulent code that could theoretically be inserted into the software of the machines. I hesitate to... I mean I hasten to point out that there is no reason to believe that this has ever happened, but the consequences of it are so devastating in principle that we have to have some ways of protecting against it. So, what is malicious code? Malicious code is software that purports to record votes accurately but actually cheats sometimes and disguises the fact that it does so. It's easy to write. It's easy to hide. If it were there, it could change the results of thousands of elections in the United States simultaneously, and it could do so

undetected. Remember, there's no reason to suppose that this has happened, but because the damage that it could do is so great we need this special program to attempt to ameliorate it or detect it. I refer to it as a potential weapon of mass electoral destruction. I take this very seriously. I consider it a matter of the highest national security that we have some confidence that this has not happened. This is the kind of problem that keeps the computer security community sleepless at night. So, what do we do about it? There are several approaches to dealing with this. One of course is a truly independent accessible voter verified paper trail, accompanied by a real serious auditing system. Of course it does no good to collect a paper trail if you don't after the fact audit it. And so, that actually is one strong control over this problem, but we do not have that in California yet, although we will in future elections. There are various cryptographically based protocols that you could add to voting systems that would address this problems (unint.) VHTI system marketed by vote here, David Chowmes (ph.) of Otegrity (ph.) system. These deserve consideration, but they are not available. Computerized ballot printing systems as opposed to DREs also address this issue. Strng coding standards and

extensive code review would address this issue. It's a disgrace that the code in all of these voting systems is basically secret so that even I, in my position, am not allowed to look at this code yet. And finally another way to address this problem, a potential problem of malicious code is parallel testing. So, let me tell you how parallel testing works. First of all, the point of malicious code would be both to modify votes in the election and also to hide from all of the testing processes that the systems go through. The testing done by ITAs and by state certification panels and county exceptions testing and pre impost LNA testing are not adequate to detect this. Why? Because if I were writing malicious code, if I really wanted to cheat, of course, I would write the codes to hide from the testing. How do you do that? You write the code to say am I in a test situation or is this a real election. If I'm in a test situation, I'll be honest. But if I think it's a real election, then and only then will I cheat. Now, that sounds like a logic conundrum that (unint.) from the land of the liars and truth tellers, but in fact to a computer scientist this is very simple security problems. So, parallel testing is a protocol that's designed to catch code even though it has been programmed this way, very

different from functionality testing, very difficult, very expensive. In California though this testing was recommended by Secretary of State Shelly's task force on electronic voting a year ago in which David Dill and I and others served. It was ordered by Kevin Shelly. It was performed in the March 2nd primary and again on the November 2nd general election, and as far as we know this is the only place in the country, for that matter in the world, where this kind of testing is done. The protocol is very difficult. Basically what you have to do is to put the machines through a test that gives it absolutely no possible cue that this could be a testing situation and isn't a real election. That mean the test has to run thirteen hours. It means it has to, you can only run seventy five to a couple of hundred votes through it in that thirteen hours even though you could potentially run hundreds of thousands. The machines have to be chosen randomly from the real population of voting machines. The votes cast on them cannot be designed for catching bugs because then you would cast every different kind of vote possible. Instead you have to statistically mimic the actual votes that would be cast in that precinct. And then you have to videotape the whole thing, thirteen hours of

videotape for each machine in the test to use as a record to detect anomalies afterwards. And then you have to resolve all the anomalies you discover. And of course we do discover anomalies.

MS: Could you reset the clock so that it could reflect an actual election date?

MS: It was conducted on election day, and the clock was set correctly, yes. The clock says election day, and that's another issue. The full protocol I'll be happy is online at the Secretary of State's website. It discusses all of these issues. Yes, believe me, we are concerned about the clock issues. So, we tested voting machines in ten counties, two machines per county, a total of twenty machines, twenty video cameras, sixty two people involved in the testing, each of whom got five to seven hours of training. There were two hundred and forty two contents involved, fifty two thousand votes cast and cast by hand on the touch screens. It must be cast on the touch screen.

If the votes came in through a serial port or through some other means, any other means than real touch screens, then of course the software would know this is a test and the whole point is to fool the software into thinking it's a

real election and to provoke it into cheating if it's going to do so. So, the results were very simple. We did not find any evidence of a malicious code in these systems in this election. The machines were one hundred percent accurate in these tests as they were in March I might add. That's the good news, or rather it's not news at all. That's the results you expect. That's the result that we better had. The only news would have been if we'd found anything else. But let me give you the caveats now.

Those of you who are taking notes, I didn't say there was no malicious codes in these machines. I said we did not find any. There is no general method of finding malicious codes in the machines. Secondly, our sample size was too small. We had only for example two ESNS machines and only two Hart machines in our sample. We had twelve Sequoia machines and I think four Debolt machines in our sample, two per county. That's just the way things work out in California. There are many kinds of malicious codes that our tests would not detect. This is not a definitive result, and the results were carefully tuned to California. They may not apply to other states.

If I were a malicious code writer in fact, I would say, if I'm in California, I'm going to behave properly. They might detect it. And anyway California is not a swing state. If you're from a different state, you are not necessarily, the logic of our test does not necessarily cover your state, although it's not irrelevant either. So, at the conclusion that I want to leave you with is that we have some evidence that at least in California and in the last two elections, the primary and the general election, that there appears not to have been a malicious code attack this year. But I think this is the kind of testing that has to be made a permanent part of our testing protocols for voting systems. Thank you.

END OF SIDE A

MS: In 2001, we put out this report. You see kind of the results of it, registration problems, one to three million confusing ballots, one to two million polling place operations, one million in 2000, and go ahead, next one. We will be putting out another report. We're going to wait till March when the data from the census for registrations come in. Here we have a picture of a polling place inside of a glass box, and I call this transparency in a voting machine because in fact there's so many steps to the voting

machines working correctly that I think everything that happens in that room is the voting machine. Process after all is what technology is. We have a lot of data coming in actually. I can just say a few things about it.

It's early data, but what's amazing is that we have a couple of states that have .4 residuals. I don't know if you know, but the residuals are the errors caused by lack of voting for President by either not voting or voting for too many, and it was 2.2 countrywide in 2000. We've never seen that low. And in fact throughout the country, we haven't gotten all the states yet, but the preliminary residuals that we have seem to have one half the errors that we had that kind that we had in 2000, an incredible, incredible improvement. By the way it is not even across voting equipment, and what we find is that the voting equipment that is new since 2000 - I was not expecting this by the way - performed much better than the equipment before that.

There are some other factors, for example tremendous advertising in LA County to get people to use what I consider possibly the worst voting machine that we have to

work with, got a very low error rate. They reduced their errors from the primary by almost five times through this Dalmatian dog advertisement. It's shocking how well they did. But that's an exciting story. It's a story about the possibility of improving polling place practice by making every voter show that they can use this voting machine before they do it and then do it. I actually that database when I last looked at it yesterday had twenty two hundred electronic voting machine complaints, up a few from what David reported. But what's shocking to me is I was expecting a million.

And so, those are the good things. Process was watched and found wanting. Everywhere I've been in the last four years watching hundreds of polling places I've seen terrible problems with polling place problems, little problems that can be fixed quite easily, places where one person has - go to the next slide - ability to compromise somebody else's.

The information is important but in this case there's a polling place where you can see the placard outside the window for somebody that is trying to run for election. They actually had a garbage can next to where you

registered because that person was also giving everyone big placards that they walked into the voting place with.

Please go to the next slide.

Supervised and secured information is also important. Here we have all of the materials that a person should see by law, and among them is the beginning of day printout from these optical scan machines in Boston. And it's on a wall where no poll worker can see so it can be vandalized.

Also, you never know if people look at it or not. You could take that polling that beginning of day record with you. At the Caltech MIT voting technology project, we've been doing various things. We work on evaluation, and I've been talking about that a bit here. We've been doing some system testing and analysis.

We're just about to do a test of verification methods by the way, David, if you want to get involved. And we do development. For example, I developed a verification system called the voter verifying audio audit transcript trail. It's much less expensive than some other verification methods. It has some advantages I'll talk about a little bit later. We have built new kinds of

security systems that have multiple agents inside of a computer that check on each other. We've been testing and designing new kinds of ballots.

We have a ballot design in case... one of the problems with voting for something and think you've voted for something else, half a percent we've tested it in DREs and also in punch cards. Half a percent of people typically and the ones in this test we've done vote for the wrong person and don't realize it. So, adjacency errors, voting for the thing next to it is very common. And we have a ballot design that reduces that by three times. We have another audio ballot design program where we believe we can reduce the amount of time that it takes for a sightless person to vote by five times.

You have no idea how frustrating it must be to spend forty five minutes voting. I don't know why they think that's an improvement, but I know that they like their secrecy. So, we've been working on various things. Let's go on to the next one. The thing that you find is I'm a Quaker and we talk about walking in the light. We'll here's a polling place in 11/2 where in fact they had brought in lights an

hour and a half after the polling place started because people couldn't see their ballots. The other thing that's interesting about this (unint.) voting place is that you'll see three people in the first booth, two in the second and two in the third. For some reason that seems to be the way that those people were voting. Let's go to the next one.

Great contrast battery operated. This is a photograph taken of a DRE where twenty machines were all plugged into the same circuit. They went down immediately about being powered up, and no one noticed. I took a photograph of it because I noticed. And when I came back an hour later unfortunately they had all gone down. They had to be put in another circuit. By the way, the circuit they put it into was in the kitchen, and it was also, there was a microwave plugged into that. But no one turned that on I don't think. Let's go on to the next.

Now, it's important that we have technology that keeps that doesn't keep us from knowing what's going on. Here is a door, an automatic door with the information for voting on it. If you walk up to it, it hits you in the face. So, let's go on. And here's someone writing down the beginning

of day election. For those of you that can't see, she's wearing stars and strip vest, but she's by herself. And my big problem with this voting machine is that so many times in the process people are in a position by themselves to make changes to other people's votes accidentally. And this person by the way she did not getting around to taking the beginning of day tallies by herself until after ten minutes. There were voters all around her because she didn't realize the place had been turned on. Let's go to the next one.

Now, these people are all standing around about ten minutes later after the polling place opened because they've all been accidentally given provisional ballots. And so, they only got to vote for a senator. This is a primary instead of voting for all of the other seven things. And let's go to the next one. And it's because there's one person at this activator module programming the smart card and that the piece of paper closest to her says how to program it for a provisional ballot. She does not ask the voter to look at their ballot and make sure they got the right ballot. She doesn't ask anybody else to check it, and it

happened all over that particular jurisdiction that day.
Let's go on to the next one.

Now, there's somebody shutting down, I'm going to the say story I'm sorry. The voting machine at the end of the day and somebody's writing down in those three different pictures the end of day results, but the people that are near her aren't watching what she writes down or writing anything down themselves. We have to have people checking. Now, unfortunately one out of twenty of the paper trail machines jammed the day when I was watching in the jurisdiction I was watching in Nevada. And so, the right thing to do would have been to replace it with a working printer, and they did have working printers to replace them with. But in fact there was actually some instructions to maybe fix the jam.

So, this woman here has a ballot box open. I never saw a ballot box, a paper trail ballot box in Nevada that was sealed by the way. Open on the day of election, she's by herself and there's scissors in front of her where she's cut this paper trail out of the paper trail so that she can... I'm not sure if she's going to roll it up and put it

in an envelope and send it to somebody or what. But anyway she's in trouble. Let's go onto the next thing.

So, the basic problems of process in the voting machine are enormous. Can you go to the next one? The question is what is verification. And the question is you see these verification... you can see the white... even if you're in the back you probably see the white stripes on the left hand side. In Nevada these paper trails were very visible, very high contrast and good in that way. Unfortunately, to get people to look at them they turned off the liquid crystal display so that you can't compare it.

So, verification at the step of is a person registered, how do we verify it, a very important question to me. Does a person get a ballot? Is the ballot cast? That's the paper trail question. Is it tallied. That's the next question. Does it go into the count into the machine? Is it counted? Does it go into the count at the final count? And these are... I don't know. Can you move that box out of the way? But there are various ways of... one of the things that I'm most concerned about, about verification as we currently

think of it is shown in that top right hand box by a shadow of a person voting.

If we don't know a way of checking if the person is lying when they say that they have this paper trail and it says something different than what they had cast on the liquid crystal display, we don't know whether we have fraud or just a liar. And so, I think we need a third mechanism to check to have a person show with a black box videotape or something that the last vote was cast as they said and that this paper trail is actually reflecting that. I want to take a moment to mention this (unint.) verified audio trail. I think it's in the next slide though. Go to the next one please. Yeah.

So, there's alternatives for verifying even the ballot. And there are various things that have been suggested. Eric Fisher somewhere in the audience has a paper that talks about five different approaches. This one, the audio verification system, what happens is you get the verification as feedback while you're making the selection. You select four Kerry and it says Kerry in your ear and that is tape recorded, and that's the reason that you hear

it is because it's tape recorded. And so, it's in this box forever.

Now, tape is actually less jam prone than paper printers, I'm sorry. And so, that's a good thing and it costs about, it costs me at Radio Shack eighty dollars to make this as opposed to the thousand dollars voting machine that the paper trails tend to we believe are costing people. So, in this scientific American October there's a little bit about various parts of the voting process and how to fix it that I wrote. And I do mention just very briefly the audio approach to verification. Next slide.

So, basically what we're discovering is that the new voting machines that have been put in place may be because of better practices in those areas by the way have been seen to have to have performed better. And what I'm really excited about, about all of the advocacy and all of the reporting is that I believe that voting has been very broken for a very long time, and in spite of the fact that we probably have half of the errors and lost votes that we had in the last election, two million votes is not a right number for lost votes. If that's what it turns out to be,

I think it's very important for us to keep moving forward and especially because fraud follows the technology and we have to secure the technology that we put in place. Even if it doesn't get hurt this time, we have to continue to be vigilant. So, thank you.

MOD: Ted, thanks very, very much. I see that we have a number of participants who have lined up to ask questions. Those of you who have an interest to do so I encourage you to get in line. Again, I remind you that we do have Q&A cards that can be filled out and submitted, and we will make certain that you're questions are answered. I am going to suggest that we take approximately twenty five minutes for questions, which means that from now until five after one we can take questions from the audience, and then we will break for lunch and I'll make an announcement before that time. And with your permission, I'd like to open the questions prerogative of the moderator to raise a couple of issues with the panel or anyone in the audience that really have not been addressed by this panel but are relevant issues to our understanding of how voting systems operate.

As I mentioned in my introduction, there has been a shift in public attention over the last two years from voting

systems that relied heavily punch cards and manual systems, lever machines. And we are now focused heavily on touch screen machines, the so called direct recording electronic machines and the issue of paper versus no paper as a way of verifying voter intent. Having said that, I'm curious as to whether there is information. We only used DRE machines in approximately a third of the country. About thirty percent of the country used DRE machines. For those portions of the country that relied on the old systems, paper systems, punch cards, lever machines, what is the error rate in those portions of the country that did not convert to newer equipment? And do we have a sense of whether the problems that we have seen in the past are continued? And, Ted, you may have some information about that.

MS: I do.

MOD: And then the related question is this. In those portions of the country that converted to DRE machines but did not have a paper system of verification some way of giving the voter some confidence that the vote was secured, and let me point out that those who are critics of the system would argue that even though you have a receipt in hand, that does not mean that the machine recorded the vote as you cast the

vote. So, to assume that paper per se is a form of secure verification raises a question about the integrity of the system and I think it was David who mentioned the need for dual verification between paper and some sort of audit system. And I was to pose that.

Then, the last relative question, and I know this is many, I'm sorry guys, relates to the fact that in the disability community there is a very strong performance for DRE machines without paper under the argument that the failure to adopt such a system has resulted in the exclusion, the disenfranchisement of persons with physical disabilities and as cumbersome as a forty five minute timeframe may be to cast a vote, as balanced against personal privacy, many of these individuals would say they'd gladly give up forty five minutes or an hour to cast a vote in private, something that citizens without disabilities ordinarily take for granted. And I'm wondering if any of our panelists can comment on any of those questions.

MS: Let me just start with the first one because I've probably forgotten otherwise, and that is that it's completely uneven. The places that did not change technologies, did not improve their results significantly. There are pockets

like Connie McCormick doing this mammoth advertising effort. But the other thing is that the Op scans seem to have brought the residual down from 2.2 to 1-ish, and these are unvarnished numbers.

These numbers you'll see us fiddling with them for the next several months as we learn. But the DREs that were purchased after 2000 performed significantly better than the ones that are purchased before. And that's because we had machines like the ones with scrolls in them and the ones that are a piece of paper over a bunch of buttons and stuff in that pool of DREs from before. I can't remember the rest of your question. So, I'll talk later.

MOD: Well, I think David may have something. The second question though related to those systems that did not have some sort of paper verification in conjunction with some private auditing systems so that we can understand whether in fact they posed real problem, has there been any kind of audit of those systems, some information related to that, and then the third question of course related to persons with disabilities.

MS: I think question number two, I supposed I'd respectfully disagree unless you were in Nevada and actually watched the

process post election and how we did audit these machines. We had several thousand electronic voting machines. There were eight hundred and thirty one thousand ballots cast. We took three percent of them which was sixty four thousand four hundred and twenty four ballots and audited them against the electronic count, which basically equates to 1.5 million individual votes themselves. So, 1.5 million individual votes were audited in Nevada so that we could guarantee to the citizens in that state that the machines in fact were programmed accurately.

Now, I will tell you that not everybody as was mentioned perhaps wants to take a look at the voter trail. For example, I mentioned earlier that Clark County had electronic voting machines, but they didn't have the printers. By introducing printers some of them may not have been used to or didn't care to take a look at that printer. But if you go up to an ATM or if you go to a gas station, you'll look at all those receipts laying on the ground. Believe me, it's the twenty five percent that do look at those receipts, a copy of those receipts that keep the other seventy five percent honest.

So, I believe the number is much higher than twenty five percent. I do want to add something else also. We did have some problems in this election. We had a small town in central Nevada that one of the data cards from the electronic voting machine couldn't be read when it was put into the counting system, didn't care. We had a paper trail. We could now redact that information off that paper trail. We knew exactly how everybody voted on that particular machine. If you had an electronic voting machine without a paper trail, how would you have ever gotten that information out if that reader card was damaged? We were able to do it because we had a paper trail.

We had another situation where the printer didn't work and the person complained and someone said see there you go the system didn't work. And I said, no, it absolutely did work because when they went to look at the system the printout, it wasn't there. They wouldn't complain to a polling person. They shut down the machine. The vote was not cast and they were able to cast their vote on another machine. So, again, the system isn't perfect. I'm not saying we built the perfect mousetrap. But I assure you we've got a

system much better than states that do not have a paper trail attached to those machines.

MS: I'd like to address questions two and three, and this is partly in answer to Len Landis' question earlier as well. It is definitely true that paper is not a (unint.) that will solve all our election problems, and in particular to deal with auditing issue it is necessary to look at a lot of issues of procedure as well. That means maintaining the integrity of paper ballots. I believe that it means making sure that the paper ballot, well, is definitely clear, that making sure that the paper ballot has primacy over any electronic records, and preferably that no electronic records are created except from the paper ballot, for example, an optical scan system. The voter fills out the paper ballot, and then it's read by a scanner that could cheat an electronic copy if it needed to.

On the issue of disability access, I think that there are some alternatives becoming available for making paper ballots an optical scan variety accessible to people with disabilities. The two solutions I know of is a touch screen interface where it can read and write on a paper ballot, translate it into other language, allow somebody to

vote on a touch screen or via audio. That system is being vended by ES&S at the moment. And other scheme that I am told has been certified, which is a ballot on demand solution where it prints out a blank optical scan ballot, the voter can fill out. But if the voter is disabled and needs to use a computer interface, it can print out an optical scan ballot that's already been filled out, which is then scanned in the usual manner. So, I think that these problems are solvable and that we can have high quality disability access without compromising the integrity of the elections.

MS: So, I wanted to address a couple of the questions as well. First of all, I want to make some remarks about disability access because it is certainly true that DRE machines are computerized interfaces provide a kind of access that in particular the blind have never had before, and that's only a good thing. But we have to be extremely careful. The concern that the blind have a very valid one is that in prior technologies the only way they can vote is to take a trusted friend with them into the voting booth and have that friend cast the ballot for them, which leaves a tiny residual of trust issue as to whether the ballot was correctly recorded and also requires them to reveal their

vote to their trusted friend. Now, I would like to compare this to the situation about when anyone votes on an electronic voting machine, that is not auditable. It doesn't have some kind of voter verified audit trail. In that case when you go into a voting booth disabled or not you're taking someone in there with you. The person you're taking in is the programmer of the software who wrote the software for that machine, and that person isn't a friend. That person's a complete stranger. Everyone is as blind as a disabled person when you walk into a voting booth with a machine that doesn't have a voter verified audit trail. So, we all have to be concerned about this. Oh, I think it is quite possible to build technologies that are both auditable and accessible, and that's the goal that we have to have. Now, why paper trail? Many of us keep repeating that paper trail is the preferred technology at least currently for this, and let me make it clear. This is not because we have some nostalgia for a retro 1950s technology. It is because paper has very important security properties that we want to use. Number one, it's right once. That is to say once paper has been written, paper can't be rewritten by software without detection. That's critical. Most computer media are easily

rewritable, not paper. Secondly, paper can be read by humans without the aid of software. That's also critical because if it took software to read it as it would if it were a magnetic card or some other computer memory medium, then you would have to... you'd have another set of software you'd have to trust in order to be able to audit the election. Third is that paper is microscopic, which means that people can watch it with their eyes. Your vote does not become invisible for a while and then account get announced. It possible to have adversaries watch the counting process and have the losers and the winners agree that a recount process worked properly, and that's just simply not possible with electronic ballots. So, that's why the voter verified paper audit trail and why paper as a medium, at least at the current stage in history is the preferred medium.

MOD: Thanks, David. Let's open up for questions and we'll alternate starting with this gentleman. Please introduce yourself.

Q: My name is Stanley Kline and I'm involved in several committees involved in this and I want to make a comment and ask the panel for its reaction. There's a federally public standard for voting machines that the voting

machines are tested against and certified and so forth. If you look at the reliability requirement in that federal standard and you do the math, it turns out that nearly ten percent of voting machines can fail on election day and nearly twenty percent of voting machines can fail during the pre election set up and if a system is less than that, and less than almost that twenty percent, the system is operating according to the federal reliability standards. I'd like your reaction to that.

A: I guess I have to agree with you completely. The federal reliability standards are out of date, near were in date, and the federal standards leave a lot to be desired and that's certainly one of them.

Q: My name is Deborah Valmer. I live in the state of Maryland. I'm kind of a community activist. On occasion I've run for public office, not successfully. But I'm very concerned about the issue of the lack of a paper trail in Maryland. We have the DeBolt machines. A comment first, I'm concerned about the loose use by people at this forum of the word receipt. We're not talking about a receipt that the voter takes away from the polling place. We're talking about a paper record which is kept which is available for a recount should that be necessary. We do

not have that in Maryland. And so, I wanted to make that point. But the question I want to ask is how do you deal with the problem that we have in Maryland and I'm sure it's true in other jurisdictions where you had people, election administrators and others responsible for the purchase of this expensive electric equipment without the paper trail. But these people now they have blinders on. They made an investment and they cannot be made to see that there is a problem, there's a mistake that yeah it would cost more money to add printers to put on a paper trail but this is really essential. And these people are just sort of invested in a decision that they've made and they don't want to change and they don't want to make it better. How do you deal with that problem.

Q: First of all, I believe that over the years the vendors have been telling election officials how to run elections. They build the machines and say these are your parameters, this is how you're going to run your election. And in order to make change and frankly I think Maryland does need to make changes, you need to have an election official that gets outside of that mentality that will ask those question that will go up to DeBolt and say how many receipts do you print. If you don't trust your own machines to print

receipts why would I trust your machine. Those kind of questions need to be asked, but it has to come from the top. And I'll tell you right now in the state of Nevada every clerk and registrar in the state of Nevada opposed the paper trail when I announced it, every clerk and registrar. And I guarantee you that most of your clerks and registrars and secretary of states or election officials, whoever they may, are opposed to that paper trail. And until you make a change in that environment, you're not going to see this sweeping across the country.

Now, the fact that Nevada was successful, the fact that we had several hundred election officials come to Nevada in September during our primary and frankly most went away impressed. The chairman of the EAC came to Nevada during our primary. He was impressed with the system and what was in place. So, slowly but surely the culture of election officials, I mean go to their conferences and they beat the drum against paper trails. That has to change. And until that changes vendors are going to continue to control the election environment that we see today.

A: With respect to the last question, I just wanted to say that in '87 Roy Saldman (ph.) called for this national

standards, and it took a long time to put together. And although it's out of date and it's not adequate it's a balancing act that has been improving, and it's really we have... we have the mandate now probably to do a good job. So, I don't think that people haven't been trying to work towards it but it's been a tough road.

This point of calling things a receipt rather than a record is really important. I was watching in Nevada where people when it was called a record, they accepted it. When it was called a receipt, they ran their hands all over the machine looking for the thing that they were going to take away with them. You probably saw that too. It's hilarious. But really the answer that I'm most comfortable with is that in we don't have Brett Williams here from Kennesaw (ph.) State in Georgia, but he has performed miracles in Georgia. They had the second worst residual in the country in 2000 and they don't at all anymore.

In fact they have at the lowest we know of. But I think that across the country it would be really great if there were colleges like Kennesaw state in every state where there are people that are knowledgeable that the secretary

of state can depend on and go to so that instead of these elections - I'm just so with you - instead of these elections being run by voting companies, most, I mean you'd be amazed at how little election workers, election officials often know about their equipment and how to set it up. The big industry for the voting companies is running elections. And that only can stop if we give resources to the election workers to be able to stand on their own two feet.

Q: My name is Rich Civil. I'm involved with a number of grassroots groups working on voting issues, predictably electronic voting in Connecticut. And as much as all of us are fascinating by the electronic machines especially those of us in IT, I've got a question about the lever machines. What is your prediction about whether they would be (unint.) certifiable and if they're not what does that mean for us, so many of us who do still vote on lever machines?

A: It's a great question. And I think the last panel in part addressed some of those issues especially Professor Overtone from George Washington who talked about the Bush v. Gore standard of required uniformity and in terms of voting to ensure that one person one vote is a respected standard that is applied across the board. There is a

question about states that use equipment in various counties that produces a differential result with respect to the number of votes that perhaps may be spoiled.

And that does pose a question about whether in fact a state that relies on a system that has a built in error rate that is far higher than might produced on newer equipment is in fact depriving its residents of the kind of accuracy and balance that would be required. But in the absence of national standards and where states are generally given the authority to establish their own standards, the question of how you get to the issue that you've addressed remains unclear. I think that's one of the reasons that we're trying to get to the question of how each of these systems has functioned and in spite of the focus and attention right now on some of the newer equipment like DRE machines. I think the question that you posed is a very serious one, and I hope in the course of the day we try to get additional information on it.

MOD: Any other comments here? David?

MS: Just a short one. I believe that lever machines because they are unsuitable are a past technology we should also retire with all deliberate speed. The only virtue that

they have is simplicity. The DRE machine is probably ten thousand times as complex as a lever machine. And so, you can understand a lever machine. But the fact that they're unsuitable I think in this day and age makes them a liability.

Q: My name is Joe Herron (ph.)...

MS: Excuse me. I just want to add to that that in a recent experiment where they took eight hundred lever machines and test them two hundred of them had odometers that didn't trip over. If you look at the residual rates in this country, New York has the worst in the country right now. It's a running total, but if you're standing up for lever machines you're going to break someone's arms. That's what happens. People get crushed by these machines.

Q: My name is Joe Herron. I'm a degreed computer scientist. I've worked in the field for about twenty five years. I first want to say compliments to David Jefferson. He speaks with some of the best clarity I've heard on some of these issues and the fact that the problem is inherently the software. But my question revolves around auditing the voting process. Exit polling has been used around the world for years to test the validity of elections, to test for fraud. We've just seen an election in the Ukraine

overturned and one of the primary indicators that something was wrong was the gap between exit polls and the official produced results. We all know that in our presidential election there were similar types of gaps. And my question is why has this been glossed over in a lot of the conversation and what do we do about it.

MOD: That's a great question. Who wants to take it? David?

A: Well, I'll take the question and I'm I think I'm not sure how much agreement we'll have on this. But I do not want to use exit polls as a metric against which to test the actual election. The number of sources of error and systematic bypass in exit polls and frankly commercial interests in exit polls is so many and they're so strong that they simply can't be used in comparison to an election. So, I guess I have to respectfully disagree with people who think that you should use them as a standard of comparison. I suppose if the exit poll showed ninety percent, ten percent in a jurisdiction and it went the other way you might have an argument. But with the elections as tight as they are and the election polls within three percent and they sampled fifteen hundred people and they only sampled voters who agreed to talk to them and they

only sample convenient polling places, I mean the exit polls are nowhere near as accurate as the actual election.

A: I'd like to comment also. As I said I get a lot of fraud theories. And this exit poll thing is fueling a wave of paranoia whether the press is covering it in the United states or not. I think given, the reason it's not covered much is that the exit poll companies have basically disavowed their own poll.

Q: ...paper and pencil and does hand counts precinct by precinct very quickly. We had two thousand people in our precinct that can be counted by hand quickly and reliably and with verifiability.

A: Appreciate George's question. Just briefly, obviously we have electronic voting on election day and early voting, but obviously if you're going to vote absentee we can't mail a machine to your house. So, we do send you an optical scan ballot paper and pencil. And I will just tell you the error rate for the optical scan system is much higher than it is for the electronic voting system. In fact we have a bulletin board that we pin the most interesting optical scan ballots where people have actually used the scissors and cut them up and thinking that they didn't quite understand the process of paper and pencil,

but the error just is tremendously hither. If you're going to disenfranchise three thousand voters, thirty five hundred voters because their paper and pencil system didn't work, I think that's worth addressing. So, anyway we have both in Nevada just for the absentee voters. And again if they don't fill in the ovals correctly if they check something wrong or they take a pair of scissors to it, it won't be read. So, for that reason we addressed the electronic voting machines.

MOD: Anyone else on the panel?

A: I think he did a great job.

A: I think there's a range of acceptable solutions, and I think that a fully manual system is within that range if we can resolve the issues of disability access.

Q: My name is Roland Parkins. One of the issues that I think has been brought to the floor by Bev Harris of black box voting is that it was eminently possible to manipulate vote totals in the central tabulating computers that were used to tabulate the counts from the various precincts. And I haven't heard anybody address that issue yet today.

A: I have reviewed dozens of voting machines, and I have yet to find a system that can't where the voting official can't change the votes. And basically these are tools made to

support collecting votes. These are not systems that have been designed to keep the people that are running them from using them as they wish. My concern is that I don't know of places here there is a protocol where you have to have two people logged onto a machine to keep something like what happened in Valuca (ph.) County where they subtracted sixteen thousand twenty two votes on the day of election from happening. And I mean Debolts is not the worst. I've seen voting equipment where it's a spreadsheet and they have a different program to present the information to the press than what they're doing while they're collecting it.

Q: Have you heard demonstration where you can log in remotely and get access to Microsoft Access and then change the totals there in the Gem software?

A: Yes, and you'd have to be able to log in from outside. When I watched in Reno, they very carefully had a network which was not on any other network the county machines were on.

Q: Mr. Jefferson?

A: Sir, I've also paid careful attention to Bev Harris' demonstrations. So, there are certainly things about which she is absolutely right. It is, she pointed out that it was possible to remotely connect to Gem servers and someone

who did that would presumably be able to modify election totals sitting in the server, and that's absolutely got to be stopped. We did stop that in California and in a November 2nd election it was not possible to do. We turned off all modems and servers and did not and stopped the practice of sending preliminary votes back by modem so as to avoid that. Bev Harris found a number of other problems on which she was technically correct. And I think that the issues that she has brought up regarding the actual technical vulnerabilities are quite real and we are paying attention to them in California at least. Where I depart from Bev Harris is I think she believes that she has evidence that these features of and she's criticizing Debolt, so I'll mention Debolt, that these features the Debolt system these vulnerabilities were designed with the intent of allowing electoral manipulation. I don't see any evidence of that at all. I think there's a big difference between bad design and deliberate attempt to suborn fraud and that's where I depart from her.

A: Roland, I'd invite you to go take a look at that voting machine out in the foyer, and anybody else who wants to take a look at it. But one of the changes that we made in Nevada for this election cycle also after going to the

electronic voting machines and I know they were doing this in Clark County, but they were downloading via modem votes tallied in outlying areas. And that was all cut off also. These machines are independently standing machines.

There's no modem lines attached to them, and there is no downloading of information. People are complaining. We've got all this electronic voting. How come it still takes you till eleven o'clock to get the results done. And that was because if you lived in Gerlack (ph.) and it was ninety miles away they still had to drive that in if they did not have a secure line for those votes. So, there's no downloading unless the lines were secure.

A: A quick comment on this. I think the problem here is not the use of computers. It's misplaced faith in computer. We would have the same problem if we did everything completely manually and delivered the precinct totals to somebody in a back room who did it all with pencil and paper. And the solution, it's great to try to secure the system, but the solution is to put in the right checks and balances so that we can independently check that the precinct totals are the numbers that went into that central system and anybody can independently add up the numbers to

make sure they add up. And at that point we don't have to trust the tally system anymore.

Q: Bob Mills from Connecticut. I was in Florida for election protection as a poll watcher. One comment that Mr. Jefferson and I would respectfully suggest that if exit polls should not be compared to the tabulated vote that we ought to stop using that as a measurement of the legitimacy of foreign elections which we have been doing for a number of years. My question is for Professor Dill who said that the anomalies that have been brought up have been explained away. In my experience in Florida, I saw one example of a Kerry vote switched for Bush. The woman could be heard screaming from inside the poll site - I voted for Kerry, the machine recorded my vote for Bush. As a poll watcher, I thought very little about this except there was an error in the machine. I get back to my daughter's house where I'm staying. I turn on the television and I find that in Youngstown, Ohio, it's been going on all afternoon and Kerry votes have been switched for Bush in all the precincts I can think... I think every single precinct in Florida and Ohio you have huge numbers of these. I have yet to hear of a single vote for Bush being switched to Kerry. And my question is, is there any explanation within

the world of computer science or higher mathematics other than fraud for this anomaly?

A: I mentioned that particular problem as one problem that appeared frequently in our election incident reporting system as well. Maybe I'm smarter than the average hacker, but if I were to change votes from one candidate to the other I would not advertise it to the voter. So, I think it's probably whether an issue of the machine confusing the voter into doing the wrong thing. I know of at least one story (unint.) where that seems to be the case or some sort of malfunction in the machine. As to the partner, we don't have statistics on that. I know that in Texas the Bush vote was in the top of the ballot in some of those counties and there was a weird thing with the machine where it would select by default the top (unit.) in the ballot. As I said, I don't know what this problem is and it needs to be investigated, but I'm certainly not going to call it fraud.

Q: Why not? It sounds like fraud to me.

A: Because actually the people that worried that had that problem when we checked into it were able to change their votes because calibrationers can cause that problem and because the first thing that you select on a voting machine you might make a mistake on and because we have a half

percent of people that make adjacency errors anyway. So, we don't have examples of people not being able to change their votes when they thought that they had voted for one and voted for the other. And there were people that claimed that they had tried to vote Bush and they had gotten Kerry. So, it wasn't just one (inaud.).

A: Let me highlight another comment, just repeat a comment in different words that David Dill said. If I were a programmer and I wanted to program those machines to commit fraud by switching Kerry votes to Bush, do you think I would present on the summary screen to tell the voter that I had done that? No. I would show a Kerry vote on the summary and I would secretly record a Bush vote. That's not what's being reported folks. So, my point is we do not have strong evidence of fraud of this kind of fraud. We don't have strong evidence of this kind of technical fraud.

A: Oh, yeah, of course, you're all correct. This problem could have been resolved if we had strong audit ability, if we had a paper trail.

Q: Hi, my name is Dale Jacobson. I'm not with any activist group. I'm just disillusioned. I vote in Maryland. Before we got the Debolt black holes in my precinct we voted optically. And unlike the absentee ballot that Secretary

of State Hill is talking about, our electronic ballot was in a fancy plastic frame that reduced a lot of the possible ways at home with just a piece of paper on the table you could mess up the ballots. I'm sure there's you can do it, and there's probably a lot of optical systems since I've only seen the one that make it better or worse. But this piece of plastic now how much the state overpaid for it. It couldn't have cost more than fifty bucks. And the precinct had one card reader for the entire precinct. So, given the difference between that and the twenty six thousand dollars computer terminal we have now before you'd have the printer do it, is there any reason to be voting on a computer versus optical? Cannot the problems with optical be fixed to the same degree with computers or close enough that it wouldn't be worth spending fifty six million dollars or I forgot seventy seven million dollars for Maryland to have computer machines?

A: I got elected to answer Dale's question. Just so that you know, Dale, in Nevada when I sat down with Sequoia and Sequoia promised to build this printer on the side of the machine, first of all, it hadn't been invented yet. There were no standards for it. It hadn't been certified. So, we had to do a lot in an eight month period for them to go

from December basically to have it ready by June for our September primary, but all along part of that contract was if you can't produce this printer we're going to optical scanning. You then have to produce an election that uses optical scanning because I guaranteed the voters in Nevada that they would have a paper trail. And Sequoia knew that they were under the gun. If they could not produce this product, they would have to produce an election in Nevada using optical scanning. We're a little different in Nevada. The reason we went with the DREs is because Clark County, the largest county already had the electronic voting machines without the printers. They had them for ten years. That's seventy percent of the population in Nevada to take the rest of the state and put them on a different system, one. Then again you've got this margin of error between one system versus another. It just made a lot more sense in Nevada. I think if I was in a different state that didn't have the margin of DREs I think optical scanning would have been just as good a decision or that the DREs had been for Nevada. So, it just depends on what that secretary, but again the paper trail has to be there and available for the public to take a look at.

MOD: Ladies and gentlemen, we have run beyond our allotted time for this workshop. We're going to take two last questions. I understand there are lots of people in line and my apologies to each of you because of our inability to get to your questions. But there are opportunities to talk with our panelists individually and again you can submit questions which will be responded to by your designated panelists. So, we hope to deal with them. The last two questions. Gentleman here on my right and the young woman on my left, sir.

Q: Yes. I'm Robert Lens. I'm with (unint.) Maryland. I was a poll watcher at Mt. Rainier Elementary School in Maryland on election day. I had a question concerning how to establish practices and procedures for maintaining the voting machines during the election date. While I was poll watching there were ten machines that by nine o'clock in the morning seven of them were working, and I saw election technicians bring a new voting machine into the polling place, take out hardware from that machine and replace hardware in one of the machines that was working, that was not working in order to get that machine running. So, I saw hardware being transferred from one machine to another machine during the voting day. Now, being a poll watcher I

had no idea what hardware was being moved from one machine to the other. I found out later that first of all of the election judges in the room only the election judge chief had any idea what those technicians were doing. No one else had any idea why those technicians were there or what they were doing with the machine. The other question that I had is that theoretically they could have been putting any hardware in the machine from one machine to the other. How do you establish procedures for maintaining non working voting machines during the working day without having the possibility of unregistered technicians carrying a voting machine into the polling place and doing with it whatever they want?

MOD: That's great question. Let's see who wants to answer it. Anyone here on the panel?

A: Well, you did not mention whether these were election official technician or vendor technicians. Do you know?

Q: No, I don't. They were two men in black leather jackets. And my understanding from Prince George's County is that election technicians are supposed to be county employees, not vendors.

A: Well, in any case I certainly agree with you that the procedures for running the election in the precinct have to

be very carefully thought out. The normal expectation of a poll worker is that if anything goes wrong with a machine, anything at all you shut that machine down and go away with fewer ones and resolve the problems later. Now, maybe some counties or states have different rules. Maybe they have technicians who are capable of reviving machines safely. I'm not sure what the rules are in Maryland. And after shutting down a machine the most complicated thing you really want poll workers to have to do is reefed the paper if there's a printer.

A: It's a great question, sir. And earlier this year the leadership conference and the Brennan Center for Justice at NYU issued a report with the assistance of many computer specialists to develop a set of procedures for safeguarding the treatment of electronic voting machines to address many of the concerns that you've talked about, about the lack of insecurity. And certainly it does go to perceptions of the integrity of the vote. It's a real issue and it's one that obviously will have to be addressed in the future. So, it's a great question.

Q: Thank you.

A: Thank you.

A: Just so you know, we addressed that issue in Nevada simply by adding a paper trail through the machine.

MOD: The last question.

A: Just in terms of that process, I totally agree with you there has to be transparency. And what I saw when I was watching there are problems in every election and you don't want people to be able to shut down a bunch of machines and make the lines nine hours long. You just don't want that to happen. So, in Nevada they had... I was shocked. Ten, fifteen minutes was the maximum time it took for a technician to show up. And when they showed up with a technician from Sequoia there were also people from Nevada that were there. So, the question is should they all wear jackets with their names of who they are and from. Maybe that would be helpful. But the idea of having hot machines, machines that are available on the day of election when a line gets long that can with a pre-designed process be put into place is practiced lots of places and solves a lot of problems. So, we have to figure out how to do it. We have to do it with transparency and we have to do it in a way that doesn't disenfranchise or spoil security.

MOD: The last question.

Q: My name is Susan Sacks. I have a doctorate in systems engineering. I'm a member of Democracy underground which is an online organization about sixty thousand people that's been doing a lot of the data mining and analysis and some of that has been trickled into the press. What I have questions about is that a lot of computer scientists are saying that the only way to resolve the software issues is that every line of code that is used in these systems from the voting machines to the tabulating machines should be open source and that it can be hacked but used to try to define any possible problem in it. If there is any malicious code, it's open. It's obvious. It's there. And that I think is the only way we can go. This has been used quite successfully with Lennox which is also open code. The other thing I had to say is that my understanding is that there are few areas in Nevada which still have some of the old Sequoia machines particularly some areas, the very populous areas of Las Vegas. I could be wrong on that, but that's what I've been told. And the final thing I'd like to mention is that the partisan ownership of these electronic machines is a very serious problem.

A: I'd like to comment on the first part. I think the disclosure of the source code is very important, but I'd go

further than you. And I don't believe that it's a complete solution because there are too many ways to hack the machine either by making subtle modifications of the source code or making changes that aren't physical in the source code. I'd also like to mention something I forget, which is there were a few reports of Bush votes changed to Kerry in the election incident reporting system.

A: Can I add something else?

Q: Would you take one more question?

A: Let me respond to this one though. I too am a strong supporter of opening up the source code of all of these voting systems, first generation to the inspection of experts who are working on behalf of election officials. And eventually I would like to see the source code just plain be public. But let me make something very clear. As David said, that is not enough. It is in fact not the case that if there is malicious logic in the source code that it's obvious. It is not even remotely the case. If I thought that were the case, that would be the answer to the problem that I was addressing earlier today. In fact it is extremely difficult and particularly to somebody who's actually trying to hide malicious code that to find it so extremely difficult that it's basically hopeless as a

strategy to depend on. It's not enough to open the code. In fact if it were that easy, you could find bugs just by reading the code too. Don't rest on that as your answer to this problem.

Q: (Inaud.)?

MOD: Well, I think quite frankly that on that issue we've had a number of speakers today address the problem of connecting partisan politics with the actual election system operation ourselves, and that would include the partisan ownership of election equipment. I mean there's clearly a need to have transparency and independence and the integrity of the system depends on separating partisan participation from the actual election system that function. And I think you've heard many speakers address the issue today including those who said that state election officials who oversee these systems should not be connected rather to partisan election politics in their given jurisdictions. I think we would certainly agree. Ladies and gentlemen, this has been an extraordinary panel. They have helped to bring more life and please join me in thanking this very distinguished group, David Dill, Dean Heller, David Jefferson and Ted Selker, and thank all of you.