Certification Test Report - Modification

Report Number: ESY-18003-CTR-02

Prepared for:

Vendor Name	Election Systems and Software (ES&S)
Vendor System	EVS 6.0.2.1
EAC Application No.	ESSEVS6021
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Accredited by the Election Assistance Commission (EAC) for Selected Voting System Test Methods or Services

Revision History

Date	Version	Author	Revision Summary
October 1st, 2018	1.0	J. Panek	Initial Draft
October 15th, 2018	1.1	A. Bunch	Updates per EAC Comments
October 23rd, 2018	1.2	J. Panek	Updates per EAC Comments

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Opinions and Interpretations

There are no opinions or interpretations included in this report, except as noted under Recommendations.

TABLE OF CONTENTS

1   INTRODUCTION

SLI Compliance is submitting this Certification Test Report as a summary of the modification and regression testing performed on the **ES&S EVS 6.0.2.1** system against the Voluntary Voting System Guidelines 1.0 (VVSG 1.0). **ES&S EVS 6.0.2.1** is a modification of the **ES&S EVS 6.0.0.0** voting system, certified by the EAC on July 2nd, 2018, with limited changes. The system was tested based on the "modified system" requirements, as set forth in section 4.6.2.3 of the "EAC Voting System Testing and Certification Program Manual, version 2.0". The purpose of this document is to provide an overview of the testing and findings for the **ES&S EVS 6.0.2.1** voting system.

This effort included review of updates made to the Technical Data Package, review of source code changes, and modification and regression testing of the **ES&S EVS 6.0.2.1** voting system**.** The process consisted of development of a test plan, source code review, technical data package (TDP) review, performance enhancement, integration, accuracy, security, and regression tests prepared or modified by SLI, execution of the tests prepared, and analysis of results. The review and testing were performed at SLI's Wheat Ridge, Colorado facility.

1.1 Test Report Attachments

The following attachments apply to this Certification Test Report:

- Attachment A – ES&S EVS6021 Attestation Letter
- Attachment B – ES&S EVS6021 Implementation Statement
- Attachment C – ES&S EVS6021 Documentation Listing
- Attachment D – ES&S EVS6021 Trusted Build Record
- Attachment E – ES&S EVS6021 PCA Summary
- Attachment F – ES&S EVS6021 List of Source Code Reviewed and Results
- Attachment G – ES&S EVS6021 Discrepancy Report
- Attachment H – ES&S EVS6021 As Run Test Plan

1.2 References

The following key documents were used in preparing this test plan.

1. Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG), 2005 Version 1.0 Volumes I and II.
2. NIST Handbook 150: 2016.
3. NIST Handbook 150-22: 2017.
4. EAC Voting System Testing and Certification Program Manual, United States Election Assistance Commission, v 2.0, May 2015
5. SLI VSTL Quality System Manual, v 2.6, March 28, 2018.

1.3 System Identification

This section provides a description of the scope of **ES&S EVS 6.0.2.1** voting system and components.

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.

1.3.1 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.

1.3.2 ExpressVote XL™

ExpressVote XL 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.

1.3.3 ExpressTouch®

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

1.3.4 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.

1.3.5 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.

1.3.6 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).

1.3.7 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).

1.3.8 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).

1.3.9 Event Log Service (ELS)

Event Log Service (**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**.

1.3.10 Removable Media Service (RMS)

Removable Media Service (**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.
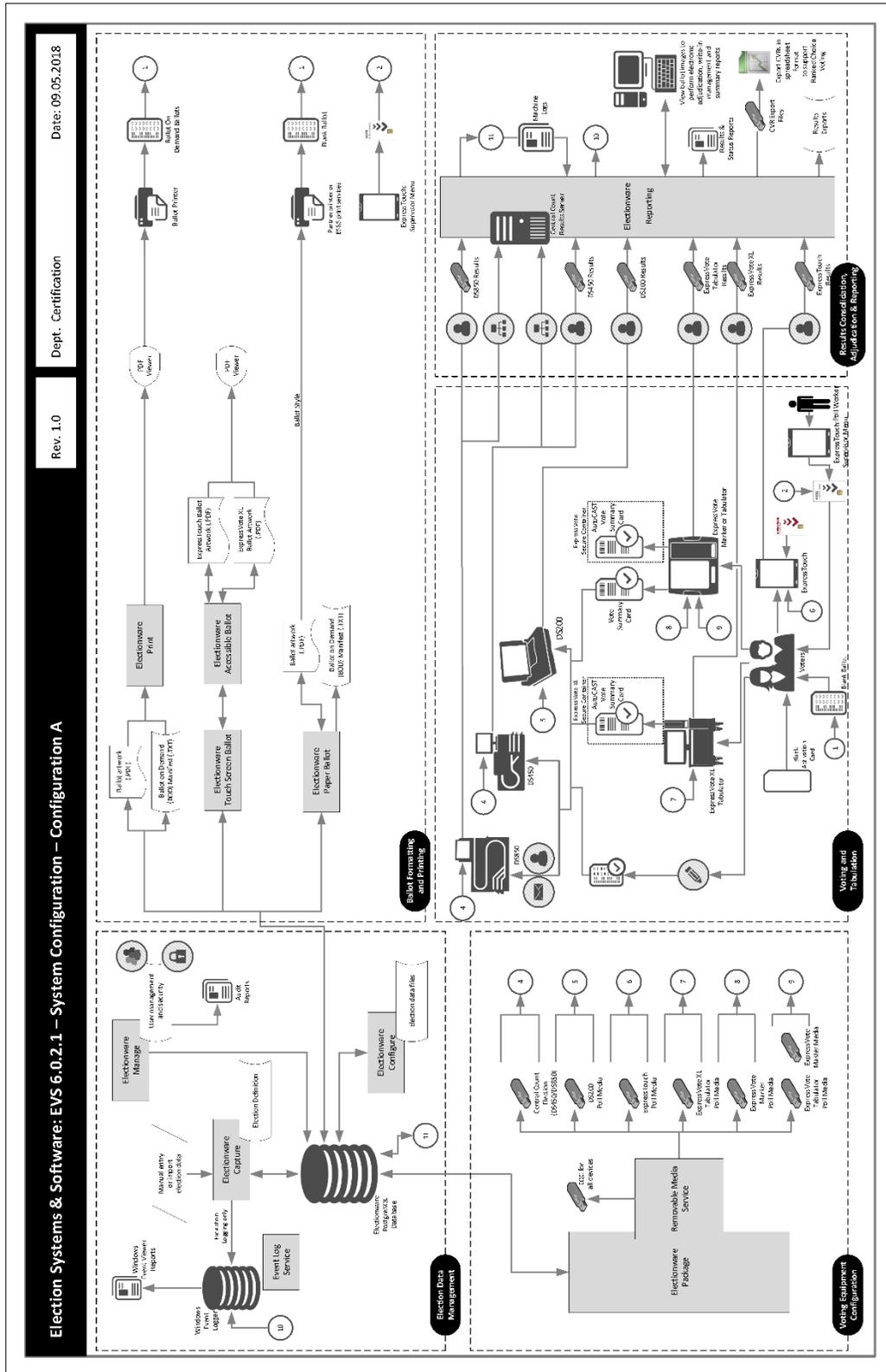
1.3.11 Block Diagrams

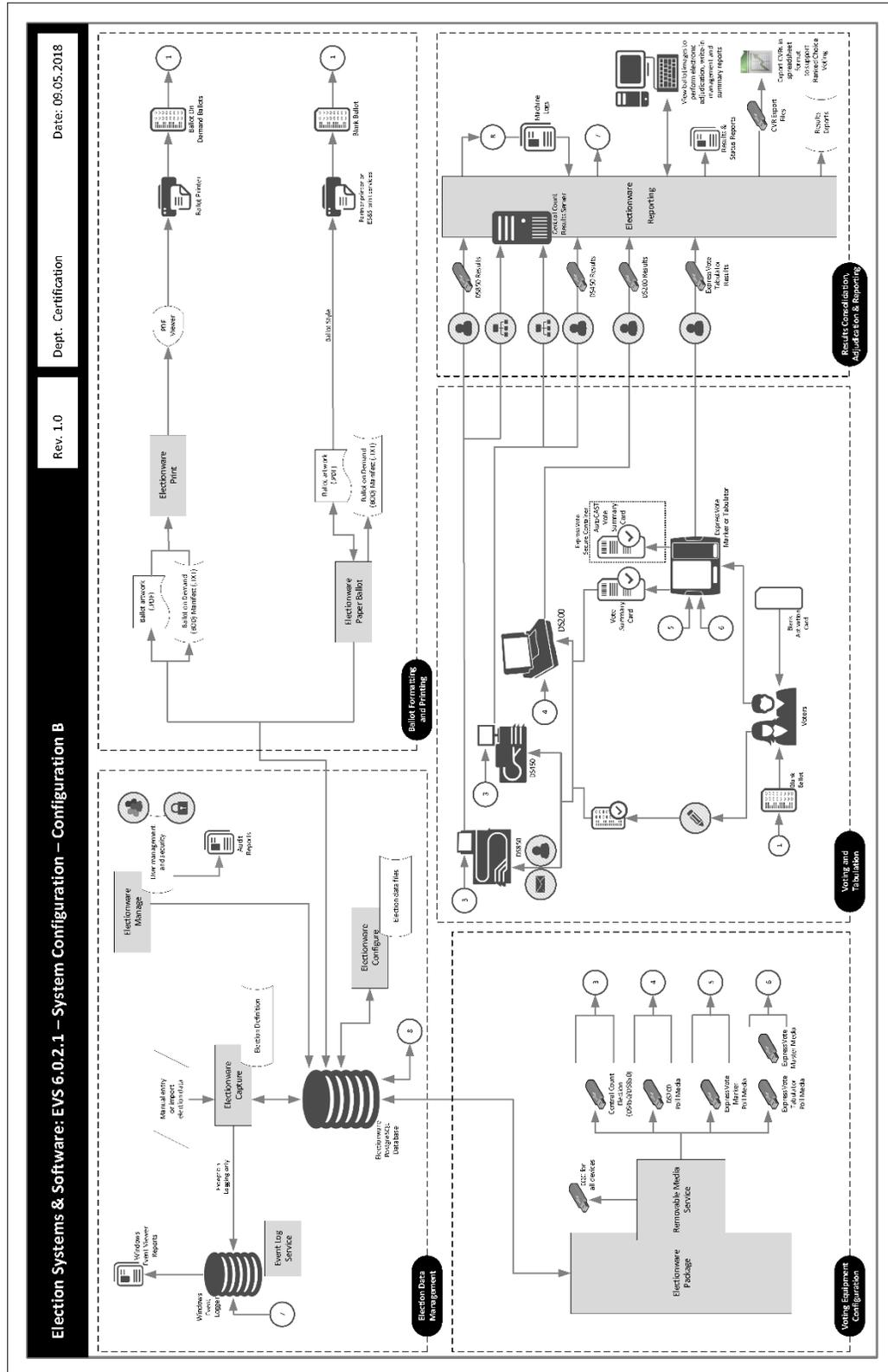**Figure 1: Voting System Overview – Configuration A**

Figure 2: Voting System Overview – Configuration B

Figure 3: Voting System Overview – Configuration C

1.4 Software and Firmware

All software/firmware to be used by the declared voting system whether directly or indirectly, in a production environment, must be validated during the certification process.

The software and firmware employed by **ES&S EVS 6.0.2.1** consists of two types, custom and commercial off the shelf (COTS). COTS applications were verified to be pristine, or were subjected to source code review for analysis of any modifications and verification of meeting the pertinent standards.

1.4.1 Manufacturer Software/Firmware

The **ES&S EVS 6.0.2.1** voting system consists of the following software and firmware components:

- **Electionware** Election database creation, media programming and tally/reporting software
- **DS450** Central Count scanner and tabulator, Central Tabulator firmware
- **DS850** Central Count scanner and tabulator, Central Tabulator firmware
- **DS200** Precinct scanner and tabulator, Precinct Tabulator firmware
- **ExpressVote HW1.0** Precinct ballot marker, Universal Voting System firmware
- **ExpressVote HW2.1** Precinct ballot marker and/or Precinct scanner and tabulator, Universal Voting System firmware
- **ExpressVote HW1.0 Previewer** ballot preview software
- **ExpressVote HW2.1 Previewer** ballot preview software
- **ExpressVote XL** Precinct ballot marker and/or Precinct scanner and tabulator, using a full-face touchscreen and Universal Voting System firmware
- **ExpressTouch** DRE, Electronic Universal Voting System firmware
- **Event Log Service (ELS)** software service monitoring user's interactions with the Election Management System
- **Removable Media Service (RMS)** software service supporting election media programming

Table 1 – ES&S EVS 6.0.2.1 Software/Firmware

Application	Version
Electionware – Standalone or Client/Server	5.0.2.0
Event Log Service	1.6.0.0
Removable Media Service	1.5.0.0
ExpressVote HW1.0	1.5.1.0
ExpressVote HW2.1	2.4.3.0
ExpressVote HW1.0 Previewer	1.5.1.0
ExpressVote HW2.1 Previewer	2.4.3.0
DS200	2.17.0.0

Application	Version
DS200 Ancillary (used to build the DS200 file, but no resultant output)	6.0.0.0
DS850	3.1.0.0
DS450	3.1.0.0
ExpressVote XL	1.0.1.0
ExpressTouch	1.0.0.0

Note: The Previewer and DS200 Ancillary file(s) are built during the same build as the respective ExpressVote and DS200 application.

1.4.2 COTS Software/Firmware

This section details the COTS software and firmware utilized within the **ES&S EVS 6.0.2.1** voting system.

Table 2 – COTS Software/Firmware

Manufacturer	Application	Version
Microsoft Corporation	Windows 7 Professional	SP-1 (64-bit)
Microsoft Corporation	Windows Server 2008	R2, SP-1 (64-bit)
Microsoft Corporation	WSUS Microsoft Windows Offline Update Utility	11.1.1
Symantec	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	Cerberus FTP Server – Enterprise	9.0.3.1 (64-bit)
Adobe	Adobe Acrobat Standard	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

1.5 Equipment

The following equipment is required for the execution of the hardware, software, telecommunications, and security tests. This includes system hardware, general purpose data processing and communications equipment, and any test instrumentation required.

1.5.1 ES&S EVS 6.0.2.1 Equipment

The following manufacturer equipment was used in testing:

Table 3 – ES&S EVS 6.0.2.1 Equipment

Hardware	HW Revision	Model
ExpressVote Universal Voting System	1.0	N/A
ExpressVote Universal Voting System	2.1, 2.1.2.0	2.1.2.0 includes display versions 6.4 and 6.8
DS200 Precinct-based Scanner and Tabulator	1.2, 1.3	N/A
DS450 Central Count Scanner and Tabulator	1.0	N/A
DS850 Central Count Scanner and Tabulator	1.0	N/A
ExpressVote XL Full-Faced Universal Voting System	1.0	N/A
ExpressTouch Electronic Universal Voting System	1.0	N/A
ExpressVote Rolling Kiosk	1.0	98-00049
ExpressVote Voting Booth	N/A	98-00051
ExpressVote Single Table	N/A	87033
ExpressVote Double Table	N/A	87032
ExpressVote ADA Table	N/A	87031
DS200 Collapsible Ballot Box	1.0	98-00009
DS200 Plastic Ballot Box	1.2, 1.3, 1.4, 1.5	57521
DS200 Metal Ballot Box	1.0, 1.1, 1.2	76245
DS200 Tote Bin	1.0	00074
DS450 Cart	N/A	3002
DS850 Cart	N/A	6823
Universal Voting Console	1.0	98-00077
Tabletop Easel	N/A	14040
ExpressTouch Voting Booth	N/A	98-00081

1.5.2 COTS Equipment

The following COTS equipment was used in testing:

Table 4 – COTS Equipment

Manufacturer	Hardware	Model	Operating System
Innodisk	USB EDC H 2SE (1GB)	DEEUH 1-01GI72AC1SB (for ExpressVote HW1.0)	N/A

Manufacturer	Hardware	Model	Operating System
Innodisk	USB EDC H 2SE (16GB)	DEUH1-16GI72AC1SB (for ExpressVote HW2.1)	N/A
Delkin Devices	USB Embedded 2.0 Module (16GB)	MY16MGFSY-RA000-D	N/A
Symbol	Scanner (External)	DS9208	N/A
Zebra Technologies	Scanner (Integrated)	DS457-SR20009	N/A
OKI	Audit Printer	Microline 420	N/A
Dell	Report Printer	S2810dn	N/A
OKI	Report Printer	B431DN B431D	N/A
Tripp Lite	Spike Cube	SPIKECUBE	N/A
APC	Backup power supply (Uninterruptible Power Supply)	Back-UPS Pro 1500 Back-UPS RS 1500	N/A
Various (EMS Networked or Standalone configuration)	• Processor: Dual Core • RAM: 4GB, 8GB recommended • Hard Disk: 150GB • Keyboard • Mouse • Monitor: 1280x800 resolution • Monitor – ExpressVote XL (Monitor needed for programming election for ExpressVote XL) 1920x1080p resolution • CD/DVD reader: 16x min • 2 USB ports: 2.0 min • Report Printer: w/printer control language driver	N/A	Windows 7 Professional, SP-1 (64-bit)
Various (EMS Networked server configuration)	• Processor: Dual Core or Quad Core • RAM: 4GB, 8GB recommended • Hard Disk: 150GB or 320GB • Keyboard		Windows Server 2008 R2, SP-1 (64-bit)

Manufacturer	Hardware	Model	Operating System
	• Mouse • Monitor: 1280x800 resolution • Monitor – ExpressVote XL Program Your Own: 1920x1080p resolution • CD/DVD reader: 16x min • 2 USB ports: 2.0 min • Report Printer: Network printer w/printer control language driver • Ethernet Port • Backup power supply: 865 Watts / 1500 VA output capacity • Network Switch: 1GB throughput		
Delkin	USB Flash Drive: 512MB, 1GB, 2GB, 4GB, 8GB	N/A	N/A
Delkin	USB Flash Drive: 16GB (Validation only)	N/A	N/A
AVID	Headphones	86002	N/A
Seiko Instruments	Thermal Printer	LTPD-347B	N/A
NCR / Nashua	Paper Roll	2320	N/A
Delkin	Compact Flash Memory Card: 1GB max	N/A	N/A
Delkin	Compact Flash Memory Card Reader/Writer	6381	N/A
Delkin	Compact Flash Memory Card Reader/Writer	DDREADER-48	N/A
Delkin	CFAST Card, 2GB, 4GB	N/A	N/A
CardLogix	Smart Card	CLXSU128KC7 / AED C7	N/A
SCM Microsystems	Smart Card Writer	SCR3310	N/A
Fujitsu	Thermal Printer	FTP-62GDSL001 FTP-63GMCL153	N/A
TDS	Ink Cartridge	2278	N/A
HP Inkjet	Ink Cartridge	87002	N/A

1.6 Test Materials

The following test materials are required for the performance of testing including, as applicable, test ballot layout and generation materials, test ballot sheets, test ballot cards and control cards, standard and optional output data report formats, and any other materials used in testing.

- Ballots and blank ballot grade paper
- Activation cards
- Smart cards
- Ballot pens
- Printer paper rolls
- General voter data*

* A large volume of voter data was generated by ES&S and used to conduct their internal testing to research and implement modifications to achieve desired performance enhancements. This voter data was used by SLI to conduct Formal Test Execution for the Performance Enhancement Test Suite.

1.7 ES&S EVS 6.0.2.1 Documentation

The documents that are a part of the **ES&S EVS 6.0.2.1** voting system are detailed in "Attachment C – ES&S EVS6021 Documentation Listing".

1.8 Modifications

The following modifications are part of the **ES&S EVS 6.0.2.1** voting system:

Table 5 – Modifications

Component	Change ID/EC#	Change Summary	Reason for Change
Electionware Results	EW-6982	Improved Manual Update performance.	Performance Improvement
Electionware Results	EW-6984	Improved poll media load results performance.	Performance Improvement
Electionware Results	EW-6985 EW-6999 EW-7099	Improved speed to open the Reporting module when large amounts of poll media are loaded.	Performance Improvement
Electionware Results	EW-6986	Improved time to Clear Results by Poll Media.	Performance Improvement
Electionware Results	EW-6988 EW-7049	Optimized multi-client Write-in Review assignment.	Write-In Optimization
Electionware Results	EW-6989	Optimized simultaneous multi-client Write-in Review assignment and filtering.	Write-In Optimization

Component	Change ID/EC#	Change Summary	Reason for Change
Electionware Results	EW-6992	Improved performance for Write-in Review query with numerous write-ins.	Write-In Optimization
Electionware Results	EW-6997	Improved speed of Write-In Report generation in a large election.	Write-In Optimization
Electionware Results	EW-7000	Improved time to Clear Results by Poll Type.	Performance Improvement
Electionware Results	EW-7036	Removed Status Pane from Load Results user interface for increased optimization.	Performance Improvement
Electionware Results	EW-7041 EW-7069	Improved timing and performance for Write-in Review query with numerous write-ins.	Write-In Optimization
Electionware Results	EW-7042	Optimized speed by creating counters map on demand with Commit Results post-adjudication step.	Performance Improvement
Electionware Results	EW-7047	Improved speed and performance for large Summary and Custom Table reports.	Performance Improvement
Electionware Results	EW-7075	Resolved intermittent "Initializing Acquire Server" message when creating Summary Report.	Performance Improvement
Electionware Results	EW-7144	Increased speed of using multiple workflows on single client by reducing size of Load Results table view to 200 entries.	Performance Improvement
Electionware Results	EW-6793	Enhanced Precinct Summary Report statistics with a partial precinct list. New use case discovered in Utah primary.	Enhancement
Electionware Results - New Use Cases	EW-7070 EW-7098 EW-7171	Allowed Write-In Review while loading results on multiple clients. New use case discovered in Kansas primary.	Write-In Optimization
Electionware Results - New Use Cases	EW-6734	Enhanced skewed ExpressVote / ExpressVote XL card images to display snippets in Write-in Review.	Enhancement
Electionware Results	EW-7186 EW-7260	Provided support for multi-language audio playback of the write-in keyboard on the ExpressVote HW 1.0, ExpressVote HW 2.1 and ExpressVote XL.	Multi-Language Support

Component	Change ID/EC#	Change Summary	Reason for Change
Electionware Results	EW-7170	Enhanced the Electionware Accessible Ballot module to ensure candidate audio and party audio is played, with no repeats, while in zoom mode.	Enhancement
ExpressVote HW 1.0 ExpressVote HW 2.1	EV1-543 EV2-414	Enhanced the audio playback of the write-in keyboard to support multi-language.	Multi-Language Support
ExpressVote HW 1.0 ExpressVote HW 2.1 ExpressVote XL	EV1-549 EV2-373 CORE-2002 EVXL-3151	Modified the user interface to properly handle manual candidate selection(s) in a contest after the selections made by the straight party selection are automatically deselected in that contest.	PA Straight Party Method
ExpressVote XL	EVXL-3089	Modified the user interface to properly handle write-in entry for a multiple Vote-For contest.	Bug Fix
ExpressVote XL	EVXL-3141 EVXL-3158	Corrected straight party audio inconsistency when changing selection.	Bug Fix
N/A	N/A	Various updates to the TDP, unrelated to the Electionware specific modifications.	Cleanup
N/A	N/A	Revised the *Standalone Setup & Configuration Guide* and *EMS Server Secure Setup & Configuration Guide* to include a new section with instructions for disabling the ActiveMQ web console.	Hardening/Security

2   Certification Test Background

This section provides a brief overview of the EAC Certification Program and the activities involved for a voting system to be considered for certification against the EAC VVSG and the EAC program manual.

2.1 System Revision History

ES&S EVS 6.0.2.1 is a modification of the **ES&S EVS 6.0.0.0** voting system, certified by the EAC on July 2nd, 2018, with limited changes. Specific engineering changes are listed in section 1.8 of this report.

2.2 Implementation Statement

The **ES&S EVS 6.0.2.1** voting system incorporates all software and hardware, as well as supporting documentation, as declared in the **ES&S**'s implementation statement, as provided to the EAC. Please refer to "Attachment B – ES&S EVS6021 Implementation Statement".

2.3 Terms and Abbreviations

The following terms and abbreviations will be used throughout this document:

Table 6 – Terms and Abbreviations

Term	Abbreviation	Description
American Association for Laboratory Accreditation	A2LA	A nonprofit, non-governmental, public service, membership society whose mission is to provide comprehensive services in laboratory accreditation and laboratory-related training.
Ballot Marking Device	BMD	An accessible computer-based voting system that produces a marked ballot (usually paper) that is the result of voter interaction with visual or audio prompts.
Cast Vote Record	CVR	Permanent record of all votes produced by a single voter whether in electronic, paper or other form. Also referred to as ballot image when used to refer to electronic ballots.
Central Count Scanner	CCS	High Speed Optical Scanner is a mark sense-based ballot and vote counting device typically located at a central count facility and is operated by an automated multi-sheet feeding capability.
Compact Flash card	CF	This is a type of flash memory card in a standardized enclosure often used in voting systems to store ballot and/or vote results data.
Commercial Off the Shelf	COTS	Term used to designate computer software, hardware or accessories that are ready-made and available for sale, lease, or license to the general public.
Direct Recording Electronic	DRE	Voting systems that, using touch screen or other user interfaces, directly record the voter's selections in each race or contest on the ballot in electronic form.
Election Assistance Commission	EAC	An independent, bipartisan commission created by the Help America Vote Act (HAVA) of 2002 that operates the federal government's voting system certification program.

Term	Abbreviation	Description
Election Management System	EMS	Typically a database management system used to enter jurisdiction information (district, precincts, languages, etc.) as well as election specific information (races, candidates, voter groups (parties), etc.). In addition, the EMS is also used to layout the ballots, download the election data to the voting devices, upload the results and produce the final results reports.
Electromagnetic Compatibility	EMC	The goal of EMC is to validate the correct functioning of different equipment in the same environment and the avoidance of any interference effects between them.
Functional Configuration Audit	FCA	The testing activities associated with the functional testing of the system.
Hybrid Device	No Abbreviation	A device that combines features of two or more functionalities that traditionally have been implemented separately. For example, ExpressVote HW2.1 can function as a vote capture device and as a precinct scanner, two functions that traditionally have not been implemented in the same hardware device.
National Institute of Standards and Technology	NIST	A non-regulatory federal agency within the U.S. Dept. of Commerce. Its mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.
National Voluntary Laboratory Accreditation Program	NVLAP	A division of NIST that provides third-party accreditation to testing and calibration laboratories.
Physical Configuration Audit	PCA	Confirms that the documentation submitted meets the national certification requirements. Includes Trusted Build activities.
Precinct Count Scanner	PCS	A precinct-count optical scanner is a mark sense-based ballot and vote counting device located at a precinct and is typically operated by scanning one ballot at a time.
Request For Information	RFI	A means used by testing laboratories and manufacturers to request that the EAC provide an interpretation of a technical issue related to testing of voting systems.

Term	Abbreviation	Description
Technical Data Package	TDP	The data package supplied by the vendor, which includes Functional Requirements, Specifications, End-user documentation, Procedures, System Overview, Configuration Management Plan, Quality Assurance Program, and manuals for each of the required hardware, software, firmware components of a voting system.
Test Method	No Abbreviation	SLI proprietary documents which are designed to group sets of EAC VVSG requirements in a logical manner that can be utilized to efficiently validate where and how requirements, or portions of a requirement, are met.
Test Module	No Abbreviation	An actionable component of a Test Method, that functionally verifies that a requirement is met within a voting system. Test Modules are at a generic level within the Test Method, and are customized for a particular voting system, within a Test Suite.
Test Suite	No Abbreviation	An actionable grouping of test modules designed to test a set of functions of a voting system or component in a specific way.
Universal Voting Console	UVC	The UVC features large, color-coded keys labeled with both visible text and Braille characters. The UVC keys enable the voter to adjust the audio volume and tempo, navigate the ballot, make contest selections, open the help screen, and use the blank privacy screen feature.
Universal Voting System	UVS	A device designed for all voters.
Voluntary Voting System Guidelines	VVSG	A set of specifications and requirements against which voting systems can be tested to determine if the systems provide all of the basic functionality, accessibility and security capabilities required for EAC certification.
Voting System Test Lab	VSTL	An independent testing organization accredited by NVLAP and the EAC to conduct voting system testing for EAC certification.
Voting Test Engineer	VTE	An SLI employee within the Compliance division who has been qualified to perform EAC voting system certification testing.

2.4 PCA - Document and Source Code Reviews

The Physical Configuration Audit (PCA) review of the **ES&S EVS 6.0.2.1** voting system documentation, submitted in the requisite Technical Data Package (TDP), was performed in order to verify conformance with the Election Assistance Commission Voluntary Voting System Guidelines 1.0 (EAC VVSG 1.0). Source code was reviewed for each software and

firmware application modified from **ES&S EVS 6.0.0.0** for the **ES&S EVS 6.0.2.1** voting system. Source code was not reviewed for firmware or software applications that were not modified for **ES&S EVS 6.0.2.1.**

All PCA reviews were conducted in accordance with *Volume 2 Section 2* of the EAC VVSG 1.0, to demonstrate that the system meets the requirements. Results of the PCA documentation review can be found in section 3.2 of this Certification Test Report. Inconsistencies or errors in documentation were identified to **ES&S** for resolution or comment. Additional details of the PCA documentation review can be found in "Attachment E – ES&S EVS6021 PCA Summary".

All PCA source code reviews were conducted in accordance with *Volume 1 Section 5.2 and Volume 2 Section 5* of the EAC VVSG 1.0, to demonstrate that the system meets the requirements. Results of the PCA source code reviews can be found in "Attachment F – ES&S EVS6021 List of Source Code Reviewed and Results".

2.5 FCA - Functional & System Testing and Sampling

The Functional Configuration Audit (FCA) review of the test documentation submitted by **ES&S** in the TDP was executed to verify testing of the voting system requirements defined in *Volume 1 Sections 2, 6, 7,* and *9* of the EAC VVSG 1.0. Changes made to the TDP from **ES&S EVS 6.0.0.0** to the TDP submitted with **ES&S EVS 6.0.2.1** were reviewed in detail.

SLI's standard Test Suites were customized for the **ES&S EVS 6.0.2.1** voting system and conducted in accordance with *Volume 2 Section 6,* in conjunction with the source code review, TDP review, performance enhancement, integration, accuracy, security, and regression tests. Simulations of elections were conducted to demonstrate a beginning-to-end business use case process for the **ES&S EVS 6.0.2.1** voting system.

2.5.1   Test Methods

All test methods employed are within the scope of SLI's VSTL accreditation. The following validated test methods were employed during this test campaign:

Table 7 – Test Methods

SLI VSTL Test Method Name
TM_Accuracy v1.1.doc
TM_Basic_Election_Components v1.0.doc
TM_Tally_and_Reporting v1.0.doc
TM_Ballot_Counter v1.1.doc
TM_Accumulating_and_Tansmitting_Results v1.1.doc
TM_Voting_Capabilities v1.3.doc
TM_Security - Access Control
TM_Security - Software Security
TM_Vote_for_N_of_M
TM_Voting_Straight_Party

The above listed test methods are implemented in a complementary fashion: modules are employed from various methods to form suites. Suites include a logical sequence of functionality that is used to validate the requirement addressed by each module within the suite. Please see the Terms and Abbreviations table for additional information about Test Modules and Test Suites.

3   Certification Test Results Summary

3.1 Source Code Review Summary

SLI has reviewed the modified software source code for each application in the **ES&S EVS 6.0.2.1** voting system to determine the code's compliance with the EAC VVSG 1.0, *Volume 1 Sections 5, 9* and *Volume 2 Section 5.4* and for compliance with **ES&S'**s internally developed coding standards. **ES&S EVS 6.0.2.1** is implemented with the C, C++, C#, Java, VB and VB.net languages. Results of the source code review are detailed in "Attachment F – ES&S EVS6021 List of Source Code Reviewed and Results".

Evaluation of Source Code

The source code was reviewed for compliance per the guidelines defined in EAC VVSG *1.0, Volume 1 Sections 5, 9* and *Volume 2 Section 5.4*. The source code was written adequately in terms of the EAC VVSG 1.0. The code is modular and contains sufficient error handling. Readability is sufficient and supports maintainability.

3.2 Technical Data Package Review Summary

SLI reviewed the **ES&S EVS 6.0.2.1** TDP for compliance with the EAC VVSG 1.0 according to *Volume 2 Section 2*. The documents that are a part of the **ES&S EVS 6.0.2.1** voting system are detailed in "Attachment C – ES&S EVS6021 Documentation Listing".

Evaluation of TDP

The Technical Data Package for the **ES&S EVS 6.0.2.1** voting system was found to comply with the standards such that a jurisdiction would be able appropriately deploy the **ES&S EVS 6.0.2.1** voting system.

3.3 Functional Testing Summary

SLI performed tests designed to functionally verify the modifications listed in section 1.8 of this report. The testing incorporated end-to-end election scenarios testing the functionality supported by **ES&S**.

3.3.1 Test Suites Utilized

The following test suites were executed:

3.3.2 Pennsylvania Straight Party Method Test Suite

A General Election designed to test all variations of the Pennsylvania Straight Party Method was performed to ensure all modifications and performance related enhancements are working correctly as documented, and in accordance with the VVSG 1.0 requirements.

3.3.3 Integration Test Suite

An Integration Test Suite designed to verify proper integration of system components was conducted using a Closed Primary. The election used included N of M voting, overvoting, undervoting, write-ins, tally, results loading, and reporting functionality.

The **ExpressVote HW1.0**, **ExpressVote HW2.1,** and **ExpressVote XL** were utilized to mark and print vote summary cards, which were then scanned into the **DS200, DS450,** and **DS850** scanning devices.

3.3.4 Accuracy Test Suite

Accuracy testing was performed to verify the ability of the system to capture, record, store, consolidate and report the specific selections and absence of selections, made by the voter for each ballot position, without error. Additionally, the system was exercised to validate that the accumulation, tallying and reporting mechanisms at the system level accurately perform their functions.

Accuracy testing was conducted at both the device level and the system level. The **ExpressVote HW1.0**, **ExpressVote HW2.1,** and **ExpressVote XL** were utilized to mark and print vote summary cards, which were then scanned into the **DS450** and **DS850** devices.

3.3.5 Performance Enhancement Test Suite

A Performance Enhancement Test Suite designed to simulate a large county-wide General Election was processed through the **Electionware** software application using prepared voter data. Data load performance enhancements were tested simultaneously using both write-in capability and periodic report generation, to ensure all performance related enhancements are working correctly as documented, and in accordance with the VVSG 1.0 requirements.

This test was conducted on a General Election utilizing the data provided by ES&S, as described in Section 1.6. The Performance Enhancement Test Suite does not include the design and processing of a Primary Election.

3.3.6 Security Test Suite

A Security Test Suite was conducted to test the specific modification regarding updates to the installation and hardening procedures for EMS to disable login to Apache ActiveMQ. The test included analyzing the changes to the EMS hardening procedure, executing the

EMS hardening procedure, and verifying that the intended outcome was achieved regarding login to Apache ActiveMQ.

3.3.7 Regression Test Suite

Regression test cases were performed to test the **Electionware** modifications for optimization of poll media results loading performance, and to address other modifications that are identified in the following sentences. Various elections were used to process vote data on all devices in the **ES&S EVS 6.0.2.1** voting system, which was then processed through **Electionware** directly via both USB poll media as well as networked configurations. Additional modification verification included testing the **Electionware** Accessible Ballot module to ensure audio is played properly while in zoom mode, enhancement of the audio playback of the write-in keyboard to support multiple languages, verification of specific reporting statistics, **ExpressVote** vote card summary snippet review, the **Electionware** load results view, and an **Electionware** on-demand counters map.

These tests were conducted using a Closed Primary, an Open Primary, and a General Election.

3.3.8 Evaluation of Functional Testing

In this test campaign, **ES&S EVS 6.0.2.1** was subjected to examination for changes, updates, and modifications made from the previously certified system, **ES&S EVS 6.0.0.0,** against applicable requirements within EAC VVSG 1.0. Results of the functional testing are detailed in "Attachment G – ES&S EVS6021 Discrepancy Report". One anomaly, one functional discrepancy, and one TDP discrepancy were observed. The functional discrepancy was resolved via a Root Cause Analysis and updated documentation. The TDP discrepancy was resolved with updated documentation. The anomaly was not successfully replicated.

Following resolution of the discrepancies, no violation of conformance to EAC VVSG 1.0 requirements were observed. All components of the **ES&S EVS 6.0.2.1** voting system have successfully passed all tests.

4 Recommendations

SLI has successfully completed the testing of the **ES&S EVS 6.0.2.1** voting system. It has been determined that the **ES&S EVS 6.0.2.1** voting system meets the required acceptance criteria of the Election Assistance Commission Voluntary Voting System Guidelines, version 1.0.

This recommendation reflects the opinion of SLI Compliance based on testing scope and results. It is SLI's recommendation based on this testing effort that the EAC grant certification of the **ES&S EVS 6.0.2.1** voting system.

5   APPROVAL SIGNATURES

SLI:

Traci Mapps
VSTL Director
October 24th, 2018

6   Appendix A – Ancillary Products

Ancillary systems represent products and utilities that are not part of the EAC certified configuration.

Ancillary systems include:

- Ballot Production
  - o   **Balotar** is a product that allows the printing of ad hoc ballots.

- Ballot Online (intElect) – ExpressPass

  - o   **Ballot Online** is a system that allows a user to access a sample ballot online and make ballot selections on any device connected to the Internet. When finished, the output from this system is the **ExpressPass** – a selection summary with a scannable QR code that the user can either print or save in an electronic format on their mobile device.

- Electronic Pollbook

  - o   **ExpressPoll** electronic pollbook stores registered voter information for precincts, districts, or entire jurisdictions.

- ExpressLink System
  - o   **ExpressLink** is a standalone application that interfaces with voter registration (electronic pollbook) systems and the **ExpressVote Activation Card Printer** to print the ballot activation code on an **ExpressVote** activation card. Separately, this application is used to program vote session activator cards for use with **ExpressTouch**.
  - o   **ExpressVote Activation Card Printer**, a thermal, on demand printer, is used to print the ballot activation code on the **ExpressVote** activation card.
  - o   **ExpressTouch Smart Card Writer** is a device used to program the ballot activation code on the **ExpressTouch** vote session activator card.

End of Certification Test Report