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Test Report for Test and Evaluation of the Voatz™ Remote Accessible Ballot Delivery, Marking and Return (RABDMR) System

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SIGNATURES

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REVISIONS

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00	Initial Release	07/14/2020
01	Updates per manufacturer comments	07/15/2020
02	Updates per manufacturer comments	07/17/2020

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1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform the evaluation of the Voatz Remote Accessible Ballot Delivery, Marking and Return (RABDMR) System to the applicable requirements in the U.S. Election Assistance Commission (EAC) 2015 Voluntary Voting System Guidelines (VVSG), Version 1.1 and the manufacturer-stated requirements set forth in the system documentation.

The objectives of the evaluation of the Voatz RABDMR were to assess the ability of the system to perform the following tasks:

- Installing, registering, and delivering a ballot to voters using the Voatz Mobile App.
- Voting using the Voatz Mobile App.
- Enforcement of voting checks and ballot validation.
- Accessibility and language support for voters using the Mobile App.
- Compliance with security and privacy requirements when voting using the Mobile App.
- Ability for voters to successfully return their completed ballot.
- Ability of election officials to perform the following actions in the Voatz Admin Portal:
    - Login using 2-factor authentication
    - View election information, including ballots
    - View eligible and signed-up voters
    - View and approve voter-submitted affidavits
    - Download and view anonymized voter-submitted ballots
- Print voter ballots.
- Optionally receive voter ballot receipts and affidavits to a fax machine.

Pro V&V Test Plan TP v. 01-02-VTZ-001-01.01 was utilized as the guiding document during test performance. During testing, minor system modifications, such as revised system documentation or software versions, may have been incorporated. This test report encompasses all aspects of testing (Phase 1 and Phase 2) and details the final versions of all technical documentation and system components and supersedes the approved test plan.

Unless otherwise annotated, all testing was conducted at the Pro V&V test facility located in Huntsville, AL, by personnel verified by Pro V&V to be qualified to perform the test

1.1 Scope

The scope of the testing event incorporated a sufficient spectrum of functional tests to verify that the RABDMR features and applications conform to the applicable requirements.

The test campaign was conducted in two phases:

Phase 1

This portion of testing assessed the RABDMR's Usability & Accessibility compliance *(Reference Pro V&V Test Report TR v. 01-02-VTZ-001-01.02).*

Phase 2

Phase 2 included all elements of the approved Test Plan inclusive of Phase 1. Specifically, this portion of testing included the following test goals:

- Verify that the RABDMR performs as documented in the provided system technical documentation
- Evaluate the RABDMR System as it relates to voter experience and transmission of the voter's selection to the jurisdiction
- Execute system use cases to evaluate system functionality
- Source Code Review
- Physical Configuration Audit (PCA)
- Functional Configuration Audit (FCA)
- System Integration Testing, including Accuracy Testing and Regression Testing
- Security Testing
- Telecommunications Testing

1.2 References

- Voatz Mobile Elections Platform Proposed Test Plan
- Implementation Statement
- Election Assistance Commission 2015 Voluntary Voting System Guidelines (VVSG) Version 1.1, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"
- Election Assistance Commission Testing and Certification Program Manual, Version 2.0
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2016 Edition, "NVLAP Procedures and General Requirements (NIST Handbook 150)", dated July 2016
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Pro V&V, Inc. Quality Assurance Manual, Revision 7.0

- System Technical Data Package *(A listing of the documents submitted for this test campaign is listed in Section 3.3 of this Test Report)*

1.3 Terms and Abbreviations

This subsection lists terms and abbreviations relevant to the hardware, the software, or this Test Plan.

"COTS" – Commercial Off-The-Shelf

"EAC" – United States Election Assistance Commission

"EBDMR" -- Electronically-assisted Ballot Delivery, Marking and Return

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ISO" – International Organization for Standardization

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"TDP" – Technical Data Package

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

2.0 TESTING OVERVIEW

The scope of this testing event incorporated a sufficient spectrum of tests to verify that the RABDMR features and applications conform to the defined requirements. The evaluation of the RABDMR System addressed each of the test goals in the following manner:

Table 2-1: Testing Overview

Test Goal	Testing Response
Perform a Usability and Accessibility Review	This review focused on the usability and accessibility of the system as evaluated against the requirements matrix in Appendix A.
Verify that the RABDMR performs as documented in the provided system technical documentation	This was evaluated during performance of the Functional Configuration Audit. Additionally, a TDP Review was performed
Evaluate the RABDMR System as it relates to voter experience and transmission of the voter's selection to the jurisdiction	This was evaluated during performance of the Functional Configuration Audit.

Table 2-1: Testing Overview *(continued)*

Test Goal	Testing Response
Execute system use cases to evaluate system functionality	This was evaluated during performance of the System Integration Testing.
Source Code Review	The source code submitted by Voatz was reviewed for adherence to applicable requirements and standards.
Physical Configuration Audit (PCA)	A PCA was performed to compare the voting system components and materials submitted for testing against the manufacturer's technical documentation to ensure everything was in agreement and correct.
Functional Configuration Audit (FCA)	A FCA was performed as an exhaustive verification of every system function and combination of functions cited in the manufacturer's documentation.
System Integration Testing, including Accuracy Testing and Regression Testing	The RABDMR was tested to address the integration of the hardware and software. This testing focused on the compatibility of the system software components and subsystems to interface with one another and with other voting system components. Abbreviated Accuracy Testing was performed to verify the system accurately stored election data.
Security Testing	The RABDMR was set up as described in the technical documentation and subjected to security testing. During the execution of this test case, the system was inspected for various controls and measure that were in place to meet the objectives of the security standards.
Telecommunications Testing	The telecommunications testing was performed to determine the capability of the system to transmit and receive data electronically using hardware and software over distances external to a polling place.

2.1 System Overview

The following sections contain a product description and an overview of the design methodology of the RABDMR System, as taken from the system technical documentation.

The Voatz Mobile Elections Platform is a configurable, cloud-based Remote Accessible Ballot Delivery, Marking and Return (RABDMR) system that:

- Delivers blank ballots to eligible voters
- Allows voters to mark their selections accessibly and verify their selections
- Returns the marked ballots to the jurisdiction according to the statutory provisions of the voter's state.

Jurisdictions can specify the method of returning voted ballots based on their state's statutory requirements and include any state-specific legal documents (such as signed affidavits or checkbox waivers.)

To determine eligibility to vote, voter registration records are incorporated into the Voatz Platform by importing the data. Typically, an indicator in the voter file designates which subset of all voters are eligible to vote remotely. While the Voatz system can remotely confirm the validity of a voter's credentials (e.g. driver's license) and verify the person presenting their credentials is the same person on the credential, it does not by itself determine whether individual voters are authorized to vote in the current election. This determination must be made by the jurisdiction and indicated in the voter records. Voatz then limits voting to those individuals so designated.

The Voatz RABDMR system uses commercial off-the-shelf (COTS) hardware; no proprietary hardware is required. Ballots are marked securely and anonymously via a mobile app on the voter's smartphone—the Voatz Mobile App (VMA).

Marked ballots are returned electronically to the jurisdiction, along with any other required documents. The jurisdiction then prints the returned marked ballots as optical scannable ballots on official ballot stock for tabulation by the primary voting system. Voters receive a password protected ballot receipt that lists their selections and contains an anonymous ID; the jurisdiction receives an identical anonymized copy. Only the voter knows the anonymous ID that is linked to them.

Voatz has provided responses to a recently issued guidance to election officials regarding electronic ballot delivery and marking circulated by the EAC. The information on the RABDMR system functionality as provided by Voatz is presented in Attachment B.

2.2 Block Diagram

The process flow of the system is depicted in Figure 1-1.

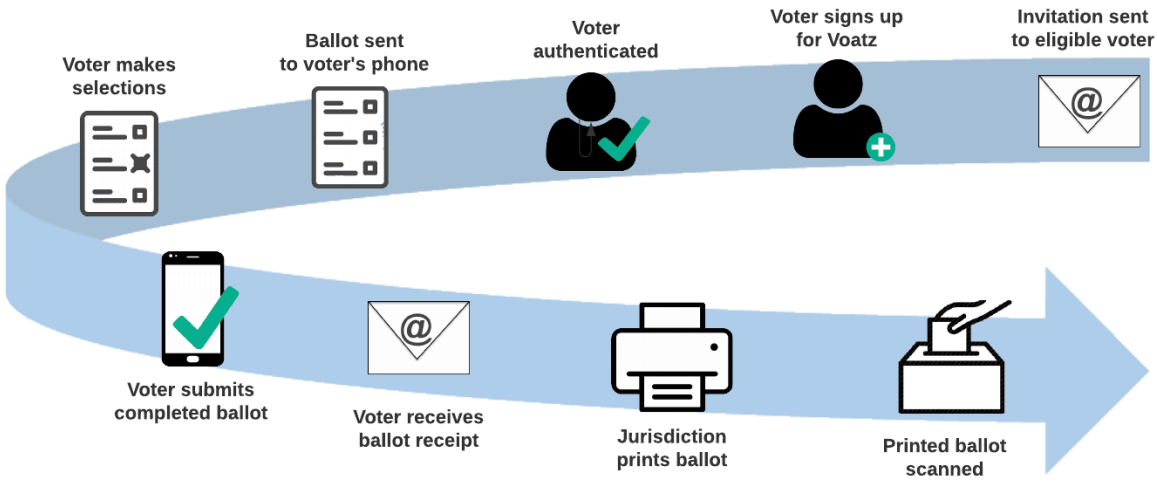
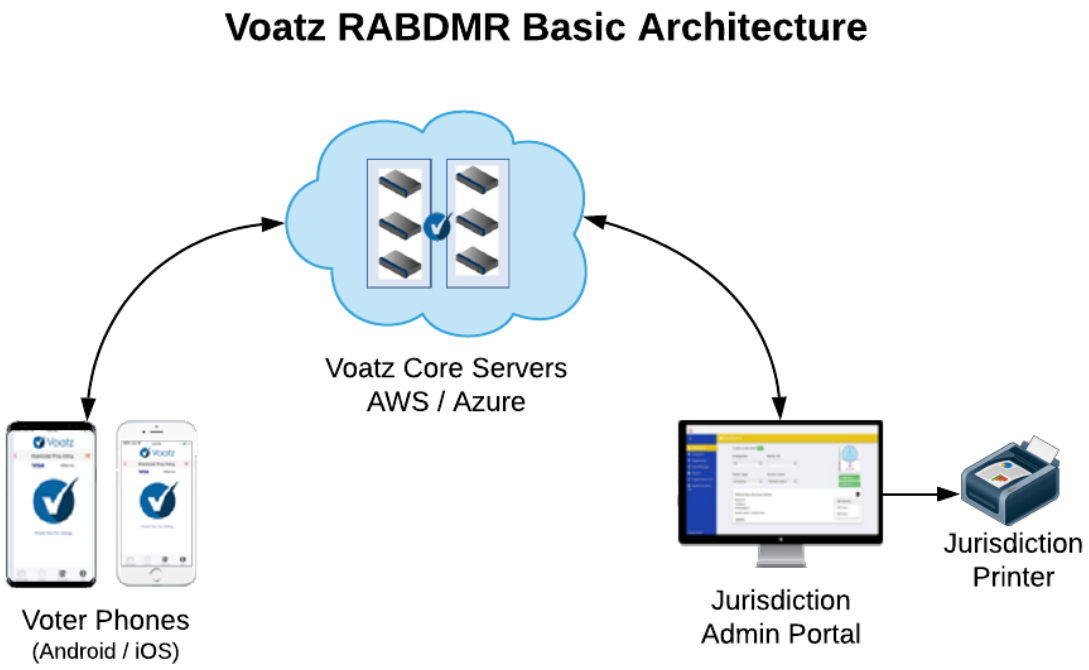


Figure 1-1. RABDMR Process Flow

2.3 Test Configuration



The testing campaign utilized various models of cell phones, with the Voatz Mobile App (VMA) installed. To access the back-end environment, one Pro V&V laptop was utilized. Ballots generated during testing were printed as optical scannable ballots using an OKI printer. An alternate test configuration returned ballots both electronically and via fax.

3.0 MATERIALS REQUIRED FOR TESTING

The following sections list all materials required during the test engagement.

The materials required for testing of the RABDMR System included all materials to enable the test campaign to occur. This included the applicable hardware and software as well as the TDP, test support materials, and deliverable materials, as described in the following subsections.

3.1 Software

This subsection lists the proprietary and COTS software provided by the manufacturer as part of the test campaign.

Table 3-1. RABDMR System Software

Firmware/Software	Version
Voatz Mobile App (VMA) for iOS	1.032 (190)
Voatz Mobile App (VMA) for Android	1.1.124 (159)
Voatz Admin Portal	1.0.48

3.2 Equipment

This subsection lists the COTS equipment provided by the manufacturer as part of the test campaign.

For COTS equipment, every effort was made to verify that the COTS equipment has not been modified for use. This was accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers for each piece of equipment. Assigned test personnel evaluated COTS hardware, system software and communications components for proven performance in commercial applications other than voting.

For smartphones, the device information was compared to the supported configurations in the campaign. Physical external and internal examination was also performed when easily accessible without the possibility of equipment damage. Solid State drives, RAM memory, and other components were examined to verify that the components match the information found on the COTS equipment manufacturer's websites. A factory reset was performed on smartphones prior to testing.

Table 3-2. RABDMR System Equipment

Component	Model	Serial Number	OS
iPhone 6s	MKRX2LL/A	C6KRL9HVGRY8	iOS 13.3.1
iPhone 6	MG4Q2LL/A	FFMP901MG5MF	iOS 12.4.5
LG Phoenix 4	LM-X210APM	912VTSM766174	Android 8.1.0
Moto e6	XT2005-1PP	352176100933789	Android 9.0
Okidata Printer	432dn-B	AK88034459C0	N/A
Brother IntelliFAX	FAX2840	U63274C0J773853	N/A

3.3 Technical Data Package

A listing of all documents contained in the system TDP relevant to this report is provided in Table 3-3.

Table 3-3. TDP Documents

Document	Version	Description
Product Summary	---	Statement of the system capability and role in the election eco-system.
Use Procedures	*1.06*	Provides a comprehensive description of the Voatz system for jurisdiction officials. It includes pre-election, election window and post-election procedures, architecture, capabilities, functionality, workflows, logic & accuracy testing, and system security.
Product Datasheet	*1.04*	Supported functionality, system limitations, and other performance characteristics.
Hardware and Software Specification	*1.04*	System hardware and software requirements.
System Test Verification and Specification	*1.03*	Describes the manufacturer's test processes, environment, data, and artifacts.
Configuration for Testing	*1.03*	Describes the configuration actions and resources required to stage a conforming test environment for the system.

Additional ancillary documents, not part of the TDP, were also submitted for review and comment. These documents include:

- Vendor Proposed Test Plan
- Open-SCAP Evaluation Report
- OWASP Security Checklist
- Jmeter 500 User Load Test Summary Report
- Voatz Test Execution Reports (iOS and Android)
- Voatz Admin Portal 1.0.48 Test Execution Report
- Hunt Engagement Summary

3.4 Test Support Materials

This subsection lists the test materials required to execute the required tests throughout the test campaign.

The following materials were supplied by Voatz to facilitate testing:

- Ballot Paper
- Printer Ink
- Other materials and equipment as required

4.0 TEST PROCESS AND RESULTS

Testing of the RABDMR System submitted for evaluation was performed to verify that the System conforms to the applicable requirements in the U.S. Election Assistance Commission (EAC) 2015 Voluntary Voting System Guidelines (VVSG), Version 1.1 and the manufacturer-stated requirements set forth in the system documentation. The VVSG 1.1 Requirements Matrix generated for this test campaign was used as a guide to determine the specific tests to be performed. Pro V&V developed test procedures designed to evaluate the system being tested against the stated requirements. The test cases were performed using three types of elections: Primary, General, and Ranked Choice voting. The test procedures were executed independently.

The evaluation areas for this test engagement are summarized in the subsections below.

4.1 Usability and Accessibility Testing

The usability testing focuses on the usability of the system being tested. Usability is defined generally as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. In the context of voting, the primary user is the voter, the product is the RABDMR, and the task is the correct recording of the voter ballot selections. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others, and the voter selections should be private. Accessibility evaluates the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B).

Usability and Accessibility Testing included system use cases for the following areas:

- Usability Support
- Cognitive Disabilities
- Perceptual Disabilities
- Interaction Disabilities
- System and Voter Wait Times
- Language Support
- General Accessibility Assistance
- Limited Vision Assistance
- Blind Voter Assistance
- Motor Control Difficulty Assistance
- Limited Hearing Assistance
- English Illiteracy Assistance
- Limited Speech Assistance

Summary Findings

The RABDMR System was evaluated against the VVSG 1.1 Requirements Matrix generated for this test campaign. Based on the results obtained, the RABDMR was determined to meet the applicable Usability and Accessibility requirements. The following observations/exceptions were noted during the review:

Table 4-1 Summary Findings

Requirement	Notes
Usability Review	
Volume I, Section 3.2.3.1 *Privacy at the polls*	
3.2.3.1.a, 3.2.3.1.b, 3.2.3.1.c, 3.2.3.1.d, 3.2.3.1.e	These requirements are not applicable due to there being no polling place.
Volume I, Section 3.2.6.1 *Timing*	
3.2.6.1.a, 3.2.6.1.b, 3.2.6.1.c	Note: Timing was tested concurrent with a simulated load of 500 other users voting.
3.2.6.1.f	The timing of the alert and expiration of session pass. However, there is no poll worker, thus there is no poll worker intervention. The user is required to login again.
Volume I, Section 3.2.7a *Alternative Languages*	
3.2.7a.i.v	Any external reports to be reviewed pending final TDP.

Table 4-1 Summary Findings (continued)

Requirement	Notes
Accessibility Review	
Volume I, Section 3.3.2 *Enhanced visual interfaces*	
3.3.2.c.i, 3.3.2.c.ii	Phone contains capability.
Volume I, Section 3.3.3 *Audio-tactile interfaces*	
3.3.3.a & 3.3.3.a.i	Any external test reports to be reviewed pending final TDP.
3.3.3.b, 3.3.3.b.i, 3.3.3.b.ii, 3.3.3.b.iii, 3.3.3.b.iv. 3.3.3.b.v, 3.3.3.c.i, 3.3.3.c.ii, 3.3.3.3.iii	The system does not contain an ATI; therefore these requirements are not applicable.
3.3.3.c.iv, 3.3.3.c.v, 3.3.3.c.vi	These requirements relate to volume control and audio presentation and were not tested, as they are dependent upon the device being utilized.
3.3.3.f, 3.3.3.g	These requirements relate to accessible voting stations and are not applicable.
Volume I, Section 3.3.4 *Enhanced input and control characteristics*	
3.3.4.a, 3.3.4.d	These requirements relate to accessible voting stations and are not applicable.
3.3.4.b	Partial Pass - Only on iPhone 6s & higher and iOS 13 & higher support hands-free operation using Voice Control. Android devices do not have this capability yet. However, both devices support limited dexterity with VoiceOver or TalkBack navigation (audio can be turned off.)
Volume I, Section 3.3.5 *Design for mobility aids*	
3.3.5	These requirements relate to accessible voting stations and are not applicable.
Volume I, Section 3.3.6 *Enhanced auditory interfaces*	
3.3.6.c	These requirements relate to volume control and audio presentation and were not tested, as they are dependent upon the device being utilized.
Volume I Section 3.3.10 *Summative Usability Report*	
3.3.10.c.i, 3.3.10.a, 3.3.10.b, 3.3.10.c	Any external test reports to be reviewed pending final TDP.

The results of the evaluation are presented in Attachment A.

Note: Each item listed in the table above is marked with an asterisk in Attachment A.

4.2 Functional Configuration Audit (FCA)

The FCA is an exhaustive verification of every system function and combination of functions cited in the manufacturer's documentation. The FCA verifies the accuracy and completeness of the system Technical Data Package (TDP).

Standardized FCA test cases were utilized during testing as well as test cases that focused on the following specific areas:

- Limits Testing (per manufacturer documentation)

- Voting Variations (per manufacturer documentation)
    - General Election
    - Primary Election
        - Open
        - Closed
        - Presidential Primary
    - Ranked Choice Election

Summary Findings

During this area of testing, an evaluation was performed on the RABDMR System as it relates to voter experience and transmission of the voter's selection to the jurisdiction. Additionally, it was verified that the RABDMR performs as documented in the provided system technical documentation.

4.3 System Integration

The system level certification tests addressed the integration of the hardware and software. This testing focused on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. System Integration testing included the Accuracy Test, which ensures that the voter's encrypted, emailed ballot receipt and jurisdiction's printed ballot match the voter's choices. The Accuracy Test was designed to test the ability of the system to "capture, record, store, consolidate, and report" specific voter selections and absences of a selection.

During test performance, the system was configured as would be for normal field use. Admin portal access was tested in two types of users, "Org Admin" and "Org User."

Summary Findings:

The RABDMR successfully completed the System Integration Test. System use cases were executed to evaluate system functionality. During execution of the test procedure, it was verified that the RABDMR successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

The Accuracy Test for this area of testing was conducted on an abbreviated scale. Admin portal access was only tested with the "Org Admin" level control during Accuracy Testing.

4.4 Physical Configuration Audit (PCA)

The Physical Configuration Audit (PCA) compared the voting system components submitted for certification testing to the manufacturer's technical documentation. The purpose of the PCA was to verify that the submitted components matched the manufacturer's technical documentation.

Summary Findings

During execution of the test procedure, the components of the RABDMR were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release.

At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented.

4.5 Source Code Review

Pro V&V reviewed the submitted source code to the EAC 2015 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V verified that the submitted documentation was sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

Summary Findings:

Pro V&V conducted both a manual and automatic source code review for Android and iOS applications. Pro V&V used Android Studio version 4.0.1 for the Android application and Xcode 11.5 for the iOS application. The Android application uses the Kotlin coding standard and the iOS application uses the Swift coding standard. Pro V&V found both code bases to be compliant to their respective standard.

4.6 Security Testing

During the execution of this test case, Pro V&V verified various controls and measures to meet the required security standards including: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

Summary Findings:

Pro V&V and Voatz decided upon using the OWASP Mobile Application Security Checklist (MASVS Version 1.1.4, MSTG Version 1.1.3) for baseline security testing. Voatz provided the checklist with their findings. Pro V&V used a sample of the test cases to verify the results. Voatz also provided output from the automated Open-SCAP Evaluation Report for Red Hat Enterprise Linux 7 Voatz servers. No security issues were found from the sample test cases.

During the security evaluation, Pro V&V was able to verify that the Voatz RABDMR utilized a Blockchain from the server throughout the remainder of the process.

4.7 Telecommunication Testing

The telecommunications testing determined the capability of the system to transmit and receive data electronically using hardware and software over distances external to a polling place. During testing, both cellular and Wi-Fi transmission were used. The testing ensured that all data transmitted during pre-voting, voting or post-voting activities was transmitted with no alteration or unauthorized disclosure during transmission.

Summary Findings:

During execution of the test procedures, it was verified that the RABDMR successfully completed the applicable telecommunications tests. The system successfully transmitted and received all data with no alteration during pre-voting, voting and post-voting activities.

5.0 CONCLUSION

Based on the results obtained during the test campaign, Pro V&V determined the Remote Accessible Ballot Delivery, Marking and Return (RABDMR) System, as presented for evaluation, meets the applicable requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2015 Voluntary Voting System Guidelines (VVSG), Version 1.1, with the clarifications or exceptions noted in Section 4.0.

ATTACHMENT A - REQUIREMENTS MATRIX

Table A-1 Usability Review Matrix Requirements

Requirement	Description	Result
Usability		
3	Usability Requirements	
3.1.1	Purpose	
3.1.1.a	All eligible voters shall have access to the voting process without discrimination.	Pass
3.1.1.a.i	The voting process shall be accessible to individuals with disabilities. The voting process includes access to the polling place, instructions on how to vote, initiating the voting session, making ballot selections, review of the ballot, final submission of the ballot, and getting help when needed.	Pass
3.1.1.b	Each cast ballot shall accurately capture the selections made by the voter.	Pass
3.1.1.b.i	The ballot shall be presented to the voter in a manner that is clear and usable. Voters should encounter no difficulty or confusion regarding the process for recording their selections.	Pass
3.1.1.c	The voting process shall preserve the secrecy of the ballot.	Pass
3.1.1.c.i	The voting process shall preclude anyone else from determining the content of a voter's ballot without the voter's cooperation. If such a determination is made against the wishes of the voter, then his or her privacy has been violated.	Pass
3.2	General usability requirements	
3.2.a and 3.2.b	The voting process shall provide a high level of usability for voters. Accordingly, voters shall be able to negotiate the process effectively, efficiently, and comfortably. The mandatory voting system standards mandated in HAVA Section 301 relate to the interaction between the voter and the voting system:	.
3.2.a.1.A	Except as provided in subparagraph (B), the voting system (including any lever voting system, optical scanning voting system, or direct recording electronic system) shall --	.
3.2.a.1.A.i	Permit the voter to verify (in a private and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted.	Pass
3.2.a.1.A.ii	Provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error).	Pass
3.2.a.1.A.iii	If the voter selects votes for more than one candidate in a single office:	.

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.a.1.A.iii.I	Notify the voter that the voter has selected more than one candidate for a single office on the ballot.	Pass
3.2.a.1.A.iii.II	Notify the voter before the ballot is cast and counted of the effect of casting multiple votes for the office.	Pass
3.2.a.1.A.iii.III	Provide the voter with the opportunity to correct the ballot before the ballot is cast and counted.	Pass
3.2.a.1.B	A state or jurisdiction that uses a paper ballot voting system, a punch card voting system, or a central count voting system (including mail-in absentee ballots and mail-in ballots), may meet the requirements of subparagraph (A) (iii) by:	.
3.2.a.1.B.i	Establishing a voter education program specific to that voting system that notifies each voter of the effect of casting multiple votes for an office.	Pass
3.2.a.1.B.ii	Providing the voter with instructions on how to correct the ballot before it is cast and counted (including instructions on how to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error).	Pass
3.2.a.1.C	The voting system shall ensure that any notification required under this paragraph preserves the privacy of the voter and the confidentiality of the ballot.	Pass
3.2.1	General usability	
3.2.1.a	The voting system shall support voters in the task of effectively completing their ballots.	Pass
3.2.1.b	The features of the voting system shall not contribute to the commission of voter error within the voting session.	Pass
3.2.2	Functional Capabilities	
	The usability of the voting process is enhanced by the presence of certain functional capabilities. These capabilities differ somewhat depending on whether or not the system presents an editable interface within which voters can easily change their votes (typically an electronic screen) or an interface in which voters must obtain a new ballot to make changes (typically a manually-marked paper ballot).	.
3.2.2.a	If the voter selects more than the allowable number of choices within a contest, the voting system shall notify the voter of the effect of this action before the ballot is cast and counted.	Pass
3.2.2.c	The voting system shall provide the voter the opportunity to correct the ballot for either an undervote or overvote before the ballot is cast and counted.	Pass

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.2.b	The voting system shall allow the voter, at the voter's choice, to submit an undervoted ballot without correction.	Pass
3.2.2.d	If and only if the voter successfully casts or prints the ballot, then the electronic ballot interface or PCOS system shall so notify the voter.	Pass
3.2.2.1	Editable electronic ballot interfaces	
	Voting systems such as DREs and EBMs present voters with an editable interface, allowing them to easily change their votes prior to final casting of the ballot.	
3.2.2.1.a	The electronic ballot interface shall prevent voters from selecting more than the allowable number of choices for each contest.	Pass
3.2.2.1.b	The electronic ballot interface shall provide feedback to the voter, before final casting or printing of the ballot, that identifies specific contests for which the voter has selected fewer than the allowable number of choices (i.e., undervotes).	Pass
3.2.2.1.c	The electronic ballot interface shall provide the voter the opportunity to correct the ballot before it is cast or printed. The electronic ballot interface shall allow the voter to make these corrections without assistance. The corrections to be supported include modifying an undervote and changing a vote from one candidate to another.	Pass
3.2.2.1.d	The electronic ballot interface shall allow the voter to change a vote within a contest before advancing to the next contest.	Pass
3.2.2.1.e	The electronic ballot interface shall provide navigation controls that allow the voter to advance to the next contest or go back to the previous contest before completing a vote on the contest(s) currently being presented (whether visually or aurally).	Pass
3.2.2.1.f	If the voter takes the appropriate action to cast a ballot, but the DRE does not accept and record it successfully, including failure to store the ballot image, then the DRE shall so notify the voter and provide clear instruction as to the steps the voter should take to cast the ballot.	Pass
3.2.2.1.g	If the electronic ballot interface generates a paper record (or some other durable, human-readable record) that can be the official ballot or determinative vote record, then the voting system shall allow the voter to verify that record using the same access features used by the voter to vote the ballot.	Pass
3.2.2.2	Non-Editable ballot interfaces	

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
	Non-Editable interfaces, such as manually-marked paper ballots, do not have the same flexibility as do editable interfaces. Nonetheless, certain features are required, especially in the case of precinct-based optical scanners.	
3.2.2.2.a	The PCOS system shall be capable of providing feedback to the voter that identifies specific contests for which the voter has made more than the allowable number of votes (i.e., overvotes).	*Not Applicable*
3.2.2.2.b	The PCOS system shall be capable of providing feedback to the voter that identifies specific contests for which the voter has made fewer than the allowable number of votes (i.e., undervotes). The system shall provide a means for an authorized election official to deactivate this capability entirely and by contest. However, if a ballot is submitted with all the contests on one side left blank, notification to the voter is performed as described in requirement 3.2.2.2 c	*Not Applicable*
3.2.2.2.c	The PCOS system shall be capable of notifying the voter that he or she has submitted a paper ballot that is blank on one or both sides. The system shall provide a means for an authorized election official to deactivate this capability.	*Not Applicable*
3.2.2.2.d	If the PCOS system has notified the voter that a potential error condition (such as an overvote, undervote, or blank ballot) exists, the system shall then allow the voter to correct the ballot or to submit it as is.	*Not Applicable*
3.2.2.2.e	Paper-based precinct tabulators shall be able to identify a ballot containing marginal marks. When such a ballot is detected, the tabulator shall:	*Not Applicable*
3.2.2.2.e.i	Return the ballot to the voter;	*Not Applicable*
3.2.2.2.e.ii	Provide feedback to the voter that identifies the specific contests for which a marginal mark was detected; and	*Not Applicable*
3.2.2.2.e.iii	Allow the voter either to correct the ballot or to submit the ballot "as is" without correction, at the voter's choice.	*Not Applicable*
3.2.2.2.f	Software used to format optical scan ballots shall constrain the size and contrast of all target areas to conform to the following requirements:	*Not Applicable*
3.2.2.2.f.i	The target shall be no less than 3 mm across in any direction	*Not Applicable*
3.2.2.2.f.ii	The contrast ratio between the target area boundaries and the surrounding space shall be no less than 10:1.	*Not Applicable*

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.2.2.g	If the voter takes the appropriate action to cast a ballot, but the PCOS system does not accept and record it successfully, including failure to read the ballot or to transport it into the ballot box, the PCOS shall so notify the voter.	*Not Applicable*
3.2.3	Privacy	
3.2.3	The voting process shall preclude anyone else from determining the content of a voter's ballot, without the voter's cooperation.	
3.2.3.1	Privacy at the polls	
3.2.3.1.a	The voting system shall prevent others from determining the contents of a ballot.	*Not Applicable**
3.2.3.1.b	The voting system shall support ballot privacy during the voting session and ballot submission.	*Not Applicable**
3.2.3.1.c	During the voting session, the audio interface of the voting system shall be audible only to the voter.	*Not Applicable**
3.2.3.1.d	The voting system shall issue all warnings in a way that preserves the privacy of the voter and the confidentiality of the ballot.	*Not Applicable**
3.2.3.1.e	The voting system shall not issue a receipt to the voter that would provide proof to another of how the voter voted.	*Not Applicable**
3.2.3.2	No recording of alternative format usage	
	When voters use non-typical ballot interfaces, such as large print or alternative languages, their anonymity may be vulnerable. To the extent possible, only the logical contents of their ballots should be recorded, not the special formats in which they were rendered. However, in the case of paper ballots, where the interface is the record, some format information is unavoidably preserved.	
3.2.3.2.a	No information shall be kept within an electronic cast vote record that identifies any alternative language feature(s) used by a voter.	Pass
3.2.3.2.b	No information shall be kept within an electronic cast vote record that identifies any accessibility feature(s) used by a voter.	Pass
3.2.4	Voter instructions, plain language, and information presentation	
	The features specified in this section are intended to minimize cognitive difficulties for voters. Voters should always be able to operate the voting system and understand the effect of their actions. Note that the “should” requirements in this section must be adhered to unless there is strong justification provided for making an exception.	

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.4.a	The voting system shall provide instructions for all its valid operations.	Pass
3.2.4.b	The voting system shall provide a means for the voter to get help directly from the system at any time during the voting session.	Pass
3.2.4.c	Instructional material for the voter shall conform to norms and best practices for plain language.	Pass
3.2.4.c.i	Warnings and alerts issued by the voting system shall be distinguishable from other information and should clearly state: The nature of the problem; Whether the voter has performed or attempted an invalid operation or whether the voting system itself has malfunctioned in some way; and The set of responses available to the voter.	Pass
3.2.4.c.ii	When an instruction is based on a condition, the condition should be stated first, and then the action to be performed.	Pass
3.2.4.c.iii	The voting system should use familiar, common words and avoid technical or specialized words that voters are not likely to understand.	Pass
3.2.4.c.iv	Each distinct instruction should be separated spatially from other instructions for visual or tactile interfaces, and temporally for auditory interfaces.	Pass
3.2.4.c.v	The voting system should issue instructions on the correct way to perform actions, rather than telling voters what not to do.	Pass
3.2.4.c.vi	The system's instructions should address the voter directly rather than use passive voice constructions.	Pass
3.2.4.c.vii	The voting system should avoid the use of gender-based pronouns.	Pass
3.2.4.d	Consistent with election law, the voting system shall support a process that does not introduce bias for or against any of the contest choices to be presented to the voter. In both visual and aural formats, the choices shall be presented in an equivalent manner.	Pass
3.2.4.e	The voting system shall provide the capability to design a ballot with a high level of clarity and comprehensibility.	Pass
3.2.4.e.i	The voting system should not visually present a single contest spread over two pages or two columns.	Pass
3.2.4.e.ii	The ballot shall clearly indicate the maximum number of candidates for which one can vote within a single contest.	Pass

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.4.e.iii	The relationship between the name of a candidate and the mechanism used to vote for that candidate shall be consistent throughout the ballot.	Pass
3.2.4.e.iv	The voting system should present instructions near to where they are needed.	Pass
3.2.4.f	The use of color by the voting system shall agree with common conventions: (a) green, blue or white is used for general information or as a normal status indicator; (b) amber or yellow is used to indicate warnings or a marginal status; (c) red is used to indicate error conditions or a problem requiring immediate attention.	Pass
3.2.4.g	When an icon is used to convey information, indicate an action, or prompt a response, it shall be accompanied by a corresponding linguistic label.	Pass
3.2.5	Visual display characteristics	
	The requirements of this section are designed to minimize perceptual difficulties for the voter. Some of these requirements are designed to assist voters with poor reading vision. These are voters who might have some difficulty in reading normal text, but are not typically classified as having a visual disability and thus might not be inclined to use the Acc-VS.	
3.2.5.a	If the voting system uses an electronic display screen as the primary visual interface for the voter, the display shall have the following characteristics:	
3.2.5.a.i	Flicker frequency NOT between 2 Hz and 55 Hz. Does not say “flashing elements” like NIST did? If so maybe one Dell reported concern in settings.	Untested
3.2.5.a.ii	Minimum display brightness: 130 cd/m2	Untested
3.2.5.a.iii	Minimum display darkroom 7×7 checkerboard contrast: 150:1	Untested
3.2.5.a.iv	Minimum display pixel pitch: 85 pixels/inch (0.3 mm/pixel)	Untested
3.2.5.a.v	Minimum display area 700 cm2	Untested
3.2.5.a.vi	Antiglare screen surface that shows no distinct virtual image of a light source	Untested
3.2.5.a.vii	Minimum uniform diffuse ambient contrast ratio for 500 lx illuminance: 10:1	Untested

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.5.b	Any aspect of the voting system voter interface that is adjustable by either the voter or poll worker, including font size, color, contrast, audio volume, or rate of speech, shall automatically reset to a standard default value upon completion of that voter's session. For the Acc-VS with an electronic image display, the aspects include synchronized audio/video mode and non-manual input mode.	Pass
3.2.5.c	If any aspect of a voting system is adjustable by either the voter or poll worker, there shall be a mechanism to allow the voter to reset all such aspects to their default values while preserving the current votes.	Pass
3.2.5.d	For all text intended for voters or poll workers, the voting system shall provide a font with the following characteristics	
3.2.5.d.i	Height of capital letters at least: 3.0 mm	Untested
3.2.5.d.ii	x-height of at least: 70% of cap height	Untested
3.2.5.d.iii	Stroke width at least: 0.35 mm.	Untested
3.2.5.e	A voting system that uses an electronic image display shall be capable of showing all information in at least two font sizes:	
3.2.5.e.i	3.0-4.0 mm cap height, with a corresponding x-height at least 70% of the cap height and a minimum stroke width of 0.35 mm;	Untested
3.2.5.e.ii	6.3-9.0 mm cap height, with a corresponding x-height at least 70% of the cap height and a minimum stroke width of 0.7 mm; under control of the voter. The system shall allow the voter to adjust font size throughout the voting session while preserving the current votes.	Untested
3.2.5.f	Text intended for the voter should be presented in a sans serif font.	Pass
3.2.5.g	Voting systems using paper ballots or paper verification records shall provide features that assist in the reading of such ballots and records by voters with poor reading vision.	
3.2.5.g.i	The voting system may achieve legibility of paper records by supporting the printing of those records in at least two font sizes, 3.0-4.0mm and 6.3-9.0mm.	Untested
3.2.5.g.ii	The system may achieve legibility of paper records by supporting magnification of those records. This magnification may be done by optical or electronic devices. The manufacturer may either: 1) provide the magnifier itself as part of the system, or 2) provide the make and model number of readily available magnifiers that are compatible with the system.	Untested

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.5.h	The colors in the default presentation shall support perception by voters and poll workers with color vision deficiencies, of all text, controls, and infographics or icons on the ballot or ballot interface.	
3.2.5.h.i	The default visual display for voters and poll workers of a voting station with an electronic display shall have a luminosity contrast ratio between the foreground text and background color of at least 10:1 for all elements that visually convey information such as text, controls, and infographics or icons. For paper ballots, the contrast ratio shall be at least 10:1 as measured based on ambient lighting of at least 300 lx.	Untested
3.2.5.h.ii	A voting station with an electronic display screen shall have a high contrast mode either as an initial setting or under the control of the voter. If the system allows the voter to adjust contrast during the voting session it shall preserve the current votes. High contrast is a luminosity contrast ratio between the foreground text and background color of at least 20:1. The high contrast mode shall use at least one of the following color combinations: o Black text on a white background o White text on a black background o Yellow text on a black background o Light cyan text on a black background	Untested
3.2.5.i	Color coding shall not be used as the sole means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.	Pass
3.2.6	Voter-interface interaction	
	The requirements of this section are designed to minimize interaction difficulties for the voter.	
3.2.6.a	Voting machines with electronic image displays shall not require page scrolling by the voter. Discussion: This is not an intuitive operation for those unfamiliar with the use of computers. Even those experienced with computers often do not notice a scroll bar and miss information at the bottom of the “page.” Voting systems may require voters to move to the next or previous "page."	Pass
3.2.6.b	The voting machine shall provide unambiguous feedback regarding the voter’s selection, such as displaying a checkmark beside the selected option or conspicuously changing its appearance.	Pass

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.6.c	d. Input mechanisms shall be designed to minimize accidental activation.	Pass
3.2.6.c.i	On touch screens, the sensitive touch areas shall have a minimum height of 0.5 inches and minimum width of 0.7 inches. The vertical distance between the centers of adjacent areas shall be at least 0.6 inches, and the horizontal distance at least 0.8 inches.	Untested
3.2.6.c.ii	No key or control on a voting machine shall have a repetitive effect as a result of being held in its active position.	Pass
3.2.6.1	Timing	
	These requirements address how long the system and voter wait for each other to interact.	.
3.2.6.1.a	The initial system response time of the electronic ballot interface shall be no greater than 0.5 seconds.	Pass*
3.2.6.1.b	When the voter performs an action to record a single vote, the completed system response time of the electronic ballot interface shall be no greater than one second in the case of a visual response, and no greater than five seconds in the case of an audio response.	Pass*
3.2.6.1.c	The completed system response time during a voter interaction with the visual display of the electronic ballot interface shall be no greater than 10 seconds.	Pass*
3.2.6.1.d	If the electronic ballot interface has not completed its visual response within one second, it shall present to the voter, within 0.5 seconds of the voter's action, some indication that it is preparing its response.	Pass
3.2.6.1.e	The electronic ballot interface shall detect and warn about lengthy voter inactivity during a voting session. Each electronic ballot interface shall have a defined and documented voter inactivity time, and that time shall be between two and five minutes.	Pass
3.2.6.1.f	Upon expiration of the voter inactivity time, the electronic ballot interface shall issue an alert and provide a means by which the voter may receive additional time. The alert time shall be between 20 and 45 seconds. If the voter does not respond to the alert within the alert time, the electronic ballot interface shall go into an inactive state requiring poll worker intervention.	Partial Pass*
3.2.7	Alternative languages	

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
	HAVA Section 301 (a)(4) states that the voting system shall provide alternative language accessibility pursuant to the requirements of Section 203 of the Voting Rights Act of 1965 (42 U.S.C. 1973aa-1a). Ideally every voter would be able to vote independently and privately, regardless of language. As a practical matter, alternative language access is mandated under the Voting Rights Act of 1975, subject to certain thresholds (e.g., if the language group exceeds 5% of the voting age population). Thus, election officials must ensure that the voting system they deploy is capable of handling the languages meeting the legal threshold within their districts.	
3.2.7.a	The voting system shall be capable of presenting the ballot, contest choices, review screens, vote verification records, and voting instructions in any language declared by the manufacturer to be supported by the system.	Pass
3.2.7.a.i	The electronic ballot interface should allow the voter to select among the available languages throughout the . voting session while preserving the current votes. When presenting a choice of languages to the voter, the electronic ballot interface shall use the native name of each language.	Pass
3.2.7.a.ii	Information presented to the voter in the typical case of English-literate voters (including instructions, warnings, messages, contest choices, and vote verification information) shall also be presented when an alternative language is being used, whether the language is written or an unwritten language presented aurally.	Pass
3.2.7.a.iii	Any records, including paper ballots and paper verification records, shall have the information required to support auditing by poll workers and others who can read only English.	Pass
3.2.7.a.iv	The manufacturer shall conduct summative usability tests for each of the voting system's supported languages, using subjects who are fluent in those languages but not fluent in English and shall report the test results, using the Common Industry Format, as part of the TDP. In addition, the usability test report shall be submitted to the EAC as part of the documentation manufacturers are required to file with the application to test a voting system.	*Not Applicable**
3.2.8	Usability for poll workers	

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
	Voting systems are used not only by voters to record their votes, but also by poll workers who are responsible for set-up, operation while polls are open, light maintenance, and poll closing. Because of the wide variety of implementations, it is impossible to specify detailed design requirements for these functions. The requirements below describe general capabilities that all systems must support.	Untested
3.2.8.a	Messages generated by the voting system for poll workers in support of the operation, maintenance, or safety of the system shall adhere to the requirements for clarity in Section 3.2.4 "Voter instructions, plain language and information presentation."	Untested
3.2.8.1	Operations	
	Poll workers are responsible for opening polls, keeping the polls open and running smoothly during voting hours, and closing the polls afterwards. Operations may be categorized in three phases: Setup includes all the steps necessary to take the system from its state as normally delivered to the polling place, to the state in which it is ready to record votes. It does not include ballot definition. Polling includes such functions as: • voter identification and authorization; • preparing the system for the next voter; • assistance to voters who wish to change their ballots or need other help; • system recovery in the case of voters who abandon the voting session without having cast a ballot; and routine hardware operations, such as installing a new roll of paper. Shutdown includes all the steps necessary to take the system from the state in which it is ready to record votes to its normal completed state in which it has captured all the votes cast and the voting information cannot be further altered.	
3.2.8.1.a	Voting system setup, polling, and shutdown, as documented by the manufacturer, shall be reasonably easy for the typical poll worker to learn, understand, and perform.	*Not Applicable*
3.2.8.1.b	The manufacturer shall conduct summative usability tests on the voting system using individuals who are representative of the general population and shall report the test results, using the Common Industry Format, as part of the TDP.	.

Table A-1 Usability Review Requirements Matrix *(continued)*

Requirement	Description	Result
3.2.8.1.b.i	The tasks to be covered in the test shall include setup, operation, and shutdown.	*Not Applicable*
3.2.8.1.b.ii	In addition, the usability test report shall be submitted to the EAC as part of the documentation manufacturers are required to file with the application to test a voting system.	*Not Applicable*
3.2.8.1.c	The voting system shall include clear, complete, and detailed instructions and messages for setup, polling, and shutdown.	*Not Applicable*
3.2.8.1.c.i	The documentation required for normal voting system operation shall be presented at a level appropriate for poll workers who are not experts in voting system and computer technology.	*Not Applicable*
3.2.8.1.c.ii	The documentation shall be in a format suitable for use in the polling place.	*Not Applicable*
3.2.8.1.c.iii	The instructions and messages shall enable the poll worker to verify that the voting system o Has been set up correctly (setup); o Is in correct working order to record votes (polling); and o Has been shut down correctly (shutdown).	*Not Applicable*
3.2.8.2	Safety	
	All voting systems and their components must be designed so as to eliminate hazards to personnel or to the equipment itself. Hazards include, but are not limited to: • fire hazards; • electrical hazards; • potential for equipment tip-over (stability); • potential for cuts and scrapes (e.g., sharp edges); • potential for pinching (e.g., tight, spring-loaded closures); and • potential for hair or clothing entanglement.	.
3.2.8.2.a	Devices associated with the voting system shall be certified in accordance with the requirements of UL 60950-1, Information Technology Equipment – Safety – Part 1 by a certification organization accredited by the Department of Labor, Occupational Safety and Health Administration's Nationally Recognized Testing Laboratory program.	Pass
3.2.8.2.b	The certification organization's scope of accreditation shall include IEC/UL 60950-1.	Pass

Table A-2 Accessibility Review Matrix Requirements

Requirement	Description	Result
Accessibility		
3.3	Accessibility Requirements	pass/fail
3.3.1	General accessibility	
	The requirements of this section are relevant to a wide variety of disabilities.	
3.3.1.a	The of this section are relevant to a wide variety of disabilities. Acc-VS shall be integrated into the manufacturer's complete voting system so as to support accessibility for disabled voters throughout the voting session.	
3.3.1.a.i	The manufacturer shall supply documentation describing 1) recommended procedures that fully implement accessibility for voters with disabilities and 2) how the Acc-VS supports those procedures.	Pass
3.3.1.b	When the provision of accessibility for the Acc-VS involves an alternative format for ballot presentation, then all information presented to non-disabled voters, including instructions, warnings, error and other messages, and contest choices, shall be presented in that alternative format.	Pass
3.3.1.c	The support provided to voters with disabilities shall be intrinsic to the Acc-VS. Personal assistive devices of the voter shall not be necessary to operate the Acc-VS correctly. This does not apply to personal assistive technology required to comply with 3.3.4 b.	Pass
3.3.1.d	If a voting system provides for voter identification or authentication by using biometric measures that require a voter to possess particular biological characteristics, then the Acc-VS shall provide a secondary means that does not depend on those characteristics.	Pass
3.3.1.e	If the Acc-VS generates a paper record (or some other durable, human-readable record) that can be the official ballot or determinative vote record then the voting system shall allow the voter to verify that record using the same access features used by the voter to cast the ballot.	Pass
3.3.2	Enhanced visual interfaces	

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
	These requirements specify the features of the Acc-VS designed to make the visual interface easier to see, in particular for voters with vision deficiencies, and synchronized with audio for voters with various language, reading, or some cognitive disabilities. In general, low vision is defined as having a visual acuity worse than 20/70. Low (or partial) vision also includes dimness of vision, haziness, film over the eye, foggy vision, extreme near-sightedness or far-sightedness, distortion of vision, color distortion or blindness, visual field defects, spots before the eyes, tunnel vision, lack of peripheral vision, abnormal sensitivity to light or glare and night People with tunnel vision can see only a small part of the ballot at one time. For these users it is helpful to have letters at the lower end of the font size range in order to allow them to see more letters at the same time. Thus, there is a need to provide font sizes at both ends of the range. People with low vision or color blindness benefit from high contrast and from a selection of color combinations appropriate for their needs. Between 7% and 10% of all men have color vision deficiencies. Certain color combinations in particular cause problems. Therefore, use of color combinations with good contrast is required. Note also the general Requirement 3.2.5 h.i. However, some users are very sensitive to very bright displays and cannot use them for long. An overly bright background causes a visual white-out that makes these users unable to distinguish individual letters. Thus, use of non-saturated color options is an advantage for some people. It is important to note that some of the requirements in 3.2.5 “Visual display characteristics” also provide support for voters with certain kinds of vision problems.	
3.3.2.a	An Acc-VS with a color electronic image display shall allow the voter to adjust the color saturation throughout the voting session while preserving the current votes.	Pass
3.3.2.a.i	At a minimum, two alternative display options listed shall be available: 1) black text on white background,2) white text on black background, 3) yellow text on a black background, or 4) light cyan text on a black background.	Pass

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
3.3.2.b	Groups of buttons and controls which perform different functions on the Acc-VS shall be distinguishable by both shape and color. This applies to buttons and controls implemented either "on-screen" or in hardware. This requirement does not apply to sizeable groups of keys in wide use by individuals with disabilities, such as a full alphabetic keyboard when used for purposes other than basic navigation and selection (e.g. entering a write-in candidate name).	Pass
3.3.2.c	If the Acc-VS has an electronic image display, the Acc-VS shall provide synchronized audio output to convey the same information as that which is displayed on the screen	
3.3.2.c.i	There shall be a means by which the voter can disable either the audio or the video output, resulting in a video-only or audio-only presentation, respectively.	Pass*
3.3.2.c.ii	The system shall allow the voter to switch among the three modes (synchronized audio/video, video-only, or audio-only) throughout the voting session while preserving the current votes.	Pass*
3.3.3	Audio-tactile interfaces	
	These requirements specify the features of the Acc-VS designed to not only assist voters who are blind, but also those voters who would benefit from an auditory, rather than a purely visual, interface.	
3.3.3.a & 3.3.3.a.i	The vendor shall conduct summative usability tests on the voting system using individuals who are blind. The vendor shall document the testing performed and report the test results using the Common Industry Format. This documentation shall be included in the Technical Data Package submitted to the EAC for national certification.	*Not Applicable**

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
3.3.3.b	The accessible voting station shall provide an audio-tactile interface (ATI) that supports the full functionality of the visual ballot interface, as specified in Subsection 2.3.3. • Instructions and feedback on initial activation of the ballot (such as insertion of a smart card), if this is normally performed by the voter on comparable voting stations • Instructions and feedback to the voter on how to operate the accessible voting station, including settings and options (e.g., volume control, repetition) • Instructions and feedback for navigation of the ballot • Instructions and feedback for contest choices, including write-in candidates • Instructions and feedback on confirming and changing selections • Instructions and feedback on final submission of ballot	*Not Applicable**
3.3.3.b.i	The ATI of the accessible voting station shall provide the same capabilities to vote and cast a ballot as are provided by other voting machines or by the visual interface of the standard voting machine. Discussion: For example, if a visual ballot supports voting a straight party ticket and then changing the choice in a single contest, so must the ATI.	*Not Applicable**
3.3.3.b.ii	The ATI shall allow the voter to have any information provided by the voting system repeated.	*Not Applicable**
3.3.3.b.iii	The ATI shall allow the voter to pause and resume the audio presentation.	*Not Applicable**
3.3.3.b.iv	The ATI shall allow the voter to skip to the next contest or return to previous contests. Discussion: This is analogous to the ability of sighted voters to move on to the next contest once they have made a selection or to abstain from voting on a contest altogether. v. The ATI shall allow the voter to skip over the reading of a referendum so as to be able to vote on it immediately.	*Not Applicable**
3.3.3.b.v	The ATI shall allow the voter to skip over the reading of a referendum so as to be able to vote on it immediately.	*Not Applicable**
3.3.3.c	All voting stations that provide audio presentation of the ballot shall conform to the following requirements:	

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
3.3.3.c.i	The ATI shall provide its audio signal through an industry standard connector for private listening using a 3.5mm stereo headphone jack to allow voters to use their own audio assistive devices.	*Not Applicable**
3.3.3.c.ii	When a voting machine utilize es a telephone style handset or headphone to provide audio information, it shall provide a wireless T-Coil coupling for assistive hearing devices so as to provide access to that information for voters with partial hearing. That coupling shall achieve at least a category T4 rating as defined by American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids, ANSI C63.19.	*Not Applicable**
3.3.3.c.iii	A sanitized headphone or handset shall be made available to each voter.	*Not Applicable**
3.3.3.c.iv	The audio system shall set the initial volume for each voting session between 60 and 70 dB SPL.	Untested*
3.3.3.c.v	The voting machine shall provide a volume control with an adjustable volume from a minimum of 20dB SPL up to a maximum of 100 dB SPL, in increments no greater than 10 dB.	Untested*
3.3.3.c.vi	The audio system shall be able to reproduce frequencies over the audible speech range of 315 Hz to 10 KHz.	Untested*
3.3.3.c.vii	The audio presentation of verbal information should be readily comprehensible by voters who have normal hearing and are proficient in the language. This includes such characteristics as proper enunciation, normal intonation, appropriate rate of speech, and low background noise. Candidate names should be pronounced as the candidate intends.	Pass
3.3.3.c.viii	The audio system shall allow voters to control the rate of speech. The range of speeds supported should be at least 75% to 200% of the nominal rate.	Pass
3.3.3.d	If the normal procedure is to have voters initialize the activation of the ballot, the accessible voting station shall provide features that enable voters who are blind to perform this activation.	Pass
3.3.3.e	If the normal procedure is for voters to submit their own ballots, then the accessible voting station shall provide features that enable voters who are blind to perform this submission.	Pass
3.3.3.f	All mechanically operated controls or keys on an accessible voting station shall be tactilely discernible without activating those controls or keys.	*Not Applicable*

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
3.3.3.g	On an accessible voting station, the status of all locking or toggle controls or keys (such as the "shift" key) shall be visually discernible, and discernible either through touch or sound.	*Not Applicable*
3.3.4	Enhanced input and control characteristics	
	These requirements specify the features of the Acc-VS designed to assist voters who lack fine motor control or use of their hands.	
3.3.4.a	The Acc-VS shall provide a 3.5 mm industry standard jack used to connect a personal assistive technology switch to the Acc-VS. This jack shall allow only switch data to be transmitted to the voting system. The voting system shall accept switch input that is functionally equivalent to tactile input. All the functionality of the Acc-VS (e.g., straight party voting, write-in candidates) that is available through the conventional forms of input, such as tactile, shall also be available through this non-manual input mechanism.	*Not Applicable**
3.3.4.b	The Acc-VS shall provide features that enable voters who lack fine motor control or the use of their hands to submit their ballots privately and independently without manually handling the ballot.	Partial pass
3.3.4.c	All keys and controls on the accessible voting station shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be no greater 5 lbs. (22.2 N).	Pass
3.3.4.d	The accessible voting station controls shall not require direct bodily contact or for the body to be part of any electrical circuit.	*Not Applicable**
3.3.5	Design for mobility aids	
	These requirements specify the features of the Acc-VS designed to assist voters who use mobility aids, including wheelchairs. Many of the requirements of this section are based on the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).	
3.3.5.a	The accessible voting station shall provide a clear floor space of 30 inches (760 mm) minimum by 48 inches (1220 mm) minimum for a stationary mobility aid. The clear floor space shall be level with no slope exceeding 1:48 and positioned for a forward approach or a parallel approach.	*Not Applicable**
3.3.5	All controls, keys, audio jacks and any other part of the accessible voting station necessary for the voter to operate the voting machine shall be within reach as specified under the following sub-requirements:	

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
3.3.5.1.a	If the accessible voting station has a forward approach with no forward reach obstruction then the high reach shall be 48 inches maximum and the low reach shall be 15 inches minimum.	*Not Applicable**
3.3.5.1.b.i 3.3.5.1.b.ii	If the accessible voting station has a forward approach with a forward reach obstruction, the following requirements apply: • The forward obstruction shall be no greater than 25 inches in depth, its top no higher than 34 inches and its bottom surface no lower than 27 inches. • If the obstruction is no more than 20 inches in depth, then the maximum high reach shall be 48 inches, otherwise it shall be 44 inches.	*Not Applicable**
3.3.5.1.b.iii	Space under the obstruction between the finish floor or ground and 9 inches (230 mm) above the finish floor or ground shall be considered toe clearance and shall comply with the following provisions: • Toe clearance shall extend 25 inches (635 mm) maximum under the obstruction • The minimum toe clearance under the obstruction shall be either 17 inches (430 mm) or the depth required to reach over the obstruction to operate the accessible voting station, whichever is greater • Toe clearance shall be 30 inches (760 mm) wide minimum	*Not Applicable**
3.3.5.1.b.iv	Space under the obstruction between 9 inches (230 mm) and 27 inches (685 mm) above the finish floor or ground shall be considered knee clearance and shall comply with the following provisions: • Knee clearance shall extend 25 inches (635 mm) maximum under the obstruction at 9 inches (230 mm) above the finish floor or ground. • The minimum knee clearance at 9 inches (230 mm) above the finish floor or ground shall be either 11 inches (280 mm) or 6 inches less than the toe clearance, whichever is greater. • Between 9 inches (230 mm) and 27 inches (685 mm) above the finish floor or ground, the knee clearance shall be permitted to reduce at a rate of 1 inch (25 mm) in depth for each 6 inches (150 mm) in height. • Knee clearance shall be 30 inches (760 mm) wide minimum.	*Not Applicable**

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
3.3.5.c	All labels, displays, controls, keys, audio jacks, and any other part of the accessible voting station necessary for the voter to operate the voting machine shall be easily legible and visible to a voter in a wheelchair with normal eyesight (no worse than 20/40, corrected) who is in an appropriate position and orientation with respect to the accessible voting station	*Not Applicable**
3.3.5.1.c	If the accessible voting station has a parallel approach with no side reach obstruction then the maximum high reach shall be 48 inches and the minimum low reach shall be 15 inches.	*Not Applicable**
3.3.5.1.d.i 3.3.5.1.d.ii	If the accessible voting station has a parallel approach with a side reach obstruction, the following sub-requirements apply. • The side obstruction shall be no greater than 24 inches in depth and its top no higher than 34 inches. • If the obstruction is no more than 10 inches in depth, then the maximum high reach shall be 48 inches, otherwise it shall be 46 inches.	*Not Applicable**
3.3.6	Enhanced auditory interfaces	
	These requirements specify the features of the Acc-VS designed to assist voters with hearing disabilities.	
3.3.6 a	The Acc-VS shall incorporate the features listed under Requirement 3.3.3 c for voting systems that provide audio presentation of the ballot.	Partial pass
3.3.6 b	If voting equipment provides sound cues as a method to alert the voter, the tone shall be accompanied by a visual cue, unless the station is in audio-only mode.	Pass
3.3.6.c	No voting device shall cause electromagnetic interference with assistive hearing devices that would substantially degrade the performance of those devices. The voting device, measured as if it were a wireless device, shall achieve at least a category T4 rating as defined by [ANSI01] American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids, ANSI C63.19.	Untested*
3.3.8	English proficiency	
3.3.8.a	For voters who lack proficiency in reading English, the Acc-VS shall provide an audio interface for instructions and ballots as described in 3.3.3 b.	Pass
3.3.9	Speech not required	
3.3.9.a	The voting system shall not require voter speech for its operation.	Pass

Table A-2 Accessibility Review Matrix Requirements *(continued)*

Requirement	Description	Result
3.3.10	Summative Usability Report	
3.3.10.a	The manufacturer shall submit a report of their summative usability tests on the voting system using individuals who are representative of the general population.	*Not Applicable**
3.3.10.a.i	The report shall be submitted in the Common Industry Format.	*Not Applicable**
3.3.10.a.ii	The report shall contain the results of the summative usability tests.	*Not Applicable**
3.3.10.b	The manufacturer shall conduct summative usability tests on the Acc-VS using individuals with low vision and shall report the test results, using the Common Industry Format, as part of the TDP.	*Not Applicable**
3.3.10.b.i	In addition, the usability test report shall be submitted to the EAC as part of the documentation manufacturers are required to file with the application to test a voting system.	*Not Applicable**
3.3.10.c	The manufacturer shall conduct summative usability tests on the Acc-VS using individuals lacking fine motor control and shall report the test results, using the Common Industry Format, as part of the TDP.	*Not Applicable**
3.3.10.c.i	The vendor shall conduct summative usability tests on the voting system using individuals lacking fine motor control. The vendor shall document the testing performed and report the test results using the Common Industry Format. This documentation shall be included in the Technical Data Package submitted to the EAC for national certification.	*Not Applicable**
3.3.10.c.i	In addition, the usability test report shall be submitted to the EAC as part of the documentation manufacturers are required to file with the application to test a voting system.	*Not Applicable**
	Discussion: Voting system developers are required to conduct realistic usability tests on their product before submitting the system to conformance testing. This is to encourage early detection and resolution of usability problems. The manufacturer must submit the usability test report to the VSTL as part of their TDP. The VSTL will then check the technical data package to ensure that the report is present and reported in the Common Industry Format and contains the results from a summative usability test.	

ATTACHMENT B – VOATZ EBDM RESPONSES

Electronic Ballot Delivery and Marking

Voatz Remote Accessible Ballot Delivery, Marking, and Return System
Voatz, Inc.

In response to recently-issued guidance to election officials regarding electronic ballot delivery and marking circulated by the Federal Election Assistance Commission (EAC) [1], Voatz provides the following information on Voatz functionality.

System Considerations

System Infrastructure

Consideration	Voatz Implementation
How will the voting infrastructure be hosted (i.e., on servers at your facility, in the cloud, etc.)?	Voatz infrastructure is hosted at qualified, professional cloud services providers Microsoft and Amazon.
If you use the cloud, do you have awareness of where will the data be hosted (i.e. outside your jurisdiction, state, or the United States)?	All Voatz critical infrastructure is hosted within the United States at Microsoft Azure™ and Amazon Web Services™ data centers.
Does the system have the capacity to handle the increased load?	Cloud services enable spinning up additional servers on demand. Voatz runs monitored automated load tests daily to assess performance of the server(s) so that additional servers can be commissioned during heaviest load if needed.
What redundancies should be built into the system (i.e., backups, failover system, etc.)?	All Voatz cloud servers have hot standby replacements and are backed up daily.
Who will administer system configuration (i.e., security, load balancing, updates, patches, etc.)?	Voatz IT operations team, with guidance from the cloud providers, handles configuration of load balancing, security patches, etc.

[1] See: *Electronic Ballot Delivery and Marking Considerations for Election Officials* (as posed by CISA)
https://www.eac.gov/sites/default/files/electionofficials/vbm/eBallot_Delivery.pdf

Electronic Interface / Usability &Accessibility

Consideration	Voatz Implementation
Is the system accessible to voters with specific needs (i.e., visual impairments, disabilities, language, etc.)?	Yes. Voatz apps operate on iOS or Android smartphones and incorporate Apple's and Google's native accessibility features including VoiceOver™, TalkBack™, etc. The Voatz interface and onscreen help are available in English and Spanish. Ballots can be translated into additional languages.
Is the system compatible with mobile devices?	Yes. Voatz apps are designed specifically to operate on Apple iOS v12.4 or higher or Android v8 or higher mobile phones (not other devices).
Is the system compatible with readily available screen readers?	Yes. Voatz runs as native iOS or Android smartphone apps which incorporate Apple's and Google's VoiceOver, TalkBack, as well as other accessibility features.
Is the system accessible with binary personal assistive technologies (i.e., jelly switches, sip-n-puff, etc.)?	Voatz for iOS supports Voice Control hands-free operation. Binary assistive technologies have not been tested but may be adaptable with Bluetooth™.
Do you provide help to voters directly through the electronic ballot delivery system?	Yes. Context dependent, on screen Help is available in English and Spanish. In addition, Voatz detects if a screen reader is enabled, and provides modified help when necessary.

Election Definition Files

Consideration	Voatz Implementation
What file format does your system accept (i.e., HTML, PDF, CSV, etc.)?	Voatz interprets native Electionware™ and ClearVote™ election definition files to transform them into remote accessible ballots. For other vendors, specific scripting routines are used to transform PDF designs into remote accessible ballot formats.
Does your voting system produce ballots in the accepted file types, or do you need software to convert them?	Yes, for supported vendors, fully marked and scannable ballots are available for printing and tabulation by the primary voting system.
What type(s) of audio files does your system use?	Audio files are not required as Apple iOS and Android provide speech to text.
What languages do the ballots need to be presented in?	Determined by jurisdiction. Voatz currently supports English/Spanish EBM interface.

Additional Supplies

Consideration	Voatz Implementation
Do you need to supply additional affidavits and instructions to the voter who votes electronically?	Voatz offers an electronic affidavit with signature or checkbox if required by the jurisdiction- typically for UOCAVA voters.
Will your materials contain labels and self-folding envelopes to mail the ballots back?	No. Ballot return is electronic over secure network and auditable.
Will you provide printable privacy sleeves for the voter to protect the ballot?	Not applicable. Electronic affidavits are stored separately from the returned ballot for privacy and ballots are identified in an anonymized manner.
What auxiliary technologies are required for the voter to complete his or her ballot (i.e., Internet service, email, printer, fax service, specific software, etc.)?	Voatz requires a supported Apple or Android smartphone, an email account, and cellular or Wi-Fi connectivity. No paper, printer or postal service is involved. Auxiliary voting channels should be available for other voters.

Ballot Duplication

Consideration	Voatz Implementation
Many ballots generated by an electronic ballot delivery system cannot be directly scanned and tabulated into your voting system. To tabulate ballots using the voting system, the ballots must be printed on paper stock meeting certain specifications. For those ballots, enough blank paper stock will need to be purchased in advance. Jurisdictions may need additional technology (i.e., ballot duplication system, ballot on demand system, etc.) or staff to duplicate electronically generated ballots onto a ballot that can be scanned and duplicated. Depending on the volume of ballots that require duplication, additional staff needs could be significant.	Voatz is rare in its ability to return the ballots electronically to the jurisdiction. After they confirm the voter's affidavit, election officials print marked, scannable ballots directly on ballot stock for tabulation. Election officials do not need to open paper mail. Nor is faxing or hand transcribing required. Voatz supports jurisdiction and/or public post-election auditing of ballots.

Security Recommendations

Vulnerability Scan and Remote Penetration Testing

Recommendation	Voatz Implementation
Because these systems are publicly facing, jurisdictions using an electronic ballot delivery system should request a vulnerability scan and remote penetration test be conducted on the system. Also, for vendor-provided systems, election officials should suggest that their vendor subject the system to a critical product evaluation. These services provide the situational awareness needed to make informed decisions to manage the risks associated with the system and are provided at no cost to election jurisdictions and their private sector partners.	Voatz conducts frequent penetration testing of all its assets. In September 2019, the CISA Hunt and Incident Response Team (HIRT) conducted a proactive hunt operation that included the Voatz internal corporate network, as well as Amazon Web Services (AWS) and Microsoft Azure cloud networks that support the mobile-based election infrastructure. HIRT analysts did not detect threat actor behaviors or artifacts of past activities on the in-scope portions of the Voatz networks. HIRT commended Voatz for their proactive measures in the use of canaries, bug bounties, Shodan alerts, and active internal scanning and red teaming.

Recommendation	Voatz Implementation
	For more, see: https://voatz.com/Hunt-Engagement-Summary-Voatz.pdf

Web-Based Portals and File Servers

Recommendation	Voatz Implementation
Use security best practices for web and network connected election systems, including two-factor authentication (2FA) for employees and voters.	Yes, Voatz Admin portal uses 2FA for election officials. Voters use the Voatz app on compatible iOS and Android smartphones with integrated security features such as biometrics, identity verification and multi-factor authentication.
Encrypt traffic using secure hypertext transfer protocol (HTTPS) or, if you use a file server, ensure it uses a secure file transfer protocol (SFTP) by supporting transport layer security (TLS) version 1.2.	Yes, all traffic is encrypted using TLSv1.2 and the payloads are further encrypted using AES-256 GCM encryption.
Obtain outside cybersecurity assessments, such as CISA vulnerability scanning and remote penetration testing.	Yes, Voatz has voluntarily submit edits platform and infrastructure for testing by CISA and 3rd party testing laboratories.