Source code review was done to determine if there were any vulnerabilities that warranted additional testing. System Level Testing examined EVS 6021 in terms of conducting a general election and closed primary election. The election runs were to (a) test and confirm that the anomalies identified during EVS 6000 examination were remediated and (b) to perform regression testing of all components of the system. The election runs allowed the Functional Examiner to ascertain that compliance with the Election Code requirements determined during the System Level Testing of EVS 6000 is maintained in the new release. The Documentation review was conducted to ensure that that the system documentation for EVS 6021 provided accurate validation procedures for verifying installation of correct system components.

Accessibility Examination

The Department of State in consultation with the Accessibility Examiner decided that the findings from EVS 6000 Accessibility Examination could be used for EVS 6021, since there were no hardware changes and the isolated code changes were for performance improvements and fixing the anomalies identified during EVS 6000 Functional Examination.

Security Testing

The Security Examiner evaluated the system changes, specifically the changes to the Electionware hardening scripts to confirm that the script changes would secure the Election Management installation further.

B. Examination Process and Procedures

The examination process and procedures followed for EVS 6000 and EVS 6021 examinations are listed in the below sections. The final determination in this report is based on the combined analysis of the results and conclusions from both examinations.

EVS 6000 Examination

Functional Examination

The public demonstration and functional examination portion commenced on June 25, 2018, at Room G24A/B of the Commonwealth Capitol Complex - Finance Building, 613 North Street, Harrisburg PA 17120. The test execution tasks took approximately two and one-half days. Members of the public were allowed as observers for the examination. The Functional Examiner performed System Level Testing, Security/Penetration Testing and Privacy and Usability Analysis during the examination. Source code and Documentation review were completed prior to the public examination at SLI lab facilities in Wheat Ridge, Colorado.

ES&S supplied all the hardware equipment required for the examination. All software and firmware necessary to perform the examination was received directly from the Voting System Test Laboratories (VSTL) that tested the voting system for EAC certification. The trusted build of the software and firmware for each device being evaluated were installed using the appropriate media for installation. The hash codes for all system components were captured using the process listed in the manufacturer's Technical Data Package (TDP) by the Functional Examiner with assistance from ES&S representative. The Functional Examiner further compared and confirmed that all the captured hash codes matched the hash codes for the EAC certified system executables before executing the test scripts.

The Functional Examiner created the election definition using Electionware and prepared the precinct tabulation device DS200, polling place vote capture devices ExpressVote XL and Express Vote 2.1 and central scanners DS450 and DS850 using transport media. The polling place was set up using ExpressVote XL, ExpressVote 2.1 Marker, ExpressVote 2.1 Tabulator and DS200. A primary and general election were then run using polling place devices and central scanners. Ballots were tabulated via the polling place tabulation devices and central scanners. Results were then tabulated using Electionware and validated against expected results.

Accessibility Examination

The accessibility examination portion commenced on June 25, 2018, at Room

G24A/B of the Commonwealth Capitol Complex - Finance Building, 613 North Street, Harrisburg, PA 17120. The examination lasted approximately three days followed by a debrief meeting on June 28, 2018 with DOS and CCD to discuss initial findings. The examination included expert review by the Accessibility Examiner, sessions with 3 poll worker groups from Dauphin County, PA, and sessions with 7 voters with disabilities using different assistive devices for voting. The voter sessions each took approximately an hour and the poll worker sessions took approximately 90 minutes each. ES&S supplied the hardware and supplies for the Accessibility Examination. The equipment was prepared for the examination by loading the required election definition using transport media. The Accessibility Examiner prepared voting scenarios for each voting session to allow comparison of results between each session. The scenarios were constructed to provide a structured opportunity to explore how the system works in all interaction modes, using:

- visual touch screen with default settings;
- visual touch screen with text size and contrast changes;
- audio and the tactile keypad;
- audio and the visual touch screen; and
- audio or visual display with the dual switch.

Both the ballot contents and the instructions for marking the ballot were designed to exercise different types of interactions (navigation in ballot, navigation in contest, undervotes, overvotes, straight party). The ballot included both very short contests, and those long enough to potentially fill more than one screen, even at the default text size.

Expert Review by Accessibility Examiner

The Accessibility Examiner used the same ballot and instructions to be used for voter and poll worker review, for their expert review, so they would be familiar with the interaction voters would experience.

Sessions with voters

The voter sessions all took about an hour. They included:

- An opening interview about their previous voting experience and the types of assistive technology they used in both daily life and in voting.
- Orientation to the system with an opportunity for voters to ask questions about any assistive technology available. For example, one participant asked if she would be able to use her own audio to connect directly to her hearing aids.
- Voting a ballot, following instructions given verbally by the Accessibility Examiner. Voters were encouraged to give feedback as they went through the ballot. The Accessibility Examiner and the voters discussed any feedback and questions that occurred during the voting sessions and re-evaluated any findings as necessary.
- A closing interview about their reactions to the experience of using the voting system.

Sessions with poll worker groups

The sessions took 60-90 minutes, depending on how many people were in each group. The session included:

- A brief orientation to the voting system and the access features, similar to the way a poll worker trainer might introduce the system.
- The poll workers each then marked a ballot, tried out the access features if they wanted, and were given an opportunity to read the "During Election Day" instructions provided with the system
- The Accessibility Examiner presented them with 6 scenarios of different access needs and asked them to help set up the system for one of the facilitators acting as the voter in each of the scenarios.

The Accessibility Examiner took notes about aspects of the system that worked well and problems they encountered during all three phases of the examination. The issues were then categorized based on their impact on a voter's ability to vote independently and

privately.

- Positives – things that voters mentioned as meeting or exceeding their expectations
- Annoyances – things voters mentioned as problems, but which did not significantly slow their progress in marking their ballot
- Problem solving – instances where voters had to pause to figure out how to complete an action or task, but were able to do so on their own, by exploring the system or relying on past experience with technology
- Needs assistance - problems that could only be solved with help, such as instructions or assistance from a poll worker
- Show stoppers - problems that could prevent successful independent and private voting, even with good knowledge about how to use the system and accessibility features

The Accessibility Examiner then compiled the findings including categorizations from the examination into a report submitted to the Secretary.

Security Testing

The Security Testing was done at SLI lab facilities in Wheat Ridge, Colorado. The Security Examiner received the hardware devices from ES&S and the software and firmware was obtained from the Voting System Test Lab (VSTL) which tested the system for EAC certification testing. The Examiner installed the Trusted Build prior to the evaluation using the appropriate media for installation. The Security Testing is comprised of a series of test suites which are utilized for verifying that a voting system will correspond to applicable security requirements within the Pennsylvania Election Code. The Security Examiner evaluated each component of the EVS 6000 system and the system as a whole for interactions between components. These test suites covered areas of confidentiality, vote anonymity, integrity, availability, and auditability of the voting systems.

The requirements associated to each area of testing were applied to the EVS 6000 system in the following manner. The Security Examiner did a review of the EAC testing reports of the system and also executed tests for a cross section of VVSG 2005 requirements to reconfirm compliance. The Security Examiner then designed tests that included in depth verification and validation of reports, audit logs and physical access controls for each of the components of the voting system. The physical security examination included security seals, lock/key combinations, measures for collection of voting in the event of an extended power outage, ballot box and system access points. Tests were done to ensure that election results, media used, reports and audit logs were protected from attempts to decrypt, manipulate or corrupt election data. The Security Examiner also created a vulnerability assessment and performed penetration testing of the EVS 6000 system.

ES&S EVS 6021 examination

Functional Examination

The follow-up examination commenced on September 25, 2018, at SLI Global Solutions facility, 4720 Independence Street, Wheat Ridge, Colorado, and was observed by Department staff in a conference room in BCEL, 210 North Office Building, 401 North Street, Harrisburg, Pennsylvania via web conference. ES&S supplied all the hardware equipment required for the examination. All software and firmware necessary to perform the examination was received directly from the VSTL that tested the voting system for EAC certification. The Functional Examiner installed and/or verified the Trusted Build for each system component. A primary and general election were then run using ExpressVote XL, ExpressVote 2.1 (Marker and Tabulator), DS200, DS450 and DS850. Results were then tabulated and validated against expected results. The Functional Examiner performed the Source Code and Documentation Review before the witnessed examination.

Security Testing

The follow-up Security testing verified the changes to the documentation for appropriately hardening the Electionware EMS for secure installation.

C. Examination Results

EVS 60000 Functional Examination

On July 16, 2018, the Functional Examiner issued his draft report for the testing of EVS 6000 with a recommendation that the system was not in compliance with Sections 1107-A(3) and (13) of the Pennsylvania Election Code, 25 P.S. §§ 3031.7(3) & (13). The report noted the following concerns for PA method implementation:

1) On the ExpressVote XL, when voting a straight party ballot and the voter modified a straight party contest that was a "vote for no more than N" and has "N" candidates for the selected party, with a write-in candidate, the voter was incorrectly notified that they were attempting to overvote. In fact, following the PA method implementation, the "N" straight party selected candidates should have been deselected and the voter should have been able to proceed with the write-in.

2) On the ExpressVote 2.1, in the general election, an issue was encountered when voting a straight party ballot and the voter modified a straight party contest that was a "vote for no more than N" and had less than "N" candidates for the selected party. In this scenario, the ExpressVote 2.1 continuously instantiated the PA method any time when the marks on the ballot were the same candidate selections as the straight party selection, irrespective of whether it was the first time a selection was made in the contest after straight party voting or not.

The Functional Examiner noted that the test results were not as expected for the tests executed to verify compliance to Section 1107-A(3), 25 P.S. § 3031.7(13), since an issue was encountered when a general election ballot was scanned through the ExpressVote XL but scanned at an unexpected orientation such that the implemented image area capture parameters were too tight and that Electionware was unable to parse two write-ins from the ballot image, so those write-ins could not be adjudicated.

The Functional Examiner also noted that the EVS 6000 system TDP needed to be

updated to provide accurate validation procedures for verifying installation of correct system components. The EVS 6000 documentation did not accurately reflect system verification procedures for ExpressVote 2.1.

The Functional Examiner's report indicated successful completion of tests executed to ascertain compliance to all other requirements mandated by the Pennsylvania Election Code. The Examiner report for EVS 6000 (Test Report – PES-002-FTR-01) included details of the test cases, execution and successful completion. The following section is a summary of the results of the examination as set forth in fuller detail in the Examiner's Report.

1. Source Code Review

Source Code Review for EVS 6000 was performed, with a focus on determining whether any vulnerabilities could be found. The Functional Examiner reported that the code review was completed with no identified malicious software, cryptographic software, process control or password management vulnerabilities. The Examiner concluded that no deficiencies were found during source code review.

2. Documentation Review

The Documentation Review testing performed by the Functional Examiner demonstrates that the EVS 6000 meets the relevant requirements of the Pennsylvania Election Code. The Examiner reviewed the "Test Report for EAC 2005 VVSG Certification Testing of ES&S EVS 6.0.0.0 Voting System" (report number ESS-7001-CTR-01).

The review of the EAC test reports by the Functional Examiner and the EAC certifications submitted by ES&S satisfy the requirements of Section 1105-A(a) of the Election Code, 25 P.S.§ 3031.5(a): requiring that an electronic voting system has been examined and approved by a federally recognized independent testing authority (ITA), or VSTL as such authorities are now called, as meeting the applicable performance and test standards established by the federal government.

Functional Examiner concluded that the design requirements of Sections 1107-A(11) and (14) of the Pennsylvania Election Code, 25 P.S. §§ 3031.7(11) & (14), are met by the combination of EAC hardware Non-Operating Environmental Tests, which included bench handling, vibration, low temperature, high temperature, humidity and product safety tests. The system accuracy testing during EAC certification testing provided confirmation of system accuracy as required by Section 1107-A(11) of the Pennsylvania Election Code, 25 P.S. § 3031.7(11).

The system summative usability test reports were accepted by the EAC as part of the Federal Certification. This, along with the Functional Examiner's use of the system, demonstrates that the system can be readily learned and hence satisfied the usability requirement of Section 1107-A(15) of the Pennsylvania Election Code, 25 P.S. § 3031.7(15).

3. System Level Testing

As set forth in the examination approach, System Level Testing was divided into two separate tests, a closed primary election and a general election. The ballots defined had contests with voting variations supported in Pennsylvania.

A closed primary election consisting of two parties (Republican, Democratic), three precincts, and 16 contests (14 partisan contests and 2 referendums - 8 "Vote for One", 1 "Vote for no more than Two", 3 "Vote for no more than Three", 1 "Vote for no more than Four" and 1 "Vote for no more than Fifteen") was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. Referendum contests were added to test the generation of non-partisan ballots. The Functional Examiner validated compliance of the system to Sections 1101-A and 1107-A(2), (5)-(11), 25 P.S. §§ 3031.1, 3031.7(2), (5)-(11). No issues or anomalies were experienced during these tests, and the objective criteria established in the test protocols were met.

A general election consisting of four parties (Republican, Democratic, Green and Libertarian), three precincts (one of which was a split precinct), and 16 contests (13 partisan contests, 1 non-partisan and 2 retention contests, 9 "Vote for One", 1 "Vote for no more

than Two", 3 "Vote for no more than Three", and 1 "Vote for no more than Fifteen") was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. The Functional Examiner examined the compliance of the system to Sections 1101-A and 1107-A(2)-(8), (10)-(11) and (13), 25 P.S. §§ 3031.1, 3031.7(2)-(8), (10)-(11) & (13).

The Functional Examiner included test cases to validate Sections 1107-A(16) and (17), 25 P.S. §§ 3031.7(16) & (17), that mandate voting systems to generate zero proof reports and correctly handle over-votes during the election runs. The remainder of the requirements of 25 P.S. §§ 3031.7(16) and (17) were validated by the Functional Examiner during the Security/Penetration Analysis.

Election definitions for both primary and general elections were created within Electionware, and transport media was created to populate ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. Polls were opened and ballots were marked manually, as well as electronically via the ExpressVote 2.1 in Marking mode, then tabulated through the polling place DS200 scanner. Ballots were marked and tabulated utilizing the polling place ExpressVote 2.1 in Tabulator mode and the ExpressVote XL devices. All ballots (hand marked, ExpressVote 2.1 in Marking mode, ExpressVote 2.1 in Tabulator mode, and ExpressVote XL) created were then tabulated through the DS450 and DS850. Thus, each ballot was tabulated three times.

The Functional Examiner used English and Spanish ballots for the test. Reports were generated after closing polls and results were validated against expected results. Each specific hardware and software component was tested for compliance with the required sections of the Election Code.

The EVS 6000 is a paper-based system and paper ballots provide a permanent physical record of each vote cast adhering to Section 1101-A, 25 P.S. § 3031.1. Hand marked paper ballots and ExpressVote 2.1 in marker mode allow voters to use the precinct scanner DS200 for tabulation. ExpressVote 2.1 in tabulator mode and ExpressVote XL create a paper ballot based on a voter's selections, which is tabulated when the voter affirms that he/she is ready to cast a vote.

The primary and general election definitions were created using Electionware and loaded to polling place devices and central scanners, which provided assurance that the system can perform ballot creation activities. The Functional Examiner successfully added contests including straight party, parties, choices, precincts, districts, ballot styles, referendum questions and retention contests with appropriate candidates and choices. The ExpressVote 2.1 (marker and tabulator), ExpressVote XL and DS200 components of the EVS 6000 successfully permitted votes for "1 of 1," "N of M," and "Question" contests for a standard and ADA voting session. The Functional Examiner also exercised a straight party vote to confirm that all appropriate candidates were selected. The Functional Examiner thus concluded that the system is in compliance with Section 1107-A(2), 25 P.S. § 3031.7(2).

Each of the applicable components of EVS 6000 allowed the test voter to cast a write-in vote and demonstrated compliance with Section 1107-A(5), 25 P.S. § 3031.7(5).

EVS 6000 meets the requirements for Section 1107-A(6), 25 P.S. § 3031.7(6), because the test voters cast votes on different ballot styles for candidates and questions and the ExpressVote 2.1 and ExpressVote XL displayed only contests for which the voter was entitled to vote.

The system's compliance to Section 1107-A(7), 25 P.S. § 3031.7(7), was demonstrated since DS200 has the capability to indicate overvotes for any office and the voter has the ability to either spoil the ballot or cast the ballot with overvotes if the voter decides to do so. ExpressVote XL and ExpressVote 2.1 (marker and tabulator) did not allow overvotes. The Functional Examiner also noted that the system allowed undervotes, but warned the user about the undervote when configured to do so.

The successful validation of the election results shows that central scanners DS450 and DS850, as well as precinct tabulator DS200, include the capability to reject all choices recorded on the ballot for an office or question if the number of choices exceeds the number for which the voter is entitled to vote, adhering to Section 1107-A(8), 25 P.S. § 3031.7(8).

The EVS 6000 complies with Section 1107-A(9), 25 P.S. § 3031.7(9), because test

voters in the closed primary election were only able to vote for referendum questions and candidates seeking the nomination of their party.

Adherence to Section 1107-A(10), 25 P.S. § 3031.7(10), was demonstrated for both ADA and standard voting sessions. ExpressVote 2.1 and ExpressVote XL allowed the voters to review their ballots before printing for tabulation on DS200 or central scanners DS450 or DS850. The Functional Examiner attempted to change votes on ExpressVote 2.1 and ExpressVote XL for candidates within the contest, as well as after leaving the contest and then returning to other contests and while reviewing the summary screen. The tests demonstrated that ExpressVote and ExpressVote XL allowed changing the selections until the voter decides to print or cast the ballot. The DS200 precinct scanner of EVS 6000 provides the voter with a caution message when the ballot contains potential errors, such as the presence of overvotes or undervotes. The voter is also presented an error report on the screen when the tabulator detects potential errors. The voter can either decide to affirm their intent by casting the ballot, or they can spoil the ballot and fill out another ballot.

Accuracy requirements of 1107-A(11), 25 P.S. § 3031.7(11), that were ascertained by reviewing EAC test reports were further validated by the successful tabulation and validation of the primary and general elections run by the Functional Examiner.

The Functional Examiner validated via test cases during the primary and general election that the tabulating devices DS200, DS450 and DS850 generated zero proof reports only before ballots were cast, the system rejected all votes for the contest in an overvote situation, and produced a results report when appropriately configured as required under Sections 1107-A(16) and (17), 25 P.S. §§ 3031.7(16) & (17). The Functional Examiner confirmed that the zero-proof report cannot be generated on demand after a ballot is cast.

Ballots were marked by hand including write-in votes during the general election to examine the system's ability to properly enact the PA method. The DS200, DS450 and DS850 demonstrated compliance to Sections 1107-A(3) and (4), 25 P.S. §§ 3031.7(3) & (4), by appropriately tabulating the votes. The Functional Examiner identified anomalies in the

implementation of the PA Method on ExpressVote 2.1 and Expressvote XL.

The voting variations used for the examination included write-in votes to ensure that all components of the system will identify the appropriate write-ins and allow the election official to tabulate all cast votes, including write-in votes. On the ExpressVote XL and Electionware, an issue was encountered when a ballot was scanned through the XL but scanned at an unexpected orientation such that the implemented image area capture parameters were too tight; consequently, the Electionware was unable to parse two write-in votes from the ballot image, so the votes could not be adjudicated. The Functional Examiner hence concluded that EVS 6000 did not comply to Section 1107-A(13), 25 P.S. § 3031.7(13).

4. Security/Penetration Analysis

The Functional Examiner adopted a strategy to review each pertinent requirement for this test individually and then created test cases to address it in either in a documentation review, a functional test, or both.

Precinct tabulation devices and ballot marking devices were configured for delivery to a polling place from warehouse including all seals and locks recommended by the manufacturer. The central scanners were configured for operation in a county office. The devices were inspected for the ability to be tampered with: the inspection examined ports, outer case and memory devices to confirm that they are all secure and the locks and seals are tamper proof and evident. The Functional Examiner also examined the components of the EVS 6000 system for password management of administrative functions and ensured that the system counter could not be reset by unauthorized persons. In addition, the Functional Examiner also reviewed "ES&S System Security Specification" document for ballot security procedures at the polling place and central location to ensure that the manufacturer recommended the required steps for configuring the EVS 6000 securely for the election. Based on the tests, the Functional Examiner concluded that that the system complies to Section 1107-A(12), 25 P.S. § 3031.7(12).

The Functional Examiner included test cases during the Security/Penetration analysis phase of the testing to evaluate the security requirements mandated by Sections 1107-A(16) and (17), 25 P.S. §§ 3031.7(16) & (17). The Functional Examiner validated that the tabulation devices ExpressVote XL, ExpressVote 2.1 (tabulator) and DS200 had a visible public counter and the system prevented authorized and unauthorized users any access to vote data while polls are open. Tests were completed to determine that USB ports do not allow any data or information to be transferred to the ExpressVote XL, ExpressVote 2.1 (tabulator) and DS200 and no maintenance, poll worker or administrative modes allow tampering with the tabulating element. The system did not allow polls to be opened without running a zeroproof report and the content of the report showed that all candidate positions, each question and the public counter were all set to zero. The functionality of the system to generate the close of polls report was verified and the report contents were analyzed to ensure that it contained the total number of ballots tabulated and total number of votes for each candidate and question on the ballot. Based on the above tests and the test cases executed while running the elections, the Functional Examiner concluded that EVS 6000 complies with all requirements mandated by 25 P.S. §§ 3031.7(16) and (17).

5. Privacy Analysis

The Functional Examiner reviewed and inspected the privacy aspects of EVS 6000 system to determine compliance with Section 1101-A(1) of the Election Code, 25 P.S. § 3031.7(1). The Functional Examiner determined that the components of the system used at the polling place comply with 25 P.S. § 3031.7(1) by review of system documentation and physical inspection. Central scanners were physically examined by the Functional Examiner for adequate visual secrecy. The Functional Examiner also verified that no voter data, including stored ballot images are tied back to any specific voter in a manner that would compromise voter secrecy.

6. Usability Analysis

The Functional Examiner determined that EVS 6000 demonstrated compliance with the usability requirements of Section 1107-A(14) and (15) of the Election Code, 25 P.S. §§

3031.7(14) & (15), by reviewing appropriate EAC certification reports and from his experience of using all the functionalities of the system during the examination.

EVS 60000 Accessibility Examination

The tests included examiner review, sessions with voters and poll workers. A summary of the test details and findings is discussed in this section.

Examiner Review

The Accessibility Examiner conducted a review of the voting system under examination prior to sessions with voters and poll workers. The Accessibility Examination team included both accessibility and usability expertise to ensure background and knowledge of the issues for accessible voting. The Accessibility Examiner had experience working with people with a wide variety of disabilities and their impact on daily life, knowledge of the range and use of assistive technologies that voters with disabilities might rely on for access, experience conducting usability evaluations with voters, and strong knowledge of best practices and design principles for digital technology and voting systems. The expert review by the Accessibility Examiner gave a chance to make sure they understand how the system and accessibility features work and to note anything that could inform preparation for other testing.

Voter Sessions

The following voter population was represented in the test sessions:

- 2 blind from birth
- 1 acquired blindness
- 1 very low vision
- 1 low vision + hard of hearing using a personal assistive device
- 1 cognitive disability
- 1 limited mobility ESL speaker (also a non-voter because not yet a citizen).

Age Ranges: 35 thru 70. All but one (a 70-year old) were in the 35-60 year-old age range.

Counties: Allegheny, Bucks, Cumberland, Dauphin, and Philadelphia

The voters had a range of voting habits. One was a non-voter. One last voted in the 2016 Presidential election. Two last voted in November 2017, and three who voted in the May 2018 Primary.

Poll worker Sessions

Poll workers were invited to come in teams. We had three sessions with poll worker teams of 2, 3, and 5 for a total of 10 people. These poll workers:

- were from Dauphin county
- had between one and twenty-four years of experience and included one election judge
- had limited experience serving voters with disabilities

The examiner compiled the findings from the examiner review, voter sessions and poll worker sessions into positives, annoyances, problem solving, needs assistance and show stoppers.

This section depicts the summarized findings of the most significant issues identified, and the Accessibility Examiner's analysis and recommendations. Attachment B of this document lists these issues in fuller detail and also describes all the observations from the Accessibility Examination.

Automatic selection and deselection and accompanying audio navigation- Some voters using audio ballots were confused by the automatic selection and deselection that is part of the straight party voting. The Accessibility Examiner noted that the audio ballot did not announce all deselections and deselects may not always be visible on screen if the contest has a long list of candidates. The Accessibility Examiner noted that in some cases this issue may lead to voters casting ballots without knowing all their choices. The problem was exacerbated by the inability

of a blind voter to successfully validate the printed ballot on the ballot viewing window on ExpressVote XL. The Accessibility Examiner also noted that the system doesn't allow deselecting all candidates in a contest, if there is an eligible candidate selected by straight party vote. Due to the confusion in selection/deselection, the voters using audio ballot were not able to perceive and understand the system behavior, leading voters into time-consuming problem solving that takes away from their primary task of voting and may lead to requesting assistance. The Accessibility Examiner noted that even though the voting systems must legally comply with the PA method of straight party voting, the interaction should fully inform the voter of what happened including number and names of the candidates being selected/deselected on screen as well as audio ballot.

Inconsistency in navigation - In both the visual and audio navigation, there were enough small problems of inconsistency or poor instructions to create a cumulative effect. This issue is most serious for voters using the audio ballot without the visual display. Every participant had at least one problem, despite relatively high election knowledge and digital experience, suggesting that the issue would be more severe for voters without these personal resources to help them understand what it is happening. This may cause the need to ask for assistance. The Accessibility Examiner recommended that all instructions must be reviewed thoroughly and have consistent language without unnecessarily repetitive instruction.

Verification is possible, but challenging – The Accessibility Examiner tested whether verification can be part of the normal course of voting for voters with disabilities and noted the results for both ExpressVote 2.1 and ExpressVote XL.

ExpressVote 2.1 – If configured as marker (without tabulation) the system ejects the ballot after printing and the ballot can be scanned in the DS200 to complete the voting process. This allows voters to review the paper ballot and also makes it possible to use personal devices like magnifiers or text readers to read the paper ballot. The ballot also can be reinserted into the ExpressVote 2.1 for review. The review by reinserting the ballot did not read back the write-in options to the voter. The Accessibility Examiner also suggested that the verification may require the ballots to be moved to a stable surface for review using magnifiers or text readers. The

examiner also noted that removing the ballot from the ExpressVote 2.1 system requires some force and some voters may require assistance.

ExpressVote XL – allows the voter to validate the paper ballot thru a glass window before casting. The Accessibility Examiner noted that this presents a problem for verification for users especially who require personal assistive devices for verification.

Despite these challenges, it is the opinion of the voters and experts that these systems are much more useable and accessible than the current ADA voting systems used in Pennsylvania and allowed most voters to vote independently.

EVS 60000 Security Examination

As mentioned in the Examination Approach section of this document, the Security Examiner defined the Security Testing to be comprised of a series of test suites which are utilized for verifying that a voting system will correspond to applicable security requirements within the Pennsylvania Election Code. The examiner analyzed the test results and summarized any identified deficiencies into 4 major categories documentation, source code, hardware, and functional. The Security Examiner then evaluated the physical security, software hardening and existing system controls in place prior to identifying items that require remediation before the system is certified for use in Pennsylvania. The examiner also provided recommendations on secure implementation and deployment.

EVS 6021 Examination Results

EVS 6021 Functional Examination

As identified in the test approach section of this document the follow-up examination of EVS 6021 included Source Code Review, Documentation Review and System Level Testing.

1. Source Code Review

A Source Code Review for the code modifications for EVS 6021 was performed,

with a focus on determining whether any vulnerabilities could be found. It was concluded that the code review was completed with no malicious software, cryptographic software, process control or password management vulnerabilities being found. The Functional Examiner concluded that no deficiencies were found during source code review.

2. Documentation Review

The Functional Examiner reviewed ES&S submitted documentation for system validation procedures. The Functional Examiner concluded that system documentation was updated to provide accurate procedures for verifying installation of correct system components on the ExpressVote 2.1.

3. System Level Testing

The System Level Testing was divided into two tests, a primary election and general election. The Functional Examiner included test cases to specifically test the PA method anomalies identified during EVS 6000 testing as part of the general election.

A closed primary election consisting of two parties (Republican, Democratic), three precincts, and 16 contests (14 partisan contests and 2 referendums - 8 "Vote for One", 1 "Vote for no more than Two", 3 "Vote for no more than Three", 1 "Vote for no more than Four" and 1 "Vote for no more than Fifteen") was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. Referendum contests were added to test the generation of non-partisan ballots. The Functional Examiner validated compliance of the system to Sections 1101-A and 1107-A(2), (5)-(11) and (13), 25 P.S. §§ 3031.1, 3031.7(2), (5)-(11) & (13). No issues or anomalies were experienced during these tests, and the objective criteria established in the test protocols were met.

A general election consisting of four parties (Republican, Democratic, Green and Libertarian), three precincts (one of which was a split precinct), and 16 contests (13 partisan contests, 1 non-partisan and 2 retention referendum, 9 "Vote for One", 1 "Vote for no more than Two", 3 "Vote for no more than Three", and 1 "Vote for no more than Fifteen") was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850.

The Functional Examiner examined the compliance of the system to Sections 1101-A and 1107-A(2)-(8), (10)-(11) and (13), 25 P.S. §§ 3031.1, 3031.7(2)-(8), (10)-(11) & (13).

The Functional Examiner created election definitions and executed appropriate test cases on all components of EVS 6021 to ensure that the modified system satisfies all requirements of the Pennsylvania Election Code. The Functional Examiner used English and Spanish ballots for the test. Reports were generated after closing polls and results were validated against expected results. Each specific hardware and software component was tested for compliance with the required sections of the Election Code.

Ballots were marked on ExpressVote XL and ExpressVote 2.1 to examine the system's ability to properly effectuate the PA method of straight party voting. The test cases included different voting patterns that selected either a candidate from the same political party, a different political party or a write in when the contest had a full slate of candidates or less than full slate of candidates. The issue found on ExpressVote 2.1 and ExpressVote XL during Examination of EVS 6.0.0.0, were verified to be resolved. The votes were tabulated accurately following the PA method rules. The Functional Examiner concluded that the EVS 6021 complies with Section 1107-A(3), 25 P.S. § 3031.7(3), since the components ExpressVoteXL, ExpressVote 2.1, DS20, DS 450 and DS 850 all handled the PA method test cases done as part of the general election test appropriately.

The issue found during the examination of EVS 6.0.0.0, on the ExpressVote XL and Electionware, when a ballot was scanned through the XL but scanned at an unexpected orientation such that the implemented image area capture parameters were too tight, that Electionware was unable to parse two write-ins from the ballot image, so could not be adjudicated, was verified to be resolved. To validate this, the Functional Examiner imported the scanned ballot data from the EVS 6000 to EVS 6021 Electionware and the write-ins were visible to be adjudicated appropriately.

The Functional Examiner confirmed with appropriate test cases and voting patterns that EVS 6021 maintains compliance to Sections 1101-A and 1107-A(2), (4)-(11) and (16)-

(17), 25 P.S. §§ 3031.1, 3031.7(2), (4)-(11), & (16)-(17), via tests cases in a similar manner as done during the EVS 6021 examination.

The Functional Examiner also noted that the paper ballots will allow statistical recounts as required by Sections 1117-A, 25 P.S. § 3031.17.

EVS 6021 was certified by EAC on November 12, 2018, and hence compiles with Section 1105-A(a) of the Election Code, 25 P.S.§ 3031.5(a), which requires that a voting system must be examined and approved by a federally recognized independent testing authority (ITA), or VSTL as such authorities are now called. The final EAC certification scope is added to this report as Attachment A.

Additional Security/Penetration Analysis, Privacy and Usability results were not conducted during the EVS 6021 examination since the test cases validated during these tests were not affected by the isolated modification done to the OVI-VC to adequately handle the PA method.

The Functional Examiner identified that the following within Article XI-A of the Pennsylvania Election Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22. are not applicable to the current examination, as each deal with non-functional testing aspects of acquisition, and use and maintenance aspects of a voting system:

- 25 P.S. § 3031.2;
- 25 P.S. § 3031.3;
- 25 P.S. § 3031.4;
- 25 P.S. § 3031.6;
- 25 P.S. § 3031.8;
- 25 P.S. § 3031.9;
- 25 P.S. § 3031.10;
- 25 P.S. § 3031.11;
- 25 P.S. § 3031.12;
- 25 P.S. § 3031.13;
- 25 P.S. § 3031.14;
- 25 P.S. § 3031.15;
- 25 P.S. § 3031.16;
- 25 P.S. § 3031.18;
- 25 P.S. § 3031.19;

- 25 P.S. § 3031.20;
- 25 P.S. § 3031.21; and
- 25 P.S. § 3031.22.

After all the testing activities, the Examiners and Department concluded that the EVS 6021 demonstrates compliance with all requirements as delineated in Article XI-A of the Pennsylvania Election Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22. The conclusion was drawn based on the examination of EVS 6021in conjunction with the EVS 6000 examination.

D. Observations

During the examination, and in the review of documentation, the Examiner and/or Department staff noted the following observations:

1. The ExpressVote XL and ExpressVote 2.1 doesn't intuitively allow a voter to deselect all candidates after straight party voting if there is an eligible candidate selected by straight party vote. This will make it difficult for a voter to vote for no candidate in a contest after voting straight party. The system presents the voter with a pop-up message suggesting that the voter cannot deselect all candidates when using the straight party option to mark the ballot. The voter must undo their straight party selection and mark individual contests if they intend to cast a "no vote" in a contest.

2. The system presented for examination had undervote warnings turned on for straight party contest on ExpressVote XL and ExpressVote 2.1. This may make the voter believe that there is a need to make a selection in that contest.

3. ES&S EVS 6021 does not support cumulative voting.

4. The system allows a configuration on ExpressVote 2.1 as tabulator where the voter can proceed to cast a vote without reviewing the paper ballot. If the system is configured to do so, the voter after reviewing the ballot on the ExpressVote 2.1 screen, can cast the ballot. With this configuration, the voter doesn't have the opportunity to verify the paper ballot before casting the vote.

5. The ExpressVote XL can be configured without the vote summary and review screen.

6. The Functional Examiner noted that ExpressVote XL must be configured to print terminal level reports to be compliant with the requirements mandated by 25 P.S. § 3031.7(16) when only one device is used at a polling place.

7. The configuration of the system complying with the Pennsylvania Election Code requirements including the PA method will require the use of appropriate selections of configurable parameters.

8. The USB devices and other portable media used with the voting system components need to be reformatted or replaced with new media before every Election use. The vendor recommendations only suggest a reformat, but doesn't specify that it needs to be a full reformat.

IV. Conditions for Certification

Given the results of the examination that occurred in June and September 2018, and the findings of the Examiners as set forth in his reports, **the Secretary of the Commonwealth certifies the EVS 6021 subject to the following conditions:**

A. Pennsylvania counties using the EVS 6021 must comply with the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011, and any future revisions or directives. In particular, Pennsylvania counties must adhere to item four (4) of the directive when setting up and positioning the ExpressVote 2.1 and ExpressVote XL in the polling place to assure compliance with the constitutional and statutory requirements that secrecy in voting be preserved *(see* Pa. Const Art. VII § 4; and Section 1107-A(l) of the Election Code, 25 P.S. § 3031.7(1)).

B. No components of the EVS 6021 shall be connected to any modem or network interface, including the Internet, at any time, except when a standalone local area wired

network configuration in which all connected devices are certified voting system components. Transmission of unofficial results can be accomplished by writing results to media, and moving the media to a different computer that may be connected to a network. Any wireless access points in the district components of EVS 6021, including wireless LAN cards, network adapters, etc. must be uninstalled or disabled prior to delivery or upon delivery of the voting equipment to a county board of elections.

C. Because EVS 6021 is a paper-based system, counties using the EVS 6021 must comply at a minimum with Section 1117-A of the Election Code, 25 P.S. § 3031.17, that requires a "statistical recount of a random sample of ballots after each election using manual, mechanical or electronic devices of a type different than those used for the specific election." This audit must be conducted via a manual count of the voter marked paper ballots exclusively. Counties must include in the sample ballots such samples as may be marked by ADA compliant components. Counties are advised to consult the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011 and any future revisions or directives that may apply to audits of electronic voting systems.

D. All jurisdictions implementing the EVS 6021 need to carry out a full Logic and Accuracy test on each device without fail and maintain evidence of Logic and Accuracy (L&A) testing in accordance with the statutory requirements for pre-election and post-election testing. The Department does not recommend automated L&A testing, and discourages the use of preprinted ballots provided by vendors. All components being used on election day, including any Electronic Poll Books being used, must be part of the L&A testing. Counties must ensure that the L&A test cases include all applicable scenarios of PA straight party method identified in Attachment C to the Directive for electronic voting systems published by BCEL on September 11, 2017.

E. EVS 6021 is a paper-based system, and hence, implementation of the system for precinct or central count scanning is scalable. Jurisdictions should calculate the number of voting booths necessary to accommodate the number of registered voters in a precinct to

avoid long lines. Jurisdictions must include the ExpressVote 2.1 or ExpressVote XL as an ADA compliant device in configuring a precinct pollingplace. Jurisdictions must also take into consideration the ballot box capacities on polling place components when deciding on the number of voting booths. Jurisdictions must also take into consideration that ExpressVote XL and ExpressVote 2.1 as a tabulator requires the ballot bin to be changed or emptied after about 300 ballots. For DS200 ballot box capacities, jurisdictions can refer to DS200 operators guide from ES&S.

F. All jurisdictions implementing the EVS 6021 must implement administrative safeguards and proper chain of custody to facilitate the safety and security of electronic systems pursuant to the Guidance on electronic Voting System Preparation and Security, September 2016.

G. Jurisdictions implementing the EVS 6021 with the Central Count Tabulator as the primary system where votes are counted only at the central counting location using central scanners, must comply with Section 301(a) of Help America Vote Act of 2002. The mandate requires counties using central count paper-based systems to develop voting system specific voter education programs that inform voters of the effect of over voting, and instruct voters on how to correct a ballot before it is cast, including instructions on obtaining a replacement ballot. Additionally, the mandate requires that the central count voting system must be designed to preserve voter confidentiality.

H. All jurisdictions implementing the EVS 6021 must ensure that no default passwords are used on any devices and that all passwords are complex and secured. Counties must implement an audit process to review and ensure that no default passwords are used upon equipment install/reinstall and routinely change passwords (at least once prior to preparing for each primary and election) to avoid any password compromise. The passwords and permissions management must at a minimum comply to the password requirements outlined in NIST 800-63. This publication can be accessed at https://pages.nist.gov/800-63-3/sp800-63-3.html

I. All jurisdictions implementing EVS 6021 must configure the polling place components of the voting system to notify voters when they attempt to cast overvotes. The

DS200 tabulation device options must be set to "Query Voter Preference" for overvoted hand marked paper ballot. This is to ensure that the system implementation adheres to the requirement of notifying the voter of overvotes as mandated by 25 P.S. § 3031.7(16).

J. All jurisdictions implementing EVS 6021 must work with ES&S to ensure that only the certified system configuration is installed on purchase or anytime a system component is replaced or upgraded. Jurisdictions must as part of their user acceptance test verify the implementation to ensure that the components, software and firmware belong to the certified system. Jurisdictions must also perform a trusted build validation as part of the election preparation activities and post-election canvass activities utilizing the vendor supplied methods of validation and verification of voting system integrity. A sample format that can be used for the attestation is added Attachment C to this document.

K. ExpressVote 1.0 and ExpressTouch devices are not certified for use in Pennsylvania with EVS 6021. These devices were not presented to the Secretary for certification by ES&S.

L. Jurisdictions can make use of the Electionware adjudication functionality to adjudicate write-ins and evaluate questionable ballots, contests or selections to determine voter intent. Any decisions made during review of the ballot must be agreed upon by a team of at least two reviewers authorized by the election official. The election official can also consult the paper ballot to assist with determinations made during adjudication. In the event of a recount, the voter verified paper ballots must be used for the count.

M. Jurisdictions implementing EVS 6021 must work with ES&S to ensure that the implemented configuration is capable of operating for a period of at least two hours on backup power as required by the VVSG. If the system components don't include internal battery packs for reliable power, the Uninterruptible Power Supply (UPS) specified in the EAC certified configuration must be purchased and used at the polling places.

N. Jurisdictions using the services of ES&S or a third-party vendor for election preparation activities must work with ES&S or the vendor to ensure that systems used for

ballot definition activities are considered part of the voting system and use certified voting system components. The systems used for ballot definition must be configured securely following conditions outlined in this report and following any Directives and Guidance issued by the Secretary. Any data transfer between the vendor and county must be done using encrypted physical media or secure file transfer process. The file transfer and download must be tracked and audited to make sure that data has not been accessed by unauthorized personnel.

O. Jurisdictions must work with ES&S to thoroughly test and review audio ballot instructions to ensure that the voters using an audio ballot can cast the ballot without requesting assistance. Jurisdictions must consider the following while reviewing the ballot:

- The audio ballot must fully inform the voter what has happened and how to select/deselect their choices
- The feedback messages must explain to voters what is happening, including the number and names of candidates being deselected
- The audio ballot must provide feedback on the reason for the changes in any selections and the interaction with straight-party choices.
- The audio ballot instructions on messages on the system must have the specific information for the task or screen before the general, repeated instructions.

P. Jurisdictions must make voters aware that voting straight party is optional via clear instructions on paper, on screen and on audio ballots. This is to ensure that the voter doesn't assume that he/she must make a selection for the straight party contest. The ballot instructions must be approved by the Department and follow any directives and/or guidance issued by the Department.

Q. The ExpressVote XL and ExpressVote 2.1 components of the EVS 6021 system does not allow the voter to deselect all candidates after voting straight party as noted

on Page 36, Observation 1 of this document. Jurisdictions must ensure that the message used in the pop up window to the voter is clear enough to communicate the system behavior to the voters. The message content must be approved by the Department and follow any directives and/or guidance issued by the Department.

R. Jurisdictions implementing ExpressVote XL must ensure that the configuration allows voters to review their vote selections on the screen and on the printed ballot card before it is cast.

S. Jurisdictions implementing the ExpressVote 2.1 as a Tabulator must ensure that the system is implemented in a configuration that allows physical review of the printed paper ballot, before casting the vote. The system **must not** be configured to have the voter validate the selections on the screen and "Autocast" the ballot, thus causing a situation where the voter has not verified what was printed on the paper ballot. The system must be configured to always return the marked ballot card ("Always Return Card" option) to the voter for review before tabulation.

T. Jurisdictions implementing ExpressVoteXL and ExpressVote 2.1 as tabulator must ensure that the system is configured to generate a printed report at the close of polls. The report must at a minimum indicate of the total number of voters whose ballots have been tabulated, the total number of votes cast for each candidate whose name appears on the ballot, and the total number of votes cast for, or against, any question appearing on the ballot.

U. The electronic voting system must be physically secured while in transit, storage, or while in use at their respective locations. Unmonitored physical access to devices can lead to compromise, tampering, and/or planned attacks.

V. Jurisdictions must implement processes and procedures involving management, monitoring and verification of seals, locks/keys, before, during and after the election.

W. Jurisdictions must seal any unused ports on the voting system components

using tamper evident seals even if the port is inside a locked compartment. Jurisdictions must work with ES&S and use physical port blocking plugs to close unused ports whenever possible before placing the tamper evident seal. The Department also recommends using port blocking plugs for exposed ports for components of the voting system housed in county office that can be removed by authorized personnel when the port is needed.

X. Jurisdictions using standalone installation of the EMS server on portable devices must protect the laptops to prevent lost or stolen device.

Y. Jurisdictions must implement processes to gather and safekeep system logs for each component of the voting system after each election. Consistent auditing of system logs and reports is vital to maintain system transparency and to ensure that any compromise or malfunction is observed and reported in a timely manner.

Z. Jurisdictions implementing EVS 6021 must ensure that the USB devices and any other removable media used for election activities is maintained with strict chain of custody. There must be a process to manage the removable media inventory to avoid misplaced and lost media. The devices must be reformatted before use in each election. Appropriate steps must be taken to ensure that the format is a full reformat of the USB devices.

AA. Jurisdictions implementing EVS 6021 must work with ES&S to ensure appropriate levels of training for election officials is planned on implementation. Counties must ensure that the trainings adhere to the "Minimum Training Requirements" specified in Attachment D of this document.

BB. Jurisdictions implementing EVS 6021 must include voter and poll worker training as part of the implementation plan. The training must include hands on practice for both voters and poll workers. Specific consideration must be given to voters using assistive devices and also poll worker education to assist voters with disabilities. Refer to Appendix B, listing detailed recommendations for deployment noted by the Accessibility Examiner.

CC. Jurisdictions implementing EVS 6021 must consider the following during

voting booth set up for serving voters requiring assistive devices

- Voters with disabilities may have assistive technology or personal notes that they need to place within reach. They may also need room to place the printed ballot on a flat surface to use personal technology such as magnifiers or text readers to verify it.

- For the ExpressVote,2.1 as marker, the path to the scanner should be as easy as possible, ideally a straight line with no obstructions. The path should include ample room to turn a wheelchair if the machine is positioned with the screen facing the wall. The ADA standards suggest a minimum of 60x60 inches for this.

Refer to Appendix B, listing detailed recommendations for deployment noted by the Accessibility Examiner.

DD. ES&S must submit the following system education materials to the Department of State and must consent to the publication and use of the video on any websites hosted by any Pennsylvania counties and the Pennsylvania Secretary of the Commonwealth or publicly available social media platform. The videos must be closed captioned for the visually impaired.

- A video (in an electronic format) for voters that demonstrates how to cast a vote and ballot using the Voting System.

- A video (in an electronic format) for precinct election officials that demonstrates how to setup, operate, and shutdown the Voting System components on an Election Day. The video must demonstrate how to set up and operate the voting system accessible devices for use by voters.

- A "quick reference guide" for precinct election officials to consult on Election Day. The guide must be specific to the purchasing county's setup and use of the Voting System including accessible options.

- A "quick reference guide" with images that demonstrates to voters how to cast a vote. Must be provided in additional languages for any jurisdictions required to meet thresholds in the Voting Rights Act.

EE. ES&S must adhere to the following reporting requirements and submit the following to the Secretary:

- Equipment Reporting. Reported field issues or anomalies that occur in Pennsylvania or elsewhere with any piece of equipment deployed in the Commonwealth of Pennsylvania within 3 days of the occurrence;

- Advisory Notices. System advisory notices issued for any piece of equipment deployed in the Commonwealth of Pennsylvania regardless of whether the incident behind the notice occurred in Pennsylvania;

- Ownership, Financing, Employees, Hosting Location. Any changes to information on the Supplier's employees and affiliates, locations, company size and ability to provide technical support simultaneously to several counties in the Commonwealth of Pennsylvania and other jurisdictions that use its Voting System. Additionally, ES&S must provide information on foreign ownership/financing, data hosting, and production for any equipment or ancillary products, including any potential conflict of interest that may have developed for employees and affiliates;

- Security Measures and any updated security testing or risk/vulnerability assessments conducted by the Supplier or a third-party;

- SOC 2 Reporting – ES&S shall provide the Secretary with its annual American Institute of Certified Public Accountants (AICPA) Attestation Standard (AT) Sec. 101 Service Organization Control ("SOC") 2, Type 2 certification (AT Sec. 101 SOC 2, Type 2), or an equivalent certification approved by the Commonwealth. Equivalent certifications include, but are not

limited to: International Organization of Standards (ISO) 2700x certification; certification under the Federal Information Security Management Act (FISMA); and AT Sec. 101 SOC 3 (SysTrust/WebTrust) certification.

FF. ES&S must adhere to the "Source Code and Escrow Items Obligations" specified in Attachement F of this document.

GG. ES&S must work with jurisdictions to ensure that the system is configured to comply with all applicable requirements of the Pennsylvania Election Code delineated in Section Article XI-A of the Pennsylvania Election Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22.

HH. Jurisdictions implementing the EVS 6021 and ES&S must work together to implement the system under this certification and must comply with the conditions found in this report, and any directives issued by the Secretary of the Commonwealth regarding the use of this System, in accordance with Section 1105-A(a)-(b) of the Election Code, 25 P.S. § 3031.5(a)-(b). ES&S must ensure that future releases of the voting system with enhanced security and accessibility features are presented for approval to the Secretary.

II. In addition, pursuant to the Directive on Electronic Voting Systems issued by the Secretary of the Commonwealth on August 8, 2006, the Directive Concerning the Use, Implementation and Operation of Electronic Voting Systems by the County Boards of Elections issued on June 9, 2011 and Section 1105-A(d) of the Pennsylvania Election Code, 25 P.S. § 3031.5(d), this certification and approval is valid only for EVS 6021. If the vendor or a County Board of Elections makes any changes to the EVS 6021 Voting System subsequent to the date of its examination, it must immediately notify both the Pennsylvania Department of State and the relevant federal testing authority or laboratory, or their successors. Failure to do so may result in the decertification of the EVS 6021 Voting System in the Commonwealth of Pennsylvania.

V. Recommendations

A. All jurisdictions implementing EVS 6021 Voting System should ensure that the system is correctly set up pursuant to all the recommendations of the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011 and Guidance on Electronic Voting System Preparation and Security, September 2016.

B. All jurisdictions implementing EVS 6021 should take appropriate steps to ensure that voter education is part of the implementation plan.

C. All jurisdictions implementing the EVS 6021 should ensure that precinct election officials and poll workers receive appropriate training and are comfortable using the system.

D. All jurisdictions considering purchase of the EVS 6021 should review the System Limits as mentioned in the EAC certification scope added as Attachment A to this report.

E. The Secretary recommends that ES&S and counties work with the Department on any changes to their voting equipment including, but not limited to, purchase and upgrades.

F. Secretary recommends in-house ballot definition activities at a county location whenever possible. If an external vendor location is used, the county should implement oversight measures to ensure that election data including ballot definition files and audit logs stored on devices outside of the county are protected from unauthorized access.

VI. Conclusion

As a result of the examination, and after consultation with the Department's staff, counsel and the examiners, the Secretary of the Commonwealth concludes that the EVS 6021 can be safely used by voters at elections as provided in the Pennsylvania Election Code and meets all of the requirements set forth in the Election Code, **provided the voting system is implemented under the conditions listed in Section IV of this report.**

Accordingly, the Secretary certifies EVS 6021 for use in this Commonwealth.

The ExpressVote XL and ExpressVote 2.1 can accommodate 10-12 voters with disabilities during an election day or 20-60 voters an hour when used as the primary voting system depending on size of the ballot. DS200 can serve 120-180 voters per hour. The ExpressVote XL and ExpressVote 2.1 ballot box will hold approximately 300 ballots and DS 200 ballot boxes can hold 1250 to 3000, 19-inch ballots depending on the type of ballot box used. After the capacity is reached the poll workers will need to change the ballot box or empty the contents to a secure box and replace the ballot box.

Attachment A – EAC Certification Scope

EVS6021_Scope&Cert.pdf

United States Election Assistance Commission

Certificate of Conformance

ES&S EVS 6.0.2.1

VVSG 2005 VER. I

EAC CERTIFIED

The voting system identified on this certificate has been evaluated at an accredited voting system testing laboratory for conformance to the *Voluntary Voting System Guidelines Version 1.0 (VVSG 1.0)* . Components evaluated for this certification are detailed in the attached Scope of Certification document. This certificate applies only to the specific version and release of the product in its evaluated configuration. The evaluation has been verified by the EAC in accordance with the provisions of the EAC *Voting System Testing and Certification Program Manual* and the conclusions of the testing laboratory in the test report are consistent with the evidence adduced. This certificate is not an endorsement of the product by any agency of the U.S. Government and no warranty of the product is either expressed or implied.

Product Name: EVS

Model or Version: 6.0.2.1

Name of VSTL: SLI Compliance

EAC Certification Number: ESSEVS6021

Date Issued: November 12, 2018

Executive Director

Scope of Certification Attached

Manufacturer: *Election Systems & Software*
System Name: *EVS 6.0.2.1*
Certificate: *ESSEVS6021*

Laboratory: *SLI Compliance*
Standard: *VVSG 1.0 (2005)*
Date: *November 12, 2018*

Scope of Certification

This document describes the scope of the validation and certification of the system defined above. Any use, configuration changes, revision changes, additions or subtractions from the described system are not included in this evaluation.

Significance of EAC Certification

An EAC certification is an official recognition that a voting system (in a specific configuration or configurations) has been tested to and has met an identified set of Federal voting system standards. An EAC certification is **not**:

- An endorsement of a Manufacturer, voting system, or any of the system's components.
- A Federal warranty of the voting system or any of its components.
- A determination that a voting system, when fielded, will be operated in a manner that meets all HAVA requirements.
- A substitute for State or local certification and testing.
- A determination that the system is ready for use in an election.
- A determination that any particular component of a certified system is itself certified for use outside the certified configuration.

Representation of EAC Certification

Manufacturers may not represent or imply that a voting system is certified unless it has received a Certificate of Conformance for that system. Statements regarding EAC certification in brochures, on Web sites, on displays, and in advertising/sales literature must be made solely in reference to specific systems. Any action by a Manufacturer to suggest EAC endorsement of its product or organization is strictly prohibited and may result in a Manufacturer's suspension or other action pursuant to Federal civil and criminal law.

System Overview

The ES&S EVS 6.0.2.1 voting system is a modification of the ES&S EVS 6.0.0.0 voting system, certified on July 2, 2018, which contains limited changes to the Electionware application. The ES&S EVS 6.0.2.1 voting system is composed of software applications, central count location devices and polling place devices with accompanying firmware, and COTS hardware and software.

Electionware®

Electionware election management software is an end-to-end election management software application that provides election definition creation, ballot formation, equipment

configuration, result consolidation, adjudication and report creation. Electionware is composed of five software groups: Define, Design, Deliver, Results and Manage.

ExpressVote XL™

ExpressVote XL is a hybrid paper-based polling place voting device that provides a full-face touchscreen vote capture that incorporates the printing of the voter's selections as a cast vote record, and tabulation scanning into a single unit.

ExpressTouch®

ExpressTouch Electronic Universal Voting System (ExpressTouch) is a DRE voting system which supports electronic vote capture for all individuals at the polling place.

ExpressVote® Hardware 1.0

ExpressVote Universal Voting System Hardware 1.0 (ExpressVote HW1.0) is a hybrid paper-based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, to be scanned for tabulation in any one of the ES&S precinct or central scanners.

ExpressVote® Hardware 2.1

ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1) is a hybrid paper-based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, and tabulation scanning into a single unit. ExpressVote HW2.1 is capable of operating in either marker or tabulator mode, depending on the configurable mode that is selected in Electionware.

There are two separate versions of the ExpressVote hardware version 2.1: 2.1.0.0 and version 2.1.2.0 (6.4 & 6.8). Please note that all future references to ExpressVote HW 2.1 as used throughout the document refers to both hardware versions.

DS200®

DS200 is a polling place paper-based voting system, specifically a digital scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS450®

DS450 is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS850®

DS850 is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

Event Log Service (ELS)

ELS monitors and logs users' interactions with the Election Management System. Events that happen when a connection to the database is not available are logged to the Windows Operating System log through the ELS.

Removable Media Service (RMS)

RMS is a utility that runs in the background of the Windows operating system. RMS reads specific information from any attached USB devices so that ES&S applications such as Electionware can use that information for media validation purposes.

Configurations

Within the scope of the ES&S EVS 6.0.2.1 voting system, three unique configurations are supported, in order to accommodate limitations of components with the ES&S EVS 6.0.2.1 voting system.

Configuration A

ES&S EVS 6.0.2.1: Test Configuration A is comprised of the entire suite of voting system products.

- Electionware
- ExpressVote Marker (HW 1.0)
- ExpressVote Marker/Tabulator (HW 2.1)
- ExpressVote XL
- ExpressTouch
- DS200
- DS450
- DS850

Configuration B

- Electionware
- ExpressVote Marker (HW 1.0)
- ExpressVote Marker/Tabulator (HW 2.1)
- DS200
- DS450
- DS850

Configuration C

- Electionware
- ExpressVote XL

Mark Definition

ES&S' declared level mark recognition for the DS200, DS450 and DS850 is a mark across the oval that is 0.02" long x 0.03" wide at any direction.

Tested Marking Devices

Bic Grip Roller Pen

Language Capability

EVS 6.0.2.1 supports English, Spanish, Chinese (Cantonese), Korean, Japanese, Hindi, Bengali, Vietnamese, Tagalog, Creole, Russian, and French. Configuration C also supports Punjabi and Gujarati.

Proprietary Components Included

This section provides information describing the components and revision level of the primary components included in this Certification.

System Component	Software or Firmware Version	Hardware Version	Model	Comments
Electionware	5.0.2.0			
ES&S Event Log Service	1.6.0.0			
Removable Media Service	1.5.0.0			
ExpressVote HW 1.0	1.5.1.0	1.0		Paper-based vote capture and selection device
ExpressVote Previewer (1.0)	1.5.1.0			
ExpressVote HW 2.1	2.4.3.0	2.1.0.0 2.1.2.0		Hybrid paper-based vote capture and selection device and precinct count tabulator
ExpressVote Previewer (2.1)	2.4.3.0			
DS200	2.17.0.0	1.2.1, 1.2.3, 1.3		Precinct Count Tabulator
DS450	3.1.0.0	1.0		Central Count Scanner and Tabulator
DS850	3.1.0.0	1.0		Central Count Scanner and Tabulator
ExpressVote XL	1.0.1.0	1.0		Hybrid full-faced paper-based vote capture and selection device and precinct count tabulator
ExpressTouch	1.0.0.0	1.0		DRE
ExpressVote Rolling Kiosk		1.0	98-00049	Portable Voting Booth
Voting Booth		N/A	98-00051	Stationary Voting Booth
ExpressVote Single Table		N/A	87033	Voting Table for One Unit
ExpressVote Double Table		N/A	87032	Voting Table for Two Units
ADA Table		N/A	87031	Voting Table for One Unit

System Component	Software or Firmware Version	Hardware Version	Model	Comments
DS200 Ballot Box		1.0	98-00009	Collapsible Ballot Box
DS200 Ballot Box		1.2, 1.3, 1.4, 1.5	57521	Plastic ballot box
DS200 Ballot Box		1.0, 1.1, 1.2	76245	Metal ballot box
DS200 Tote Bin		1.0	00074	Tote Bin Ballot Box
DS450 Cart		N/A	3002	
DS850 Cart		N/A	6823	
Universal Voting Console		1.0	98-00077	Detachable ADA support peripheral
Tabletop Easel		N/A	14040	
ExpressTouch Voting Booth		N/A	98-00081	Stationary Voting Booth
SecureSetup	2.0.0.1			Proprietary Hardening Script

COTS Software

Manufacturer	Application	Version
Microsoft Corporation	Server 2008	R2 w/ SP1 (64-bit)
Microsoft Corporation	Windows 7 Professional	SP1 (64-bit)
Microsoft Corporation	WSUS Microsoft Windows Offline Update Utility	11.1.1
Symantec	Endpoint Protection	14.0.1 (64-bit)
Symantec	Symantec Endpoint Protection Intelligent Updater (File-Based Protection)	20180116-002-core3sdsv5i64.exe
Symantec	Symantec Endpoint Protection Intelligent Updater (Network-Based Protection)	20180115-040-IPS_IU_SEP_14RU1.exe
Symantec	Symantec Endpoint Protection Intelligent Updater (Behavior-Based Protection)	20180108-003-SONAR_IU_SEP.exe
Cerberus	CerberusFTP Server – Enterprise	9.0.3.1 (64-bit)
Adobe	Acrobat	XI
Microsoft Corporation	Visual C++ Redistributable	vc_redist.x86.exe (32-bit)
RSA Security	RSA BSAFE Crypto-C ME for Windows 32-bit	4.1
OpenSSL	OpenSSL	2.0.12
OpenSSL	OpenSSL	2.0.16
OpenSSL	OpenSSL	1.02d
OpenSSL	OpenSSL	1.02h
OpenSSL	OpenSSL	1.02k

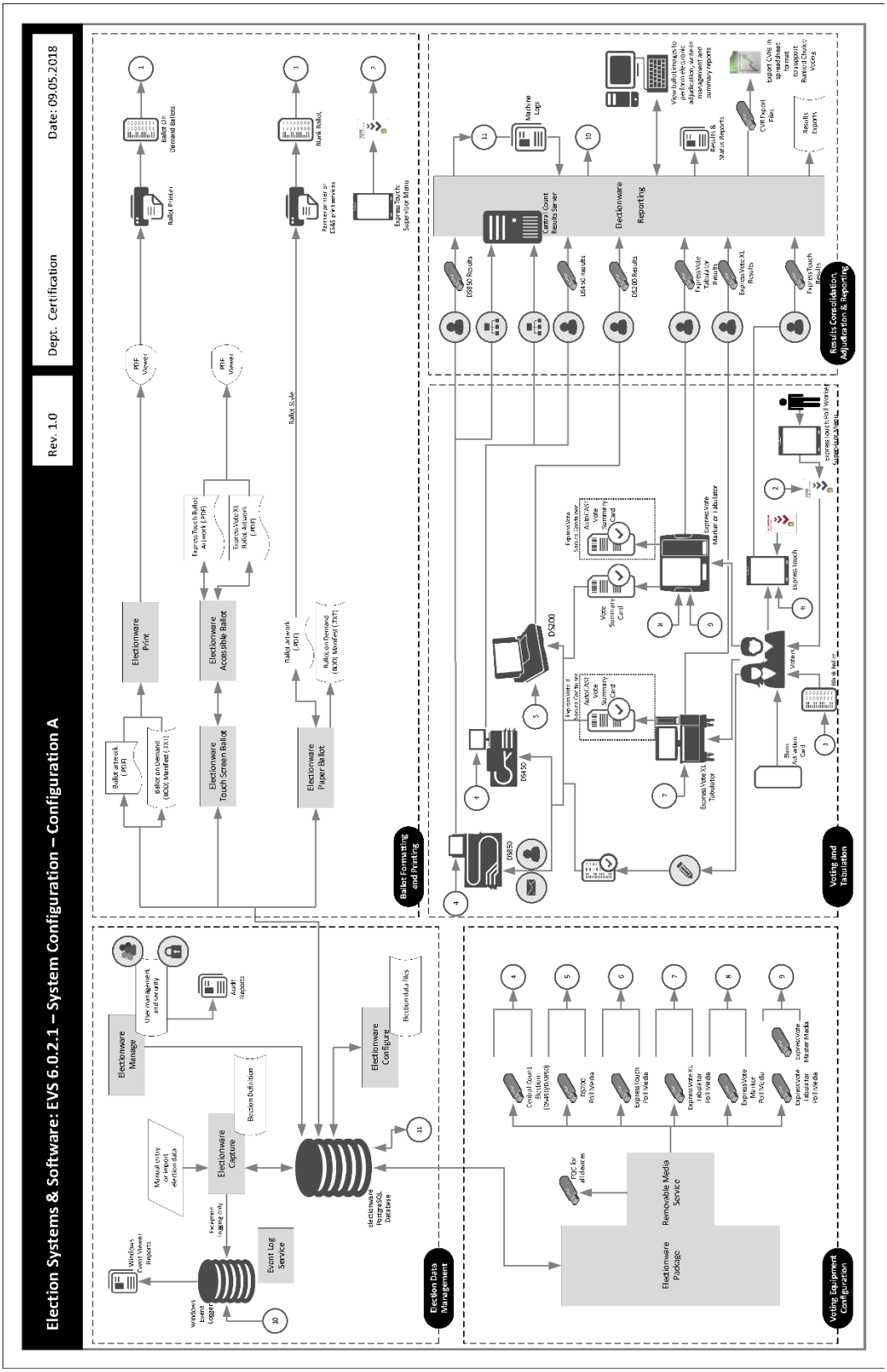
COTS Hardware

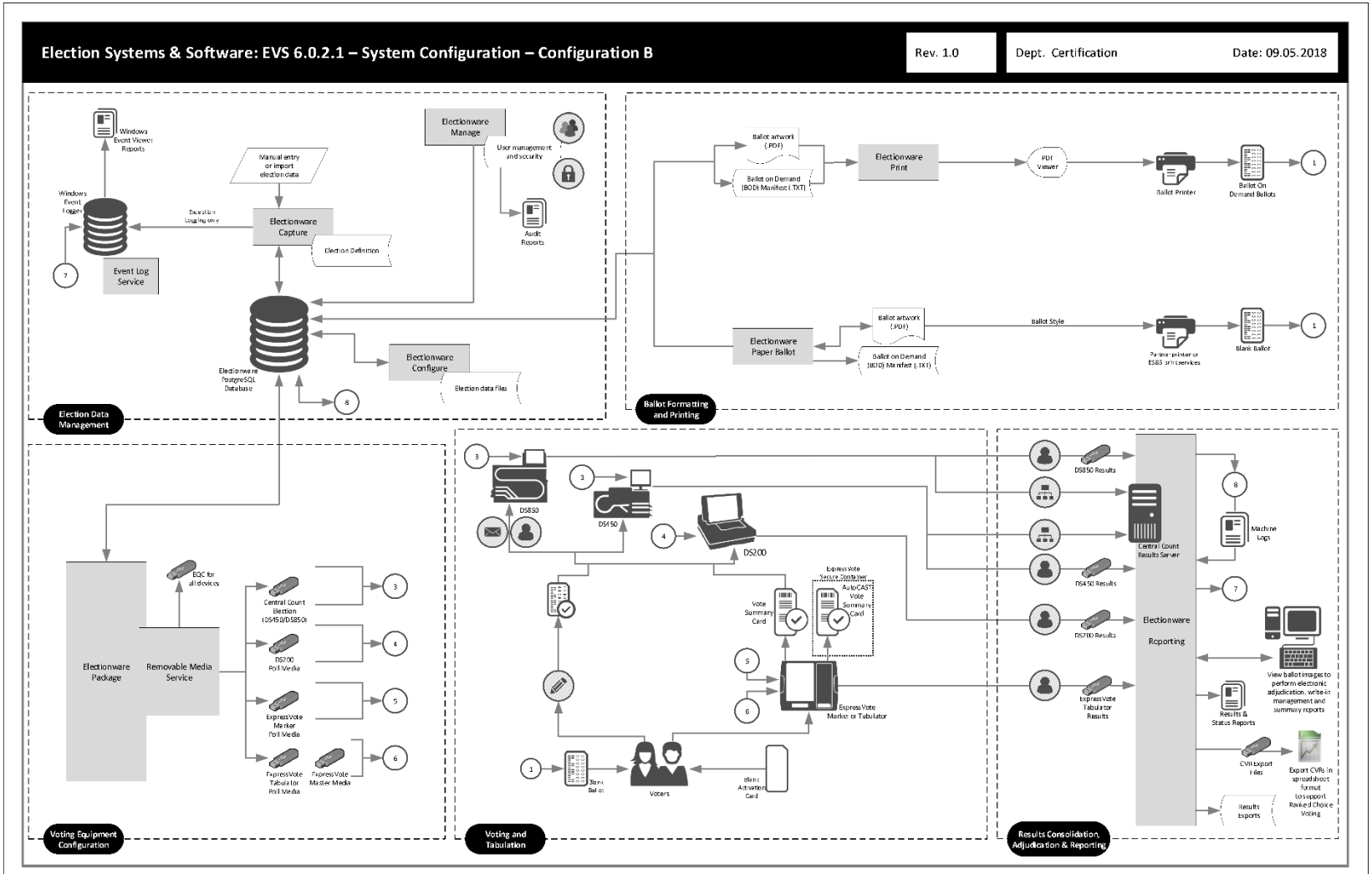
Manufacturer	Hardware	Model/Version
EMS Server		
EMS Client or Standalone Workstation		
Innodisk	USB EDC H2SE (1GB) for ExpressVote 1.0	DEEUH 1-01GI72AC1SB
Innodisk	USB EDC H2SE (16GB) for ExpressVote 2.1	DEEUH 1-16GI72AC1SB
Delkin	USB Flash Drive	512MB, 1 GB, 2 GB, 4 GB, 8 GB
Delkin	Validation USB Flash Drive	16 GB

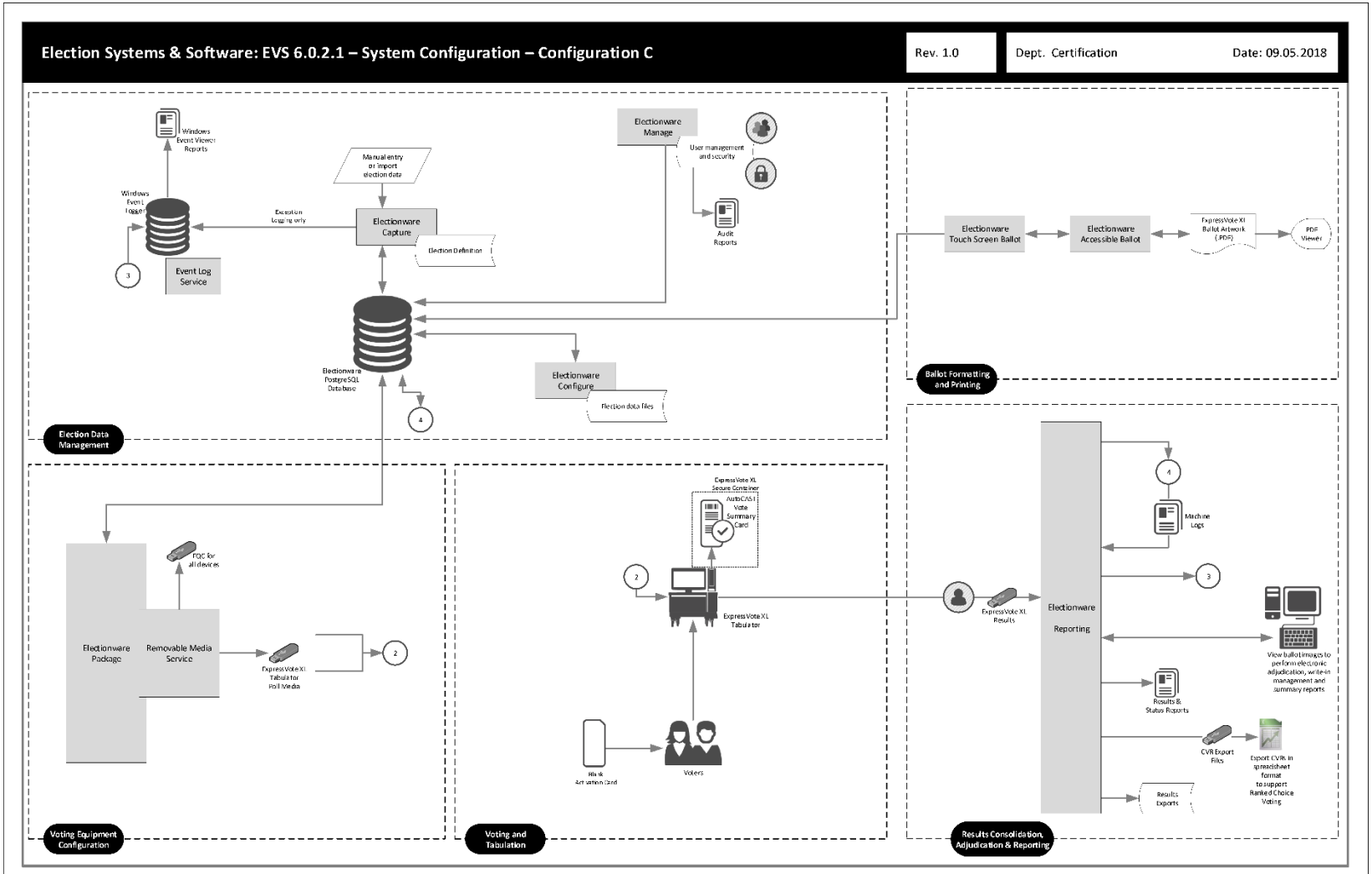
Delkin	USB Embedded 2.0 Module Flash Drive	MY16MGFSY-RA000-D / 16 GB
Delkin	Compact Flash Memory Card	1 GB
Delkin	Compact Flash Memory Card Reader/Writer	6381
Delkin	CFAST Card	2GB, 4GB
Delkin	CFAST Card Reader/Writer	DDREADER-48
CardLogix	Smart Card	CLXSU128kC7/ AED C7
SCM Microsystems	Smart Card Writer	SCR3310
Avid	Headphones	86002
Zebra Technologies	QR code scanner (Integrated)	DS457-SR20009
Symbol	QR Code scanner (External)	DS9208
Dell	DS450 Report Printer	S2810dn
OKI	DS450 and DS850 Report Printer	B431dn/B431d
OKI	DS450 and DS850 Audit Printer	Microline 420
APC	DS450 UPS	Back-UPS Pro 1500
APC	DS850 UPS	Back-UPS RS 1500 or Pro 1500
Tripp Lite	DS450 and DS850 Surge Protector	Spike Cube
Seiko Instruments	Thermal Printer	LTPD-347B
NCR/Nashua	Paper Roll	2320
Fujitsu	Thermal Printer	FTP-62GDSL001/ FTP-63GMCL153

Configuration Diagrams

Configuration A




Election Systems & Software: EVS 6.0.2.1 – System Configuration – Configuration B
Rev. 1.0
Dept. Certification
Date: 09.05.2018
Windows Event Viewer Reports
Windows Event Logger
Event Log Service
Manual entry or import election data
Electionware Capture
Election Definition
Electionware Manage
User management and security
Audit Reports
Electionware PostgreSQL Database
Electionware Configure
Election data Files
Election Data Management
Ballot artwork (.PDF)
Ballot on Demand (BOD) Manifest (.TXT)
Electionware Print
PDF Viewer
Ballot Printer
Ballot On Demand Ballots
Electionware Paper Ballot
Ballot Style
Blank Ballot
Ballot Formatting and Printing
Electionware Package
Removable Media Service
EQC for all devices
Central Count Election (DS450/DS850)
DS200 Poll Media
ExpressVote Marker Poll Media
ExpressVote Tabulator Poll Media
ExpressVote Master Media
Voting Equipment Configuration
DS850
DS450
DS200
Vote Summary Card
AutoCAST Vote Summary Card
ExpressVote Marker or Tabulator
Blank Ballot
Voters
Blank Activation Card
Voting and Tabulation
DS850 Results
DS450 Results
DS200 Results
ExpressVote Tabulator Results
Central Count Results Server
Electionware Reporting
Machine Logs
Results & Status Reports
View ballot images to perform electronic adjudication, write-in management and summary reports
CVR Export Files
Export CVRs in spreadsheet format to support Ranked Choice Voting
Results Exports
Results Consolidation, Adjudication & Reporting


Election Systems & Software: EVS 6.0.2.1 – System Configuration – Configuration C
Rev. 1.0
Dept. Certification
Date: 09.05.2018
Windows Event Viewer Reports
Windows Event Logs
Event Log Service
Manual entry or import election data
Exception Logging only
Electionware Capture
Election Definition
Electionware Manage
User management and security
Audit Reports
Electionware PostgreSQL Database
Electionware Configure
Election data files
Election Data Management
Electionware Touch Screen Ballot
Electionware Accessible Ballot
ExpressVote XL Ballot Artwork (.PDF)
PDF Viewer
Ballot Formatting and Printing
Electionware Package
Removable Media Service
TDC for all devices
ExpressVote XL Tabulator Poll Media
Voting Equipment Configuration
ExpressVote XL Secure Container
AuditCAST Vote Summary Card
ExpressVote XL Tabulator
Blank Activation Card
Voters
Voting and Tabulation
ExpressVote XL Results
Electionware Reporting
Machine Logs
View ballot images to perform electronic adjudication, write-in management and summary reports
Results & Status Reports
CVR Export Files
Export CVRs in spreadsheet format to support Ranked Choice Voting
Results Exports
Results Consolidation, Adjudication & Reporting

System Limitations

This table depicts the limits the system has been tested and certified to meet.

System Characteristic	Boundary or Limitation	Limiting Component
Max. precincts allowed in an election	9,900	Electionware
Max. ballot styles in an election	15,000	Electionware
Max. candidates allowed per election	10,000	Electionware
Max. contests allowed in an election	10,000	Electionware
Max. number of parties allowed	General election: 75 Primary election: 30	Electionware
Max. District Types/Groups	25	Electionware
Max. districts of a given type	250	Electionware
Max. Contests allowed per ballot style	500	N/A
Max. Reporting Groups in an election	14	Electionware
Max. candidates allowed per contest	230	Electionware
Max. "Vote For" per contest	230	Electionware
Max. ballots per batch	1,500	DS450/DS850

Component Limitations:

Electionware

1. Electionware capacities exceed the boundaries and limitations documented for ES&S voting equipment and election reporting software. For this reason, ballot tabulator limitations define the boundaries and capabilities of Electionware system.
2. Electionware software field limits were calculated using default text sizes for ballot and report elements. Some uses and conditions, such as magnified ballot views or combining elements on printed media or ballot displays, may result in limits lower than those listed in the System Overview.
3. The Electionware Export Ballot Images function is limited to 250 districts per export.
4. Electionware is limited to the language special characters listed in the System Overview. Language special characters other than those on this list may not appear properly when viewed on equipment displays or reports.

5. The Straight Party feature must not be used in conjunction with the Single or Multiple Target Cross Endorsement features.
6. The 'MasterFile.txt' and the 'Votes File.txt' do not support results for elections that contain multiple sheets or multiple ExpressVote cards per voter. These files can be produced using the Electionware > Reporting > Tools > Export Results menu option. This menu option is available when the Rules Profile is set to "Illinois".

Paper Ballot Limitations

1. The paper ballot code channel, which is the series of black boxes that appear between the timing track and ballot contents, limits the number of available ballot variations depending on how a jurisdiction uses this code to differentiate ballots. The code can be used to differentiate ballots using three different fields defined as: Sequence (available codes 1-16,300), Type (available codes 1-30) or Split (available codes 1-18).
2. If Sequence is used as a ballot style ID, it must be unique election-wide and the Split code will always be 1. In this case the practical style limit would be 16,300.
3. The ExpressVote activation card has a limited ballot ID based on the three different fields defined as: Sequence (available codes 1-16,300), Type (available codes 1-30) or Split (available codes 1-18).
4. Grid Portrait and Grid Landscape ballot types are New York specific and not for general use.

ExpressVote

1. ExpressVote capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. For this reason, Election Management System and ballot tabulator limitations define the boundaries and capabilities of the ExpressVote system as the maximum capacities of the ES&S ExpressVote are never approached during testing.

ExpressVote XL

1. ExpressVote XL capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting systems. For this reason, Election Management System and ballot tabulator limitations define the boundaries and capabilities of the ExpressVote XL system as the maximum capacities of the ES&S ExpressVote XL are never approached during testing.
2. ExpressVote XL does not offer open primary support based on the ES&S definition of Open Primary, which is the ability to select a party and vote based on that party.
3. ExpressVote XL does not support Massachusetts Group Vote.
4. ExpressVote XL does not support Universal Primary Contest.
5. ExpressVote XL does not support Multiple Target Cross Endorsement.
6. ExpressVote XL does not support Reviewer or Judges Initials boxes.
7. ExpressVote XL does not support multi-card ballots.
8. In a General election, one ExpressVote XL screen can hold 32 party columns if set up as columns or 16 party rows if set up as rows.
9. ExpressVote XL does not support Team Write-In.

ExpressTouch

1. ExpressTouch capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting systems. For this reason, Election Management System limitations define the boundaries and capabilities of the

ExpressTouch system as the maximum capacities of the ES&S ExpressTouch are never approached during testing.
2. ExpressTouch does not offer open primary support, which is the ability to select a party and vote based on that party.
3. ExpressTouch does not support Massachusetts Group Vote.
4. ExpressTouch does not support Universal Primary Contest.
5. ExpressTouch does not support Multiple Target Cross Endorsement.
6. ExpressTouch does not support Team Write-In.

DS200

1. The ES&S DS200 configured for an early vote station does not support precinct level results reporting. An election summary report of tabulated vote totals is supported.
2. The DS200 storage limitation for write-in ballot images is 3,600 images. Each ballot image includes a single ballot face, or one side of one page.
3. Write-in image review requires a minimum 1GB of onboard RAM.
4. To successfully use the Write-In Report, ballots must span at least three vertical columns. If the column is greater than 1/3 of the ballot width (two columns or less), the write-in image will be too wide to print on the tabulator report tape.

Functionality

VVSG 1.0 Supported Functionality Declaration

Feature/Characteristic	Yes/No	Comment
Voter Verified Paper Audit Trails		
VVPAT	No	
Accessibility		
Forward Approach	Yes	
Parallel (Side) Approach	Yes	
Closed Primary		
Primary: Closed	Yes	
Open Primary		
Primary: Open Standard (provide definition of how supported)	Yes	Configuration B only
Primary: Open Blanket (provide definition of how supported)	No	
Partisan & Non-Partisan:		
Partisan & Non-Partisan: Vote for 1 of N race	Yes	
Partisan & Non-Partisan: Multi-member (“vote for N of M”) board races	Yes	
Partisan & Non-Partisan: “vote for 1” race with a single candidate and write-in voting	Yes	
Partisan & Non-Partisan “vote for 1” race with no declared candidates and write-in voting	Yes	
Write-In Voting:		
Write-in Voting: System default is a voting position identified for write-ins.	Yes	
Write-in Voting: Without selecting a write in position.	Yes	
Write-in: With No Declared Candidates	Yes	
Write-in: Identification of write-ins for resolution at central count	Yes	
Primary Presidential Delegation Nominations & Slates:		

Feature/Characteristic	Yes/No	Comment
Primary Presidential Delegation Nominations: Displayed delegate slates for each presidential party	No	
Slate & Group Voting: one selection votes the slate.	No	
Ballot Rotation:		
Rotation of Names within an Office; define all supported rotation methods for location on the ballot and vote tabulation/reporting	Yes	
Straight Party Voting:		
Straight Party: A single selection for partisan races in a general election	Yes	
Straight Party: Vote for each candidate individually	Yes	
Straight Party: Modify straight party selections with crossover votes	Yes	
Straight Party: A race without a candidate for one party	Yes	
Straight Party: N of M race (where "N">1)	Yes	
Straight Party: Excludes a partisan contest from the straight party selection	Yes	
Cross-Party Endorsement:		
Cross party endorsements, multiple parties endorse one candidate.	Yes	
Split Precincts:		
Split Precincts: Multiple ballot styles	Yes	
Split Precincts: P & M system support splits with correct contests and ballot identification of each split	Yes	
Split Precincts: DRE matches voter to all applicable races.	Yes	
Split Precincts: Reporting of voter counts (# of voters) to the precinct split level; Reporting of vote totals is to the precinct level	Yes	It is possible to list the number of voters.
Vote N of M:		
Vote for N of M: Counts each selected candidate, if the maximum is not exceeded.	Yes	
Vote for N of M: Invalidates all candidates in an overvote (paper)	Yes	
Recall Issues, with options:		
Recall Issues with Options: Simple Yes/No with separate race/election. (Vote Yes or No Question)	No	
Recall Issues with Options: Retain is the first option, Replacement candidate for the second or more options (Vote 1 of M)	No	
Recall Issues with Options: Two contests with access to a second contest conditional upon a specific vote in contest one. (Must vote Yes to vote in 2nd contest.)	No	
Recall Issues with Options: Two contests with access to a second contest conditional upon any vote in contest one. (Must vote Yes to vote in 2nd contest.)	No	
Cumulative Voting		
Cumulative Voting: Voters are permitted to cast, as many votes as there are seats to be filled for one or more candidates. Voters are not limited to giving only one vote to a candidate. Instead, they can put multiple votes on one or more candidate.	No	
Ranked Order Voting		

Feature/Characteristic	Yes/No	Comment
Ranked Order Voting: Voters can write in a ranked vote.	No	
Ranked Order Voting: A ballot stops being counting when all ranked choices have been eliminated	No	
Ranked Order Voting: A ballot with a skipped rank counts the vote for the next rank.	No	
Ranked Order Voting: Voters rank candidates in a contest in order of choice. A candidate receiving a majority of the first choice votes wins. If no candidate receives a majority of first choice votes, the last place candidate is deleted, each ballot cast for the deleted candidate counts for the second choice candidate listed on the ballot. The process of eliminating the last place candidate and recounting the ballots continues until one candidate receives a majority of the vote	No	
Ranked Order Voting: A ballot with two choices ranked the same, stops being counted at the point of two similarly ranked choices.	No	
Ranked Order Voting: The total number of votes for two or more candidates with the least votes is less than the votes of the candidate with the next highest number of votes, the candidates with the least votes are eliminated simultaneously and their votes transferred to the next-ranked continuing candidate.	No	
Provisional or Challenged Ballots		
Provisional/Challenged Ballots: A voted provisional ballots is identified but not included in the tabulation, but can be added in the central count.	Yes	
Provisional/Challenged Ballots: A voted provisional ballots is included in the tabulation, but is identified and can be subtracted in the central count	Yes	
Provisional/Challenged Ballots: Provisional ballots maintain the secrecy of the ballot.	Yes	
Overvotes (must support for specific type of voting system)		
Overvotes: P & M: Overvote invalidates the vote. Define how overvotes are counted.	Yes	
Overvotes: DRE: Prevented from or requires correction of overvoting.	Yes	
Overvotes: If a system does not prevent overvotes, it must count them. Define how overvotes are counted.	Yes	
Overvotes: DRE systems that provide a method to data enter absentee votes must account for overvotes.	Yes	
Undervotes		
Undervotes: System counts undervotes cast for accounting purposes	Yes	
Blank Ballots		
Totally Blank Ballots: Any blank ballot alert is tested.	Yes	
Totally Blank Ballots: If blank ballots are not immediately processed, there must be a provision to recognize and accept them	Yes	
Totally Blank Ballots: If operators can access a blank ballot, there must be a provision for resolution.	Yes	
Networking		
Wide Area Network – Use of Modems	No	