Modification Test Plan

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Prepared for:

Vendor Name	*Election Systems and Software (ES&S)*
Vendor System	*EVS 6.0.2.0*
EAC Application No.	*EVS6020*
Vendor Address	*11208 John Galt Boulevard* *Omaha, Nebraska 68137*

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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
September 2nd, 2018	1.0	J. Panek	Initial Draft

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1 INTRODUCTION

This Modification Test Plan outlines the test approach SLI Compliance will follow when performing modification and regression testing on the **ES&S EVS 6.0.2.0** system against the Voluntary Voting System Guidelines 1.0 (VVSG 1.0). **ES&S EVS 6.0.2.0** 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 will be 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 a clear understanding of the work SLI will conduct and a detailed plan outlining the test effort.

When the testing is complete, SLI will submit a Modification Test Report that details all test results and findings from the test effort, as well as a recommendation to the EAC regarding certification.

1.1 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.

1.2 Terms and Abbreviations

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

Table 1 – 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.

Term	Abbreviation	Description
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.
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 lay out 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.
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.

Term	Abbreviation	Description
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.
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.
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.

1.3 Project Overview

This Modification Test Plan contains a description of the previously certified system, the modifications made to that system, and the approach SLI will implement to perform modification and regression testing of the **ES&S EVS 6.0.2.0** voting system against the requirements of the federal Voluntary Voting System Guidelines 1.0 (VVSG 1.0), Volumes 1 and 2.

1.4 Description and Overview of the Certified System

This section contains a description of the previously certified system, the specific modifications to the current system version, and the impact of those modifications on the system and certification testing.

1.4.1 Definition of Baseline Certified System

This modification project builds upon the foundation established in **ES&S EVS 6.0.0.0,** which contains the applications **Electionware, Event Log Service, Removable Media Service,** the polling place devices **ExpressVote HW1.0, ExpressVote HW2.1, ExpressVote XL, ExpressTouch,** and **DS200,** as well as the central count location devices **DS450** and **DS850**.

The table below details each application employed by the **ES&S EVS 6.0.0.0** voting system.

Table 2 – ES&S EVS 6.0.0.0 Software and Firmware

Application	Version
Electionware – Client/Server	5.0.0.0
Event Log Service	1.6.0.0
Removable Media Service	1.5.0.0
ExpressVote HW2.1 Previewer	2.4.0.0
ExpressVote HW1.0 Previewer	1.5.0.0
DS200	2.17.0.0
DS850	3.1.0.0
DS450	3.1.0.0
ExpressVote XL	1.0.0.0
ExpressTouch	1.0.0.0

1.4.2 Modifications

ES&S EVS 6.0.2.0 is a modification of the EAC-certified **ES&S EVS 6.0.0.0** system. The following modifications are implemented in this release with updates to the **Electionware** application:

- Improved Manual Update performance.
- Improved poll media load results performance.
- Improved speed to open the Reporting module when large amounts of poll media are loaded.
- Improved time to Clear Results by Poll Media.
- Optimized multi-client Write-in Review assignment.
- Optimized simultaneous multi-client Write-in Review assignment and filtering.
- Improved performance for Write-in Review query with numerous write-ins.
- Improved speed of Write-In Report generation in a large election.
- Improved time to Clear Results by Poll Type.
- Removed Status Pane from Load Results user interface for increased optimization.
- Improved timing and performance for Write-in Review query with numerous write-ins.

- Optimized speed by creating counters map on demand with Commit Results post-adjudication step.
- Improved speed and performance for large Summary and Custom Table reports.
- Resolved intermittent "Initializing Acquire Server" message when creating Summary Report.
- Increased speed of using multiple workflows on single client by reducing size of Load Results table view to 200 entries.
- Enhanced Precinct Summary Report statistics with a partial precinct list. New use case discovered in Utah primary.
- Allowed Write-In Review while loading results on multiple clients. New use case discovered in Kansas primary.
- Enhanced skewed ExpressVote / ExpressVote XL card images to display snippets in Write-in Review.

1.4.3 Initial Assessment of Impact of the Modifications

ES&S EVS 6.0.2.0's modifications listed in section 1.4.2 affect only the **Electionware** application.

Review of the modifications implemented, and source code modified indicates the need for only a limited Functional Configuration Audit (FCA) to verify that the system continues to meet VVSG 1.0 requirements. The limited FCA will consider not only the implemented modifications, but also functions that have not changed but may be impacted by the modifications.

Updates made to this system only apply to the **Electionware** application, which has modified source code and will require a new build. This will be subjected to FCA review at an appropriate level of scrutiny.

1.4.4 Block Diagrams

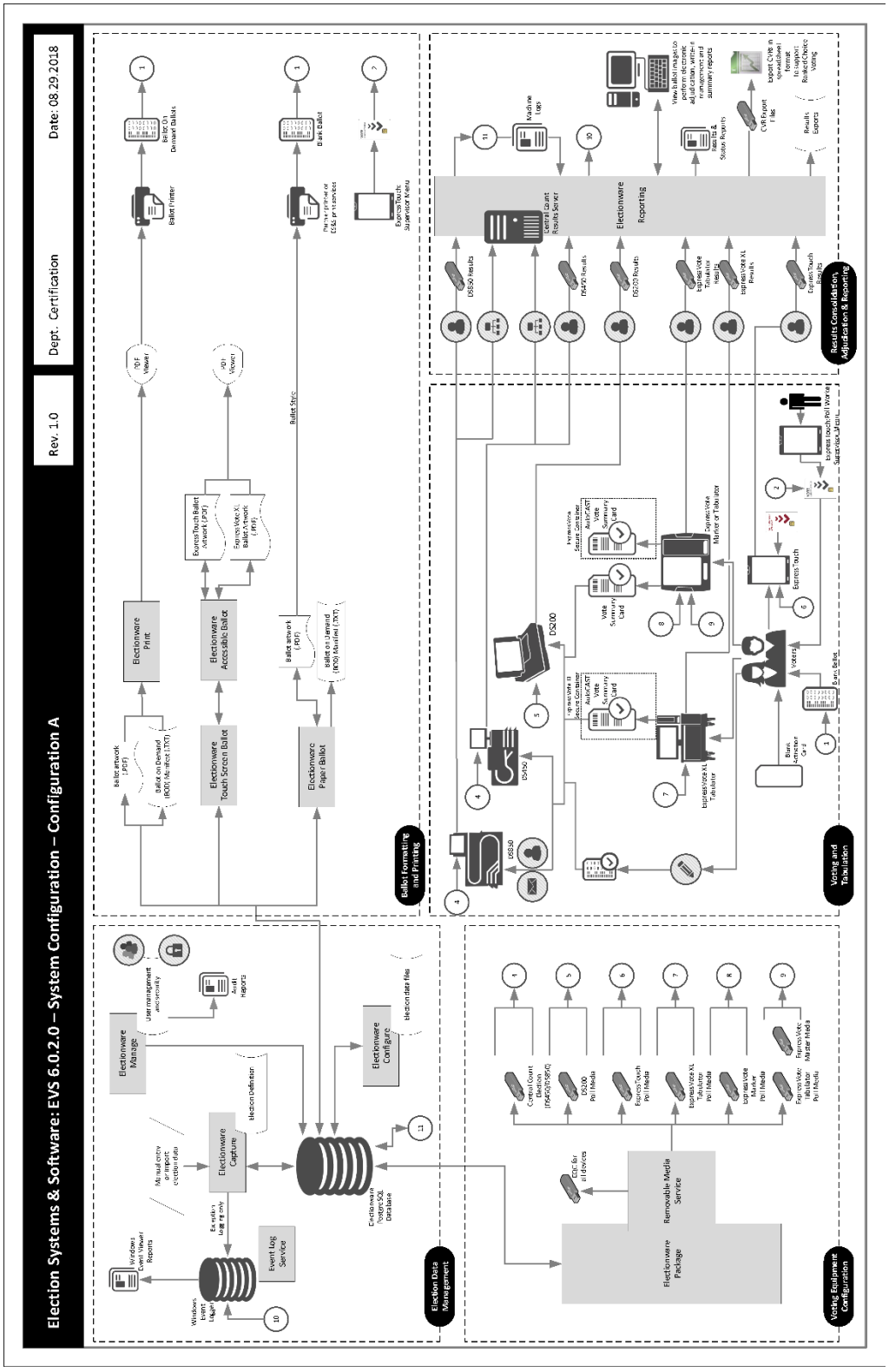

Figure 1: Voting System Overview – Configuration A

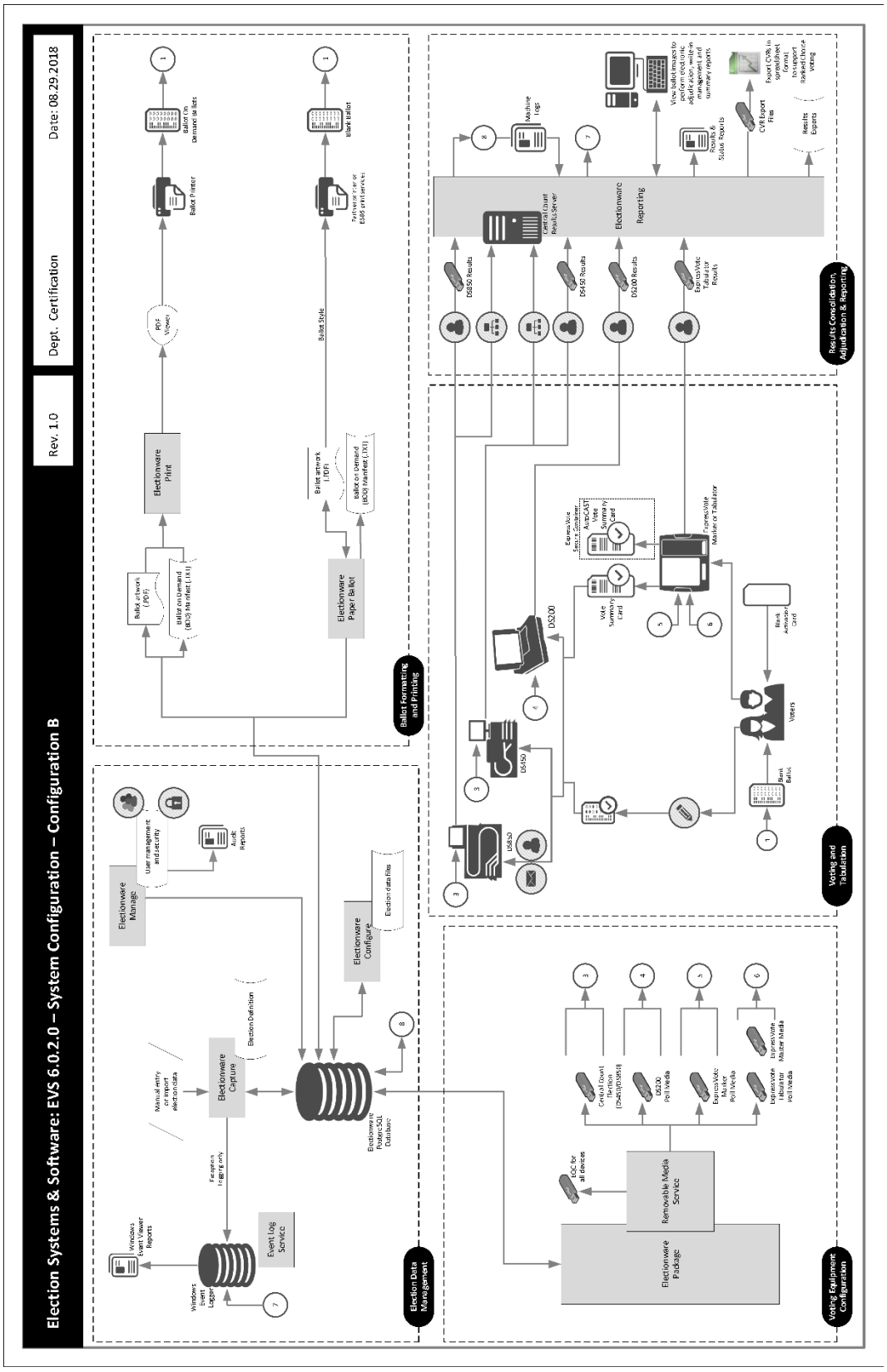

Figure 2: Voting System Overview – Configuration B

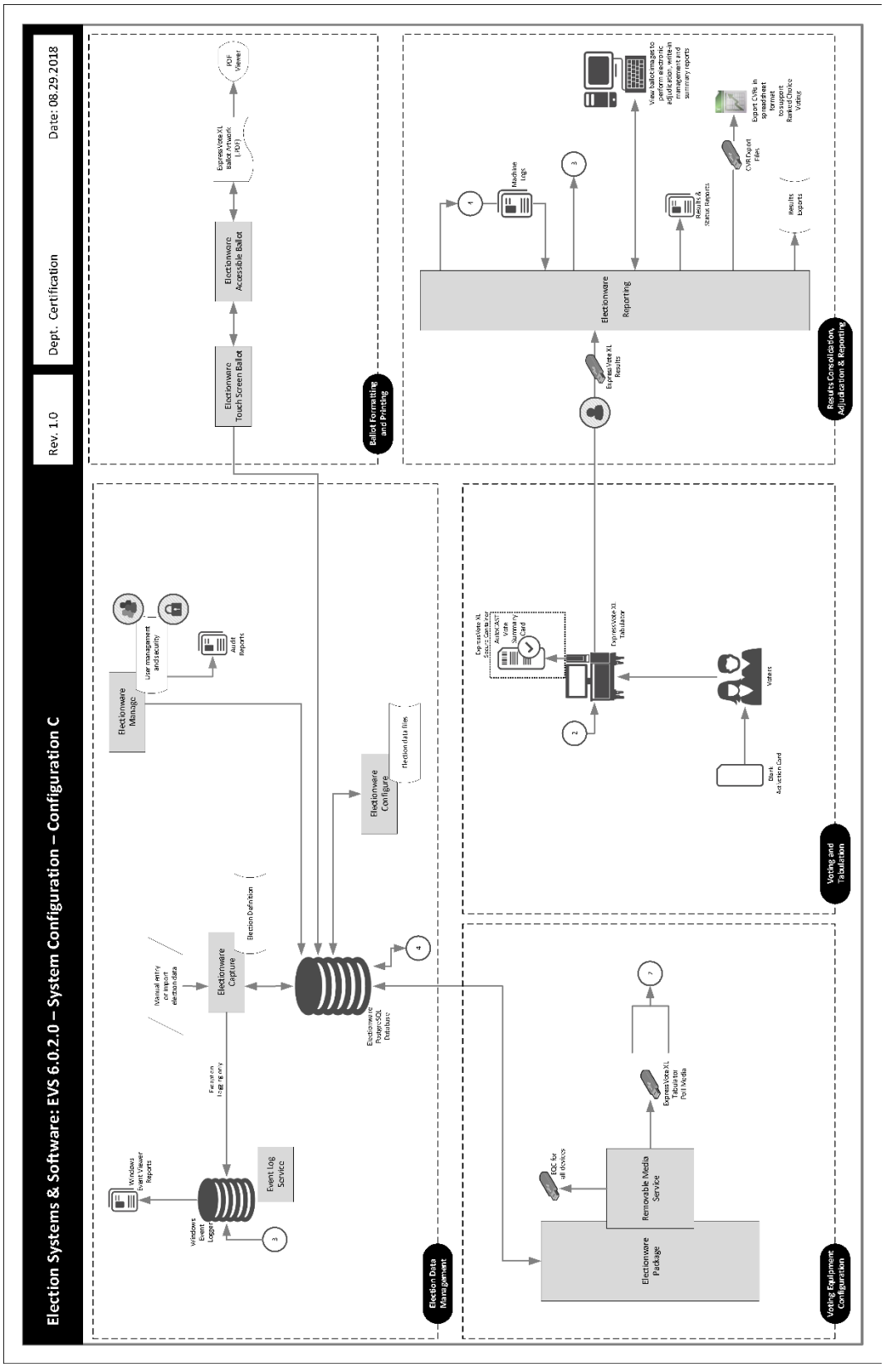

Figure 3: Voting System Overview – Configuration C

1.5 Project Schedule

The following schedule describes the high-level tasks and assigned personnel titles that will be involved in the Certification Test effort of the **ES&S EVS 6.0.2.0** voting system.

1.5.1 Owner Assignments

- System Analysis and Review will be conducted by the Source Code Review (SCR) team, Security and Voting Test Engineers, with oversight by the Test Manager (TM)
- Source code review will be conducted by SCR Test Engineers, with oversight by the TM
- Documentation review will be conducted by Security and Test Engineer personnel, with oversight by the TM
- Test Module Development and Validation will be conducted by Security and Test Engineer personnel, with oversight provided by the TM
- Test Suite Development and Validation will be conducted by Security and Test Engineer personnel, utilizing SLI's formal Test Methods, with oversight provided by the TM
- Formal Test Execution will be conducted by Security and Test Engineer personnel, with oversight by the TM

1.5.2 Test Module Development and Validation

Test Modules will be developed and/or modified to provide repeatable detailed test steps. The modules will be validated prior to Formal Test Execution to ensure accurate testing of the voting system. Test modules are validated by internal review and execution. The test modules and the test suites that are written by SLI provide traceability to the VVSG 1.0 requirements by referencing each VVSG 1.0 requirement addressed within the Test Module.

1.5.3 Test Suite Development

Test Suites will be developed to group and focus testing around key areas of the voting system. Each Test Suite will contain multiple test modules providing clear and traceable test scripts and information. Potentially, variations of the same suite may be run multiple times to verify different configurations.

1.5.4 Trusted Build

A Trusted Build will be performed for **Electionware** version 5.0.1.0 and used for Formal Test Execution on **ES&S EVS 6.0.2.0**. All other components of the **ES&S EVS 6.0.2.0** voting system remain unchanged from the previously EAC certified **ES&S EVS 6.0.0.0** voting system. In the event that one or more discrepancies are discovered during Formal Test Execution on the Trusted Build, another Trusted Build will be performed,

incorporating necessary changes to the source code. The first Trusted Build performed will be considered an intermediate compliance build used for testing purposes only.

1.5.5 Formal Test Execution

Formal Test Execution of the validated Test Suites will be conducted against the declared voting system. One or more builds will be performed for the modified component(s) of the system and used in conjunction with the remaining certified components of the system, in order to test to determine whether the system is compliant with the VVSG requirements.

1.5.6 Third Party Hardware Testing

No hardware testing is scheduled for this certification project.

1.5.7 Project Timeline

The following schedule outlines the expected timeline for this project.

Task Name	Start	Finish
ES&S Project Plan for EVS 6020	**Thu 8/30/18**	**Tue 11/6/18**
6020 EAC Certification	**Thu 8/30/18**	**Tue 11/6/18**
Phase 1	**Thu 8/30/18**	**Thu 10/18/18**
Project Initiation	**Thu 8/30/18**	**Thu 8/30/18**
TDP Deliver/Receive Vendor Package	**Fri 8/31/18**	**Fri 8/31/18**
Hardware and Accessories	**Fri 8/31/18**	**Fri 8/31/18**
Start-up and Other Deliverables	**Fri 8/31/18**	**Fri 8/31/18**
TDP Deliveries - Documents	**Fri 8/31/18**	**Fri 8/31/18**
Submission - Document Check-in	**Fri 8/31/18**	**Fri 8/31/18**
TDP Review	**Fri 8/31/18**	**Mon 9/10/18**
Review - Source Code	**Fri 9/7/18**	**Mon 9/10/18**
Review -Code	**Fri 9/7/18**	**Mon 9/10/18**
Document Review	**Fri 8/31/18**	**Wed 9/5/18**
Hardware	**Wed 9/5/18**	**Fri 9/7/18**
HW / SW Configuration Audit	**Wed 9/5/18**	**Fri 9/7/18**
Test Plan Development	**Tue 9/4/18**	**Thu 10/18/18**
Phase 2	**Tue 9/4/18**	**Mon 9/10/18**
Vendor Specific Module Creation/Validation	**Tue 9/4/18**	**Mon 9/10/18**
Notify EAC of Test Suites Ready for their review	**Mon 9/10/18**	**Mon 9/10/18**
Phase 3	**Mon 9/10/18**	**Mon 9/17/18**
Trusted Build	**Mon 9/10/18**	**Tue 9/11/18**
Official Test Execution of Test Suites	Mon 9/10/18	Mon 9/17/18
Phase 4	**Tue 9/4/18**	**Tue 11/6/18**
Create Certification Report	Mon 9/17/18	Thu 9/20/18
Final updates to Test Plan	Thu 9/20/18	Fri 9/21/18
EAC Review	Fri 9/21/18	Thu 10/18/18
Final updates to Test Report	Thu 10/18/18	Fri 10/19/18
EAC Acceptance	Mon 10/22/18	Fri 11/2/18
Report Complete	Fri 11/2/18	Fri 11/2/18
Project Management	**Tue 9/4/18**	**Mon 10/1/18**
EAC Repository and Manufacturer	**Fri 11/2/18**	**Tue 11/6/18**

Phase 5	**Fri 11/2/18**	**Tue 11/6/18**
Manufacturer Deposit	**Fri 11/2/18**	**Mon 11/5/18**
Return Equipment to Vendor	**Mon 11/5/18**	**Tue 11/6/18**
Archive Test Materials	**Fri 11/2/18**	**Mon 11/5/18**

1.5.8 EAC & Manufacturer Dependencies

The Modification Test Plan will require EAC approval prior to finalization.

ES&S is required to provide all source code, documentation, equipment and supporting materials identified as part of the voting system.

All identified source code discrepancies must be resolved, and the code must be built successfully, be installed, as well as successfully complete operational status checks prior to Formal Test Execution.

In addition, **ES&S** is required to provide training on the voting system and support throughout the life of the project.

2 PRE-CERTIFICATION TESTING AND ISSUES

2.1 Evaluation of prior VSTL testing

VSTL testing has been performed on the version previous to the **ES&S EVS 6.0.2.0** voting system. The previous version of this system, **ES&S EVS 6.0.0.0,** is EAC certified and will serve as the source code base for this evaluation.

2.2 Evaluation of prior non-VSTL testing

No prior state or non-VSTL lab testing is pertinent to the **ES&S EVS 6.0.2.0** voting system. Review of **ES&S** internal testing is performed during the FCA review.

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 will be vetted by SLI, then used to conduct Formal Test Execution for the General Test Suite.

2.3 Known Vulnerabilities

Review of the “Known Vulnerabilities” database, maintained by SLI, has provided 49 known vulnerabilities to previous **ES&S** systems, which are already accounted for in SLI’s Testing.

3 MATERIALS REQUIRED FOR TESTING

Any materials that are used in an election cycle must be provided to SLI to facilitate testing of the voting system. This section outlines the required materials.

3.1 Software/Firmware

All software and 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 following software/firmware is required for the execution of formal tests. This includes all supporting software such as operating systems, compilers, assemblers, application software, firmware, any applications used for burning of media, transmission of data or creation/management of databases.

3.1.1 Manufacturer Software/Firmware

The **ES&S EVS 6.0.2.0** 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 3 – ES&S EVS 6.0.2.0 Software/Firmware

Application	Version
Electionware – Client/Server	5.0.1.0
Event Log Service	1.6.0.0
Removable Media Service	1.5.0.0
ExpressVote HW2.1 Previewer	2.4.0.0

Application	Version
ExpressVote HW1.0 Previewer	1.5.0.0
DS200	2.17.0.0
DS850	3.1.0.0
DS450	3.1.0.0
ExpressVote XL	1.0.0.0
ExpressTouch	1.0.0.0

3.1.2 COTS Software/Firmware

This section details the COTS software and firmware utilized within the **ES&S EVS 6.0.2.0** voting system.

Table 4 – COTS Software/Firmware

Manufacturer	Application	Version
Microsoft Corporation	Window 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)

3.1.3 Additional Supporting Test Software

This section outlines the test specific software that will be used by SLI in the certification campaign.

Table 5 – Additional Supporting Test Software

Manufacturer	Application	Version
SLI Compliance	Module Finder	1.0

Manufacturer	Application	Version
Prestosoft	ExamDiff Pro	3.0

3.2 Equipment

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

3.2.1 ES&S EVS 6.0.2.0 Equipment

The following manufacturer equipment will be used in testing:

Table 6 – ES&S EVS 6.0.2.0 Equipment

Hardware	Model	Version
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	87001
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

3.2.2 COTS Equipment

The following COTS equipment will be used in testing:

Table 7 – COTS Equipment

Manufacturer	Hardware	Model	Operating System
Innodisk	USB EDC H 2SE (1GB)	DEEUH 1-01GI72AC1SB (for ExpressVote HW1.0)	N/A
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: 4 GB, 8 GB recommended • Hard Disk: 150 GB • Keyboard • Mouse • Monitor: 1280x800 resolution • Monitor – ExpressVote XL (Monitor needed for programming election for ExpressVote XL) 1920x1080p resolution • CD/DVD reader: 16x min	N/A	Windows 7 Professional, SP-1 (64-bit)

Manufacturer	Hardware	Model	Operating System
	• 2 USB ports: 2.0 min • Report Printer: w/printer control language driver		
Various (EMS Networked server configuration)	• Processor: Dual Core or Quad Core • RAM: 4 GB, 8 GB recommended • Hard Disk: 150 GB or 320 GB • Keyboard • 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: 1 GB throughput		Windows Server 2008 R2, SP-1 (64-bit)
Delkin	USB Flash Drive: 512 MB, 1 GB, 2 GB, 4 GB, 8 GB	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: 1 GB max	N/A	N/A
Delkin	Compact Flash Memory Card Reader/Writer	6381	N/A

Manufacturer	Hardware	Model	Operating System
Delkin	CFAST Card, 2GB, 4GB	N/A	N/A
Lexar	CFAST Card Reader/Writer	LRWCR1TBNA	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

3.3 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 election voter data referenced in section 2.2

3.4 Deliverable Materials

The following are documents and materials to be delivered as a part of the **ES&S EVS 6.0.2.0** voting system.

Document	Version
System Overview	1.1
System Functionality Description	1.0
DS200 Operator's Guide	2.1
DS450 Operator's Guide	2.1
DS850 Operator's Guide	2.1
EVS Event Log Service User's Guide	1.1
Electionware Vol. I: Administrator Guide	1.0
Electionware Vol. II: Define User Guide	1.0
Electionware Vol. III: Design User Guide	1.0
Electionware Vol. IV: Deliver User Guide	1.0
Electionware Vol. V: Results User Guide	1.0
Electionware Vol. VI: Appendices	1.0
ExpressTouch Operator's Guide	1.11

Document	Version
ExpressVote Operator's Guide (HW1.0)	1.12
ExpressVote Operator's Guide (HW2.1)	1.13
ExpressVote XL Operator's Guide	1.12
Requirements of the 2005 VVSG Trace to Vendor Testing	1.0
Requirements of the 2005 VVSG Trace to Technical Data Package	1.0
DS200 Hardware Specification HW 1.2	3.5
DS200 Hardware Specification HW 1.3	4.6
DS450 Hardware Specification	1.9
DS850 Hardware Specification	1.9
ExpressTouch Hardware Specification	1.1
ExpressVote Hardware Specification HW1.0	3.10
ExpressVote Hardware Specification HW2.1	1.3
ExpressVote XL Hardware Specification	1.1
Approved Parts List - DS200 v1.2	1.1
Approved Parts List - DS200 v1.3	1.3
Approved Parts List - DS450	1.2
Approved Parts List - DS850	1.4
Approved Parts List - ExpressTouch v1.0	1.0
Approved Parts List - ExpressVote v1.0	2.1
Approved Parts List - ExpressVote v2.1	2.4
Approved Parts List - ExpressVoteXL v1.0	1.1
System Development Program	1.5
ES&S Coding Standards	1.4
License Agreements for Procured Software	1.6
DS200 – Software Design Specification	1.4
DS450 – Software Design Specification	1.6
DS850 – Software Design Specification	1.4
Electionware – Software Design Specification	1.0
Electionware – PostGreSQL Entity Descriptions	N/A
Event Log Service – Software Design Specification	1.1
ExpressTouch Software Design Specification	1.6
ExpressVote (HW1.0) Software Design Specification	1.4
ExpressVote (HW2.1) Software Design Specification	1.6
ExpressVote XL Software Design Specification	1.8
System Test Plan	1.0
Usability Test Report: DS200 Precinct-Based Scanner and Tabulator	N/A
Quality Assurance Test Cases - DS200	1.0
Quality Assurance Test Cases - DS450	1.0
Quality Assurance Test Cases - DS850	1.0
Quality Assurance Test Cases - Electionware: Manage	1.0
Quality Assurance Test Cases - Electionware: Define	1.0
Quality Assurance Test Cases - Electionware: Design	1.0

Document	Version
Quality Assurance Test Cases - Electionware: Deliver	1.0
Quality Assurance Test Cases - Electionware: Results	1.0
Quality Assurance Test Cases - ExpressLink	1.0
Quality Assurance Test Cases - ExpressTouch	1.0
Quality Assurance Test Cases - ExpressVote HW1.0	1.0
Quality Assurance Test Cases - ExpressVote HW2.1	1.0
Quality Assurance Test Cases - ExpressVote XL	1.0
Quality Assurance Test Cases - Field Limits	1.0
Quality Assurance Test Cases - Integration	1.0
Usability Test Report: ExpressTouch Electronic Universal Voting System	N/A
Usability Test Report: ExpressVote Universal Voting System (HW1.0)	N/A
Usability Test Report: ExpressVote Universal Voting System (HW2.1)	N/A
Usability Test Report: ExpressVote XL Full-Faced Universal Voting System	N/A
EMS Client Workstation Secure Setup & Configuration Guide	1.0
EMS Server Secure Setup & Configuration Guide	1.0
Standalone EMS Workstation Secure Setup & Configuration Guide	1.0
Voting System Security Specification	1.3
Security Script Description	1.0
Voting System Hardware - Physical Security Guide	1.11
Verification Procedure: DS200 Precinct Scanner and Tabulator	1.0
Verification Procedure: DS450 High-Throughput Scanner & Tabulator	1.0
Verification Procedure: DS850 High-Speed Scanner & Tabulator	1.0
Verification Procedure: Election Management System Workstation and Server	1.0
Verification Procedure: ExpressTouch	1.0
Verification Procedure: ExpressVote Hardware 1.0	1.0
Verification Procedure: ExpressVote Hardware 2.1	1.0
Verification Procedure: ExpressVote XL	1.0
Verification Procedure: Verification PC Setup	1.0
Validation File List: DS200	1.2
Validation File List: DS450	1.2
Validation File List: DS850	1.3
Validation File List: Event Log Service	1.0
Validation File List: ExpressTouch	1.1
Validation File List: ExpressVote HW1.0	1.0
Validation File List: ExpressVote HW2.1	1.0
Validation File List: ExpressVote XL	1.1
Validation File List: ExpressVote HW1.0 Previewer	1.0

Document	Version
Validation File List: ExpressVote HW2.1 Previewer	1.0
Validation File List: Electionware	1.1
Validation File List: Removable Media Service	1.0
DS200 Maintenance Manual	1.3
DS450 Maintenance Manual	1.5
DS850 Maintenance Manual	1.6
ExpressTouch Maintenance Manual	1.7
ExpressVote Maintenance Manual (HW1.0)	1.3
ExpressVote Maintenance Manual (HW2.1)	1.4
ExpressVote XL Maintenance Manual	1.6
Personnel Deployment and Training Program	1.1
Configuration Management Program	1.4
Technical Documentation Program	1.3
Manufacturing Quality Assurance Program	1.7
Software Quality Assurance Program	1.3
Ballot Production Guide for EVS	3.0
Conformity Statement: 2005 VVSG	N/A
COTS Production Implementation Plan	1.0
EAC Application Requirements Trace	N/A

4 TEST SPECIFICATIONS

The following are the specifications for testing to be conducted on **ES&S EVS 6.0.2.0** voting system. The specifications contain details on the focus of testing, configuration(s), and the functions to be tested.

4.1 Requirements

The **ES&S EVS 6.0.2.0** voting system will be tested to the approved VVSG 1.0 requirements.

Modifications made to the **ES&S EVS 6.0.2.0** voting system, specific to the **Electionware** application, are detailed in section “1.4.2 Modifications” and dictate evaluation against the following pertinent VVSG requirements:

- 2.4.3 Producing Reports
- 2.1.2 Accuracy
- 2.1.4 Integrity
- 2.1.6 Election Management System
- 5.2 Software Design and Coding Standards
- 9.7.2 Functional Configuration Audit

4.2 Hardware Configuration and Design

The **ES&S EVS 6.0.2.0** as declared in the application for certification submitted to the EAC, consists of:

- An **Electionware** standalone workstation with minimum requirements of 150 GB hard disk, 8 GB of recommended memory and Dual Core processing speed.
- For network configuration, six networked workstations with minimum requirements of 150 GB hard disk, 8 GB of recommended memory and Dual Core processing speed. Additionally, the network configuration includes a server with minimum requirements of 320 GB hard disk, 4 GB of memory and Quad Core processing speed.
- The precinct level employs **ExpressTouch**, **ExpressVote HW1.0**, **ExpressVote HW2.1** and **ExpressVote XL** universal voting devices, and the **DS200** tabulator.
- The central count location employs the **DS450** and **DS850** tabulators.
- The consolidation, tally and reporting process employs the workstation with either a direct connect or a network printer.

4.3 Test Suite and Software Functional Test Case Design

Each modification made to the voting system will be reviewed, and test cases will be modified or designed accordingly to verify functionally that the modifications work as documented. Regression test cases will be designed to focus around the **Electionware** modifications for optimization of poll media results loading performance. This will be achieved through a series of accuracy test modules, as well as general and primary elections, to ensure the **Electionware** application is accurately loading and processing all variations of results generated by the system and that the integrity of all data is maintained at all times.

4.3.1 General Election Test Suite

A General Election designed to simulate a large county-wide general election will be processed through the **Electionware** software application using prepared voter data. Data load performance enhancements will be 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.

4.3.2 Modifications Test Suite

A modifications test suite will be designed to address specific modifications that are not incorporated into the General Test Suite. This will include verification of specific reporting statistics with an closed primary, **ExpressVote** vote card summary snippet review, the **Electionware** load results view, and an **Electionware** on-demand counters map.

4.3.3 Regression Test Suite

Regression test cases will be designed to focus around the **Electionware** modifications for optimization of poll media results loading performance. Various elections will be used to process vote data on all devices in the **ES&S EVS 6.0.2.0** voting system, which will then be processed through **Electionware** directly via both USB poll media as well as networked configurations.

4.4 TDP Evaluation

SLI is completing an assessment of the deliveries of the Technical Data Package for **ES&S EVS 6.0.2.0** against the **ES&S EVS 6.0.0.0** TDP. Any modification to previously reviewed documentation is being reviewed. Any subsequent re-deliveries of the TDP items will be solely the result of fixes to discrepancies identified in the remaining FCA or PCA activities.

4.4.1 Document Review

SLI will conduct a PCA review of all vendor traced documents submitted for review in the delivery of the **ES&S EVS 6.0.2.0** TDP. These include:

- System configuration overview
- System functionality description
- System hardware specifications
- Software design and specifications
- System test and verification specifications
- System security specifications
- User/system operations procedures
- System maintenance procedures
- Personnel deployment and training requirements
- Configuration management plan
- Quality assurance program
- System change notes

Documents are verified for compliance to the VVSG 1.0, Volume 2, Sections 2.2 through 2.13 and Volume 2, Section 6.6. Unless noted otherwise, all requirements are successfully met within the pertinent areas of the TDP.

4.5 Source Code Review

4.5.1.1 Source Code Review

The certification campaign for the **ES&S EVS 6.0.2.0** voting system includes software and firmware from **ES&S EVS 6.0.0.0** that have been modified by and are proprietary to **ES&S**. SLI will conduct a source code review of all modified source code for the

Electionware application submitted in the delivery of the voting system TDP for **ES&S EVS 6.0.2.0** for compliance to the VVSG 1.0, Volume 2, Section 6.6.

The coding languages involved in the vendor's applications include:

- C
- C++
- C#
- SQL
- VB.Net
- Java
- Visual Basic

Source Code Review Tools utilized by SLI include:

- Module Finder: an SLI proprietary application used to parse module names from C/C++ and VB code and populate the identified module names into the review documents
- ExamDiff Pro: a commercial application used to compare revised code to previously reviewed code

Any subsequent re-reviews of source code will be the result of fixes to discrepancies identified in the FCA activities.

COTS operating systems and software used in the voting system have been verified as authentic and unmodified in the **ES&S EVS 6.0.2.0** test campaign.

4.6 Trusted Build

The Trusted Build for the **Electionware** application version 5.0.1.0, which will be used for Formal Test Execution on **ES&S EVS 6.0.2.0,** will be conducted prior to SLI's final testing and will be completed on-site at SLI's facility. SLI will use its approved standard lab procedure that details the processes for controlling, managing, and conducting the Trusted Build. This process includes the following:

- Preparation for the Trusted Build - Obtaining and reviewing **ES&S**'s procedure for constructing the build platform, verifying the target build platform, and acquiring and verifying the necessary materials.
- Execution of the Trusted Build – SLI will perform the Trusted Build by using the step-by-step build procedure, as provided by **ES&S,** to create the build starting from a pristine build environment. SLI records and ascertains the following items throughout the build process:
    - Build environment images at various key points
    - Build environment and file hashes at various key points
    - Build environment hardware characteristics
    - Build results from code compilation and file hashes
    - Final software install files and file hashes

- Deliverables to Testing – Upon completion of the Trusted Build, certain items are sent to the SLI test group. The final result will be a media containing the following:
    - Final software install files
    - Hash values to validate the install files

Final Record Keeping and Archiving Procedures – At the conclusion of the Trusted Build process, SLI completes all final record keeping and archiving procedures at SLI's facility. This record keeping includes any unique identifiers, results of the build with version numbers and dates and descriptions of all hashes and images in the repository.

4.7 Standard VSTL Test Methods and Uncertainty of Test Data Measurement

This test campaign utilizes Standard VSTL test methods and election-specific type test data only.

4.8 EAC Interpretations

This Modification Test Plan and the execution of tests for the voting system identified in this plan do not include any additional EAC interpretations.

4.9 EAC Notices of Clarification

This Modification Test Plan and the execution of tests for the voting system identified in this plan account for the following NOC's:

- NOC 2016-02: Trusted Build
- NOC 2013-02: Detailed Description of Changes for Modifications
- NOC 2013-01: Discrepancy Listing in Test Report-FINAL_10 17 13
- NOC 2009-005: Development and Submission of Test Plans for Modifications to EAC Certified Systems.
- NOC 2009-004: Test Report
- NOC 2009-002: Clarification of EAC Laboratory Independence Requirement
- NOC 2009-001: Clarification of the Requirements for Voting System Test Laboratories (VSTLs) Development and Submission of Test Plans
- NOC 2008-003: Clarification of EAC Conformance Testing Requirements for Voting System Test Laboratories (VSTLs)

5 TEST DATA

Test data for the **ES&S EVS 6.0.2.0** voting system is compiled such that all functionality declared will be tested to determine conformance to the standards.

5.1 Data Recording

SLI has evaluated the system functionality, as described by manufacturer technical documentation, as well as requirements as listed in the EAC VVSG 1.0, and made determinations as to expected results of all data inputs into the **ES&S EVS 6.0.2.0** voting system. This includes:

- Election type
- Precincts of all types
- Districts
- Offices
- Contests
- Candidates
- Parties
- Devices used
- Voting variations employed
- Issues/Referendums
- Votes cast for each candidate/issue/referendum
- Vote consolidation data from one device/level to the next

The data is contained in one master data record, including each input and each expected output. This data is incorporated into the appropriate test suite, populating test modules with exact expected data for the function being tested.

Testing information is recorded in the test suites, as well as in test notebooks, which are utilized according to SLI's standard lab procedure *SLP-VC-30 - Test Notebooks*.

5.2 Test Data Criteria

SLI has evaluated the system functionality as described by manufacturer technical documentation, as well as requirements as listed in the EAC VVSG 1.0, and made determinations as to expected output of all data inputs into the **ES&S EVS 6.0.2.0** voting system. A data matrix will be recorded into one master data record that couples data inputs to their expected output, as determined above. The system's execution shall be measured against the expected results.

6 TEST PROCEDURE AND CONDITIONS

This section describes the test conditions and procedures for execution of test suites. If a particular sequence is mandatory for the execution of suites, a rationale will be given. Additionally, this section is used to describe procedures for setting up equipment that will be utilized in test suite execution.

6.1 Facility Requirements

Testing will be performed on-site at SLI in Colorado.

Four secure labs are available with appropriate power supply and space to accommodate the various configurations defined within this Modification Test Plan. Temperature/humidity gauges will be employed in order to determine the appropriate conditions exist during testing.

Unless otherwise specified herein, all remaining tests, including system level functional testing, shall be performed at standard ambient conditions:

- Temperature: 64°F - 79°F (17.7°C - 26.1°C)
- Relative Humidity: 20 to 90%
- Atmospheric Pressure: Local Site Pressure

All TDP and test documentation is stored on-site at SLI's facility in a secure project directory on SLI's secure voting server.

6.2 Test Setup

Configurations of **ES&S EVS 6.0.2.0** will be deployed that conform to each specific test suite's needs. Some configurations will consist of standalone implementations, while other configurations will utilize networked implementations of various applications, such as **Electionware**, **DS450** and **DS850**. In all instances, **ES&S EVS 6.0.2.0** documentation will be followed in the setup of the configurations.

Successful completion of operational status checks will indicate that the system is ready for test execution.

6.3 Test Sequence

While there is no required sequence for performing voting system certification testing and audits, there are prerequisite tasks for some testing. Any needed prerequisites are contained within the suite for that test.

7 TEST OPERATIONS PROCEDURES

An inventory has been performed to verify the voting equipment received contains hardware and software elements as defined in the TDP prior to commencement of testing.

Throughout the testing effort, test suites and modules will be marked as follows:

- **Accept –** Test is accepted as successful.
- **Reject –** Test is rejected as unsuccessful.
- **NT –** Not Testable is used for test modules that cannot be completed. For example, if failure of one test module precludes attempting subsequent test modules, the latter will be marked as NT.

Test results **Reject** and **NT** will include comments by the Test Engineer explaining the reason for the result. Issues encountered during review and testing will be documented in the Discrepancy Report as well as reported to the EAC in an authorized manner. Issues that do not conform to the requirements of the VVSG 1.0 will be marked as **Documentation Discrepancies** or **Functional Discrepancies** (a discrepancy occurs when the software does not meet defined software requirements or specifications). SLI employs a system of checks such that any issue uncovered during testing is first designated as an "anomaly". The anomaly is then reviewed, and the cause is determined as either a flaw in the test or in the voting system itself. If the issue is determined to be a flaw in the test, the test will be re-written, re-validated and then formally re-run. If the issue is determined to be a flaw in the voting system, then a discrepancy is opened against the system. While test suites and test modules undergo a validation phase prior to formal execution, last minute code changes can possibly change the behavior from what the test module defines as expected. If this is the case, the review process employed during the anomaly phase will reveal this situation, thus reducing the chance of a false positive in terms of an unfounded discrepancy being written against the voting system.

Issues that are encountered during testing or documentation review but are not addressed by the applicable standard will be added to the Discrepancy Report and noted as **Informational**. The vendor has the option whether to address Informational issues.

8 APPROVAL SIGNATURES

SLI:

Traci Mapps
VSTL Director
September 7th, 2018

9 Appendix A – Ancillary Products

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

Ancillary systems include:

- Ballot Production
  - **Balotar** is a product that allows the printing of ad hoc ballots.
- Ballot Online (intElect) – ExpressPass
  - **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
  - **ExpressPoll** electronic pollbook stores registered voter information for precincts, districts, or entire jurisdictions.
- ExpressLink System
  - **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**.
  - **ExpressVote Activation Card Printer**, a thermal, on demand printer, is used to print the ballot activation code on the **ExpressVote** activation card.
  - **ExpressTouch Smart Card Writer** is a device used to program the ballot activation code on the **ExpressTouch** vote session activator card.

End of Modification Test Plan