2023 U.S. Election Assistance Commission Voluntary Electronic Poll Book Pilot Program Report

October 25, 2023

Acknowledgments

The U.S. Election Assistance Commission (EAC) would like to recognize the following organizations and their representatives who made this pilot possible through their time and talents. Their dedication to this effort has been invaluable.

Voluntary Pilot Participants

Provided electronic poll book systems to further the EAC's research efforts on their capability to comply with federal requirements.

Commercial Manufacturers

Election Systems & Software (ES&S)

KNOWiNK

Robis Elections Inc.

Tenex Software Solutions

VOTEC Corporation

State and Local Jurisdictions

Maricopa County Elections Department

North Carolina State Board of Elections

Voting System Test Laboratories

Performed evaluations of the piloted systems to draft standards prepared by the EAC. This required dedication of time and consistent communication to ensure they were meeting the EAC's expectations.

Pro V&V, Inc.

(Huntsville, Alabama)

SLI Compliance

(Wheat Ridge, Colorado)

Technical Expert Consultants

Provided technical assistance in the development of draft Security and Accessibility/Usability requirements for pilot evaluation.

Mandiant

(Security Requirements)

National Institute of Standards and Technology (NIST)

(Accessibility/Usability Requirements)

Advisory Boards & Stakeholders

Provided guidance throughout the pilot, presenting a perspective from the state and local levels, and providing technical expertise when necessary.

EAC Standards Board

EAC Board of Advisors

EAC Technical Guidelines Development Committee (TGDC)

EAC Local Leadership Council (LLC)

Executive Summary

An increasing number of election jurisdictions have begun utilizing electronic poll books, commonly referred to as e-poll books or EPBs. EPBs play a central role during the in-person voting experience in the sense that they supplement or substitute the use of traditional paper poll lists to access and track voter registration records. These systems have been used to streamline the check-in process, automate ballot issuing, collect and display critical data, and enhance the security of the voting process by providing real-time confirmation that a registered voter can only check in and vote one time. Currently, only 16 states that utilize EPBs have established a formal certification program to ensure EPB manufacturers comply with state laws and regulations.[1]

The U.S. Election Assistance Commission (EAC) recognized the need to establish a uniform set of standards and best practices for EPB testing and usage, in an effort to enhance the security, accessibility, and usability of these devices. In response to the increasing demands from the public and various stakeholders, the EAC launched a pilot of the nation's first voluntary program for testing of EPBs on the federal level in 2021, to determine if federal certification is a viable solution in the foreseeable future of EPB usage during elections in the United States. As a result of the development of the Election Supporting Technology Evaluation Program (ESTEP), which was formally established by hiring its first director in 2022, the EAC has now collected findings and feedback from the Voluntary Electronic Poll Book Pilot Program, which are presented in this report.

This report identifies noteworthy findings, possible limitations, and plausible solutions to establishing a formal program for EPB certification. The EAC highlights the following conclusions, which are detailed in Section IX of this report:

1. There is a need to enhance data collection methods in the EAC's Election Administration and Voting Survey (EAVS) to include further research questions pertaining to EPBs and other election-supporting technologies.
2. Prior to the development of a formal program for certification, it is imperative that the EAC examine the applicability of existing requirements at the state and local level for possible revisions to federal requirements.
3. Version 0.9 of the Voluntary Electronic Poll Book Requirements should be revised to include baseline functionality requirements and to add clarification to requirements that weren't easily achievable during this Pilot Program.
4. A Manual, outlining administrative processes and guidelines for participation in the ESTEP, should be established.

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[1] A full list of states that have established a formal certification program can be found in Appendix 2.

5. An agile program for testing and certifying EPBs at the federal level, should be implemented.
6. Once the EAC Commissioners have discussed and implemented all preceding recommendations, ESTEP should move forward with piloting the next election-supporting technology.

The EAC's Voluntary Electronic Poll Book Pilot Program has confirmed that developers in the current landscape of EPB manufacturing are capable of meeting 95% of the requirements as currently drafted in the Voluntary Electronic Poll Book Requirements (VEPBR v0.9). **This finding indicates that our nation's e-poll books are ready for use in elections today.** Drawing on this conclusion, the ESTEP Director recommends the development and implementation of a formal program for EPB testing and certification at the U.S. Election Assistance Commission.

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I. Background

Under the authority of the Help America Vote Act (HAVA), the U.S. Election Assistance Commission (EAC) began exploring the need to develop standards for election-supporting technologies in 2021, by introducing the nation's first Voluntary Electronic Poll Book Pilot Program at the federal level. In an effort to achieve this goal, the EAC developed the Election Supporting Technology Evaluation Program (ESTEP), responsible for the creation of draft standards, administration of pilot programs, and presentation of pilot findings. This program was formally established in September 2022, through employing its first director, and received Congressional funding for the development of a full program in 2023. This additional funding permitted the EAC to launch the EPB pilot, contract with Voting System Test Laboratories (VSTLs) to conduct testing, employ four Election Technology Specialists to oversee pilot program activities, and purchase additional program resources. ESTEP aims to establish requirements and guidelines specific to election technologies that are not covered under the Voluntary Voting System Guidelines (VVSG), which also includes voter registration databases, election night reporting systems, and ballot delivery systems.

Purpose

This Pilot Program was designed to develop a set of testable guidelines, procedures, and program materials that could be utilized to encourage the standardization of the security, accessibility, and usability of EPBs across the United States. Due to increasingly targeted attacks from nation-state actors against our election infrastructure, the security of EPBs has never been more important. It was necessary for the EAC to develop standardized requirements to ensure that:

- EPBs are capable of providing a positive experience for their users,
- mitigations to network-related security threats, such as malware, ransomware, phishing, denial of service, and injection attacks, can be enforced through testing and certification of these systems,
- human errors in configuring and utilizing security features are mitigated through advanced usability features, and
- all eligible voters have access to the process in the most accessible and efficient manner possible.

Design

Utilizing a standardized evidence-based approach, this Pilot Program involved a seven-phase process (Figure 1) in which EPB manufacturers demonstrated their ability to effectively build, test, monitor, and maintain their election technology solution according to standards developed by the EAC. This process has been designed to verify the security, usability, and accessibility of EPB systems in the United States. This report represents the completion of the sixth phase of the pilot process and marks the culmination of a two-year evaluation program.

| PHASE 1 Develop Requirements | PHASE 2 Develop Pilot Artifacts | PHASE 3 Establish Test Group | PHASE 4 System Evaluation | PHASE 5 Pilot Findings Evaluation | PHASE 6 Present Findings | PHASE 7 Commissioner Decision |

Figure 1. Election Supporting Technology Pilot Evaluation Process.

II. Introduction to Electronic Poll Books

Though jurisdictions throughout the United States vary in their definitions of EPBs, the EAC broadly defines these systems to be inclusive of commercial and in-house applications. In version 0.9 of the Voluntary Electronic Poll Book Requirements, hereinafter referred to as VEPBR v0.9, the EAC defines an EPB as:

Equipment (including hardware, firmware, and software), materials, and documentation used to partially automate the process of checking in voters, assigning voters the correct ballot style, and marking off voters who have been issued a ballot.[2]

Simply defined, EPBs are laptops, tablets, or kiosks (Figures 2, 3, and 4), designed to replace paper poll lists, that access digital voter registration records for their representative jurisdiction. In contrast to a voting system, EPBs' primary users are election workers, and do not collect or tabulate cast vote records. EPBs were initially designed in an effort to automate the election process and alleviate the burden on election workers, who update voter registration records and evaluate a voter's eligibility to participate in the election process. In recent years, these systems have evolved to serve a variety of administrative functions before, during, and after an election. EPBs can now be used to capture voter signatures, identify a voter's ballot style or preferred language, detect ineligible voters, and extract data reports.

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[2] Source: U.S. Election Assistance Commission, *Voluntary Electronic Poll Book Requirements Version 0.9* (2023).

Figure 2. VOTEC Corporation's VoteSafe with a kiosk interface.

Figure 3. KNOWiNK's PollPad with a tablet interface.

Figure 4. Robis Election Inc.'s AskED with a laptop interface.

There are two ways in which an EPB can access voter registration records: through direct connection to a voter registration database, or through manual uploads of the registration records. In jurisdictions that utilize direct connections, EPBs display live updates of voter check-ins across precincts through real-time connection to a voter registration system. In contrast, systems that access voter registration data through manual uploads do not maintain any real-time connection and require election administrators to export check-in records after the polls close. In some states and territories, EPBs also hold the capability to communicate with each other directly in a secured cloud environment.

III. EPBs in the United States

Throughout the past 15 years, the United States has witnessed a steady increase in the use of EPBs during elections. The EAC first began tracking EPB usage in 2008, when only 23 states and territories reported using EPBs. The most recent data from the 2022 Election Administration and Voting Survey (EAVS)[3] findings revealed that 40 states and territories currently utilize EPBs, with 19 reporting the usage of EPBs in *all* jurisdictions and 21 only utilizing EPBs in *some* jurisdictions (Table 1 and Figure 5). This is a 60% increase in comparison to the 2008 EAVS findings.

Table 1. EPB Usage in the United States	
All Jurisdictions (19)	Arizona, Arkansas, Colorado, Delaware, District of Columbia, Florida, Georgia, Indiana, Iowa, Kentucky, Maryland, Michigan, New Jersey, New Mexico, North Carolina, North Dakota, Rhode Island, South Carolina, U.S. Virgin Islands
Some Jurisdictions (21)	Alabama, California, Hawaii, Idaho, Illinois, Kansas, Minnesota, Mississippi, Missouri, Nevada, New York, Ohio, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia, Wisconsin, Wyoming
No Jurisdictions (12)	Alaska, Connecticut, Louisiana, Maine, Massachusetts, Montana, Nebraska, New Hampshire, Oklahoma, Oregon, Vermont, Washington

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[3] Source: U.S. Election Assistance Commission, *Electronic Poll Book Report* (2023).

Figure 5. Map of EPB Usage in the United States.

Differences in System Development

Based on data compiled by Verified Voting,[4] it was found that at least 13 commercial EPB manufacturers were utilized throughout the United States during the November 2022 general election. As demonstrated in Figure 6, the most widely used system is KNOWiNK's Poll Pad, which was utilized by 24% of states and territories in the United States during the November 2022 general election. Other widely used systems include Election Systems and Software's (ES&S) ExpressPoll (20%) and Tenex Software Solutions' Precinct Central (15%) EPBs. The remaining manufacturers service less than 10 states, which includes American Election Systems (AES), Civix/DemTech, Content Active, DFM Associates, ELECTEC Election Services Inc., Platinum, Robis Elections Inc., Runbeck, VOTEC Corporation, and VR Systems. It is important to note that many states and local jurisdictions may have retired systems purchased and used prior to the November 2022 general election.

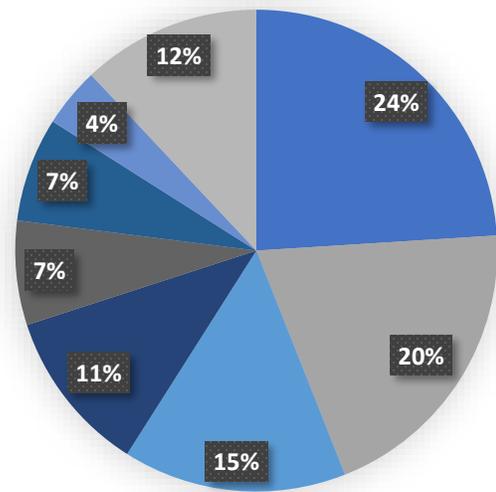[4] Source: Verified Voting, *Voting Equipment Database* (2022).

The development of in-house EPB systems originated in Iowa in 2009, through the development of the Iowa Precinct Atlas Consortium (IPAC). This EPB software program was piloted under the direction of former Cerro Gordo County Auditor, Ken Kline, in an effort to respond to the challenges faced with enforcing new election laws. In 2013, the program was formally established through agreements with 28 counties under the oversight of the Iowa State Association of Counties (ISAC). 83% of Iowa counties now utilize the IPAC system to process voters during elections.[5]

Since 2009, there have been 10 additional states to develop EPBs solely for internal use, making up 11% of the total EPB usage landscape in the United States.[6] Of the 11 total states that use in-house applications, five systems were developed solely for use in local jurisdictions, whereas six systems were developed for use statewide (Appendix 2). Currently, there are only three states that require their jurisdictions to solely utilize in-house systems: Colorado, Michigan, and Wisconsin.

- 24% - KNOWiNK
- 20% - Election Systems & Software
- 15% - Tenex Software Solutions
- 11% - In-House Systems
- 7% - Robis Elections Inc.
- 7% - VOTEC Corporation
- 4% - VR Systems
- 12% - Other

Figure 6. Representation of EPB Manufacturers in the United States.

Regulations for Purchase

There are various states (65%) that permit local jurisdictions to independently select the EPB manufacturer that will service their area. This allows jurisdictions to select the solution that is most effective for the resource limitations and needs based on who enters the market by state standards and regulations. This selection process is still often limited to a list of manufacturers the state has approved, through EPB certification or other regulations.

Only 35% of states that permit EPB usage employ a top-down approach for their purchase. In these states, only one EPB solution is utilized statewide. While a small percentage require their

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[5] Source: Iowa State Association of Counties, *Iowa Precinct Atlas Consortium* (2023).
[6] Source: Verified Voting, *Voting Equipment Database* (2022).

jurisdictions to utilize an in-house application (2%), the majority of these states use one commercially manufactured EPB solution. Table 2 displays further details.

Table 2. States with Multiple EPB Solutions versus Single EPB Solutions	
Multiple EPB Solutions (25)	Alabama, Arizona, Arkansas, California, Delaware, Florida, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Mississippi, Missouri, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Virginia, Wyoming
One EPB Solution (15)	Colorado, District of Columbia, Georgia, Idaho, Maryland, Michigan, Minnesota, North Dakota, Rhode Island, South Carolina, South Dakota, Utah, West Virginia, Wisconsin, U.S. Virgin Islands

Testing & Certification

The concept of certifying EPBs originated in Indiana in 2013. Under the authority of the Indiana Secretary of State, the Voting System Technical Oversight Program (VSTOP) at Ball State University assisted in the development of first-in-the-nation legislation requiring that all EPBs successfully complete system field testing and receive certification from the Indiana Secretary of State prior to use during an Indiana election. Since 2013, VSTOP has conducted a four-step sequence to evaluate EPBs to state requirements, outlined in Indiana's Electronic Poll Book Certification Test Protocol, and advises the Indiana Secretary of State on the certification of EPBs in Indiana.

Various states have since adopted their own regulations, legislation, or standards for the evaluation and, in some cases, certification of EPBs. On October 25, 2019, the National Conference of State Legislatures (NCSL) reported that 13 states had established certification procedures for EPBs.[7] In 2022, the EAC found that 17 states require EPBs to be certified under state legislation prior to use in an election.[8] In total, there are 38 states that regulate the use of EPBs through certification or other statutory requirements (Appendix 2).

IV. Developing Requirements

Phase 1 of the pilot process involved the development of the Voluntary Electronic Poll Book Requirements (VEPBR v0.9), in consultation with Mandiant and the National Institute of Standards and Technology (NIST). This included drafting the document, soliciting and incorporating feedback from stakeholders, and continuous revision, before a final version could be produced. The EAC devoted approximately 15 months to this effort.

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[7] Source: National Conference of State Legislatures, *Brief: Electronic Poll Books* (2019).
[8] Source: U.S. Election Assistance Commission, *Electronic Poll Book Report* (2023).

Targeted Audience

The VEPBR v0.9 was designed to be used primarily by EPB system manufacturers and VSTLs. Manufacturers will utilize these requirements to design and build new EPB systems to minimum standards. VSTLs will utilize these requirements in the future to develop test plans for the analysis and testing of EPB systems to verify whether the system has met all requirements as established by the EAC. States and territories may utilize these requirements as a baseline and include additional requirements, as deemed necessary by their legislation or other regulations.

Considerations

In developing these requirements, the EAC also recognized important differences between voting systems and EPB systems in the development of minimum requirements for system evaluation. These differences have been identified in the VEBPR v0.9[9] and are revisited below.

Election workers are the primary users. In contrast to voters who interact with a voting system for one brief session, election workers have been trained on the functionality and operability of EPBs in order to complete necessary tasks many times during a voting day. In addition, the 2022 EAVS jurisdictions reported that more than half of election workers were 61 years or older and less than one-fifth were younger than 41 years old. This means that EPBs should be designed in a way that is accessible to users of all ages and disabilities.

Voters may also interact directly with the EPB. Depending on the design of the system, voters may be asked to:

- Confirm information on a screen
- Provide identification by handing an ID card to a worker or placing it in position for the system to read
- Sign their name on the main EPB screen or on a smaller device
- Be given information on paper, including information to authorize them to vote or activate the voting system or directions to a different voting location

Check-in is a public, not a private procedure. The list of voters is a public record, and in some locations, the names and even addresses of voters are announced for observers to hear. This means that the concerns about voter privacy that are central to the design of voting systems do not apply to EPBs.

Check-in is an assisted task, with no expectation that it is done independently. The election worker and the voter work together to complete the check-in process. Election workers assist all voters, including those with language or accessibility needs. An important consideration in

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[9] Source: U.S. Election Assistance Commission, *Voluntary Electronic Poll Book Requirements Version 0.9* (2023).

setting accessibility requirements for EPBs is when (and what type of) assistance is acceptable and when it interferes with voter independence.

EPB hardware and software are different from voting systems. EPBs are often assembled from standard computing devices, such as a laptop or tablet. They run on conventional operating systems rather than a custom platform. They often include several additional commercial off the shelf (COTS) devices including a printer, signature pad, or barcode scanner.

There is more flexibility in how EPBs are set up for use. Unlike a voting system, they can be set up for the specific team of election workers who will use them during a voting day. Requirements that adjust the screen display are an important way to mitigate these issues and make sure that the information on the screen is clear.

- They are set up once at the start of the day and peripherals are attached at that time by someone familiar with the system.
- EPBs are typically placed on a working surface where they can be adjusted for physical reach and touch.
- Like voting systems, lighting conditions may not be optimal, including poor lighting, reflections, or glare from lights and windows.

There may be requirements for actions by election workers that affect the fundamental nature of the task. These actions may include:

- Reviewing or comparing a voter's signature to the image of one on file
- Reading information on an ID card
- Handling an ID card or a scanner to read the voter information into the system, a printed voter authorization form to be given to the voter, or turning the EPB screen so the voter can read it or sign their name

An EPB interface can assist election workers in performing some tasks. For example, they can include instructions for infrequent tasks or may include design elements to draw attention to similar names or notifications of voter status in a way that would be considered bias under VVSG 2.0 requirement 5.2-A No bias in a voting system. The report checklists for usability and accessibility of electronic poll books includes a list of usability considerations specific to EPBs that could be used for examination as part of a certification or procurement process.

Requirements Revision

The EAC engaged in an iterative process of feedback and revision with various stakeholders to ensure the VEPBR v0.9 would be comprehensive of the evaluation needs for EPBs during this Pilot Program. The following timeline outlines this iterative process.

- In **October 2021**, the EAC contracted with Mandiant to assist in the development of baseline security requirements and NIST to assist in the development of baseline accessibility requirements for voluntary EPB pilot testing participation.
- In **December 2021**, the EAC Standards Board created the Voluntary Voting System Guidelines (VVSG) Subcommittee which prioritized reviewing the Pilot Program's draft requirements.
- In **March 2022**, the first version of the VEPBR v0.9 was drafted and distributed to the VVSG Subcommittee and NIST for consideration.
- In **October 2022**, the EAC received feedback from the VVSG Subcommittee and NIST and began implementing changes based on recommendations.
- In **October 2022**, ESTEP contacted Pro V&V, Inc. and SLI Compliance to initiate the pilot process and solicit their review of the VEPBR v0.9 for feedback.
- By **December 2022**, the EAC received feedback from Pro V&V, Inc. and SLI Compliance and began implementing changes based on recommendations.
- On **January 19th, 2023**, VEPBR v0.9 was released to the public.

V. Developing Pilot Artifacts

Phase 2 of the pilot process involved the development of pilot artifacts. These artifacts serve as a commencement of the pilot activities and were designed to organize information collected during the pilot. The following artifacts were produced.

Participant Agreements. As shown in Appendix 3, this document described the responsibilities and expectations of both participants and the EAC's ESTEP Director during the Pilot Program. Participants were required to submit a complete EPB for evaluation to a VSTL, designated by the EAC and agreed to by the participant, which included any peripherals and documentation required to set up and operate the system. Participants were permitted to have no more than two personnel on-site at the VSTL to assist with equipment setup, operation, or take down. Overall, these signed agreements indicated a participant's willingness to work with the EAC and VSTLs in good faith to ensure accurate processes, efficient communication, and a successful overall experience.

Test Plans. These documents were prepared by VSTLs for each system, and included a statement of testing, the scope of testing, test methods to be utilized, resources for tracking results and issues, and proposed deliverables (i.e. test reports). These plans also involved the development of matrices to be completed during the evaluation of systems submitted for testing to the VEPBR v0.9.

VI. Establishing a Test Group

Phase 3 of the pilot process involved the recruitment of voluntary participants. To locate participants for this Pilot Program, inquiries for voluntary participation were distributed to representatives from EPB manufacturers utilized throughout the United States and all testing laboratories accredited by the EAC in January 2023. In response, two VSTLs, five commercial manufacturers, and two in-house manufacturers entered into agreements for pilot participation between January 31, 2023, and June 14, 2023 (Table 3).

Selecting Accredited VSTLs

VSTLs are accredited by the EAC after NIST and the National Voluntary Lab Accreditation Program (NVLAP) have reviewed and approved their technical competence and lab practices to ensure the test authorities are fully qualified. It is required that each VSTL develop teams with expertise in three distinct disciplines: penetration testing, software testing, and election technology and administration. Each technical testing laboratory expert designated to review EPBs according to the requirements of the VEPBR v0.9 must demonstrate proficiency in the following skills:

- Familiarity with penetration testing methodologies,
- Hands-on knowledge of vulnerability scanning, system exploitation, reconnaissance, hardware exploitation, wireless tools, and
- Ability to design and run tests and evaluate and report findings.

As of June 2023, there are two VSTLs that have been accredited by the EAC, in conjunction with NIST and NVLAP. These are Pro V&V, Inc., based out of Huntsville, Alabama, and SLI Compliance, located in Wheat Ridge, Colorado. In October 2022, the EAC contacted each VSTL to inquire about their willingness and capability to test EPBs during this Pilot Program. This process began with their review of the VEPBR v0.9.

Selecting Voluntary Participants

Participation in this program was initially limited to the first commercial manufacturers who returned signed agreements to the EAC. Additional FY23 resources, allowed the EAC to expand this initial sample. In an effort to diversify the systems evaluated during this pilot, the EAC included systems that had been manufactured in state and local jurisdictions (in-house). By June 2023, all manufacturers had submitted their systems for evaluation to their designated VSTL. Voluntary participants, including their submitted systems, development methods, and designated VSTLs have been demonstrated in Table 3.

VII. Evaluating Piloted Systems

Phase 4 of the pilot process involved VSTL evaluations of piloted systems to the VEPBR v0.9. Between January 2023 and August 2023, participants completed voluntary pilot testing at Pro V&V, Inc. and SLI Compliance. All testing was performed to the VEPBR v0.9 (Appendix 1). During the evaluation, these systems were configured for use during an election. This effort included a review of all technical documentation and all source code. Voluntary participants were asked to submit the following information to the EAC and their designated VSTL to initiate the testing procedure:

- Administrative and technical points of contact
- System description (marketing materials or other public descriptions)
- System documentation (list of accessibility capabilities, device capabilities and limits, coding convention, functional diagrams, and training materials)
- System components and materials shipped to the designated VSTL

Table 3. Voluntary EPB Pilot Participants			
System Manufacturer	**System Name/Version**	**Development**	**VSTL**
Election Systems & Software, Inc.	ExpressPoll 7.2.5.0	Commercial	Pro V&V
KNOWiNK	Poll Pad 3.4	Commercial	SLI Compliance
Maricopa County, Arizona Elections Department	SiteBook 3.4	In-House	SLI Compliance
North Carolina State Board of Elections	On-Site Voter Registration Database 2.9.120	In-House	Pro V&V
Robis Elections Inc.	AskED ePollbook 3.4	Commercial	SLI Compliance
Tenex Software Solutions	Precinct Central 5.1.9	Commercial	Pro V&V
VOTEC Corporation	VoteSafe 1.3.77	Commercial	Pro V&V

Election Systems & Software (ES&S)

System Name	ExpressPoll
System Version	7.2.5.0
System Development	Commercial

Manufacturer Information	Election Systems & Software (ES&S)
	11208 John Galt Blvd
	Omaha, Nebraska 68137

VSTL Information	Pro V&V, Inc.
	6705 Odyssey Dr NW Suite C
	Huntsville, Alabama 65806

Participant Agreement Signed	January 31, 2023
Final Test Report Received	April 26, 2023

Manufacturer's Provided System Description: The ExpressPoll electronic poll book system gives election workers a simple-to-operate voter check-in device to quickly and accurately verify voters and issue ballots. Use of the ExpressPoll reduces wait time for voters, increases the accuracy of voters' personal information, and improves the Election Day experience for all. The 10.5-inch touch screen provides an intuitive, easy-to-understand user interface, like digital devices many election officials use in their everyday lives. At the polling location, the ExpressPoll terminal comes fully assembled and ready to use, making Election Day setup quick and easy for your election officials.

Figure 7. Election Systems & Software's (ES&S) ExpressPoll.

KNOWiNK

System Name	Poll Pad
System Version	3.4
System Development	Commercial
Manufacturer Information	KNOWiNK
	460 N Lindbergh Blvd
	St. Louis, Missouri 63141
VSTL Information	SLI Compliance
	4720 Independence Street
	Wheat Ridge, Colorado 80033
Participant Agreement Signed	February 1, 2023
Final Test Report Received	June 9, 2023

Manufacturer's Provided System Description: The Poll Pad solution provides a seamless electronic voter check-in and verification process for election authorities. Poll Pad is a secure Apple iPad application requiring no appendages for operation and includes some of the following features: secure, accurate voter lookup for voter check-in, applicability for vote center style or precinct style polling locations, secure connectivity, a reduction in the total number of provisional ballots issued, on-demand ballot printing, applicability for early & absentee voting, and same-day voter registration.

Figure 8. KNOWiNK's PollPad.

Maricopa County (AZ) Elections Department

System Name	SiteBook
System Version	3.4
System Development	In-House
Manufacturer Information	Maricopa County Elections Department
	510 S 3rd Ave
	Phoenix, Arizona 85003
VSTL Information	SLI Compliance
	4720 Independence Street
	Wheat Ridge, Colorado 80033
Participant Agreement Signed	June 14, 2023
Final Test Report Received	September 8, 2023

Manufacturer's Provided System Description: The Maricopa County Elections Department SiteBook is a staff-driven, designed, and constructed voter check-in system. Introduced at the November 2017 jurisdictional elections, it uses proprietary software that ties voter check-in terminals directly with the department's voter registration system, providing an enhanced and streamlined voter experience.

Figure 9. Maricopa County Elections Department's SiteBook.

North Carolina State Board of Elections (NCSBE)

System Name	On-Site Voter Registration Database (OVRD)
System Version	2.9.120
System Development	In-House
Manufacturer Information	North Carolina State Board of Elections (NCSBE)
	PO Box 27255
	Raleigh, North Carolina 27611
VSTL Information	Pro V&V, Inc.
	6705 Odyssey Dr NW Suite C
	Huntsville, Alabama 65806
Participant Agreement Signed	April 25, 2023
Final Test Report Received	July 6, 2023

Manufacturer's Provided System Description: The State Election Information Management System (SEIMS) is an in-house developed and supported election management and voter registration system used by all 100 North Carolina counties. Within this system are SEIMS One-Stop Voting Application (SOSA), which is an e-poll book used at all early voting sites, and Onsite Voter Registration Database (OVRD), which is the EPB Election Day application for optional use by the counties. Counties may alternatively use manual poll books or authorized e-poll books from third-party manufacturers.

Figure 10. North Carolina's On-Site Voter Registration Database (OVRD).

Robis Elections Inc.

System Name	AskED ePollbook
System Version	3.4
System Development	Commercial

Manufacturer Information	Robis Elections Inc.
	1750 N Washington St Unit 128
	Naperville, Illinois 60563

VSTL Information	SLI Compliance
	4720 Independence Street
	Wheat Ridge, Colorado 80033

Participant Agreement Signed	January 31, 2023
Final Test Report Received	July 19, 2023

Manufacturer's Provided System Description: The AskED ePollbook provides a complete, secure system for checking in voters, tracking poll worker time, tracking absentee ballot drop off and assisting poll workers with "just-in-time training" for anything else that happens in the polling place. In addition to checking in voters, the AskED ePollbook gives jurisdictions a window into what is happening at each voting location and allows election officials to better manage the entire election.

Figure 11. Robis' AskED ePollbook.

Tenex Software Solutions

System Name	Precinct Central
System Version	5.1.9
System Development	Commercial
Manufacturer Information	Tenex Software Solutions
	5021 W Laurel St
	Tampa, Florida 33607
VSTL Information	Pro V&V, Inc.
	6705 Odyssey Dr NW Suite C
	Huntsville, Alabama 65806
Participant Agreement Signed	January 31, 2023
Final Test Report Received	June 13, 2023

Manufacturer's Provided System Description: Precinct Central Console is a comprehensive real-time monitoring and election configuration platform that allows elections staff to monitor devices, users, communications, and performance metrics, all on an easy-to-use, dedicated computing environment. All Customers receive a private, secure, and isolated environment for monitoring election activity in real-time from the office. Tenex understands that management staff on Election Day can be stretched thin and will need access to important election information on-the-go from wherever they are. A mobile website of the Precinct Central Console provides direct access to critical election information to officials who can quickly respond to issues in the field. The Precinct Central Console is also the election office portal for all pre-election setup activity and post-election data reconciliation, auditing, and export.

Figure 12. Tenex Software Solutions' Precinct Central.

VOTEC Corporation

System Name	VoteSafe
System Version	1.3.77
System Development	Commercial
Manufacturer Information	VOTEC Corporation
	10920 Via Frontera Suite 110
	San Diego, California 92127
VSTL Information	Pro V&V, Inc.
	6705 Odyssey Dr NW Suite C
	Huntsville, Alabama 65806
Participant Agreement Signed	April 13, 2023
Final Test Report Received	July 10, 2023

Manufacturer's Provided System Description: VOTEC's VoteSafe electronic poll book processes voters and serves as a comprehensive election management tool. VoteSafe expedites the retrieval of a voter record, confirms the voter's status, precinct and ballot style and efficiently records voting history. In addition to streamlining the voter check-in process, VoteSafe has a robust management tool, PollPower, to monitor a polling location site and voter activity levels. A dashboard interface includes real-time verification that polling locations are opened and closed on time, voter check-in counts by time slice and location, and turnout percentages.

Figure 13. VOTEC Corporation's VoteSafe.

VIII. Evaluating Pilot Findings

Phase 5 of the pilot process involved conducting a thorough analysis of all test results and feedback provided by manufacturers and VSTLs. As discussed in this section, the following high-level assumptions can be concluded as a result of pilot findings. Recommended solutions to these assumptions have been presented in Section IX of this report. To ensure the confidentiality of participant results in this pilot, all manufacturer names have been excluded from findings.

- There was not a single requirement in which all piloted systems failed. This implies that all requirements have been met by at least one manufacturer during VSTL evaluation to the VEPBR v0.9, and are thus capable of being tested with the possibility of certification.

- The most dominant reason for failure was due to insufficient documentation.

- The majority of EPBs sold for use in the United States are not currently designed to meet the EAC's evaluation requirements as currently drafted in the VEBPR v0.9.

- Some requirements, such as those with a documentation element, may be considered vague, leaving them subject to varying interpretations by VSTLs during evaluation. Through a review of feedback provided by manufacturers and VSTLs, the EAC will need to revisit requirements in need of clarification. This might also result in the development of additional resources to aid manufacturers and VSTLs in the testing process.

- Due to variations between in-house and commercially manufactured systems, cost considerations, and the time required to implement major changes, the EAC should consider revising requirements so that some become optional to achieve certification. With this in mind, should a manufacturer wish to market a functionality labeled as "optional" in the revised requirements, VSTLs should evaluate the e-poll book to ensure the system's conformance with the optional requirement.

- Manufacturers that service clients in multiple states and territories have more experience with EPB certification requirements and protocols.

Pass/Fail Analysis Categories

The EAC conducted an evaluation of all seven participant scores in all categories of the VEPBR v0.9, including sub-requirements, for a total analysis of 168 individual requirements. In the submitted test reports, VSTLs provided justification to each manufacturer for failed categories during system testing. After analyzing these justifications, five categories were created for the analysis of test findings (Table 4).

Table 4. Pass/Fail Analysis Categories		
Category	**Description**	**Resolutions to Meet Piloted Federal Requirements for EPBs (VEPBR v0.9)**
Pass	The EPB successfully completed testing.	No further action is required.
Fail 1	The manufacturer's documentation was either not provided, or deemed insufficient to meet the requirement.	Manufacturers should enhance their technical documentation to meet the requirements and resubmit their data package to the EAC and VSTL for reconsideration.
Fail 2	The EPB doesn't currently support the functionality specified by the requirement, and couldn't be evaluated during this iteration of testing. This was occasionally marked as "N/A" in VSTL reports.	Manufacturers should develop functionalities to meet the requirements and resubmit their system for evaluation to the VSTL.
Fail 3	The EPB supports the functionality, but errors were noted during testing.	Manufacturers should patch the deficiencies in their system to meet the requirements and resubmit their system for evaluation to the VSTL.
TBD	Further action or information was needed from the VSTL.	The EAC should contact the VSTL for further clarification on failed requirements.

Note: All categories marked "TBD" or "to be determined" have since been resolved through communications between the EAC and the VSTL.

Test Results

There were two participants who demonstrated that the current draft version of requirements (VEPBR v0.9) is capable of being achieved, as they attained a pass rate of 70% or higher. These participants also demonstrated their advanced proficiency in developing technical documentation necessary for evaluation to the VEPBR v0.9. The average participant score for all requirements was 51.7%. As will be discussed in further detail, insufficient documentation seemed to present the most significant challenge in meeting the requirements. Participants would have scored an average of 79.4%, had documentation expectations been met.

Documentation Rigors

As alluded to previously, it was discovered that the dominant reason for failure (27.6%) was the result of insufficient documentation for VSTL analysis (Fail 1 category). This implied that an average of 46 individual requirements required a technical review of the data package in order to evaluate the system. Upon further review, it has been determined that only 20 requirements currently specify a documentation element (Table 5). However, each section's introductory paragraph in the VEPBR v0.9 leaves testing expectations subject to interpretation by the VSTL with language that states:

*"The EPB system **or its documentation** must [meet the following requirements]…"*

Table 5. Requirements with Specified Documentation Elements	
Section #	**Title**
1.1.2	Access control policies and procedures
1.2.1	Documentation of asset management features
1.2.4	Document the application of tamper-evident sealing
1.2.5	Document anti-theft controls, and emergency system decommissioning
1.3.7	Cryptographic key management documentation
1.4.6	Secure network configuration documentation
1.5.8	Third-party code and libraries
1.5.11	Documentation of media sanitization procedures
1.6.3	Application errors
1.7.1	List of approved suppliers
1.7.2	Authenticity of components
1.7.3	Provenance of devices
2.1.1	User-centered design process
2.1.3	Accessibility documentation
2.1.29 (1)	Instructions for election workers
2.1.30	Plain language
2.1.36 (1.b, 2)	Usability testing with voters
2.1.37	Usability testing with election workers
2.1.38	Physical manipulation

Documentation plays a critical role in the evaluation process of EPBs. It demonstrates the basic functionality of the system, identifies troubleshooting measures that become essential during a live election, and outlines other features and precautions that may not be visibly present within the system from an end-user perspective. Documentation should be designed in a manner that is comprehensible from the perspective of a user who does not have advanced experience or knowledge of EPBs. Developing documentation will bring manufacturers closer to attaining an EAC certification.

Although it is now known that manufacturers have the capability to develop this documentation, this finding prompted the EAC to discuss methods that might assist manufacturers in meeting

requirements with documentation elements. As recommended by manufacturers, the most supportive method might be a template that encompasses all documentation elements. As recommended by VSTLs, it may be advantageous to require that manufacturers complete a test readiness review (TRR) prior to submitting their systems for testing to EAC standards. Other methods might include standardized language in the VEPBR v0.9 and testing matrices, developed by the EAC, for VSTL use during evaluation.

Missing or Unsupported Functionalities

The second largest reason for failure (15.7%) was that the EPB did not support the functionality at the time of testing, resulting in the VSTLs' inability to evaluate the system against the requirement. As was discovered during the EAC's exit interviews with both manufacturers and VSTLs, this does not mean that manufacturers are incapable of modifying their systems. Rather, these systems have not yet been designed to meet the EAC's evaluation requirements. Since these piloted systems predate the VEPBR v0.9, this pilot's timeline did not allow manufacturers to modify their systems to meet certain requirements. Additionally, state and local jurisdictions with in-house systems may not support those functionalities due to state-specific laws. Once the EAC has revised the VEPBR v0.9 and v1.0 has been released, manufacturers will be responsible for developing the additional features necessary to meet federal requirements, should they wish to obtain an EAC certification.

Considerations for Leading Pass/Fail Requirements

There were 14 requirements where all pilot participants received a passing score (Table 6). These were all under section 2.1 of the VEPBR v0.9, the Core Functionality of Accessibility and Usability Requirements. In contrast, there were 15 requirements where only one participant achieved a passing score (Table 7). Of these requirements, eight pertained to Security (Sections 1.1, 1.3, 1.4, and 1.5), whereas seven pertained to Accessibility and Usability (Sections 2.1 and 2.2).

Table 6. Requirements with 100% Pass Rates	
Section #	**Title**
2.1.5	Reset to default settings
2.1.7	Default contrast
2.1.9 (1)	Color conventions
2.1.10	Using Color
2.1.17 (1.a, 1.b)	Scrolling
2.1.18 (1, 2, 4, 5)	Touch screen gestures
2.1.21	Key Operability
2.1.22	Bodily Contact
2.1.24	System response time
2.1.25	System-related errors
2.1.27	Warnings, alerts, instructions
2.1.30	Plain Language
2.1.31 (1.b, 2.a)	Electronic display screens
2.1.38	Physical manipulation

This finding will be essential during the re-evaluation of requirements. Specifically, requirements with 100% pass rates (Table 6) will be permanently seated in the VEPBR v1.0, without any modification. Requirements with 14% pass rates (Table 7) will require major reconsideration by the EAC.

Table 7. Requirements with 14% Pass Rates	
Section #	**Title**
1.1.4	Multi-Factor Authentication
1.1.7 (2)	Session termination, device lock, and reauthentication
1.1.8	Unsuccessful logon attempts
1.1.9	System use notification
1.3.4	Verification of voter information
1.3.7	Cryptographic key management documentation
1.4.7	Secure network configuration documentation
1.5.8	Third-Party Code and Libraries
2.1.35	Federal standards for accessibility
2.1.36	Usability testing with voters
2.1.37	Usability testing with election workers
2.2.2	Audio synchronized
2.2.3	Audio settings
2.2.4	Speech Frequencies
2.2.5	Audio comprehension

Manufacturer's Pilot Experiences

On August 28, 2023, the EAC conducted exit interviews with representatives from all commercial and in-house manufacturers regarding their experiences with the pilot. 13 representatives from Election Systems and Software (ES&S), KNOWiNK, Maricopa County, North Carolina, Tenex Software Solutions, Robis Elections Inc., and VOTEC Corporation, participated in the meeting to provide their feedback on five questions. The EAC has aggregated the most significant takeaways below.

There is desire to develop a formal program for EPB certification. Many manufacturers expressed their enthusiasm for having the opportunity to participate in this pilot and look forward to the future of EPB certification on the federal level.

Clear and frequent communication and cooperative efforts are necessary for the successful implementation of a formal certification program. In general, manufacturers had positive experiences when communicating with the EAC and VSTLs during this pilot. However, there were some instances where feedback could have been received in a timelier manner.

The EAC should clearly define expectations for manufacturers. Manufacturers expressed interest for the EAC to develop templates and checklists for test readiness review, indicating why these requirements are mandated and what is actually expected of these systems prior to evaluation.

Manufacturers would like to see the separation of requirements for systems that have been developed in-house as opposed to commercially. Both in-house manufacturers noted that there is no demand to meet all voluntary requirements, as some of the requirements are not applicable in their areas. Considering this factor and the cost of certification, in-house manufacturers would most likely not submit their systems for certification under the current version of requirements.

Although the major reason for failure was the result of "insufficient documentation," manufacturers reiterated that they are capable of developing the documentation necessary to meet those requirements. At this time, manufacturers haven't developed the documentation necessary to meet the EAC's requirements, as their clients have not had a need for this information. The documentation currently available has only been created for state and local jurisdictions that are currently serviced by each manufacturer, and the specific laws and regulations in those areas. In addition, documentation has been developed based on the information that already exists for specific operating systems. Once the EAC has published the final version of the requirements, manufacturers can then develop the documentation necessary to meet those requirements.

All EPB manufacturers are capable of adapting to meet the EAC's requirements at the v0.9 standard, though there is interest for the EAC to explain why some of the requirements have been deemed mandatory for evaluation. Manufacturers reiterated that they are capable of meeting these requirements, though they are unsure about the time it will require to implement changes to their systems. Rather, their concern is that the features they will need to design to meet the requirements will not be used by their clients. It was noted that the EAC is evaluating requirements that are not currently implemented by some manufacturers' client jurisdictions, which seems unnecessary. Manufacturers would like to see further explanation for the EAC's decision to include these requirements in the VEPBR v0.9 before the changes are implemented on their systems.

The EAC should reconsider existing requirements, given some assumptions about the design of EPBs. Many manufacturers noted that the requirements were developed under the guidance of the VVSG, which may not be the best method of developing minimum evaluation requirements for EPBs. In addition, EPBs are more frequently developed with COTS hardware and software. Lastly, there may be operating differences, such as those between Windows and MacOS, that prevent certain systems from meeting a requirement. Specific manufacturer-provided recommendations for requirements revision, including their justifications, have been documented in Appendix 4 and will be considered by the EAC for implementation in a formal program.

There is interest in the development of functional requirements, though the EAC should be cognizant of differences throughout state and local jurisdictions. It is important to consider that states may have vast differences in baseline functionality requirements, such as

check-in procedures. Rather than expecting compliance to any one standard, the EAC should require documentation on how the system can perform that baseline functionality. Specific recommendations for baseline functionality requirements have been documented in Appendix 4 and will be considered by the EAC for implementation in a formal program.

VSTL's Pilot Experiences

In August 2023, the EAC conducted exit interviews with Pro V&V and SLI Compliance regarding their experiences with the pilot. A series of 15 questions were addressed. The EAC has aggregated the most significant takeaways below.

As the Pilot Program evolves, so will the ability of EPB manufacturers in the private sector to develop products in line with program standards. VSTL representatives concluded that while this program is in the pilot stages, many of the manufacturers involved in the pilot did not have the chance to update or design their systems to meet the required standards. It is believed with time and established requirements that can be reviewed and studied by manufacturers, program standards will be met as developers adjust their systems to meet these requirements. It is thought that manufacturers may currently do what is required to market their products, but once compliance has adapted to become more methodical and architectural, they can and will likely adjust.

For a formal certification program to be successful, requirements should also evaluate the baseline functionality of EPBs, based on existing market standards. Specifically, the EAC should continue to develop a certification program with baseline standards set from various states, such as California, Indiana, New York, and Ohio. Basic functionality requirements could consist of examples such as demonstrating the check-in process, identifying voter information, documenting procedures for battery backups, etc. This could in the future include other standards revolving around accessibility requirements as well. The four states mentioned as starting points could be considered to have advanced and clearly established basic functionality requirements for standardization within the certification program. Once evaluation is available via the EAC's voluntary requirements, manufacturers should find success in passing a standard set of requirements and providing the necessary documentation.

The EAC should clearly communicate with manufacturers what these standards are, and possibly include examples for sections related to documentation or more technical aspects that are newer to manufacturers. In establishing a finalized certification program with baseline standards, cohesive partnerships between the EAC and manufacturers will aid manufacturers in the process of certification. The EAC will provide clarity on documentation requirements and technical aspects of the certification process for the manufacturers' benefit within the guidelines of the program.

Participant preparation is key for long-term success of the certification program, which can come with time, familiarity with standards, and succinct project management by manufacturers. In revamping requirements for a finalized certification program, the EAC can look at current requirements, pass and fail rates of participants, and past interviews in the post-certification pilot process to assess how to better prepare manufacturers interested in obtaining an EAC certification. In particular, revamped standards will focus on the area of documentation standards and requirements from VEPBR v0.9.

Standards currently set in the Pilot Program are some of the most advanced and will be attainable by manufacturers in the long term. Various feedback from the manufacturers and their pilot experiences suggests that the EAC's draft requirements for EPBs (VEPBR v0.9) are more stringent than requirements that manufacturers are currently familiar with. As the EAC continues to evolve the EPB Certification Program, changes to these standards will need to be clearly communicated in an effort to aid manufacturers in achieving federal certification.

The EAC should continue to engage with VSTLs as the program continues to evolve. The partnership between the EAC and noted VSTLs is crucial to discovering needed standards for a finalized certification program. Specifically, imitating the VVSG's process to require requests for interpretation (RFI) from a manufacturer for any challenges to requirements may be a potential avenue for success within a certification program. In continuation, the EAC should develop methods so that those methods can be utilized by laboratories during testing. This could include testing scenarios, system usage, etc.

IX. Recommendations

The EAC's Election Supporting Technology Evaluation Program (ESTEP) has reviewed the findings of the first federal attempt to evaluate the security, accessibility, and usability of EPBs in the United States. Based on this Pilot Program's results and feedback received, ESTEP has formulated a set of recommendations for consideration by the EAC Commissioners. These recommendations may demand revision upon further consideration by EAC Commissioners, election administrators, and members of the public.

There is a need to enhance data collection methods in the EAC's Election Administration and Voting Survey (EAVS) to include further research questions pertaining to EPBs and other election-supporting technologies.

At the time of this pilot, very little information existed on the scope of EPB usage throughout the United States. Going forward, ESTEP proposes the expansion of questions posed in the 2024 EAVS, regarding the utilization of, not only EPBs across the United States, but also other election-supporting technologies, such as ballot delivery systems, election night reporting databases, and voter registration systems. This approach would assist the EAC in obtaining a

more precise representation of the extent and regulation use of these systems in state and local jurisdictions.

For the purposes of responding to this pilot, information could be collected on the following pertaining to EPBs:

- An indication of the method(s) by which state or local jurisdictions recorded voter check-ins during the previous general election,
- The number of EPBs deployed during the previous general election,
- The make, model, and version (if known) of EPBs used,
- An expansion of categories identifying equipment uses, and
- Methods of internet connectivity used by the EPB, if any.

Prior to the development of a formal program for certification, the EAC should examine the applicability of existing requirements at the state and local level for possible revisions to federal requirements.

In an effort to better evaluate the baseline functionality of EPBs, a review of existing requirements on the state and local level might assist the EAC in drafting federal standards for EPB functionality. By studying established mandates in states such as California, Indiana, Ohio, and New York, the EAC can design baseline functionality requirements to ensure they are familiar to manufacturers, VSTLs, and local jurisdictions. In addition, designing tools similar to those at the state level, such as test readiness matrices, may assist manufacturers in their preparedness to achieve federal certification.

Version 0.9 of the Voluntary Electronic Poll Book Requirements should be revised to include baseline functionality requirements and to add clarification to requirements that weren't easily achievable during this Pilot Program.

An assessment of the Pilot Program's final scores reveals that these systems could have scored more favorably with the clarification of certain requirements. ESTEP believes that disparate interpretations of the existing requirements could have affected pilot outcomes. While certain sections of these requirements, such as Network/Telecommunications Security and Accessibility, demonstrated robustness, other sections remained sufficiently vague. As a result, VSTLs marked participants as failing in areas where they might have passed, had the instructions or requirements been clearer and more specific.

Therefore, ESTEP suggests a thorough review and revision of the present requirements. This revision would primarily focus on refining and adjusting the specific mandates for documentation and clarifying certain requirements that needed further elaboration, as presented in Table 7 and Appendix 4. The EAC should also consider developing evaluation requirements for basic functionality, such as those presented in Appendix 4. This will necessitate a collaborative process for the development and maintenance of standards, involving groups

such as the EAC's Advisory Boards and the National Institute of Standards and Technology (NIST). Additionally, a public comment period and Commissioner involvement, including voting on updated standards, are recommended.

Once these changes have been implemented, it will be the responsibility of the EAC to communicate changes to manufacturers so they may begin developing their systems to meet EAC requirements. Likewise, the EAC should also communicate with VSTLs to ensure that they are prepared to evaluate systems to these requirements and understand the intended interpretation. Developing standardized matrices for test readiness review (TRR) and VSTL evaluation should assist with communicating expectations. Additionally, the EAC should establish kick-off meetings at the start of each test campaign to ensure all expectations are clarified and to allow for any questions to be addressed.

A Manual, outlining administrative processes and guidelines for participation in the Election Supporting Technology Evaluation Program, should be established.

Developing a Program Manual would allow ESTEP to improve the overall efficiency of both formal programs for certification and pilot programs for other election supporting technologies moving forward. In establishing structure and clarifying expectations, a Manual could assist in providing results and responses to inquiries in a timelier manner. Timelines for responding to feedback and inquiries may also improve overall communication within the program. It would be recommended that this Manual be developed before a formal program for certifying EPBs be established.

An agile program for testing and certifying EPBs at the federal level should be designed and implemented.

By instituting an agile certification program for EPBs, the EAC can implement and address the recommendations mentioned earlier, while also adapting to changes in EPB technology and legislation as they arise. Beyond streamlining the testing process conducted by VSTLs, this formal certification program will serve as the cornerstone for instilling confidence among the electorate in the technology employed to facilitate their participation in the democratic process. This program should be designed to complement existing systems on the market and should be achievable by both manufacturers and state or local jurisdictions that wish to submit their systems for evaluation. This being said, if state and local jurisdictions do not wish to apply for certification, these requirements could be applied on a state or local level.

Once the EAC Commissioners have discussed and implemented all preceding recommendations, ESTEP should move forward with piloting the next election-supporting technology.

With approval, the EAC recommends piloting blank ballot delivery systems or election night reporting databases.

Blank Ballot Delivery Systems. Electronic ballot delivery involves securely transmitting and distributing election ballots to eligible voters through digital means, such as email or secure online platforms. While some state-level regulations exist, there are currently no federal requirements for states, local jurisdictions, and election vendors to build upon. This technology has become critical for providing accessible ballots to voters with disabilities and voters protected under the Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA). In 2009, Congress enacted the Military and Overseas Voter Empowerment (MOVE) Act, which amended UOCAVA to establish procedures for states to deliver blank ballots and collect marked ballots of absentee overseas uniformed services voters. Establishing federal requirements would assist states in meeting requirements under UOCAVA and the MOVE Act, while also ensuring the secure and accessible delivery of ballots to these voters.

Election Night Reporting Databases (Results Reporting). Election night reporting software facilitates the collection, reporting, and secure sharing of accurate election results in real-time. However, there are no federal standards governing the design, security, and setup of this critical aspect of the electoral process.

X. Final Conclusions

The EAC's Voluntary Electronic Poll Book Pilot Program was conducted in direct response to requests from the election community to explore establishing and evaluating baseline requirements for electronic poll books. The Program provided a positive and educational experience for all participants, while shedding light on areas in need of improvement in the EAC's requirements and processes. This experience has also highlighted a growing demand for additional pilot programs and certification guidelines for various election-supporting technologies, reflecting the need for adaptability in an evolving landscape. **This pilot has demonstrated that our nation's e-poll books are election-day ready.**

Should the Commissioners wish to establish a formal program for certifying EPBs on the federal level, the EAC's Election Supporting Technology Evaluation Program will be responsible for:

1. Developing and implementing a Program Manual, designed to provide guidance on eligibility and processes to manufacturers who wish to enter the program and VSTLs responsible for evaluating submitted systems,
2. Developing additional program artifacts, such as test readiness review and evaluation matrices, designed to prepare manufacturers for evaluation and streamline the testing process, and
3. Revising the Voluntary Electronic Poll Book Requirements, to ensure the clarification and attainability of requirements necessary to achieve an EAC certification.

The EAC is committed to enhancing program development and administrative processes based on experiences and lessons learned during this pilot. In doing so, the EAC is prepared to spearhead the piloting of robust and practical standards for all election supporting technologies. The agency looks forward to advancing the integrity and security of the electoral process as the use of election supporting technology expands during federal elections.

XI. Appendices

Appendix 1 – Voluntary Electronic Poll Book Requirements Version 0.9

Appendix 2 – Electronic Poll Books in the United States

Appendix 3 – Participant Agreement Template

Appendix 4 – Manufacturer-Recommended Revisions to VEPBR v0.9

Appendix 1
Voluntary Electronic Poll Book Requirements
Version 0.9

Voluntary E-Poll Book Certification Requirements Version 0.9

January 19, 2023

U.S. Election Assistance Commission

Executive Summary

The purpose of the requirements is to provide a set of specifications against which e-poll book systems can be tested to determine if they provide accessibility and security capabilities. This document is the first iteration of national level e-poll book standards and is designed to ensure consistent security and accessibility in e-poll book systems utilized across the United States of America.

The cybersecurity of e-poll book systems has never been more important. Attacks from nation state actors against our election infrastructure have specifically targeted these systems in past elections [insert footnotes to published reports?] and the U.S. Election Assistance Commission (EAC) believes that attacks against these types of systems will increase in future elections.

Table of Contents

Introduction

This document is the first version of national level e-poll book security and accessibility standards and was developed by the EAC to specifically address e-poll books. Adherence to these requirements is governed by state and territory-specific laws and procedures.

How the Requirements are to be Used

This document will be used primarily by e-poll book system manufacturers and Voting System Test Laboratories (VSTLs) as a baseline set of requirements for e-poll book system security and accessibility to which states or territories will add their specific requirements, as necessary. This audience includes:

- Manufacturers, who will use these requirements when they design and build new e-poll book systems.
- Voting system test laboratories, who will refer to this document when they develop test plans for the analysis and testing of e-poll book systems to verify whether the system meets these requirements.

Scope

The scope of this document is limited to e-poll book systems acquired by states and evaluated by the EAC. E-poll book systems are defined in this document as:

Equipment (including hardware, firmware, and software), materials, and documentation used to partially automate the process of checking in voters, assigning voters the correct ballot style, and marking off voters who have been issued a ballot.

E-poll books are used in a voting location to assist election workers in checking in voters, ensuring that they are eligible to vote and, in some places, managing updating voter records. Additionally, e-poll books also have administrative functions to prepare for an election and extract data reports afterwards. The same usability and accessibility feature important in the voting location will also support back-office workers. Additionally, e-poll books may use an air-gapped configuration at the precinct with a separate local copy of the registration list or can be connected (wired or wireless) via a public or private network with a central repository of registration information where records can be checked and updated in real time across the jurisdiction.

While e-poll books can provide additional functionality such as poll worker time keeping, ballot printing, or communications between a central office and polling places, the requirements in this document specifically apply to the following functionality **(where allowed by state, territorial, or jurisdictional laws or rules):**

- Allows voters to check-in electronically
- Allows poll workers to easily direct voters to the correct polling location
- Is capable of scanning voter identification to pull up a voter's information
- Allows poll workers to look up voters across precincts, enabling consolidated vote centers

- Allows real-time updates of voter history when operated in a connected configuration
- Notifies poll workers if a voter has already been issued an absentee or mail-in ballot
- Produces turnout numbers and lists of who voted
- Allows for same-day voter registration
- Can display a photo to verify a voter's identity
- Can produce information used to activate a ballot for voting machines that require this functionality (printed ballot number, activated electronic token, etc.)

There are some important differences between the context of use for voting systems and e-poll books that are important to keep in mind when considering VVSG requirements.

Election workers are the primary users. Unlike voters, they are trained in how to use the e-poll book. In contrast to voters who interact with a voting system for one brief session, election workers complete the basic tasks many times during a voting day. Election workers are also older than average. The [2018 Election Administration and Voting Survey (EAVS)](#) jurisdictions said that more than two-thirds were 61 years or older and less than one-fifth were younger than 41 years old. This means they are more likely to have age-related visual or dexterity disabilities, making accessibility a priority.

Voters may also interact directly with the e-poll book. Depending on the design of the system, voters may be asked to:

- Confirm information on a screen
- Provide identification by handing an ID card to a worker or placing it in position for the system to read
- Sign their name on the main e-poll book screen or on a smaller device
- Be given information on paper, including information to authorize them to vote or activate the voting system or directions to a different voting location

Check-in is a public, not a private procedure. The list of voters is a public record, and in some locations, the names and even addresses of voters are announced for observer to hear. This means that the concerns about voter privacy that are central to the design of voting systems do not apply to e-poll books.

Check-in is an assisted task, with no expectation that it is done independently. The election worker and the voter work together to complete the check-in process. Election workers assist all voters, including those with language or accessibility needs. An important consideration in setting accessibility requirements for e-poll books is when (and what type of) assistance is acceptable and when it interferes with voter independence.

E-poll book hardware and software are different from voting systems. E-poll books are often assembled from standard computing devices, such as a laptop or tablet. They run on conventional operating systems rather than a custom platform. They often include several additional COTS devices including a printer, signature pad, or barcode scanner.

There is more flexibility in how e-poll books are set up for use. Unlike a voting system, they can be set up for the specific team of election workers who will use them during a voting day

- They are set up once at the start of the day and peripherals are attached at that time by someone familiar with the system
- E-poll books are typically placed on a working surface where they can be adjusted for physical reach and touch
- Like voting systems, lighting conditions may not be optimal, including poor lighting, reflections, or glare from lights and windows

Requirements that adjust the screen display are an important way to mitigate these issues and make sure that the information on the screen is clear.

There may be requirements for actions by election workers that affect the fundamental nature of the task. These actions may include:

- Reviewing of comparing a voter's signature to the image of one on file
- Reading information on an ID card
- Handling an ID card or a scanner to read the voter information into the system, a printed voter authorization form to be given to the voter, or turning the e-poll book screen so the voter can read it or sign their name

An e-poll book interface can assist election workers in performing some tasks. For example, they can include instructions for infrequent tasks, or may include design elements to draw attention to similar names or notifications of voter status in a way that would be considered bias under VVSG 2.0 requirement *5.2-A No bias* in a voting system. The report *Checklists for usability and accessibility of electronic pollbooks* includes a list of usability considerations specific to e-poll books that could be used for a heuristic examination as part of a certification or procurement process.

Section 1 - Security Requirements

Security requirements are organized based on the following security categories:

1. Access control
2. Physical security measures
3. System integrity
4. Network/telecommunications security
5. Software design/architecture standards
6. Logging
7. Supply chain risk management

Each numbered section below contains a brief explanatory description followed by the actual requirements, labeled 1.1, 1.2, etc. for section 1 or 7.1, 7.2, etc. for section 7.

Section 1.1 – Access control

Access to both physical and digital spaces containing EPB systems, voter information, and communication equipment must be strictly controlled during the entire EPB lifecycle from manufacturing and development to end-of-life disposal of the information and equipment to detect and prevent supply chain attacks.

EPB manufacturers must establish procedures and technical controls that reflect applicable federal and state laws, Executive Orders, regulations, directives, policies, standards, and guidance to control access to physical sites and networks containing EPBs and related communications equipment. Access control systems will be automated when possible.

An EPB system must be configured to:

- Implement account management
- Follow established account management procedures and processes
- Implement and enforce role-based access
- Implement and support multi-factor authentication
- Implement and enforce separation of duties
- Implement and enforce least privilege
- Implement and enforce session termination, device lock, and reauthentication
- Record unsuccessful logon attempts
- Implement system use notification

1.1.1 – Account management

EPB systems and related components such as databases or network communications equipment must authenticate each user with access to the system using an automated account management system. The account management system must require unique passwords for each user.

Discussion

The following are best practices for account management:

- Remove vendor access when no longer necessary

- Automatically remove temporary or emergency accounts after a specified date or period

- Automatically disable inactive accounts after a specific period

- Audit account creation, modification, enabling, disabling, and account removal actions with a notification to auditing personnel

- Limit the use of dynamic privilege management capabilities

- Do not allow the use of shared or group accounts

- Remove assigned privileges from accounts when removed from the group

References: NIST SP 800-53 rev. 5 (AC-2)

1.1.2 – Access control policies and procedures

The EPB system must have documentation for access control policies and procedures describing how the requirements in Section 1 are implemented.

References: NIST SP 800-53 rev. 5 (AC-1)

1.1.3 – Role-based access

The EPB system must implement role-based access control (RBAC) with least privilege. Each role must be limited to the functions, processes, and data authorized for the specific role.

References: NIST SP 800-53 rev. 5 (AC-2)

1.1.4 – Multi-factor authentication

The system shall enforce multi-factor authentication (MFA) for all privileged operations if the system has a multi-factor authentication option.

Discussion

Privileged operations can include account creation, deletion, permission modification, or when directly updating external databases such as voter registration databases. Additionally, Multi-factor authentication does not mean having multiple passwords.

References: NIST SP 800-63-3

1.1.5 – Separation of duties

The EPB system must be configurable to enforce separation of duties as defined by the jurisdiction.

Discussion

For example, changes to voter information or system configurations may need to be authorized by two or more personnel to mitigate insider threats.

References: NIST SP 800-53 rev. 5 (AC-5)

1.1.6 – Least privilege

The EPB system must enforce the concept of least privilege for accounts to restrict both privileged and non-privileged accounts to only permission required to carry out the role assigned to the account.

Discussion

A poll worker should be prevented from making configuration changes on the system. The concept of least privilege should also be applied to administrators and supervisor groups and accounts.

References: NIST SP 800-53 rev. 5 (AC-6)

1.1.7 – Session termination, device lock, and reauthentication

The EPB system must include session termination, device lock, and reauthentication functionality including:

1. a user-initiated or time configurable automatic lockout when a user is away from the system, which can be defined and implemented by the jurisdiction
2. a configurable mechanism to automatically terminate a user session after a defined period of inactivity and lock the device; which can be defined and implemented by the jurisdiction
3. requiring reauthentication of the authorized user after the session is terminated and the device locked; and
4. the account lockout must include a blank or configurable screen when the system is locked to obscure any data presented on the screen when terminated.

References: NIST SP 800-53 rev. 5 (AC-11, AC-12)

1.1.8 – Unsuccessful logon attempts

The EPB system must be configured to lock after a configurable number of login attempts for 15 minutes or until an administrator or technician can unlock the account.

References: NIST 800-53 rev. 5 (AC-7)

1.1.9 – System use notification

The EPB system must include a configurable logon banner or system use notification for the user to accept upon logon.

References: NIST SP 800-53 rev. 5 (AC-8)

1.1.10 – Information and data flow

Information flows between EPB systems and other systems connected to public networks must be limited to only the required information to protect voter data from being accessible by unauthorized users.

Discussion
The use of unique IDs not easily associated with a voter should be used to transmit information rather than using actual voter PII during data exchanges.

References: NIST 800-53 rev. 5 (AC-4)

Section 1.2 – Physical security measures

Physical security measures must be in place to prevent unauthorized access to devices, communications equipment, and voter information to include any database backups.

An EPB system must:

- Document asset management features
- Implement and enforce device disk encryption
- Enforce BIOS or firmware interface access restrictions
- Document the application of tamper evident sealing
- Document anti-theft controls, and emergency system decommissioning

1.2.1 – Documentation of asset management features

The EPB system documentation must detail the location and use of any unique serial numbers, part numbers, or other identifying features for each individual hardware component of the system that can be used for asset management.

> References: NIST SP 800-53 rev. 5 (CM-8)

1.2.2 – Device disk encryption

Each component of the EPB system containing internal memory used to store voter or ballot information must enforce whole disk encryption.

> References: NIST SP 800-53 rev. 5 (AC-19)

1.2.3 – Device BIOS or other firmware interface access

Each component of the EPB system containing BIOS or other firmware interface must require authentication to access the device BIOS or other firmware interface. If passwords/codes are used, they should follow strong password guidelines, and be changed from any manufacturer defaults.

> References: NIST SP 800-53 rev. 5 (SI-7)

1.2.4 – Document the application of tamper evident sealing

The EPB system documentation must include information on how and where to apply tamper evident sealing of the physical components of the system that contain voter or ballot information. Additionally, any built-in tamper evident protections (lights, alarms, logging) must be documented.

> References: NIST SP 800-53 rev. 5 (SR-5, SA-18)

1.2.5 - Document anti-theft controls, and emergency system decommissioning

The EPB system documentation must include information on anti-theft controls including functionality to remotely secure a stolen or lost device with access to pertinent data.

Section 1.3 – System Integrity

The EPB system must implement security measures to prevent malicious activity and protect the integrity, confidentiality, and availability of data. The system must be configured to:

- Support an EDR tool (public network connected EPB systems only)
- Support an antivirus tool to detect and alert on malicious code
- Support file integrity checking to monitor file changes

1.3.1 – Endpoint detection and response (EDR) tool

If the EPB system requires connection to a public network during election day operation, the system must support an EDR tool to prevent, detect, and respond to attempts to manipulate the system such as: cross-site scripting (XSS), code injection, or denial of service (DoS) attacks.

> References: NIST SP 800-53 rev. 5 (SI-4)

1.3.2 – Antivirus tool

The EPB system must implement an antivirus tool to detect and alert on malicious code.

> References: NIST SP 800-53 rev. 5 (SI-3)

1.3.3 – Authentication to access configuration file

The EPB system must allow only authenticated system administrators to access and modify device configuration files.

> References: NIST SP 800-53 rev. 5 (SI-7), VVSG 2.0 13.1.1-A

1.3.4 – Verification of voter information

The EPB system must:

1. cryptographically verify the integrity and authenticity of all voter data;
2. immediately log any verification error; and
3. immediately present on-screen any verification errors.

1.3.5 – Cryptographic module validation

The EPB system's cryptographic functionality must be implemented in a cryptographic module that meets current FIPS 140 validation, operating in FIPS mode.

This applies to:

1. software cryptographic modules, and
2. hardware cryptographic modules.

Discussion

Use of cryptographic modules validated at level 1 or above ensures that the cryptographic algorithms used are secure and correctly implemented. The current version of *FIPS 140[NIST01, NIST19a]* and information about the *NIST Cryptographic Module Validation Program* are available under *[NIST20e]* in Appendix C: References. Note that a device can use more than one cryptographic module, and quite commonly can use a software module for some functions and a hardware module for other functions.

1.3.6 – Cryptographic strength

The EPB system's cryptography must employ NIST approved algorithms with a security strength of at least 112-bits.

Discussion

At the time of this writing, NIST specifies the security strength of algorithms in SP 800-57, Part 1. This NIST recommendation will be revised or updated as new algorithms are added, and if cryptographic analysis indicates that some algorithms are weaker than presently believed. The security strengths of SP 800-57 are based on estimates of the amount of computation required to successfully attack the particular algorithm. The specified strength should be sufficient for several decades.

This requirement is not intended to forbid all incidental use of non-approved algorithms by OS software or standardized network security protocols.

1.3.7 – Cryptographic key management documentation

The EPB system documentation must describe how key management is to be performed.

References: VVSG 2.0 13.3-E

Section 1.4 – Network/Telecommunications Security

The EPB system must be configured to:

- Implement FIPS 140 approved encryption for the transfer of data
- Disallow connections to unapproved external networks
- Disallow connections to unapproved external devices
- Implement network firewall settings for approved communication (public network connected EPB systems only)
- Documentation of the network and communications architecture

1.4.1 – Network encryption

The system must be configured to utilize FIPS 140 approved network encryption for the transfer of data.

References: NIST SP 800-53 rev. 5 (AC-17)

1.4.2 – Disallow connections to unapproved external networks

If the system requires connection to a public network during election day voter check-in operations, the e-poll book must be configured to disallow connections to unapproved external networks. This may be accomplished through IP or MAC address allow listing or other configurations where external network access is explicitly granted.

References: NIST SP 800-53 rev. 5 (AC-3, AC-4)

1.4.3 – Disallow connections to unapproved external devices

The e-poll book must be configured to disallow connections to unapproved external devices.

References: NIST SP 800-53 rev. 5 (AC-4, AC-20)

1.4.4 – Network firewall

If the EPB system requires connection to a public network during election day voter check-in operation, the e-poll book must implement a firewall configured to only allow approved communication with each device within the system.

References: NIST SP 800-53 rev. 5 (AC-3)

1.4.5 – Confidentiality and integrity of transmitted data

The EPB system must:

1. mutually authenticate all network connections;
2. cryptographically protect the confidentiality of all data sent over a network; and
3. cryptographically protect the integrity of all voter information sent over the network.

Discussion

Mutual authentication provides assurance that each electronic device is legitimate. Mutual authentication can be performed using various protocols, such as IPsec and SSL/TLS. This requirement includes network appliances such as switches, firewalls, and routers within its scope.

This does not prevent the use of "double encrypted" connections employing cryptography at multiple layers of the network stack. Data must be encrypted before transmission.

Integrity protection ensures that any inadvertent or intentional alterations to data are detected by the recipient. Integrity protection for data in transit can be provided through the use of various protocols such as IPsec VPNs and SSL/TLS. For more information about TLS implementations, see *NIST SP 800-52 rev. 2, Guidelines for the Selection, Configuration, and Use of Transport Layer Security (TLS) Implementations*.

References: VVSG 2.0 13.4-A

1.4.6 – Documentation of the network and communications architecture

The EPB system documentation must include the network and communications architecture of any network used by any portion of the system.

Discussion

Documentation can assist with data flow analysis, proper network configuration, and architecture to properly support the system.

References: NIST SP 800-53 rev. 5 (PL-8, PM-7, SA-17); VVSG 2.0 15.4-A

1.4.7 – Secure network configuration documentation

The EPB system documentation must list security configurations and be accompanied by network security best practices according to the National Institute of Standards and Technology (NIST).

Discussion

A variety of documentation providing secure configurations for network devices is publicly available from the US government.

If outside manufacturers provide guidance and best practices, these need to be documented and used to the extent practical.

This documentation should include the use of wireless security protocols, firewalls and intrusion detection systems, and switch and/or router configuration.

References: NIST SP 800-53 rev. 5 (PL-8, PM-7, SA-17); VVSG 2.0 15.4-B

Section 1.5 – Software Design and Architecture

The EPB system or its documentation must:

- Execute on a supported operating system
- Support updates and patching
- Utilize recognized software standard(s)
- Perform client-side input validation
- Perform server-side input validation
- Document the use of third-party code or libraries
- Disable unneeded services and applications
- Document proper media sanitization

1.5.1 – Execute on a Supported Operating System

The EPB System software must execute on an operating system that is currently supported with updates and/or patches.

References: NIST SP 800-53 rev. 5 (SA-22)

1.5.2 – Support Updates and Patching

The EPB system's applications must have the ability to be updated and/or patched.

References: NIST SP 800-53 rev. 5 (SA-22)

1.5.3 – Utilize recognized software standards

Application logic must adhere to a published, credible set of coding rules, conventions, or standards (called "coding conventions") that enhance the workmanship, security, integrity, testability, and maintainability of applications.

Discussion

Coding conventions may be specified by the EAC in conjunction with voting system test labs.

The requirements to follow coding conventions serves two purposes. First, by requiring specific risk factors to be mitigated, coding conventions support integrity and maintainability of voting system logic. Second, by making the logic more transparent to a reviewer, coding conventions facilitate test lab evaluation of the logic's correctness to a level of assurance beyond that provided by operational testing.

References: NIST SP 800-53 rev. 5 (SI-2, SI-7); VVSG 2.0 2.1-C

1.5.4 – Input validation and error defense

The EPB system must:

1. monitor I/O operations;
2. validate all input against expected parameters, such as data presence, length, type, format, uniqueness, or inclusion in a set of whitelisted values;
3. report any input errors and how they were corrected; and
4. check information inputs to ensure that incomplete or invalid inputs do not lead to irreversible error.

Discussion

Input includes data from any input source: input devices (such as touch screens, keyboards, keypads, and assistive devices), networking port, data port, or file.

References: NIST SP 800-53 rev. 5 (SI-10); VVSG 2.0 2.5.2-A

1.5.5 – Escaping and encoding output

EPB system software output must be properly encoded, escaped, and sanitized.

Discussion

The output of a software module can be manipulated or abused by attackers in unexpected ways to perform malicious actions. Ensuring that outputted data is of an expected type or format assists in preventing this abuse. Additional information about this software weakness can be viewed at *MITRE CWE 116: Improper Encoding or Escaping of Output [MITRE20c].*

References: VVSG 2.0 2.5.3-A

1.5.6 – Sanitize output

The EPB system must sanitize all output to remove or neutralize the effects of any escape characters, control signals, or scripts contained in the data which could adversely manipulate the output source.

Discussion
Output includes data to any output source: output devices (such as touch screens, LCD screens, printers, and assistive devices), networking port, data port, or file.

References: VVSG 2.0 2.5.3-B

1.5.7 – Stored injection

The EPB system must sanitize all output to files and databases to remove or neutralize the effects of any escape characters, control signals, or scripts contained in the data which could adversely manipulate the system if the stored data is read or imported at a later date by another part of the system.

Discussion
A stored injection attack saves malicious data which is harmless when stored, but which is potent when read later in a different context or when converted to a different format. For example, a malicious script might be written to a file and do no harm to the EPB system, but later be evaluated and harmful when the file is transferred and read by the voter registration system. Input should also be filtered, but sanitizing stored output provides defense in depth.

References: VVSG 2.0 2.5.3-C

1.5.8 – Third-Party Code and Libraries

The EPB system documentation must identify and list all third-party code and libraries in a way that allows users to track against CVE listings. This should include software name, version, and manufacturer.

References: NIST SP 800-53 rev. 5 (SI-2)

1.5.9 – Application allowlisting

The EPB system must only run applications that have been verified against an allowlist.

Discussion
This requirement helps ensure only authorized applications run on the EPB system.

References: NIST SP 800-53 rev. 5 (SA-8); VVSG 2.0 14.3.2-C

1.5.10 – Integrity protection for software allowlists

The EPB system must protect the integrity and authenticity of the allowlist configuration files.

> **Discussion**
> If the allowlist is improperly modified, the software allowlisting mitigation can be defeated. The most common way of providing allowlist configuration file protection could be a digital signature.

References: VVSG 2.0 14.3.2-D

1.5.11 – Documentation of media sanitization procedures

The EPB system documentation must include instructions on the proper sanitization of storage media prior to transfer or disposal of equipment.

References: NIST SP 800-53 rev. 5 (MP-6)

Section 1.6 – Logging

The EPB system must be configured to log records for:

- General system usage
- Operational maintenance activity
- Resolving system issues
- Validating system integrity
- Generating reports

1.6.1 – General system usage

The EPB system must be configured to log records of general system usage including, but not limited to:

- Account management
- User logon attempts
- Application execution

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

1.6.2 – Operational maintenance activity

The EPB system must be configured to log records including, but not limited to:

- Software updates or patching
- System startup and shutdown
- Changes in system configuration

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

1.6.3 – Application errors

The EPB system must be configured to log all application errors. The system documentation must contain descriptions of error codes and messages for use in troubleshooting.

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

1.6.4 – System integrity

The EPB system must be configured to log records including, but not limited to:

- EDR alerts
- Antivirus alerts
- File integrity monitoring
- Physical tamper alerts (if applicable)

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

1.6.5 – Report Generation

The system must be configured to log the generation of all reports.

Section 1.7 – Supply Chain Risk Management

The EPB system documentation must detail the risk assessments and controls utilized to reduce the potential for supply chain compromises. The documentation must contain:

- List of approved suppliers
- Verification of authenticity of components
- Verification of provenance of system devices

1.7.1 – List of Approved Suppliers

The EPB system documentation must include a list of approved suppliers. If the supplier goes out of business or is purchased by another company, the EPB system documentation must be updated to include current information.

References: NIST SP 800-53 rev. 5 (SR-6)

1.7.2 – Authenticity of Components

The EPB system documentation must detail controls used to determine if the system's software, firmware, hardware, or other system components are authentic and unaltered. For software or firmware, this must include hash validation procedures. For hardware, this must include details on identifying manufacturer approved hardware through checking labeling, tamper evidence, or other characteristics.

References: NIST SP 800-53 rev. 5 (SR-4, SA-19)

1.7.3 – Provenance of Devices

The system documentation must detail the origin and ownership of any software, firmware, or hardware used within the system.

References: NIST SP 800-53 rev. 5 (SR-4)

Section 2 – Accessibility and Usability Requirements

The requirements for e-poll book usability and accessibility are based on the requirements for voting systems in the VVSG 2.0. They have been adapted for e-poll books with changes in wording as well as adding to or removing sections of the original requirement.

There are three groups of requirements:

1. Core functionality for all e-poll books
2. E-poll books with audio output for either election workers or voters
3. E-poll books that support alternative languages

In some cases, new requirements have been added to the end of each group.

Section 2.1 – Core functionality

2.1.1– User-centered design process

The manufacturer must submit a report providing documentation that the system was developed following a user-centered design process.

The report must include, at a minimum:

1. A listing of user-centered design methods used;
2. the types of voters and election workers included in those methods;
3. how those methods were integrated into the overall implementation process; and
4. how the results of those methods contributed to developing the final features and design of the system.

Discussion

The goal of this requirement is to allow the manufacturer to demonstrate, through the report, the way their implementation process included user-centered design methods.

ISO-9241-210:2019 Ergonomics of human-system interaction – Part 210: Human-centered design for interactive systems provides requirements and recommendations for human-centered principles and activities throughout the life cycle of computer-based interactive systems. It includes the idea of iterative cycles of user research to understand the context of

use and user needs, creating prototypes or versions, and testing to confirm that the product meets the identified requirements.

This requirement does not specify the exact user-centered design methods to be used, or their number or timing.

The ISO group of requirements, *Software engineering – Software product quality requirements and evaluation (SQUARE) – Common Industry Format (CIF) for Usability* includes several standards that are a useful framework for reporting on user-centered design activities and usability reports:

- ISO/IEC TR 25060:2010: General framework for usability-related information
- ISO/IEC 25063: 2014: Context of use description
- ISO/IEC 25062:2006: Usability test reports
- ISO/IEC 25064:2013: User needs report
- ISO/IEC 25066:2016: Evaluation report

References: 2.1.36, 2.1.37, VVSG 2.0 (2.2-A), ISO-9241-210:2019, ISO/IEC TR 25060:2010, ISO/IEC 25063:2014, ISO/IEC 25062:2006, ISO/IEC 25064:2013, ISO/IEC 25066:2016

2.1.2– Vote records

All records produced by the e-poll book must have the information required to support auditing by election workers and others who can only read English.

References: VVSG 2.0 (5.1-C), WCAG 2.0, and Section 508

2.1.3– Accessibility documentation

As part of the overall system documentation, the manufacturer must include descriptions and instructions for all accessibility features that describe:

- Recommended procedures for supporting the use of the system by voters with disabilities
- How the e-poll book system supports those procedures

Discussion
The purpose of this requirement is for the manufacturer not simply to deliver system components, but also to describe the accessibility scenarios they are intended to support, so that election offices have the information they need to effectively make accessibility features available to voters with disabilities.

References: VVSG 2.0 (5.1-F), WCAG 2.0, and Section 508

2.1.4 – Sound cues

Sound and visual cues must be coordinated so that sound cues are accompanied by visual cues.

Discussion

The equipment might beep if the election worker or voter makes an error. If so, there has to be an equivalent visual cue, such as the appearance of an icon or blinking element.

Audio output also supports non-written languages, voters with low literacy, or voters with low vision.

References: VVSG 2.0 (5.2-E), WCAG 2.0, and Section 508

2.1.5 – Reset to default settings

If the adjustable settings of an e-poll book have been changed by the election worker, the system must automatically reset to the default setting when the election worker signs out.

Discussion

This ensures that the system presents the same initial appearance to each election worker.

This requirement covers all settings that can be adjusted, including font size, color, contrast, audio volume, rate of speech, turning on or off audio or video, and enabling alternative input devices.

References: VVSG 2.0 (7.1-A)

2.1.6 – Reset by election worker

There must be a way for the election worker to restore the default settings while preserving the current state of any transaction or activity that the election worker is engaged in.

Discussion

This requirement allows a voter or election worker who has adjusted the system to an undesirable state to reset all settings with the information presented to the voter including any data already entered.

References: VVSG 2.0 (7.1-B)

2.1.7 – Default contrast

The default contrast ration must be at least 10:1 for all elements that visually convey information such as text, controls, and infographics or icons.

1. For electronic displays for voters and election workers, this is measured as a luminosity contrast ratio between the foreground and background colors of at least 10:1.
2. For paper records, the contrast ratio will be at least 10:1 as measured based on ambient lighting of at least 300 lx.

Discussion

This applies to information such as voter names or informational icons identifying election worker selections or other information.

Purely decorative elements that do not communicate meaning do not have to meet this requirement.

A 10:1 luminosity contrast ratio provides enough difference between the text and background to enable people with most color vision deficiencies to read the screen. This is higher than the highest contrast requirements of 7:1 in WCAG 2.0 Checkpoint 1.4.6 (Level AAA) to accommodate a wider range of visual disabilities. There are many free tools available to test color luminosity contrast using the WCAG 2.0 algorithm.

References: VVSG 2.0 (7.1-C), WCAG 2.0, and Section 508

2.1.8 – Contrast options

The e-poll book must provide options for high and low contrast displays, including the alternative display contrast options as listed below:

1. A high contrast option with a white background and dark text, with a luminosity contrast ratio of at least 20:1.
2. A high contrast option with a black background (between #000000 and #111111) and one of the following foreground options, including:
   a. yellow text similar to #FFFF00, providing a contrast ratio of at least 17.5:1,
   b. cyan text similar to #00FFFF, providing a contrast ratio of at least 15:1, and
   c. white text similar to #FAFAFA, providing a contrast ratio of at least 18:1.
3. A low contrast option, providing a contrast ratio in the range of 4.5:1 to 8:1.

Discussion

This requirement for options for the overall display contrast ensures that there is an option for the visual presentation for people whose vision requires either high or low contrast.

High and low contrast options apply to the entire screen, including decorative elements.

Examples of color combinations for low contrast options include:
- brown text similar to #BB9966 on a black background,
- black text on a background with text similar to #BB9966,
- grey text similar to #6C6C6C on a white background,
- grey/brown text similar to #97967E on a black background, and
- grey text similar to #898989 on a dark background similar to #222222

References: VVSG 2.0 (7.1-D), WCAG 2.0, and Section 508

2.1.9 – Color conventions

The use of color by the e-poll book must follow these common conventions:

1. Green, blue, or white is used for general information or as a normal status indicator;
2. Amber or yellow is used to indicate warnings or a marginal status;
3. Red is used to indicate error conditions or a problem requiring immediate attention.

References: VVSG 2.0 (7.1-E)

2.1.10 – Using color

Color coding must not be used as the only means of communicating information, indicating an action, prompting a response, distinguishing a visual element, or providing feedback on system actions or selections.

Discussion

While color can be used for emphasis, some other non-color design element is also needed. This could include shape, lines, words, text, or style. For example, an icon for "stop" can be red enclosed in an octagon shape. Or a background color can be combined with a bounding outline and a label to group elements on the screen.

References: VVSG 2.0 (7.1-F)

2.1.11 – Text size (electronic display)

An e-poll book's electronic display for check-in screens must be capable of showing all information in a range of selectable text sizes, with a default text size at least 4.8 mm (based on the height of the uppercase I), allowing the text to both increase and decrease in size.

The e-poll book may meet this requirement in one of the following ways:

1. Provide continuous scaling with a minimum increment of 0.5 mm that covers the full range of text sizes from 3.5 mm to 9.0 mm.
2. Provide at least four discrete text sizes, in which the main options fall within one of these ranges:
   a. 3.5-4.2 mm (10-12 points)
   b. 4.8-5.6 mm (14-16 points)
   c. 6.4-7.1 mm (18-20 points)
   d. 8.5-9.0 mm (24-25 points)

Discussion

The sizes are minimums. These ranges are not meant to limit the text on the screen to a single size. The text can fall in several of these text sizes. For example, primary instructions might be in the 4.8-5.6 mm range, secondary information in the 3.5-4.2 mm range, and titles or button labels in the 6.4-7.1 mm range.

References: VVSG 2.0 (7.1-G), WCAG 2.0, Section 508

2.1.12 – Text size (paper)

If the e-poll book provides printed materials to the voter, they must have a font size of at least 3.5 mm (10 points).

Discussion

Although the system can be capable of printing in several font sizes, local or state laws and regulations can also govern the use of various font sizes.

If the system includes a large-print display option, a good range for the text size is 6.4-7.1 mm matching the size in 2.*1.11 – Text size (electronic display)*.

References: VVSG 2.0 (7.1-I), WCAG 2.0, Section 508

2.1.13 – Scaling and zooming

When the text size is changed, all other information in the interface, including informational icons, screen titles, buttons, and entry fields, must change size to maintain a consistent relationship to the size of the text. Informational elements in the interface do not have to be scaled beyond the size of the text.

1. When the text is enlarged up to 200% (or 7.1 mm text size), the layout must adjust so that there is no horizontal scrolling or panning of the screen.

Discussion

The intention of this requirement is that all of the informational elements of the interface change size in response to the text size. However, some interface designs include elements that are already large enough that making them larger would distort the layout. In this case, this does not require those elements to grow proportionately beyond the size of the text.

Techniques for managing scaling and zooming an electronic interface while adjusting the layout to fit the new size are sometimes called responsive design or responsive programming.

This requirement does not preclude novel approaches to on-screen magnification such as a zoom lens showing an enlarged view of part of the screen (as long as it meets the requirements for the operability of the controls).

References: VVSG 2.0 (7.1-H), WCAG 2.0

2.1.14 – Toggle keys

The status of all locking or toggle controls or keys (such as the "shift" key) for the e-poll book that are available to the election worker or voter must be visually discernable, and discernable through either touch or sound.

References: VVSG 2.0 (7.1-O), WCAG 2.0, Section 508

2.1.15 – Identifying controls

Buttons and controls used to operate the e-poll book must be distinguishable by both shape and color for visual and tactile perception.

Well-known arrangements or groups of keys may be used only for their primary purpose. For example, a full alphabetic keyboard may be used for entering text in a form, or navigation keys on the keyboard may be used by election workers.

References: VVSG 2.0 (7.1-P), WCAG 2.0, Section 508

2.1.16 – Display and interaction options

The e-poll book must provide at least a visual format with enhanced visual options, supporting full functionality under all visual options.

- how to use accessibility features and settings;
- changes in the display format or control options
- navigating the screen
- activating options
- confirming choices

References: VVSG 2.0 (7.2-A), WCAG 2.0, Section 508

2.1.17 – Scrolling

If the amount of information that needs to be shown means that it does not fit on a single screen using the election worker's visual display preferences, the e-poll book must provide a way to view all of the information.

1. The e-poll book may display the information by:
    a. Pagination – dividing the list of voters or other information into "chunks," each filling one screen and providing ways for the election worker to navigate among the different chunks, or
    b. Scrolling – keeping all of the content on a single long display and providing controls that allow the election worker to scroll continuously through the content.
2. For either display method, the interface must:
    a. Have a fixed header or footer that does not disappear, so election workers always have access to navigation elements.
    b. Include easily perceivable cues in every display format to indicate that there is more information available.

Discussion

The ability to scroll through long lists of information on a single logical page can be particularly important when an election worker selects larger text.

Information elements that need not scroll might include instructions and general controls including preference settings or navigation controls.

A scrolling interface that meets this requirement offers election workers a combination of easily perceivable controls or gestures to navigate through long lists or other lengthy content. For example:
- Navigation does not rely on knowledge of any particular computer platform or interface standard.
- Navigation does not only rely on conventional platform scroll bars, which operate differently on two of the major commercial computer platforms.
- Controls have visible labels that include words or symbols.
- Controls are located in the election worker's visual viewing area at the bottom (or top) of the

scrolling area, for example in the center of a column of names or a paragraph of text. This is especially helpful for people with low digital or reading literacy.

References: VVSG 2.0 (7.2-D), WCAG 2.0, Section 508

2.1.18 – Touch screen gestures

E-poll books may use touch screen gestures (physical movements by the user while in contact with the screen to activate controls) in the interface if the following conditions are met:

1. Gestures are offered as another way of interacting with a touch screen and an optional alternative to the other touch interactions.
2. Gestures work consistently.
3. Gestures are used in a way that does not create accidental activation of an action through an unintended gesture.
4. Gestures are limited to simple, well-known gestures.
5. Gestures do not require sequential, times, or simultaneous actions.

Discussion

In relying on simple and common gestures, this requirement does not intend to fully duplicate the gestures for commercial mobile platforms used with an audio format for accessibility.

Tapping (touching the screen briefly) is the most basic gesture and is used on all touch screens. Other commonly used gestures include:
- Pinching or spreading fingers to zoom,
- swiping to scroll, and
- pressing and holding to drag.

Examples of gestures that require sequential or simultaneous actions are double-tapping, 2, 3, or 4 finger swiping, touch and hold for a set period of time, or those that require coordinated actions with fingers on both hands. On desktop systems, assistive preference options like Sticky Keys can make these complex gestures accessible, but they require familiarity beyond what is acceptable in an e-poll book system.

Examples of times gestures include differentiating between long and short touches, or which require touching twice in rapid succession to highlight and then activate a button or selection.

References: VVSG 2.0 (7.2-E)

2.1.19 – Accidental activation

Both on-screen and physical controls on the e-poll book must be designed to prevent accidental activation.

There are at least two kinds of accidental activation:

- When a control is activated to execute an action as it is being "explored" by the user because the control is overly sensitive to touch.

- When a control is in a location where it can easily be activated unintentionally. For example, when a button is in the very bottom left corner of the screen where a user might hold the unit for support.

The draft for WCAG 2.1, the next version of WCAG 2.0, includes a similar requirement and offers guidelines for preventing accidental activation including that the activation be on the release of the control (an "up-event") or equivalent, or that the system provides an opportunity to confirm the action.

References: VVSG 2.0 (7.2-H), WCAG 2.1

2.1.20 – Touch area size

If the e-poll book has a touch screen, the touch target areas must:

1. Be at least 12.7 mm (0.5 inches) in both vertical and horizontal dimensions;
2. be at least 2.54 mm (0.1 inches) away from adjacent touch areas; and
3. not overlap another touch area.

Discussion

The requirements for touch size areas are larger than commercial standards for mobile devices:

- to ensure that the touch areas are large enough for users with unsteady hands;

- to ensure that systems allow full adjustment to the most comfortable posture; and

- to allow for touch screens that do not include advanced algorithms to detect the center point of a touch.

The required marking area size is within the sizes suggested in the draft WCAG 2.1 for target areas that accept a touch action.

An MIT Touch Lab study of Human Fingertips to Investigate the Mechanics of Tactile Sense found that the average human finger pad is 10-14 mm and the average fingertip is 8-10 mm.

References: VVSG 2.0 (7.2-I), WCAG 2.1

2.1.21 – Key operability

Physical keys, controls, and other manual operations on the system must be operable with one hand and not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys must be no greater than 5 lbs. (22.2 N).

References: VVSG 2.0 (7.2-K), WCAG 2.0, Section 508

2.1.22 – Bodily contact

The e-poll book controls must not require direct bodily contact or for the body to be part of any electrical circuit. If some form of contact is required, a stylus or other device with built-in permanent tips will be supplied to activate capacitive touch screens.

References: VVSG 2.0 (7.2-L), WCAG 2.0, Section 508

2.1.23 – No repetitive action

E-poll book keys or controls must not have a repetitive effect when they are held in an active position.

References: VVSG 2.0 (7.2-M), WCAG 2.0, Section 508

2.1.24 – System response time

The e-poll book must complete a visual response or display in no more than 1 second or displays an indicator that a response is still being prepared.

References: VVSG 2.0 (7.2-N)

2.1.25 – System-related errors

The e-poll book must help election workers complete their duties accurately and effectively, ensuring that the features of the system do not lead to election workers making errors.

References: VVSG 2.0 (7.3-A)

2.1.26 – Feedback

The e-poll book must provide unambiguous feedback confirming each election worker action.

References: VVSG 2.0 (7.3-E)

2.1.27 – Warnings, alerts, and instructions

Warning, alerts, and instructions issued by the e-poll book must be distinguishable from other information.

1. Warnings and alerts must clearly state, in plain language:
    a. The nature of the issue or problem,
    b. whether the election worker has performed or attempted an invalid operation or whether the e-poll book itself has malfunctioned in some way, and
    c. the responses available to the election worker.
2. Each step in an instruction or item in a list of instructions must be separated:
    a. Spatially in visual formats, and
    b. with a noticeable pause in audio formats.

References: VVSG 2.0 (7.3-K), WCAG 2.0, Section 508

2.1.28 – Icon labels

When an icon label is used in the electronic interface to convey information, indicate an action, or prompt a response, it must be accompanied by a corresponding label that uses text.

only means by which information is conveyed since there is no widely accepted "iconic" language, and therefore, not all users might understand a given icon.

References: VVSG 2.0 (7.3-L), ADA Standards for Accessible Design (Chapter 7)

2.1.29 – Instructions for election workers

The e-poll book must include clear, complete, and detailed instructions and messages for setup, check-in, shutdown, and how to use accessibility features.

1. The documentation required for normal operation must be:
   a. Presented at a level appropriate for election workers who are not experts in e-poll books and computer technology, and
   b. in a format suitable for use in the polling place.
2. Printed procedural instructions, and on-screen instructions and messages must enable the election workers to verify that the e-poll book:
   a. Has been setup correctly (setup),
   b. is in correct working order to check-in voters (polling), and
   c. has been shut down correctly (shutdown).

Discussion

This requirement covers documentation for those aspects of system operation normally performed by election workers and other "non-expert" operators. It does not address inherently complex operations such as device configuration. The instructions are usually in the form of a written manual, but can also be presented on other media, such as a DVD or video. In the context of this requirements, "message" means information delivered by the system to the election workers as they attempt to perform setup, polling, or shutdown operations.

For instance, the documentation should not presuppose familiarity with personal computers. A single large reference manual that simply presents details of all possible operations would be difficult to use, unless accompanied by aids such as a simple "how-to" guide.

It is especially important that election workers and other non-expert workers know how to set up accessibility features which are not used frequently.

Overall, election workers should not have to guess whether a system has been setup correctly. The documentation should make it clear what the system "looks like" when correctly configured.

References: VVSG 2.0 (7.3-O)

2.1.30 – Plain language

Information and instructions for voters and election workers must be written clearly, following the best practices for plain language. This includes messages generated by the e-poll book for election workers in support of the operation, maintenance, or safety of the system.

Discussion

The plain language requirements apply to instructions that are inherent to the e-poll book system or that are generated by default.

Any legally required text is an exception to this plain language requirement.

Plain language best practices are guidelines for achieving clear communications and include:
- Using familiar, common words and avoiding technical or specialized words that election workers are unlikely to understand. For example, "There is additional information on the other side" rather than "Additional information is presented on the reverse."
- Issuing instructions on the correct way to perform actions, rather than telling election worker what not to do. For example, "Select a voter to strike them off" rather than "If the voter is not selected, they will not be stricken."
- Addressing the election worker directly rather than using passive voice when giving instructions. For example: "Insert activation card" rather than "the activation card must be inserted."
- Stating a limiting condition first, followed by the action to be performed when an instruction is based on a condition. For example: "In order to select a voter, do X", rather than "Do X, in order to select a voter."
- Avoiding the use of gender-based pronouns. For example: "Select the voter directly on the tablet" rather than "Select his name directly on the tablet."

References: VVSG 2.0 (7.3-P)

2.1.31 – Electronic display screens

If the e-poll book uses an electronic display screen, the display must have the following characteristics:

1. For all electronic display screens:
    a. Antiglare screen surface that shows no distinct virtual image of a light source or a means of physically shielding the display from such reflections, and
    b. Minimum uniform diffuse ambient contrast ratio for 500 lx luminance : 10 :1.
2. If the display is the primary visual interface for e-poll book functions:
    a. minimum display resolution: 1920 x 1080 pixels.

Discussion

This requirement does not apply to non-primary display screens such as those used by peripheral devices such as printers or signature pads.

References: VVSG 2.0 (8.1-A), WCAG 2.0, Section 508

2.1.32 – Flashing

If the e-poll book emits light in flashes, there must be no more than three flashes in any one-second period.

References: VVSG 2.0 (8.1-B), WCAG 2.0, Section 508

2.1.33 – Secondary ID and biometrics

If the e-poll book uses biometric measures for identifying or authenticating election workers, it must provide an alternative that does not depend on the same biometric capabilities.

Discussion

For example, if fingerprints are used for identification, another mechanism will be provided for users without usable fingerprints.

References: VVSG 2.0 (8.1-D), WCAG 2.0, Section 508

2.1.34 – Eliminating hazards

The e-poll book and all associated devices must be certified in accordance with the requirements of *IEC/UL 62368-1, Edition 3: Standard for Audio/video, Information and Communication Technology Equipment – Part 1: Safety Requirements* by a certification organization accredited by the Department of Labor, Occupational Safety and Health Administration's Nationally Recognized Testing Laboratory program.

The certification organization's scope of accreditation is acceptable if it includes *IEC/UL 62368-1*.

Discussion

IEC/UL 62368-1 is a comprehensive standard for IT equipment.

References: VVSG 2.0 (8.1-K), IEC/UL 62368-1

2.1.35 – Federal standards for accessibility

E-poll books and their software must meet federal standards for accessibility, including the version of *Section 508 Information and Communication Technology (ICT) Final Standards and Guidelines*, in effect as of January 18, 2018, and the *WCAG 2.0 Level AA checkpoints* included in that standard.

Discussion

Section 508 standards apply to electronic and information technology, including computer hardware and software, websites, multimedia, and other technology such as video, phone systems, and copiers. This requirement also supports the ADA.

References: VVSG 2.0 (8.2-A), WCAG 2.0, Section 508

2.1.36 – Usability testing with voters

The manufacturer must conduct usability tests on the e-poll book system with voters using the system to complete any actions to be taken by voters.

1. The tests must include checking-in participant voters who represent the following:
    a. General population
    b. Voters who are native speakers of the language being tested or for each language defined as being supported in the manufacturer's documentation
    c. Blind voters
    d. Voters with low vision
    e. Voters with limited dexterity
2. The manufacturer must submit a report of the results of their usability tests, including effectives, efficiency, and satisfaction measures, as part of their documentation using ISO/IEC 25062:2006: Common Industry Format (CIF) for usability test reports.

Discussion

E-poll book system developers are required to conduct realistic usability tests on their product before submitting the system to conformance testing. This is to ensure that the user-centered design process required for quality implementation has produced a usable and accessible system.

References: VVSG 2.0 (8.3-A), ISO/IEC 25062:2006: Common Industry Format (CIF) for Usability Test Reports

2.1.37 – Usability testing with election workers

The manufacturer must conduct usability tests of the e-poll book setup, operation during voting, and shutdown as documented by the manufacturer, with representative election workers, to demonstrate that election workers can learn, understand, and perform these tasks successfully.

The test must include handling all variations in voter check-in conditions and other tasks for election workers using the e-poll book at a voting location, including:

1. Setup and opening for polling
2. Operation during voting
3. Use of assistive technology or language options that are part of the system
4. Shutdown at the end of a voting day during a multi-day early voting period, if supported by the e-poll book
5. Setting up the e-poll book to use different display formats and interaction modes.

The test participants must include election workers representing a range of experience.

The manufacturer must submit a report of the results of their usability tests as part of their documentation using ISO/IEC 25062:2006: Common Industry Format (CIF) for Usability Test Reports.

Discussion

In the usability testing plan from the 2016 report *Usability testing for e-pollbooks: A test protocol* outlines a method for efficiently testing an e-poll book using scenarios for checking in voters that cover variations in this task. The same scenarios can be adapted for usability testing with voters in *1.36 – Usability testing with voters*.

The report, *Checklists for usability and accessibility of electronic pollbooks*, includes checks for a heuristic review of the poll worker interface.

References: VVSG 2.0 (8.4-A), ISO/IEC 25062:2006: Common Industry Format (CIF) for Usability Test Reports

2.1.38 – Physical manipulation

The check-in steps of the e-poll book must allow for assistance from the election worker if the voter needs to manipulate or use any aspect of the e-poll book, including attached devices.

Section 2.2 – Requirements for e-poll books supporting audio

2.2.1 – Information in all modes

Instructions, warnings, and messages must be presented to election workers in the display formats and interaction modes supported by the system.

Discussion

For audio mode, this requirement can be met with audio that includes cues to help users know what to expect. For example, announcing the number of voters in the list makes it easier to jump from one item to another without waiting for the audio to complete. Audio cues can also ensure the election worker is aware of notifications or error conditions.

References: VVSG 2.0 (5.2-C), WCAG 2.0, Section 508

2.2.2 – Audio synchronized

The e-poll book must provide the option for synchronized audio output to convey the same information that is displayed visually to the election worker or voter.

Discussion

This requirement covers all information, including information entered by an election worker or voter unless the information is not easily readable, such as a voter's signature.

This requirement applies to any audio output, whether it is recorded or generated as text-to-speech.

Any differences between audio and visual information are for functional purposes only, with variations only based on differences in the display format and interaction mode, especially for instructions.

This feature can assist voters with cognitive disabilities.

References: VVSG 2.0 (5.2-D), WCAG 2.0, Section 508

2.2.3 – Audio settings

The e-poll book's audio format interface must meet the following requirements:

1. The settings for volume and rate of speech are followed regardless of the technical means of producing audio output.
2. The default volume for each election worker's log-in session is set between 60 and 70 dB SPL.
3. The volume is adjustable from a minimum of 20 dB SPL up to a maximum of 100dB SPL, in increments no greater than 10dB.
4. The rate of speech is adjustable throughout a voter check-in transaction while preserving the current state, with 6 to 8 discrete steps in the rate.
5. The default rate of speech is 120 to 125 words per minute (wpm).
6. The range of speech rates supported is from 60-70 wpm to 240-250 wpm (or 50% to 200% of the default rate), with no distortion.
7. Adjusting the rate of speech does not affect the pitch of the voice.

Discussion

The top speech rate is slower than some audio users prefer for narrative reading to ensure that names are pronounced clearly and distinctively.

Note that the calculation of rate of speech can vary based on the length of the words in the sample, so requirements are stated as a small range.

Speech rates as slow as 50 wpm and as fast as 300 wpm can be included if this can be done without distortion or flanging.

This requirement is intended to be tested using "real ear" measurements, not simply measurements at the point of the audio source.

According to an explanation written by the Trace Center, 60dB SPL is the volume of ordinary conversation.

FCC regulations for hearing aids, *47 CFR Parts 20 and 68: Hearing Aid Standard*, includes useful information about how to test audio volume and quality.

References: VVSG 2.0 (7.1-K), WCAG 2.0, Section 508

2.2.4 – Speech frequencies

The e-poll book's audio format interface must be able to reproduce frequencies over the audible speech range of 315 Hz to 10 KHz.

Discussion

The required frequencies include the range of normal human speech. This allows the reproduced speech to sound natural.

This is not a requirement for the capability of the system so that it is possible to create intelligible audio.

References: VVSG 2.0 (7.1-L), WCAG 2.0, Section 508

2.2.5 – Audio comprehension

The e-poll book's audio format interface must be capable of presenting audio content so that it is comprehensible to people who have normal hearing and are proficient in the language with:

1. Proper enunciation, normal intonation, accurate pronunciation in the context of the information, and the capability to pronounce voter names as intended;
2. low background noise; and
3. recording or reproduction in dual-mono, with the same audio information in both ears.

Discussion

This requirement covers both recorded and synthetic speech. It applies to those aspects of the audio content that are inherent to the system or that are generated by default. To the extent that election officials determine the audio presentation, it is beyond the scope of this requirement.

Support for non-written languages and low literacy includes audio output that is usable by voters who can see the screen.

The International Telecommunications Union (ITU) provides a set of freely available test signals for testing audio quality in *Rec. ITU-T P.50 Appendix I*.

References: VVSG 2.0 (7.1-M), WCAG 2.0, Section 508, ITU-T (P.50 Appendix I)

2.2.6 – Audio control

The e-poll book must allow the election worker to control the audio format either through custom controls or using the platform or device controls, including:

1. Pausing and resuming the audio; and
2. repeating any information.

References: VVSG 2.0 (7.2-G)

2.2.7 – Standard audio connectors

If audio output is supported by the system, the e-poll book hardware platform must provide its audio signal for the audio format interface through an industry standard connector using a 3.5 mm (1/8 inch) stereo headphone jack to allow voters and election workers to use their own audio assistive devices for private listening.

References: VVSG 2.0 (8.1-E)

Section 2.3 – Requirements for e-poll books supporting additional languages

2.3.1 – Languages

The e-poll book must be capable of displaying and printing all the information contained in the e-poll book and e-poll book instructions in all languages the manufacturer has declared the system supports, in visual formats, and in audio formats for e-pollbooks that support audio formats.

References: VVSG 2.0 (5.1-B), Voting Rights Act

2.3.2 – Presenting content in all languages

All information that is presented to the election worker and information presented to the voter in English must also be capable of being presented in all other languages that are supported, whether the language is in visual or audio format (for e-poll books that include audio). This includes instructions, warnings, and messages.

References: VVSG 2.0 (5.1-B), Voting Rights Act

2.3.3 – Language selections

It must be possible to select languages separately for the election worker screens and for screens or information presented to the voter.

1. Changing the language for the election worker must not cause any language changes in the e-poll book interface or attached devices that are viewed by voters.
2. Changing the language used for any voter-facing interface of the e-poll book or by attached devices must not cause any language changes to the interface used by election workers.

Discussion

It is possible for an election worker to use a translator or other assistance while helping a voter check-in. Additionally, a voter may understand an election worker's instructions but feel more comfortable with written instructions requiring a signature to be provided in their native language.

References: VVSG 2.0 (5.1-B), Voting Rights Act

Appendix 2
Electronic Poll Books in the United States

Electronic Poll Books in the United States

State/Territory	In-House System	Commercial System	Total Manufacturers	ePB Definitions	Testing & Certification	Other Regulations
Alabama		X	3		X	
Alaska			0			
Arizona	X	X	5	X		X
Arkansas		X	2	X		X
California		X	4	X	X	
Colorado	X		1			
Connecticut			0		X	
Delaware		X	2	X		
District of Columbia		X	1			
Florida	X	X	3			X
Georgia		X	1	X		X
Hawaii	X	X	2			
Idaho		X	1	X	X	
Illinois	X	X	8			X
Indiana		X	3	X	X	
Iowa	X	X	3	X		X
Kansas		X	4	X	X	
Kentucky		X	2	X	X	
Louisiana			0			
Maine			0			
Maryland		X	1			X
Massachusetts			0		X	
Michigan	X		1			X
Minnesota		X	1			X
Mississippi		X	3			X
Missouri		X	4			X
Montana			0			
Nebraska			0			X
Nevada		X	2			X
New Hampshire			0		X	
New Jersey		X	3		X	
New Mexico		X	2			X
New York		X	3	X	X	
North Carolina	X	X	2		X	
North Dakota		X	1			X
Ohio		X	5	X	X	
Oklahoma			0			
Oregon			0			
Pennsylvania		X	4		X	
Rhode Island		X	1	X		X
South Carolina		X	1			X
South Dakota		X	1	X		X
Tennessee	X	X	4			X
Texas	X	X	7		X	
Utah		X	1			
Vermont			0			
Virginia		X	4		X	
Washington			0			
West Virginia		X	1	X		X
Wisconsin	X		1		X	
Wyoming		X	2	X		X
U.S. Virgin Islands		X	1			

For questions, corrections, and updates, please contact ESTEP@eac.gov.

Appendix 3
Participant Agreement Template

Overview

This agreement relates to your participation in the U.S. Election Assistance Commission (EAC) e-poll book pilot evaluation program (pilot program or program). This document describes responsibilities and expectations of both participants and the EAC for the duration of the agreement. We ask that you read, sign, and return this agreement to initiate participation in the program. Questions or requests for clarification regarding program requirements may be submitted to the EAC Director of the Election Supporting Technology Evaluation Program. Due to resource constraints, participation will be limited to the first four manufacturers who return the agreement.

Pilot Program Description

The goal of the EAC e-poll book pilot program is to develop a set of testable guidelines, procedures, and program materials that can help standardize the security, accessibility, and usability of e-poll book systems utilized across the United States of America. The cybersecurity of e-poll book systems has never been more important. Attacks from nation-state actors against our election infrastructure are increasingly targeting these critical systems. Creating and implementing baseline security guidelines will help improve the overall security and integrity of our election systems and processes.

Standardized usability and accessibility help ensure that systems evaluated by the EAC are able to provide a superior user experience for both poll workers and voters. All eligible voters should have access to the process in the most independent and equitable manner possible. Good usability also helps mitigate human errors in configurating and utilizing security features.

The program intends to use a standardized and evidence-based approach to verifying the security, usability, and accessibility of e-poll books. Participants will have the opportunity to demonstrate their ability to effectively build, test, monitor, and maintain their election technology solution throughout the process. The EAC will test our assumptions related to the draft guidelines labeled version 0.9 and sent to prospective participants on January 19th, 2023 as well as the test procedures, identify shortcomings and potential solutions, and publish a report on its findings at the conclusion of the pilot program.

Agreement

Participants are not required to take part in the pilot program and may end their participation at any time. Participants will not be paid for their participation or reimbursed for expenses related to participation in the program. The EAC will compensate the designated voting system test laboratory (VSTL) for expenses related to testing each participant's system. Provision of equipment and supplies to a VSTL and any travel expenses for manufacturer personnel will be the responsibility of the participant.

Each participant in this pilot program agrees to comply with the requirements of the program. Participants will be required to submit a complete e-poll book system to a VSTL designated by the EAC and agreed to by the participant. This includes any peripherals and documentation required to set up and operate the system. Transportation and storage cases are not within scope of the testing and do not need to be supplied unless required for operation of the system.

The EAC will coordinate a testing schedule with each participant to occur between February 15th and July 15th, 2023, at the participant's and VSTL's convenience. Participants are allowed to have no more

than two personnel on site at the VSTL to assist testing personnel with equipment setup, operation, or take down. Participants will coordinate any on-site visits with the VSTL.

Participants, the EAC, and the designated VSTL agree to work together in good faith to ensure accurate processes, efficient communication, and a successful overall experience. The EAC agrees to protect proprietary information for the entire period these materials remain in its possession. Participants understand that non-proprietary program information such as specific testing results and final reports issued by the EAC will be shared with EAC stakeholders. Records will be available to the public pursuant to the Freedom of Information Act and any applicable exemptions. The EAC will retain and dispose of all records associated with the pilot program in accordance with federal law.

The pilot program will be administered by the EAC's Director of the Election Supporting Technology Evaluation Program. The administrator's responsibilities include:

- Accepting agreements on a first come, first served basis, up to a maximum of four total participants.
  - If a participant is not prepared, does not submit materials in a timely manner, or withdraws from participation, a new participant will be chosen if testing of the system has not already begun at the VSTL. Once testing begins, information about a withdrawal may be noted in the EAC's final report as relevant data in evaluating the pilot.
- Communication and coordination with participants, the VSTL, and EAC staff
- Review of program artifacts such as test plans, test reports, and participant documentation
- Producing the final report including findings and recommendations with supporting materials

After submission of a signed agreement and acceptance into the program, the EAC will request the following items within two weeks to facilitate participation:

- Administrative and technical points of contact
- System description (marketing materials or other public descriptions)
- System documentation
- System components and materials shipped to the designated VSTL

The EAC appreciates each participant's willingness to take part in this pilot program. Participation will help strengthen the security of these critical systems and help provide a roadmap for future standardization and evaluation efforts.

Your signature below means that you consent to the terms of the pilot program outlined above. Please return signed agreement (digital or "wet" signature) to jphelps@eac.gov and include an email and phone number for the authorized contact at your organization.

**Appendix 4
Manufacturer-Recommended Revisions to VEPBR v0.9**

Manufacturer Recommendations for Revisions to the Voluntary Electronic Pollbook Requirements (VEPBR) Version 0.9

Existing Requirements for Revision

Requirement (Section #, Title)		Justification for Revision
1.1.1	Account management	We do not believe any feedback should be provided to a user about another user's password. The standard should be unique username/password combo, not unique password. Such a standard would allow a user to discover other valid passwords through brute force of just trying to change their own password over and over until they get refused. Then they could try that "used" password on other accounts. We believe this standard introduces an unnecessary security vulnerability.
1.1.4	Multi-factor authentication	Requiring multi-factor authentication in the polling place by pollworkers would create an undue burden on jurisdictions as pollworkers are temporary staff who may change even last minute at any particular site. While this can be offered to jurisdictions who can support it, it should not be required to be used.
1.2.1	Documentation of asset management features	This feels like busy work. Why? This is going to be different for each jurisdiction, so I wasn't sure what the purpose of that was. I think something that would be helpful for us is, if you have something in mind, make a sample document and give that to everybody.
1.2.4	Document the application of tamper-evident sealing	This appears to be a requirement from a tabulator where seals are used to cover the memory cards. ePollbooks typically do not use such memory cards and there is often nothing in particular to seal. The requirement should be removed.
1.4.3	Disallow connections to unapproved external devices	This requirement is too vague. Units should not connect to external networks nor any inserted foreign data drives, but validating connection of all peripherals seems unnecessary and burdensome.
1.4.7	Secure network configuration documentation	While we follow NIST best practices, we do not reference NIST in the documentation. We would think just following the best practices would be the requirement, not naming any specific organization such as NIST.
1.6.5	Report generation	This appears to be a tabulator requirement. We see no good reason to log the display of reports on an ePollbook. If the EAC intends this requirement, we believe they need to define what reports they mean and why. For instance, the ePollbook displays the number of voters checked-in at all times. Clicking or tapping that number will show the breakdown of those voters by precinct, voting method, etc. Why would this display be logged? It can be referenced by the pollworkers at any time as many times as they want throughout the day.
1.7.2	Authenticity of components	For COTS components, this could be a very difficult/expensive requirement. Perhaps the requirement should be what you are trying to protect against instead of this specific solution. For example, the requirement would be: "describe how your system protects firmware from being altered by a user."

Requirement (Section #, Title)		Justification for Revision
2.1.8	Contrast options	Seems to be a voter-level facing requirement, that has limited applicability to the pollbook.
2.1.14	Toggle keys	Consideration of different COTS products and what offerings they have, if any, in regards to tactile and sound.
2.1.15	Identifying controls	Consideration of different COTS products and what offerings they have, if any, in regards to identifying controls.
2.1.16	Display and interaction options	Consideration of different COTS products and what offerings they have, if any, in regards to display and interaction options.
2.1.20.2	Touch area size	Consideration of the different COTS tablet screen size used and what surface area that then allows for.
2.1.28	Icon labels	Can you explain the purpose of this requirement? Is it for screen readers or for scaling? Each object can have a screen reader text equivalent that does not need to visibly appear next to the item and all objects are supposed to scale per your standard when we add more robust scaling. This standard seems to limit the functional design of the screens unnecessarily. Instead the standard should address whatever the problem or need is that you are trying to address.
2.1.35	Federal standards for accessibility	What products/solutions do vendors need to use to test to these standards?
2.3.1	Languages	Consideration to limit this requirement to providing alternative language in voter-facing screens only.
2.3.2	Presenting content in all languages	Consideration to limit this requirement to providing alternative language in voter-facing screens only. Having some flexibility. The only covered language for us, besides English, would be Spanish, so we're only going to build for our system to those two different languages. Having a vendor that would be selling this across many jurisdictions, they might have the need to be able to serve all those various different covered languages. But for us, that's just one small example, that for those homegrown systems, there might be a level of customization... I would encourage the EAC then to figure out what those standards are and how an organization would go about meeting [them] when they are homegrown systems.

Functional Requirements for Inclusion

Short Name	Involving a demonstration or description of...
Workflow	General functions of the EPB that might affect how it is used.
Check-in Procedures	The check-in process, from start to finish.
Connectivity/Communication	The EPB's connectivity to its host, the polling location, and potentially, voting systems.
Voter Information	How the EPB displays voter information, including the EPB's capability to show data points to registered voters.
Voter Lists	How the EPB maintains and imports a list of registered voters and identifies whether an individual has voted.
Printing Capabilities	Whether the EPB supports this functionality, and procedures to print voter receipts.
Barcode Reading	Whether the EPB supports this functionality, and procedures to scan a barcode, such as those on a Voter's ID.
Signature Comparison	How the EPB stores a voter's signature, if applicable, and procedures to ensure that a voter's signature matches the pre-existing signature image affiliated with that voter.