Toward Voters' Equal Protection in Participation

A Roadmap to Equal Voting Experience for Voters With Disabilities

An Election Technology Policy Briefing

Prepared For: **Disability Advocates, Public Policy Leadership & Interested Citizens**
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Executive Summary

Important strides have been made in the ways in which American voters with disabilities are served. Nevertheless, misconceptions about these voters persist at the highest levels, including a lack of awareness of the rights specific to these voters, and how these rights are not met. Outdated but common views illustrate lack of awareness of the specific voting rights of Americans with disabilities. Many voters with disabilities must accept risks and challenges that other voters do not. In fact, they may not be able to vote at all, because they are not served by any of the current options.

The reasons inadequate voting service for Americans with disabilities arose are primarily financial—there is little business incentive for the commercial election technology industry to produce innovations to better serve voters with disabilities. The industry is not solely to blame; outmoded policy frameworks that are used to justify providing fewer services to smaller groups of disadvantaged voters are equally at fault.

A road map is required for change that lays out a different and stronger commitment to all voters, and defines the requirements for new uses of technology with concomitant public policy to more aggressively meet all the needs of different kinds of voters with disabilities and different types of disadvantaged voters.

True democracy requires that the “hierarchy of needs” be replaced with a model based on uniform voting rights: a model that guarantees equally safe, secure, and effective voting for all voters, regardless of need. To put a fine point on it, there were upwards of 38 million voters with disabilities eligible to cast a ballot in 2020, and unfortunately they were nearly twice as likely as non-disabled voters to encounter problems.

Uniform voting rights encompass the principle of equal protection: no voter should be compelled to forgo some elements of protection of their ballot or their voting experience, in order to exercise their rights. These rights are not met in the current status quo; voters lower on the hierarchy of needs receive inferior service due to increased costs or other limitations.

To overcome the defects, necessary actions include technical innovations, changes to election administration, policy changes, and advocacy for them.

By abandoning the hierarchy-of-needs policy framework, and adopting the principle of full service for disabled voters in every situation, we define a pyramid of service, with each higher level having progressively more requirements for equal service.

This paper sets forth a roadmap of objectives, and actions for each, in terms of technology, policy, and advocacy. Taken together, the roadmap’s guidance comprises an undertaking of considerable effort and importance, but taken individually, each action is firmly rooted in current facts on the ground, and tractable steps forward.

Introduction

Important strides have been made over the past decade in the ways in which American voters with disabilities are served. Nevertheless, misconceptions about these voters persist at the highest levels, including a lack of awareness of the rights specific to these voters, and how these rights are not met. Misconceptions about in-person voting mask the reality of inferior service, for example:

> *"Some voters with disabilities can still easily vote in person by hand. And, since HAVA[1], we now have the additional in-person voting option with a voting machine, just as independent, private, and protected as voters who mark ballots by hand."*

In reality, many kinds of voting machines expose voters to risks that are not shared by pen-and-paper voters. There are similar misconceptions about voting outside of the polling place:

> *"Voters who are not able to vote in person can vote at home on an absentee-ballot using pen-and-paper. Some voters are not able to vote paper ballots, but they can vote at home with the assistance of a trusted household member or caregiver."*

These outdated but common views illustrate common lack of awareness of the specific voting rights of Americans with disabilities: to be served with a method of accessible voting that is private and independent, and is equally protected in terms of security and the ability to be audited just as are other voters' ballots. It is simply inadequate for any voter to lack a method of voting that is private and independent, or to have as their only option a method that is less equally protected than non-accessible methods, subject to potential risks or harms that other voters to do not face.

Many voters with disabilities must accept risks and challenges that other voters do not; they may be required to:

> Use voting machines that do not produce regular ballots;
> Use absentee ballots that are less likely to be counted; or
> Use computer-assisted home-voting methods that are neither independent or private.

In fact, they may not be able to vote at all, because they are not served by any of the above current options.

This state of affairs is inequitable; it is illegal; and it must change, but how?

1 The Help America Vote Act of 2002

1. A Pathway Forward

How did inadequate voting service for Americans with disabilities Arise? The reasons are primarily financial: there is little business incentive for the commercial election technology industry to produce innovations to better serve voters with disabilities. The industry is not solely to blame; outmoded policy frameworks, such as the "hierarchy of needs," that are used to justify providing fewer services to smaller groups of disadvantaged voters are equally at fault.

What is required is a master plan—a road map of sorts—for change that lays out a different and stronger commitment to all voters, and defines the requirements for new uses of technology with concomitant public policy to more aggressively meet all the needs of different kinds of voters with disabilities and different types of disadvantaged voters.

This paper is intended to serve as such a roadmap, and is guided by three questions:

Where is the current situation in America; the good and the not-so-good?
How did this come to be?
Where can America go from here?

2. Current Situation: the Roots of Significant Harms to Disabled Voters' Participation

The current voting options for voters with disabilities have their roots in U.S. election practices and laws. Absentee voting began during the Civil War. Over the course of the ensuing century, access to absentee voting was extended to several kinds of voters, including voters with disabilities, and regularized to use the same ballots as in in-person voting. Private and independent voting in person emerged as a standard practice early in the 20th century, following the adoption of several election reforms, including the Australian secret ballot. The Help America Vote Act (HAVA) of 2002 made an explicit requirement for private and independent voting for all voters, explicitly including voters with disabilities.[2] Other Federal election laws, as well as civil rights laws and disability rights laws applied to voting, now establish rights to equal protection of all voters in all methods of voting.

Prior to HAVA, there were only two options for voters with disabilities:

If a voter with disabilities was unable to appear in person at a voting place and vote with pen and paper, they could vote with pen and paper at home;

If they could not use pen and paper, they simply could not vote privately and independently.

HAVA added an additional option—voting in-person with the assistance of voting machines—and more recently, another has been added, "remote access vote by mail" (RA-VBM) systems, or home voting solutions in a few variations. Proponents claim these solutions can serve voters who are not served by other options but who have access to computers with assistive technology. These voters can use their home computers to interact with software in a home voting experience that produces a home-printable paper ballot and affidavit to return in the same manner as manual voter's absentee ballot kit.

It's worth noting that a 2020 study commissioned by the EAC and Rutgers found that only around 4-5% of voters with disabilities desired using this method for the next time they

2 https://www.ada.gov/ada_voting/ada_voting_ta.htm

voted.[3] This option serves some voters, but it creates a new "bottom rung" in a hierarchy of needs for the voters who don't have home computers with assistive devices, or who cannot physically handle printers and paper and envelopes, except with assistance.

Indeed, all of these solutions are products of the same outdated thinking: develop new solutions for the largest group of under-served voters while leaving the most in need behind. Policy makers and service providers often adhere to this hierarchy of needs, with predictable results: those with more common needs get better service, while those with more unusual needs face compromises and restrictions others do not. Not only is such a quality-of-service ranking inequitable, it also ignores the fact that none of the services are entirely adequate:

> Only a few ballot-marking devices actually work well for in-person voters with disabilities;
>
> Absentee voting has potential pitfalls that in-person voting does not, such as delayed delivery, signature mismatch, and ballot rejection; and
>
> Personally assisted voting is not always available or acceptable.

"If disabled voters voted at the same rate as those without disabilities then we'd have an additional 2.3 million people voting."

—Rutgers University[4]

In fact, a large number, perhaps a majority, of voters with disabilities face voting options that not only fail to truly deliver HAVA-required private, independent voting, but also fail to deliver on ADA and other legal requirements for equal protection. The next section provides details – supported in greater detail in Appendix A – of the several ways in which current methods of voting violate the rights of voters with disabilities.

> True democracy requires that the hierarchy of needs be replaced with a model based on uniform voting rights: a model that guarantees equally safe, secure, and effective voting for all voters, regardless of need.

There were upwards of 38 million voters with disabilities eligible to cast a ballot in 2020,[5] and unfortunately they were nearly twice as likely as non-disabled voters to encounter problems when voting. This manifests itself in a 5-7% gap in turnout between voters with/without disabilities.[6] All voters should have voting options that provide the same rights and benefits, whether an individual voter belongs to the largest class of voters (voters in person who hand mark paper ballots), or to one of several distinct groups of voters with disabilities who have the same basic rights but who require additional services to exercise them:

All voters deserve equal service, regardless of the effort required to serve them.
All voters deserve equally safe, secure, and effective service, regardless of method.

3 https://smlr.rutgers.edu/sites/default/files/Documents/Centers/Program_Disability_Research/Disability_and_voting_accessibility_2020_election_Final_Report_survey_results.pdf See Page 12

4 https://smlr.rutgers.edu/sites/default/files/Documents/Centers/Program_Disability_Research/Fact%20Sheet%20Disability%20Voter%202018%20Elections.pdf See Page 1

5 https://smlr.rutgers.edu/sites/default/files/Documents/Centers/Program_Disability_Research/Disability_electorate_projections_2020.pdf

6 https://smlr.rutgers.edu/sites/default/files/Documents/Centers/Program_Disability_Research/AAPD-RevUp_presentation_on_disability_and_voting_accessibility_3-18-21.pdf

Uniform voting rights encompass the principle of equal protection: no voter should be compelled to forgo some elements of protection of their ballot or their voting experience, in order to exercise their rights. Those uniform rights include:

The ability to mark a ballot privately and independently;

The ability to cast a ballot, or, in the case of absentee voting, to return a ballot, privately and independently;

The expectation that their privacy and their ballot's integrity will be protected just as those of other voters;

For that return process to have the same protections of their personal privacy and their ballot's integrity as other voters;

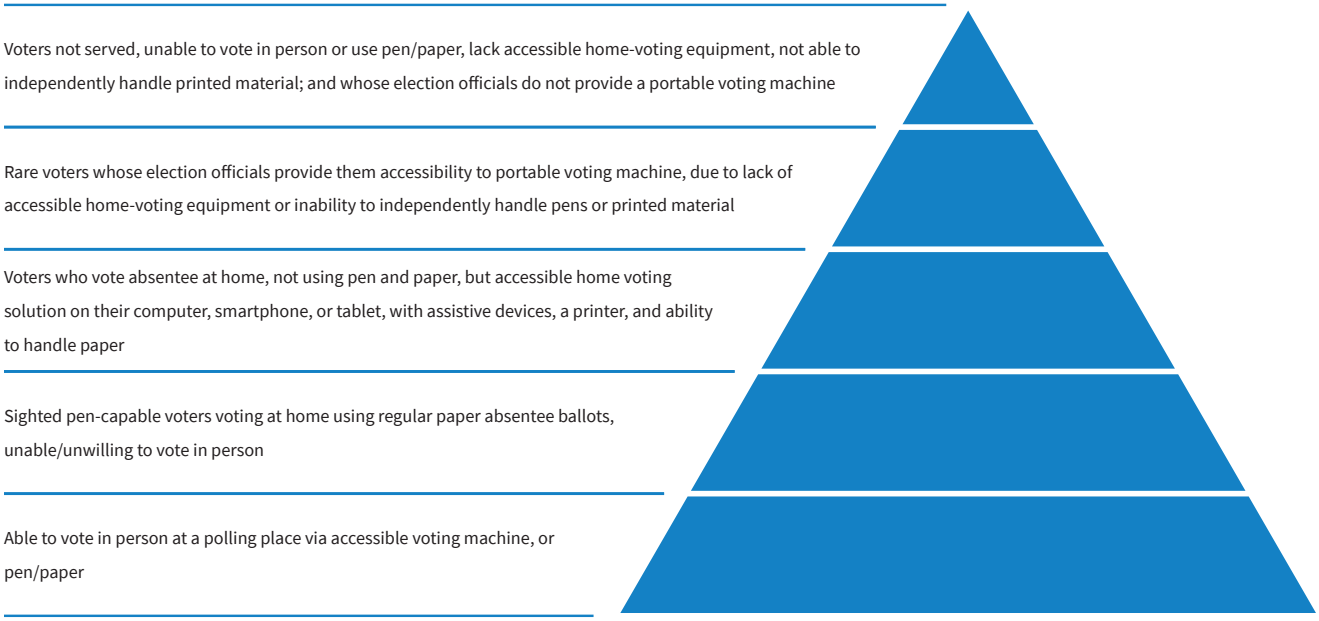
The expectation that their vote will be counted, just as those of other voters;

The expectation to participate and benefit equally in an election that can be audited to ensure that the election results are correct, protected from providing an incorrect election return because of an undetected flaw or failure of technology for counting ballots;

The ability to cast/return a ballot in a process that equally supports an audit process, without imposing additional burdens, risks, or potential harms that are not present for other voters.

These rights are not met in the current status quo; voters lower on the hierarchy of needs receive inferior service due to increased costs or other limitations. Therefore, the question remains: how can all voters be served according these rights, regardless of needs or requirements for equal voting?

Figure 1
Pyramid of Voting Scenarios



3. Full Service vs. Current Reality

Supplying full service for all voters requires that the hierarchy of needs be replaced with a pyramid of services, where the base of pyramid is the largest group of voters who share the most common methods of voting. Going up the pyramid, progressively smaller groups of voters share a voting method, which may require additional cost or effort per voter comparer to lower layers, in order to provide equal service.

3.1 Voter Requirements in a Pyramid of Service

The base layer of the pyramid is the majority of American voters who are adequately served by in-person voting at a voting place, via one of two options – pen-and-paper ballot marking, or use of an accessible voting machine – and either a ballot box (that transports ballots to a central facility where it is counted by an optical scanning machine), or a precinct optical-scan machine that counts a ballot and stores it in an internal ballot box.

Approximately half of American voters with disabilities cast their ballots in person early or on Election Day. Despite the innovations of current accessible ballot-marking devices (BMDs), 18% of these voters report some sort of difficulty in casting their ballot in person (compared to 10% for voters without disabilities).[7]

The next layer up in the pyramid are voters who are adequately served by voting at home using an absentee voting kit mailed to them, voting at home, and returning the completed "ballot kit" either via postal service, or going to a drop box themselves, or having a

7 https://smlr.rutgers.edu/sites/default/files/Documents/Centers/Program_Disability_Research/AAPD-RevUp_presentation_on_disability_and_voting_accessibility_3-18-21.pdf See Page 16.

household member go to an official ballot drop box, or in some cases deposited in a vote center ballot box.[8] This layer includes voters with disabilities who can vote at home with pen and paper, but who are unable or unwilling to do so at an in-person voting place. However, absentee voting has risks not present for in person voting, and mitigations (ballot tracking, signature cure, etc.) are not available to voters with disabilities, or in some cases available but not accessible.[9] Voters with disabilities report a lower rate of difficulty with this voting method; however, over 22% of voters with visual acuity issues report some sort of difficulty in casting a ballot by mail.

Voters in all the layers further up are voters for whom none of the down-pyramid options are accessible: neither hand-marking a ballot (at home or in a voting place), nor using a voting machine in a polling place. In a purely logical world with unlimited resources for elections, these voters would be served by election officials bringing a polling-place BMD to each voter who must vote at home without having to use pen and paper. If that were so, everyone would vote with either a pen or a BMD (whether at home or in a voting place); and everyone would have the same accommodations both at home and also in the voting place for BMD voters who do not have the ability to handle a paper ballot and insert it into a ballot box or precinct ballot-counting device.

Because this level of service isn't feasible in most places, the next layer compromises on the bring-the-machine-to-the-voter approach by targeting voters who have home computers with assistive devices, printers, and the ability to handle paper. This format has proven itself to be an attractive option for many voters with disabilities; between 12-14% of these voters report that they would prefer to use such a method over any other for the next election they vote in.[10] Out of the 38+ million voters with disabilities, it would mean between 4.5 to 5.3 million voters could cast their ballots in this way in the next election.

However many current home voting systems do not produce a regular ballot that can be counted in the same way as other voters' ballots. Instead of a ballot the voter gets a printed sheet that records the voters choices.[11] Election officials subsequently use this sheet to prepare a regular ballot that can be counted normally. As a result, the voter depends on the copyist, much as they would have depended on an assistant at home. The seemingly independent voting method is not independent after all. Worse, the voter might not even know about the ballot copying process, and incorrectly believe that she was well served with truly independent and private voting. In addition, current systems have privacy, security, and other issues, discussed in Appendix A.

The tip of the pyramid consists of two groups of voters who cannot vote in person, must vote at home, and cannot rely on paper vote-by-mail:

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8 In "all mail voting" states, this is actually the base of the pyramid, though in person voting is still provided for the small fraction of voters who need to vote in person for any of several reasons.

9 Ibid

10 Note: That figure was for a preference, but did not reflect whether or not they had the equipment, connectivity, or other needed resources. And of course, a preference does not guarantee they could. https://smlr.rutgers.edu/sites/default/files/Documents/Centers/Program_Disability_Research/AAPD-RevUp_presentation_on_disability_and_voting_accessibility_3-18-21.pdf See Page 12

11 It should be noted, however, that a growing problem is the trend for fewer folks to have paper printers connected to their personal computing or mobile devices. Rhetorically, perhaps this should be taken as a reason for election officials to better accommodate other forms of accessible voting.

Voters who have the required equipment and willingness to use a remote-access vote-by-mail service, but cannot privately and independently print, handle, and envelope documents for paper return; and

Voters without that equipment, or willingness.

For both groups, the current best option — in the sense of services, and of feasibility — is the bring-the-machine-to-the-voter approach. Though costly, it could be limited to just the tip-of-pyramid voters, if a jurisdiction also offered a truly private and independent remote-access vote by mail service to home voters who are able to handle paper.[12]

For the top-layer voters in jurisdictions that do not offer this service, the message to the voter from the elections office falls into two groups of states. For most states, the message is:

> "I'm sorry we don't have a way for you to vote privately and independently; here are your choices for voting dependently."

Then there are a few states among the 30+ states that have authorized digital ballot return for Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA) voters,[13] and that have also extended that return option to voters with disabilities. In those few states, the message might be:

> "You can vote dependently but otherwise like other absentee voters, or you could try another option called digital ballot return, if you don't mind incurring cyber-security risks that apply to military/overseas voters, but not to regular voters."

The current options have several disadvantages, as described in detail in Appendix A, but there is scope for actions that build on those above, with a truly private and independent home voting system that supports paper return.

Beyond Voters With Disabilities: We've focused on a pyramid of service that is mainly oriented to voters with disabilities. But there are other voters that also have a basic constraint that renders most voting methods inapplicable. One example is voters who live in extremely remote areas — often people indigenous to the continent — who don't have postal service, and for whom there are real costs and limits on getting to a voting place or to a mail pick up location to obtain vote-by-mail materials. Like disabled voters at the top of the pyramid, these voters can't feasibly vote in person or by mail.

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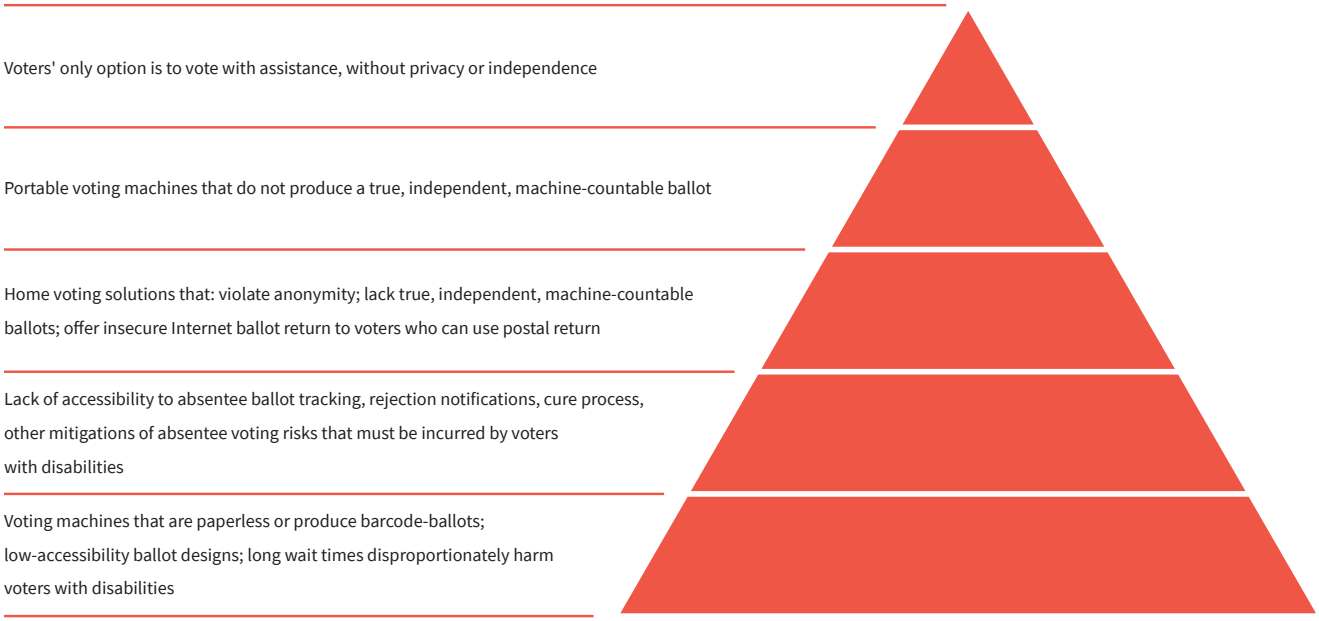
12 However, there remains a concern about the costs for scaling up to support such Go-To-Voter systems, since each mobile voting system (for instance, in the Oregon AFB) even with careful scheduling, can only accommodate on the order of a dozen voters per day. Unfortunately, there is currently a lack of reliable demographics for how many voters are currently "print disabled" and truly need digital ballot return or Go-To-Voter accommodations. Is it 1% of voters, more, or 1 in a thousand? The data is not currently available. So, indeed, this option must practically be limited to the tip-of-the-pyramid voters.

13 See: https://www.fvap.gov/info/laws/uocava

Figure 2
Pyramid of Voting Scenarios and Its Harmful Effect on Voters With Disabilities



3.2 Current Reality in a Pyramid of Service

As shown in Figure 2, voters with disabilities are under-served at every level of the pyramid:

The top of the pyramid consists of voters who must vote at home, cannot use a pen, and lack accessible computing equipment needed for RA-VBM (and/or prefer not to incur additional risk of digital return). For these voters, the best option may be service via a "truck roll", i.e., a brought-to-the-home voting booth. The tip of the pyramid consists of voters who need or prefer the mobile to-the-home voting booth but are not provided access to it.

Just below the tip are similar voters for whom the mobile to-the-home voting booth is provided, for example, Oregon's "Alternative Format Ballot" available for use on a voter's own computing equipment, or on equipment brought to them.[14] Despite Oregon's leadership in this area, few jurisdictions offer this option.

For those who must vote at home, cannot use a pen, but do have home computers with assistive devices, RA-VBM systems are an option, but many RA-VBM systems falsely claim to provide a private and independent voting experience, with equal protections.

- A few states permit the use of RA-VBM systems and also offer a feature developed for military/overseas voters: a digital ballot return option.[15] This option provides an alternative to print/sign/mail conventional return, but one that has

14 https://sos.oregon.gov/voting/Pages/instructions-disabilities.aspx

15 Despite the National Federation for the Blind, the AAPD, and other advocates' claims that digital ballot return provides more privacy and independence; digital ballot return also has privacy and independence issues. For example, digitally returned ballots do not provide for voters accessible verification of their transcribed ballots.

not provided equal protection the same as conventional return, due to cyber-security issues. In an inter-agency report commissioned by the EAC, digital ballot return was found to be a 'High Risk' method of transmitting ballots.[16]

- Particularly, in some current RA-VBM systems, the digital return option comes without disclosure of privacy and security risks. Some voters unwittingly forgo equal protection in exchange for convenience, when they could easily have used conventional paper ballot return. Other voters — for example those with disabilities that preclude them handling paper and envelopes — may require digital ballot return for privacy and independence, but aren't given the information to enable them to make their own judgment about the tradeoff between equal protection and independence.

For those who must vote at home and can vote with pen-and-paper, absentee or by-mail voting is a good option, but not without tradeoffs – tradeoffs that also apply to remote-access vote-by-mail. With in-person voting, a ballot once cast is or will be counted. With by-mail voting, the marked ballot might not be returned in time to be counted, might be judged to be invalid because of a signature mismatch, or an administrative error. In some but not all states,[17] voters can mitigate these risks by the use of services that track ballot return en route, record delivery at an elections office, notify voters of signature mismatch (or other issues) and offer a "cure period", among others. But in many cases the mitigatory services are not highly accessible, having been designed for use by the general absentee voter group, not specifically for voters with disabilities, who may have less access to these mitigations.

For in-person voting on ballot marking devices (BMDs), in some states and localities, voters with disabilities are forced to use a second-class voting method that does not produce the same regular bubble ballots as other voters, and are subject to additional risks that do not apply to other voters.[18]

Voters with disabilities — including but not limited to age-related disabilities — are disproportionately harmed when in person voting has delays caused by technology problems, procedural failures, and insufficient accommodations. A 2016 GAO report on the accessibility of in-person voting found 60% of the surveyed polling locations had some form of potential impediment to voters.[19]

16 https://www.politico.com/f/?id=00000172-9406-dd0c-ab73-fe6e10070001

17 https://www.vote.org/ballot-tracker-tools/

18 Some ballot marking devices such as the Los Angeles County's VSAP BMD could be used to produce mark sense ballots that look very similar to the hand-marked paper ballots (HMPBs).

19 https://www.gao.gov/products/gao-18-4

Figure 3
Table of Actions Needed

	Technology	Policy and Advocacy	Administration and Standards
Assistive Voting Technology To-The-Voter:	**Technology:** accessible portable/mobile voting devices that can be more easily delivered to the home of a voter who needs home voting but lacks the equipment.	**Advocacy:** for widespread use of to-the-voter voting services, using the model of the few jurisdictions that offer such service. **Advocacy:** For the needs for sustained ongoing funding for these services.	**Administration:** define practices that make it easy and accessible for voters to request these services. **Standards:** extend NIST guidelines on accessible voting, to apply to new kinds of to-the-voter systems.
Assistive Voting Using Voter Equipment:	**Technology:** develop open source software for home voting solutions, that is devoid of current systems privacy issues, creates true legal paper absentee ballots, and that can be inspected for possible defects in privacy, independence, and security. **Technology:** Research and Development toward definitive solutions to several hard problems in secure computing, in order to enable the creation of home voting system with an EBR option.	**Policy:** to resolve policy issues for the types of voters and situations in which digital return is the only private and independent option. **Advocacy:** for full public transparency of such technology. **Advocacy:** For such funding and direction of such R&D, for public transparency of its results, and for standards.	**Standards:** for the assessment of RA-VBM systems' privacy, independence, audit support, and security.
At Home Pen and Paper Voting:	**Technology:** develop systems that accessibly deliver mitigation services.	**Policy and Advocacy:** require mitigations to be made available for all voters.	**Administration:** availability of mitigations should be delivered both with technology and without it, to avoid a digital divide among voters with disabilities.
Voting at Voting Places:	**Technology:** create open source BMD software that can be inspected for defects, and used by hardware system integrators to create inexpensive non-proprietary BMDs using conventional hardware that has support for accessibility peripherals. **Technology:** Develop "voter services kiosk" systems shift error handling from the head of the voter check-in line to a kiosk designed specifically for resolution of voter check in problems. **Technology:** Develop new electronic poll book technology that is designed for resilience and does not require that voter check-in cease when technical issues arise.	**Policy and Advocacy:** eliminate Direct Recording Electronics (DRE) usage, and usage of Ballot Marking Devices (BMD) that do not create a standard format ballot that is counted in the same manner as ballots of pen-and-paper voters. **Policy and Advocacy:** For the development and use of these new technologies for reducing polling place delays.	**Standards:** develop national data interoperability standards, and open-source reference software for them, that enable any standards-compliant BMD to work with any standards-compliant election administration system, and any standards-compliant ballot scanning system.

4. Roadmap of Actions Toward Full Service for All Voters

To overcome the aforementioned defects, a coordinated plan of action is required. Necessary actions include technical innovations, changes to election administration, policy changes, and advocacy for them. These actions are listed in the table above, with columns for each of these kinds action, and rows that correspond to the pyramid of service shown earlier.

At the tip of the pyramid, action is needed to address the most dis-served voters, those who currently have no option but to vote with personal assistance, foregoing the right to privacy and independence.

Actions Needed

Advocacy: widespread use of to-the-voter voting services, using the model of the few jurisdictions that offer such service, but technology development work is likely needed as well.

Technology: accessible portable/mobile voting devices that can be more easily delivered to the home of a voter who needs home voting but lacks the equipment. The results of such technology development may also yield to-the-voter equipment that is less logistically easier and possible less expensive to transport to voters' homes.

Standards: extend NIST guidelines on accessibile voting, to apply to new kinds of to-the-voter systems.

Advocacy: the needs for sustained ongoing funding for these services, and for new administrative practices.

Administration: define practices that make it easy and accessible for voters to request these services, and for election officials to conduct outreach to find voters who need these services

Just below the top of the pyramid are voters in jurisdictions that do offer to-the-voter home voting service. These voters will also benefit from advocacy that extends the reach of these services to voters who may not be aware of them.

The next level of the pyramid includes voters that must vote at home, and have their own accessible computing equipment for accessible home voting.

Actions Needed

Technology: develop open source software for home voting solutions, that is devoid of current systems privacy issues, creates true legal paper absentee ballots that are machine counted (no transcription required), and that can be inspected for possible defects in privacy, independence, and security.

Advocacy: for full public transparency of such technology.

While such systems may benefit many home voters, they don't address the requirements of voters who are unable to independently perform the paper handling required for vote-by-mail, even when they can use their home equipment and RA-VBM solutions to create a printable ballot and voter affidavit document. For these voters, to-the-voter equipment is the best short-term option. However, there is also demand for RA-VBM systems that provide electronic ballot return (EBR). Current EBR options are fraught with cyber-security risks that make it impossible to provide equal protection, and eliminate risks that are not faced by paper-based absentee voters. To eventually meet this demand responsibly, significant technology research and development (R&D) will be needed.

Technology: R&D toward definitive solutions to several hard problems in secure computing, in order to enable the creation of home voting system with an EBR option.

Advocacy: for such funding and direction of such R&D, for public transparency of its results, and for standards.

Standards: for the assessment of RA-VBM systems' privacy, independence, audit support, and security.

Policy: to resolve policy issues for the types of voters and situations in which digital return is the only private and independent option.

Many voters with disabilities who are able to vote at home with pen-and-paper remain disadvantaged by limited availability and accessibility of services that mitigate the risks of absentee voting described above.

Actions Needed

Policy and Advocacy: require mitigations to be made available for all voters.

Technology: develop systems that accessibly deliver mitigation services. Make mitigations available to voters with computing devices and Internet access, e.g. a voter app on mobile devices, and similar web app. Implement these systems specifically for accessibility for voters with disabilities.

Administration: availability of mitigations should be delivered both with technology and without it, to avoid a digital divide among voters with disabilities.

The base of the pyramid, in-person voting, has challenges both specifically in accessible voting, and more generally in disproportionate harm to voters with disabilities. For accessible voting, the actions required are:

Actions Needed

Policy and Advocacy: eliminate Direct Recording Electronics (DRE) usage, and usage of Ballot Marking Devices (BMD) that do not create a standard format ballot that is counted in the same manner as ballots of pen-and-paper voters.

Technology: create open source BMD software that can be inspected for defects, and used by hardware system integrators to create inexpensive non-proprietary BMDs using conventional hardware that has support for accessibility peripherals.

Standards: develop national data interoperability standards, and open-source reference software for them, that enable any standards-compliant BMD to work with any standards-compliant election administration system, and any standards-compliant ballot scanning system.

To address some causes of delays in voting place operation, the actions required are:

Technology: develop “voter services kiosk” systems shift error handling from the head of the voter check-in line to a kiosk designed specifically for resolution of voter check in problems.

Technology: develop new electronic poll book technology that is designed for resilience and does not require that voter check-in cease when technical issues arise.

Policy and Advocacy: for the development and use of these new technologies for reducing polling place delays.

Figure 4
Voting Method Decision Tree

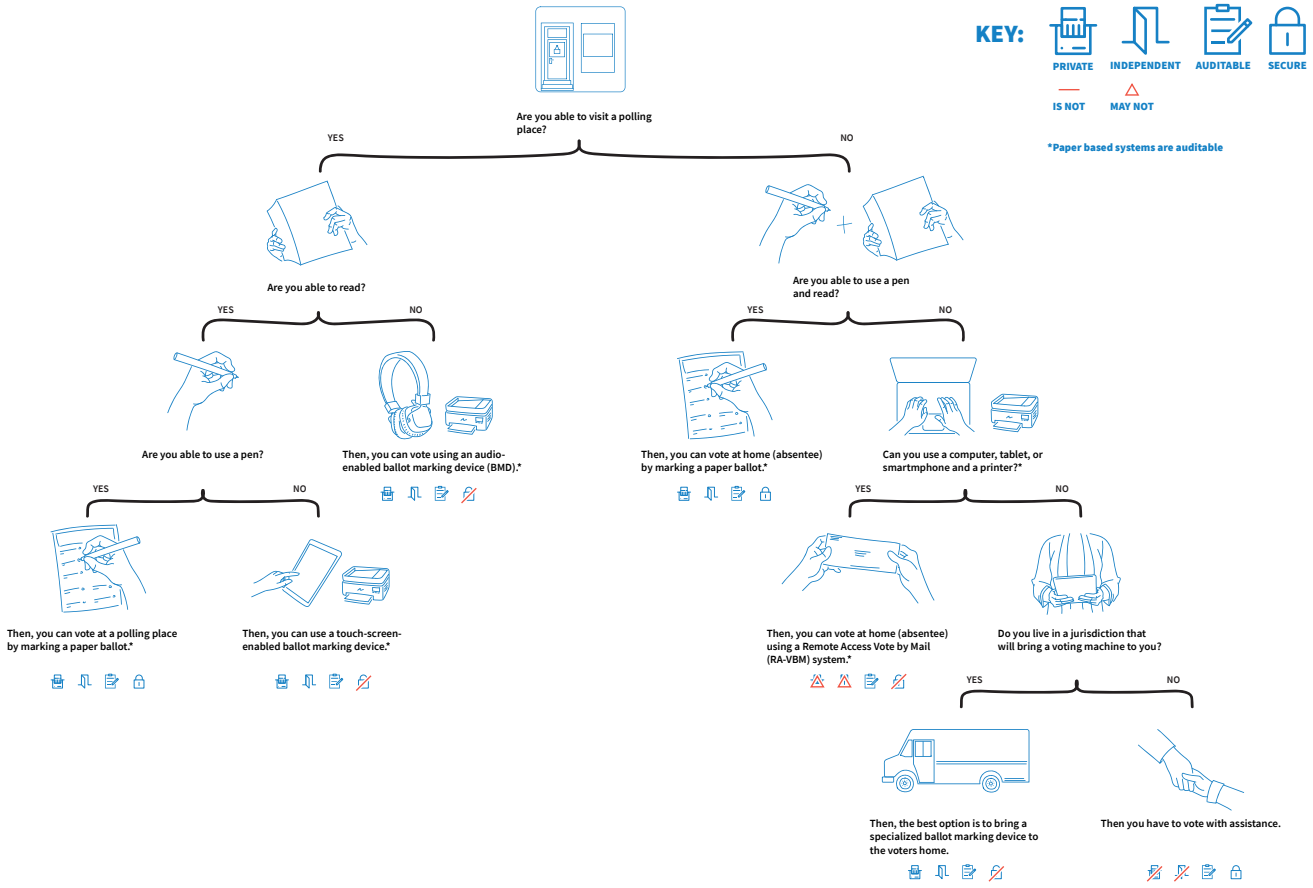


Figure 4 provides a visual summary of the voting options currently available, in the form of a "decision tree" that defines a voter's options based on their abilities. Each method is tagged is icons that show whether the method is fully, partly, or not at all private, independent, auditable, and secure. Based on this view (with details provided in Appendix A), the roadmap of action can be concisely summarized as: do the technology work to remedy each case, advocate for and set policies requiring the technological or procedural changes, and do the standards and administrative work that's needed to support policies.

5. Roadmap Summary: Toward Equality at Every Level of Voter Service

By abandoning the hierarchy-of-needs policy framework, and adopting the principle of full service for disabled voters in every situation, we have defined a pyramid of service, with each higher level having progressively more requirements for equal service.

After reviewing the defects and limitations of current voting options, this paper has laid out a roadmap of objectives and actions for each, in terms of technology, policy, and advocacy. Taken together, the roadmap's guidance comprises an undertaking of considerable effort and importance, but taken individually, each action is firmly rooted in current facts on the ground, and tractable steps forward.

Appendix A: Supporting Details

This Appendix supplements Section 3.2 with additional detail on the current limitations of options for voters with disabilities, details that support the actions specified in the roadmap of Section 4.

A.1 In-Person Voting: Accessible DRE and BMD Voting Machines

The Help America Vote Act (HAVA)-mandated accessible "voting machines" currently fall into three broad categories. Only one delivers on the HAVA mandate; voters who must use the others are unnecessarily disadvantaged, with no recourse.

1 The oldest category is the Direct Recording Electronics (DRE) machine, some of which are entirely paperless. Voters face the risk that the computer storage data that represents their votes might be damaged, tampered, or deleted because these machines do not produce a paper ballot. Regardless of speculation about risk and frequency, the fact that voters with disabilities face this risk, while paper-and-pen voters do not, makes this voting method separate, unequal, and less protected.

   Some DREs are not entirely paperless, operating with the same risks to stored data, but also producing a paper record of each voter's choices. While the paper record is helpful for an auditing process, the paper records are not accessible to all voters. As a result, if an audit uses a paper record that was not verified by the voter, the audit is not comparing auditors' human interpretation to a true record of the voter's intent. An audit is not guaranteed to uncover a case where an individual voter's choices were not accurately recorded, and the voter did not or was not able to review the paper record

2 The second category is a more modern accessible Ballot Marking Device (BMD), that unlike a DRE does not store vote data, but like a DRE produces a paper record instead of a full ballot like that marked by other voters. This "voter choices card" has a barcode that encodes the voter's choices, in addition to the printed text of the voter's choice. The card is counted by an optical scanning device, but not via the same method as a true ballot scanner. Instead, the barcode is decoded, and the resulting voter choices are recorded as votes.

   The use of these "bar-code" accessible BMDs exposes BMD voters to risks (including errors in writing or reading the barcode) that are not present for bubble ballot voters. Again, regardless of speculation about risk and frequency, the fact that voters with disabilities face this risk, while others do not, makes bar-code BMDs a separate and unequal method of voting. This is true even in jurisdictions where all in-person voters use bar-code BMDs; in each such jurisdiction, some voters have the option of voting absentee via hand-marking a regular ballot, a lower-risk option that is not available to some voters with disabilities.

3 The third category of current voting machines consists of accessible BMDs that produce a marked ballot in the same ballot format as hand-marked ballots, and counted in the same way. (Applicable solutions here could include "Poll-Pass" or "Vote Carrier Systems" such as Los Angeles County's VSAP system.) Only this category provides full service to all voters that use it.

A.2 Voting With a "Home BMD"

More recently, some jurisdictions have provided at-home voters with an alternative to pen-and-paper absentee or by-mail voting: the use of a "Remote Access Vote by Mail" (RA-VBM) system. The RA-VBM approach started with Oregon's Alternative Format Ballot (AFB), designed specifically for Oregon voters who vote at home, cannot or choose not to use a pen, and who have their own home computer equipment with assistive devices and a printer.

States or vendors aiming to serve a wider range of voters with home computers have developed other RA-VBM systems or home voting systems. Often delivered by way of an online web-based interface, the systems work somewhat like a Ballot Marking Device (BMD), to present ballot choices to a user, to temporarily store the choices, and generate a paper ballot to be printed. In addition, these systems also generate the voter statement, or affidavit, document, and assistance in printing and packaging these documents, to be returned the same way as a conventional pre-printed mailed-out absentee ballot return kit, but with voter-supplied materials.

A.2.1 Not Actually Independent

However, many current RA-VBM systems share one limitation that makes it impossible to provide voters with disabilities the HAVA-mandated private and independent voting experience. The limitation is similar to the "bar code" BMD voting machines described above. The home printed ballots are not true complete ballots, but rather a sheet with a printed record of the voter's choices only — and in some cases with a barcode that represents the choices.

Once received by election officials, these sheets are transcribed to real full-scale bubble ballots, and the result is scanned just as hand marked ballots are. The transcription can be manual, or can be assisted by a barcode reader, but the net effect is the same: the voter depends on another person to create their complete and machine-countable ballot. The seemingly private and independent home voting experience is in fact not independent at all, but dependent on a person (or a person with software assistance) that could introduce errors that do not represent the voter's intent. Further, when a barcode is used to aid transcription, the barcode writing and reading function is an additional source of potential error that does not apply to pen-and-paper home voters.

Worse, this deficiency is often not disclosed. An informed voter would be able to make their own choice between:

> Not private, not independent voting via a pen-using assistant who transcribes the voter's intent in the voter's presence.
>
> Private but not independent voting via a home computer to produce a document that is then used by someone else — not in the voter's presence, and not chosen by the voter—to create the voter's true ballot.

The lack of full disclosure and decision support means that voters with disabilities, who use this home voting option, are not given the opportunity to independently choose their voting method.

A.2.2 Less Protected via Audit

Another consequence of transcription is that the voter faces additional risk that other voters do not face, of their ballot's correct interpretation being checked in a ballot audit. Some jurisdictions' audit processes fail to require that the audit process use the document created by the voter, which in the case of a voter using a current RA-VBM system, is the

home printed document—not the result of transcribing it. Regardless of requirements, there is a risk that the local election officials will fail to store the original and the transcribed ballot together, or fail to include them in the pool for ballot audits, or use the transcribed ballot, which might have transcription errors.

Regardless of speculation about risk and frequency, the fact that voters with disabilities face this risk, while paper-and-pen voters do not, makes this voting method separate, unequal, and less likely to be protected by an audit process.

A.2.3 Not Actually Private

The Oregon AFB employs a simple technical approach that yields high accessibility for voters with disabilities, but not great usability for other voters. In this approach, the AFB really is a kind of ballot document, an HTML file that a browser can render locally, collect voter choices, and use embedded JavaScript to create a printable HTML file that serves as a simple voter-choice-only card with barcode. Though not truly independent, this approach is private, because all voting activity happens locally on the voter's computer. In fact, after using an Internet connection and a remote web site to download the HTML file, a voter could disconnect her computer from any network, and vote the ballot just as effectively.

Other RA-VBM systems, whoever are not private, when they depend on a remote server, running a web application, for server/browser communication in which the voter's choices are sent to a server, and the server produces the voter-choice-only card. The server simultaneously contains the voter's identity (which they must first validate, in order to be presented with the right ballot) and the voter's ballot choices. This approach is no more private than voting in front of a camera; the voter has no idea who has access to the server and the data residing on it. In a well-managed system, the system's operators would have strict rules about system access intended to constrain their ability to view the voter's data.

Nevertheless, the risk that such rules are present and are followed — to say nothing of the risk of cyber-attack on the Internet-connected server that could also expose data stored on the server — are risks that are faced by the users of these RA-VBM systems, but are not faced by many other absentee voters.

A.2.4 Is "Private, Independent, and Accessible" Possible?

Some may wonder why such a system would be built with these shortcomings, or if these shortcomings are somehow necessary. They are not. RA-VBM systems were built primarily for military/overseas voters to whom HAVA-mandated privacy/independence requirements could be waived. The Oregon AFB system was built explicitly for voters with disabilities, and lacks the privacy violations of RA-VBM.

However, a truly private independent home voting solution must produce a file that when printed at home is a complete ballot, countable by optical scan, and containing all the same information as a pre-printed mailed-out absentee ballot, but rendered in a printable document sized for ordinary 8.5 x 11 paper. Lacking that, current RA-VBM systems are really separate and unequal voting methods for voters with disabilities.

Private and independent production of such ballots is definitely more difficult than production of sheets to be later transcribed. Optical scanning and counting of home printed ballots is not part of the functionality of current voting system products' central scanners. But both tasks are technically feasible; avoiding these tasks because of an easier path is understandable for a for-profit voting system vendor, but the result does not enable election officials to meet their HAVA mandate.

A.3 Voting at Home With Neither Pen Nor RA-VBM

If there were such a truly private and independent home voting solution, it could meet the needs of many homebound voters, in the same way as a BMD meets the needs of voters with disabilities who vote in a voting place. But that would not include every homebound voter:

> Some are not able to privately and independently handle printed materials and envelops to create a postal return envelope.
>
> Others may lack a printer, or lack a computer with the accessibility peripherals that some voters have.

For these voters, some localities can do a "truck-roll" of a mobile voting booth with BMD, to the voter's home, somewhat analogous to the voting place practice of curb-side voting, but in this case the curb being that of the voter's home. (This is described elsewhere as "bring-the-machine-to-the-voter.") In the case of the Oregon AFB, the system was designed to work equally well for voters with home computers, or voters without them, served by an AFB system brought to the voter's home.

But the practice is far from universal, and that leaves some voters without an option to vote privately and independently. That fact of life is part of what has led to proposals to extend to disabled voters the same electronic or digital ballot return that some states have already authorized for military/overseas voters as defined by the Federal law called "UOCAVA" (Uniformed and Overseas Citizens Absentee Voting Act; see Footnote 14).

A.4 Military-Style Voting at Home

The problem with that approach is that the various digital return methods — eMail, Fax, file upload to a web server, file upload via a mobile app — all have cybersecurity risks that are not faced by paper absentee voters. These methods are, again, separate and not equal. Those risks may be acceptable to UOCAVA voters, because the UOCAVA law does not forbid separate and unequal voting methods. In fact, among more than thirty states that have authorized digital ballot return for military voters, some states have specifically required military/overseas voters to waive ballot privacy.

In effect, these states are telling military voters that they have a choice: waive privacy in order to use a system that returns the ballot and affidavit nearly instantly (when working correctly); or use postal return and risk delivery delays that could render the ballot uncounted because of late arrival. The privacy waiver is not capacious, but a simple result of the digital ballot return methods, the most common of which are email, fax (which like email transits the Internet), and web-based file upload.

Each of them has Internet security risks, of course, including integrity and privacy risks, but the methods themselves are inherently not private. For example, consider the situation in which an election official receives an email message with one file attachment that is a ballot, and another that is an affidavit document, both to be printed for later adjudication. The printing process could render both documents visible at the same time, even inadvertently, in a way that does not apply to a normal paper absentee ballot arriving in a privacy sleeve alongside an affidavit. A similar situation applies to the IT system operators of the email server, and similarly to operators of a web server used for file upload.

However, for voters with disabilities, such a non-private, and separate/unequal option likely does not provide for the HAVA required private and independent voting method, nor does it provide equal protection with paper-based absentee voters' experience.

Regardless of speculation about risk and frequency (whether of accidental privacy violations, IT operator malfeasance, or cyber-attacks by nation state adversaries), the fact that voters with disabilities face these risks, while paper-and-pen voters do not, makes this voting method separate and unequal. Though meeting the needs of UOCAVA voters in the 30+ digital-ballot-return states, the same methods do not meet requirements for voters with disabilities.

A.5 Undisclosed Cyber Security Risks

Some remote-access vote-by-mail (RA-VBM) systems include an additional feature intended for the military-voter situation described above. That feature is a form of digital ballot return that is an alternative to what an RA-VBM military voter would otherwise have to do: print the absentee ballot materials created by the RA-VBM system, scan the printed documents, and email or upload the scan files. The alternative is to skip the printing and scanning process, relying on the RA-VBM to upload the digital ballot and affidavit.

Although the file upload mechanism is similar to what a voter could perform separately (in a few states), the difference is that the files do not transmit to a state-managed site (e.g., a .gov or .state.us domain), but rather transmit to a server (e.g., .com) that is part of the RA-VBM product.

This alternative is presented as a convenience, but not as a more risky alternative that the voter may view as a necessary risk, undertaken after full disclosure of security risks and of the RA-VBM vendors' role as an intermediary between the voter and the election official. As a result of this lack of disclosure, some voters unwittingly forgo equal protection in exchange for convenience, when they could easily have used conventional paper ballot return.

For military voters, this approach might be considered relatively benign, considering the assumption that most military voters are indeed in a situation where digital return is the only option for getting an absentee ballot kit returned in time. Even so, the lack of disclosure is troubling.

However, for home-based voters with disabilities, digital ballot return is considerably more troubling. A great many of these voters do not face the issue of a postal return time frame so protracted that it risks the ballot being counted—the main reason for digital ballot return for military voters. For almost any home voter that is physically capable handling a printed ballot and affidavit, and enveloping them, digital ballot return is an unnecessary risk.

However, there are home-based voters with disabilities who do lack that physical capability. They have choices: forgo privacy and independence in favor of physical assistance with enveloping by a person of their choice; or retain privacy and independence, with the trade-off of additional security risks. But such a choice should be based on full disclosure—not touted for convenience—so that each voter can make their own judgment about the tradeoff between equal protection and independence.

Most particularly, for voters who have the option of a to-the-home visit of a roving polling place, the use of digital return, without disclosure of option, is a particular disservice.

Regardless of how one views the likelihood of nation-state cyber-attackers placing malicious software that could violate a home voter's privacy or ballot integrity (either on the voter's home computer, or the election officials' systems), the very fact that it is possible means that digital-return home voters face a threat not faced by voters able to cast a ballot in person. The option of a separate and not equally protected option, for voters with disabilities, should be offered with care.

A.6 In Person Voting Delays

Finally, returning to in-person voting, one of the disadvantages of in person voting disproportionately and significantly affects some voters with disabilities: delays, long lines, and long waiting times to vote in person.

There are a variety of causes: flaws in paper poll books, voters going to an incorrect election day voting place, electronic poll book (ePB) technology malfunctions, and more. Dealing with these issues takes time, especially when error handling is done at the head of the voter check in line, preventing voters in line from checking in, until the error is handled.

To address the latter issue, new technology can help to shift error handling from the head of the line to a “voter services kiosk” designed specifically for resolution of voter check in problems, and to facilitate provisional voting in a way that is more comprehensible and reliable that current practices of filling out provisional voter forms. Critically, such kiosks must be accessible, to enable voters with disabilities equal access to self-service problem resolution.

For delays caused by ePB malfunctions, solutions require new ePB technology that (unlike current systems) are designed for resiliency, do not require network service to check in voters, and which work with voter services kiosk to facilitate provisional voting when required by ePB issues.

About the Author

John Sebes is one of two co-founders and Chief Technology Officer ("CTO") for the U.S. based OSET Institute ("OSET"), a non-partisan non-profit 501(c)(3) public benefit corporation headquartered in the Silicon Valley. He leads all aspects of technology strategy, vision, architecture, engineering and development for the TrustTheVote® Project – the flagship effort of the Institute.

Prior to founding the OSET Institute, John has been a software engineer, technical consultant, and CTO, working in several areas, including network infrastructure, application frameworks, embedded systems, critical infrastructure, data center operations, with strong common themes of risk management, security, privacy, and reliability. Innovation and technology transfer have been another consistent theme, in settings as varied as government-funded R&D, venture-backed start-ups, professional services, academia, and non-profits.

For parts of his career, John provided independent consulting services related to information security and IT operations assurance, for a variety of organizations ranging from technology start-ups and venture capital firms to major government agencies and established financial services firms. At other times, John has been a Principal Investigator in R&D projects, ranging from DARPA projects performed in the pre-Web era, to recent work with DHS on public (open source) security technology.

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