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Test Plan for EAC VVSG 1.0 Certification Testing
Election Systems & Software (ES&S)
Voting System (EVS) 6.0.3.0

EAC Project Number: ESSEVS6030

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SIGNATURES

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REVISIONS

Revision	Description	Date
00	Initial Release	05/22/2020
01	EAC Comments	06/04/2020

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1.0   INTRODUCTION

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow to perform certification testing during a system modification campaign for the Election Systems and Software (ES&S) Voting System (EVS) 6.0.3.0 (EVS 6.0.3.0) to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Prior to submitting the voting system for testing, ES&S submitted an application package to the EAC for certification of the EVS 6.0.3.0. The application was accepted by the EAC and the project was assigned the unique Project Number of ESSEVS6030.

At test conclusion, the results of all testing performed as part of this test campaign will be submitted to the EAC in the form of a national certification test report.

1.1   Description and Overview of EAC Certified System Being Modified

The EAC Certified System that is the baseline for the submitted modification is described in the following subsections. All information presented was derived from the previous Certification Test Report, the EAC Certificate of Conformance and/or the System Overview.

The following subsections describe the baselined EVS 6.0.2.0. *Note: EVS 6.0.2.0 is considered the primary baseline for EVS 6.0.3.0; however, additional firmware for ExpressVote HW1.0, ExpressVote HW2.1 and ExpressVote XL are also harvested from the EAC certified EVS 6.0.2.1, resulting in two versions for those components. Both versions of firmware are listed in the relevant table below.*

EVS 6.0.2.0 are composed of software applications, central count location devices and polling place devices with accompanying firmware, and COTS hardware and software. EVS 6.0.2.0 is comprised of the following components: ExpressVote Universal Voting System Hardware 1.0 (ExpressVote HW1.0), ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1); DS200 precinct-based scanner and tabulator (DS200); DS450 high-throughput central scanner and tabulator (DS450); DS850 high-speed central scanner and tabulator (DS850); ExpressVote XL Full-Face Universal Voting System (ExpressVote XL); ExpressTouch Electronic Universal Voting System (ExpressTouch); Electionware Election Management Software (Electionware); ES&S Event Log Service (ELS); and Removable Media Service (RMS).

ExpressVote Hardware 1.0 (ExpressVote HW1.0)

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. The ExpressVote can serve all voters, including those with special needs, allowing voters to cast vote summary cards autonomously. Voters navigate ballot selections using the touch screen, detachable ADA keypad or ADA support peripheral such as a sip-and-puff device or two-position switch.

ExpressVote Hardware 2.1 (ExpressVote HW2.1)

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. The ExpressVote can serve all voters, including those with special needs, allowing voters to cast vote summary cards autonomously. Voters navigate ballot selections using the touch screen, detachable ADA keypad or ADA support peripheral such as a sip-and-puff device or two-position switch.

DS200 Precinct-based Scanner and Tabulator (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 High-Throughput Scanner and Tabulator (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 High-Speed Scanner and Tabulator (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).

Electionware Election Management 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 Full-Face Universal Voting System (ExpressVote XL)

ExpressVote XL is a hybrid paper-based polling place voting device that provides a full-face 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.

ExpressTouch Electronic Universal Voting System (ExpressTouch)

ExpressTouch is a DRE voting system which supports electronic vote capture for all individuals at the polling place.

ES&S 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.

1.1.1 Baseline Certified System

The baseline system for this modification is the EVS 6.0.2.0. However, additional firmware for ExpressVote HW1.0, ExpressVote HW2.1 and ExpressVote XL are also harvested from the EAC certified EVS 6.0.2.1, resulting in two versions for those components. The tables below describe the certified equipment and firmware versions.

Detailed descriptions of the EVS 6.0.2.0 and EVS 6.0.2.1 test campaigns are contained in SLI Compliance Report No. ESY-18003-CTR-01, Version 1.2 and Report No. ESY-18003-CTR-02, Version 1.2, which are available for viewing on the EAC's website at www.eac.gov.

Table 1-1. EVS 6.0.2.0 EAC Certified System Components - Proprietary

System Component	Software or Firmware Versions	Hardware Version(s)	Description
Electionware	5.0.1.0	---	Election management software that provides end-to-end election management activities
ES&S Event Log Service (ELS)	1.6.0.0	---	Logs users' interactions with EMS
Removable Media Service (RMS)	1.5.0.0	---	Utility that runs in the background of the Windows operating system
DS200	2.17.0.0	1.2, 1.3	Precinct Count Tabulator that scans voter selections from both sides of the ballot simultaneously
DS200 Ballot Box	---	1.0, 1.1	Collapsible Ballot Box (Model 98-00009)
DS200 Ballot Box	---	1.2, 1.3, 1.4, 1.5	Plastic Ballot Box (Model 57521)
DS200 Tote Bin	---	1.0	Tote Bin Ballot Box (Model 00074)
DS450	3.1.0.0	1.0	Central Count Scanner and Tabulator
DS450 Cart	---	---	Model 3002
DS850	3.1.0.0	1.0	Central Count Scanner and Tabulator
DS850 Cart	---	---	Model 6823
ExpressVote XL	1.0.0.0, 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 HW1.0	1.5.0.0, 1.5.1.0*	1.0	Hybrid paper-based vote capture and selection device
ExpressVote Previewer (1.0)	1.5.0.0, 1.5.1.0*	---	Ballot preview software

Table 1-1. EVS 6.0.2.0 System Components – Proprietary *(continued)*

System Component	Software or Firmware Versions	Hardware Version(s)	Description
ExpressVote HW2.1	2.4.0.0, 2.4.3.0*	2.1.0.0, 2.1.2.0	Hybrid paper-based vote capture and selection device
ExpressVote Previewer (2.1)	2.4.0.0, 2.4.3.0*	---	Ballot preview software
ExpressVote Rolling Kiosk	---	1.0	Portable Voting Booth (Model 98-00049)
Voting Booth	---	---	Stationary Voting Booth (Model 98-00051)
ExpressVote Single Table	---	---	Voting Table for One Unit (Model 87033)
ExpressVote Double Table	---	---	Voting Table for Two Units (Model 87032)
ADA Table	---	---	Voting Table for One Unit (Model 87031)
Universal Voting Console (UVC)	---	2.0	Detachable ADA support peripheral (Model 98-00077)
Tabletop Easel	---	---	Model 14040
ExpressTouch Voting Booth	---	---	Stationary Voting Booth (Model 98-00081)
SecureSetup	2.0.0.1	---	Proprietary Hardening Script

* *Harvested from EVS 6.0.2.1*

Table 1-2. EVS 6.0.2.0 EAC Certified System Components – COTS Software

Manufacturer	Application	Version
Microsoft Corporation	Windows 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	Cerberus FTP Server – Enterprise	9.0.3.1 (64-bit)
Adobe	Acrobat	XI
Microsoft Corporation	Visual C++ Redistributable	vc_redist.x86.exe (32-bit)

Manufacturer	Application	Version
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

Table 1-3. EVS 6.0.2.0 EAC Certified System Components – COTS Hardware

Manufacturer	Hardware	Model/Version
Dell	EMS Server	PowerEdge T630
Dell	EMS Client or Standalone Workstation	OptiPlex 5040, 5050
Innodisk	USB EDC H2SE (8GB) for ExpressVote 1.0	DEEUH1-01GI72AC1SB
Innodisk	USB EDC H2SE (16GB) for ExpressVote 2.1	DEEUH1-16GI72AC1SB
Delkin	USB Flash Drive (512MB, 1GB, 2GB, 4GB, 8GB)	N/A
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 (1GB)	---
Delkin	Compact Flash Memory Card Reader/Writer	6381
Delkin	CFAST Card (2GB, 4GB)	N/A
Lexar	CFAST Card Reader/Writer	LRWCR1TBNA
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, Pro 1500
Tripp Lite	DS450 Surge Protector	Spike Cube
Seiko Instruments	Thermal Printer	LTPD-347B
NCR/Nashua	Paper Roll	2320
Fujitsu	Thermal Printer	FTP-62GDSL001, FTP-63GMCL153

1.1.2   Description of Modification

The EVS 6.0.3.0 is a modified voting system configuration that includes upgrades to the components of the EVS 6.0.2.0 that introduces multiple performance and optimization improvements for Electionware. The list below includes specific changes between the current EVS 6.0.3.0 and the baseline of the EVS 6.0.2.0:

SOFTWARE/FIRMWARE

Cross-Product Changes

- Arial Fonts

  Included the recommended Arial fonts, which allows states to have better flexibility for ballot/election layout.

  Impacted products:

  — Election Management System

- Increased RAM Potential

  Provided the option for increased physical RAM on the EMS in the client, server and/or standalone configurations (optional). Increased the amount of virtual RAM available to Electionware (optional).

  Impacted products:

  — Election Management System

- Modified Password Policy

  Provided a method for modifying the Microsoft Windows password policy to not expire on the EMS (optional).

  Impacted products:

  — Election Management System

Electionware

- Adjudication

  — Provided an additional user logging message to enhance the transparency and security of the database. This additional logging is included within the Reporting module to assist users during ballot adjudication.

- Performance Improvement

  — Provided an additional internal Postgres system logging message to enhance the security and performance of the database. This additional logging is included within the internal Postgres logging for analytical, internal traceability and allows for further indexing for added performance.

- Migrated Electionware from a 32-bit to a 64-bit application. This allows increased memory allocation and improves system performance.

- Exports/Reporting

  - Removed all empty entries in the CVR export report.

  - Improved performance and efficiency when generating a custom CSV export.

  - Resolved a scenario in the exported cast vote record where, in rare circumstances, a contest write-in snippet was incorrectly assigned.

Removable Media Service

- Performance Improvement

  Modified the installation directory to accommodate 64-bit Electionware application.

1.1.3 Initial Assessment

An initial assessment on the submitted modifications was performed to determine the scope of testing. Testing from the previous test campaign was used to establish the baseline. Based on the assessment, it was determined the following tasks would be required to verify compliance of the modifications:

- Source Code Review, Compliance Build, Trusted Build, and Build Document Review

- System Level Testing

  - System Integration

  - Accuracy

- Technical Documentation Package (TDP) Review

- Functional Configuration Audit (FCA)

- Physical Configuration Audit (PCA)

- Regression Testing

1.1.4 Regression Test

Regression testing for this test campaign will consist of the execution of the System Integration.

1.2 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"

- Election Assistance Commission Testing and Certification Program Manual, Version 2.0

- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0

- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2016 Edition, "NVLAP Procedures and General Requirements (NIST HB 150-2016)", dated July 2016

- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008

- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002

- Pro V&V, Inc. Quality Assurance Manual, Revision 1.0

- Election Assistance Commission "Approval of Voting System Testing Application Package" letter dated May 6, 2016

- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)

- EAC Notices of Clarification (NOC) (listed on www.eac.gov)

- SLI Certification Test Report – Modification, Report No. ESY-18004-CTR-01, v1.1, dated April 23, 2019

- EAC Certificate of Conformance ES&S EVS 6.0.4.0, dated May 3, 2019

- EAC Grant of Certification, ESSEV6040, dated May 3, 2019

- ES&S Technical Data Package *(A listing of the EVS 6.1.0.0 documents submitted for this test campaign is listed in Section 4.5.1 of this Test Plan)*

1.3   Terms and Abbreviations

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

"ADA" – Americans with Disabilities Act 1990

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"EAC" – United States Election Assistance Commission

"ELS" – Election Log Service

"EMS" – Election Management System

"ES&S" – Election Systems and Software

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"NOC" – Notice of Clarification

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RMS" – Removable Media Service

"RFI" – Request for Interpretation

"TDP" – Technical Data Package

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

1.4 Project Schedule

The Project Schedule for the test campaign is located in Appendix A. The dates on the schedule are not firm dates but planned estimates based on the anticipated project work flow.

1.5 Scope of Testing

The scope of testing focused on evaluating the modifications detailed in Section 1.1.2 of this Test Plan. Primarily, these modifications focused on upgrades to the components of the previously certified EVS 6.0.2.0. To determine the EVS 6.0.3.0 test requirements, the submitted modifications were evaluated against each section of the EAC VVSG 1.0 to determine the applicable tests to be performed. Based on this assessment, it was determined that multiple areas within the EAC VVSG 1.0 would be evaluated to encompass the required tests.

A breakdown of the areas and associated tests is listed below:

- EAC VVSG 1.0 Volume 1, Section 2: Functional Requirements

    — System Integration Testing

    — Functional Configuration Audit (FCA)

    — Physical Configuration Audit (PCA)

    — Technical Documentation Package (TDP) Review

    — Accuracy Testing

- EAC VVSG 1.0 Volume 1, Section 5: Software Requirements

— Source Code Review, Compliance Build, Trusted Build, and Build Document Review

   — Technical Documentation Package (TDP) Review

   — Functional Configuration Audit (FCA)

1.5.1 VVSG

The EVS 6.0.3.0 shall be evaluated against the relevant requirements contained in the EAC VVSG 1.0.

1.5.2 RFIs

There are no RFIs released by the EAC as of the date of this Test Plan that pertain to this test campaign that were not in effect at the time of the baseline system certification.

1.5.3 NOCs

There are no NOCs released by the EAC as of the date of this Test Plan that pertain to this test campaign that were not in effect at the time of the baseline system certification.

1.6 System Overview

EVS 6.0.3.0 includes the following hardware: ExpressVote Universal Voting System Hardware 1.0 (ExpressVote HW1.0), ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1); DS450 high-throughput central scanner and tabulator (DS450); DS200 precinct-based scanner and tabulator (DS200); DS850 high-speed central scanner and tabulator (DS850); ExpressVote XL Full-Face Universal Voting System (ExpressVote XL); and ExpressTouch Electronic Universal Voting System (ExpressTouch).

The EVS 6.0.3.0 system components submitted for testing are listed in the tables below.

Table 1-4. EVS 6.0.3.0 System Components - Proprietary

System Component	Software or Firmware Versions	Hardware Version(s)	Description
Electionware	5.0.1.1	---	Election management software that provides end-to-end election management activities
ES&S Event Log Service (ELS)	1.6.0.0	---	Logs users' interactions with EMS
Removable Media Service (RMS)	1.9.0.0	---	Utility that runs in the background of the Windows operating system
DS200	2.17.0.0	1.2,1.3	Precinct Count Tabulator that scans voter selections from both sides of the ballot simultaneously

Table 1-4. EVS 6.0.3.0 System Components – Proprietary *(continued)*

System Component	Software or Firmware Versions	Hardware Version(s)	Description
DS200 Ballot Box	---	1.0, 1.1	Collapsible Ballot Box (Model 98-00009)
DS200 Ballot Box	---	1.2, 1.3, 1.4, 1.5	Plastic Ballot Box (Model 57521)
DS200 Tote Bin	---	1.0	Tote Bin Ballot Box (Model 00074)
DS450	3.1.0.0	1.0	Central Count Scanner and Tabulator
DS450 Cart	---	---	Model 3002
DS850	3.1.0.0	1.0	Central Count Scanner and Tabulator
DS850 Cart	---	---	Model 6823
ExpressVote XL	1.0.0.0, 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 HW1.0	1.5.0.0, 1.5.1.0	1.0	Hybrid paper-based vote capture and selection device
ExpressVote Previewer (1.0)	1.5.0.0, 1.5.1.0	---	Ballot preview software
ExpressVote HW2.1	2.4.0.0, 2.4.3.0	2.1.0.0 2.1.2.0	Hybrid paper-based vote capture and selection device
ExpressVote Previewer (2.1)	2.4.0.0, 2.4.3.0	---	Ballot preview software
ExpressVote Rolling Kiosk	---	1.0	Portable Voting Booth (Model 98-00049)
Voting Booth	---	---	Stationary Voting Booth (Model 98-00051)
ExpressVote Single Table	---	---	Voting Table for One Unit (Model 87033)
ExpressVote Double Table	---	---	Voting Table for Two Units (Model 87032)
ADA Table	---	---	Voting Table for One Unit (Model 87031)
Universal Voting Console (UVC)	---	2.0	Detachable ADA support peripheral (Model 98-00077)
Tabletop Easel	---	---	Model 14040
ExpressTouch Voting Booth	---	---	Stationary Voting Booth (Model 98-00081)
SecureSetup	2.0.0.1	---	Proprietary Hardening Script

Table 1-5. EVS 6.0.3.0 System Components – COTS Software

Manufacturer	Application	Version
Microsoft Corporation	Windows 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	Cerberus FTP 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

Table 1-6. EVS 6.0.3.0 System Components – COTS Hardware

Manufacturer	Hardware	Model/Version
Dell	EMS Server	PowerEdge T430, T630
Dell	EMS Client or Standalone Workstation	Latitude 5580, OptiPlex 5040, 5050, 7020
Innodisk	USB EDC H2SE (8GB) for ExpressVote 1.0	DEEUH1-01GI72AC1SB
Innodisk	USB EDC H2SE (16GB) for ExpressVote 2.1	DEEUH1-16GI72AC1SB
Delkin	USB Flash Drive (512MB, 1GB, 2GB, 4GB, 8GB)	N/A
Delkin	USB Embedded 2.0 Module Flash Drive	MY16MGFSY-RA000-D / 16 GB
Delkin	Compact Flash Memory Card (1GB)	---
Delkin	Compact Flash Memory Card Reader/Writer	6381

Table 1-6. EVS 6.0.3.0 System Components – COTS Hardware

Manufacturer	Hardware	Model/Version
Delkin	CFAST Card (2GB, 4GB)	N/A
Lexar	CFAST Card Reader/Writer	LRWCR1TBNA
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, Pro 1500
Tripp Lite	DS450 Surge Protector	Spike Cube
Seiko Instruments	Thermal Printer	LTPD-347B
NCR/Nashua	Paper Roll	2320
Fujitsu	Thermal Printer	FTP-62GDSL001, FTP-63GMCL153

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1.6.1 Block Diagram

Figure 1-1. EVS 6.0.3.0 System Overview

1.6.2 System Limits

The system limits that ES&S has stated to be supported by the EVS 6.0.3.0 are provided in the table below.

Table 1-7. EVS 6.0.3.0 System Limits

System Characteristic	Boundary or Limitation	Limiting System Component
Max. precincts allowed in an election	9,900	Electionware
Max. candidates allowed per election	10,000	Electionware
Max. contests allowed in an election	10,000	Electionware
Max. contests allowed per ballot style	500 or # of positions on ballot	N/A
Max. candidates (ballot choices) allowed per contest	230	Electionware
Max. number of parties allowed	General election: 75 Primary election: 30 (including nonpartisan party)	Electionware
Max. 'vote for' per contest	230	Electionware
Ballot formats	All paper ballots used in an election must be the same length. Votable paper ballots must contain the same number of rows	Ballot scanning equipment
Max. Ballot Styles	15,000	Electionware
Max. ballots per batch	1,500	DS450/DS850
Max. precinct types/groups	25 (arbitrary)	Electionware
Max. precincts of a given type	250 (arbitrary)	Electionware
Max. reporting groups	14	Electionware

Additionally, the following EVS 6.0.3.0 component limitations have been identified:

ExpressVote XL Limitations

1. ExpressVote XL 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 XL system as the maximum capacities of the 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.

ExpressVote Limitations

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

ExpressTouch Limitations

1. ExpressTouch capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. 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 based on the ES&S definition of Open Primary, 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.

Electionware Limitations

1. Electionware software field limits were calculated based on an average character width 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 field limits (and associated warnings) lower than those listed. Check printed media and displays before finalizing the election.

2. Electionware Export Ballot Images function is limited to 250 districts per export.

3. Electionware supports the language special characters listed in this the System Overview document. Language special characters other than those on this list may not appear properly when viewed on equipment displays or reports.

4. The Straight Party feature must not be used in conjunction with the Single or Multiple Target Cross Endorsement features.

5. 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".

<u>Electionware Paper Ballot Limitations</u>

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. For paper ballots, 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 ballot ID consisting of 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.

<u>DS200 Limitations</u>

1. The 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 three or more 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.

1.6.3 Supported Languages

The following languages are supported by the EVS 6.0.3.0:

- English

- Spanish

- Chinese

- Korean

- Japanese

- Hindi

- Bengali

- Vietnamese

- Tagalog

- Creole

- Russian

- French

- Gujarati *(ExpressVote XL and Electionware only)*

- Punjabi *(ExpressVote XL and Electionware only)*

Support for all stated languages will be verified; however, only English and Spanish language ballots will be cast during the performance of functional testing. Additionally, one character based language (Chinese) will be tested during System Integration Testing.

1.6.4 Supported Functionality

The EVS 6.0.3.0 is designed to support the following voting variations:

- General Election
- Closed Primary
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Split Precincts
- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots
- Straight Party Voting
- Cross-party Endorsement

2.0 PRE-CERTIFICATION TESTING AND ISSUES

This section describes previous testing performed prior to submitting the voting system to the EAC.

2.1 Evaluation of Prior VSTL Testing

Pro V&V evaluated to the published Final Test Report for the EVS 6.0.3.0 in order to baseline the current system under test.

2.2 Evaluation of Prior Non-VSTL Testing

No prior non-VSTL testing of the EVS 6.0.3.0 modifications were considered for this test campaign.

2.3   Known Field Issues

EVS 6.0.3.0 is a modification to a previously certified system and has not yet been fielded.

3.0   MATERIALS REQUIRED FOR TESTING

The following sections list all materials needed to enable the test engagement to occur.

The materials required for testing of the EVS 6.0.3.0 include all materials to enable the test campaign to occur. This includes the applicable hardware and software as well as the TDP, test support materials, and deliverable materials, as described in the following subsections.

3.1   Software

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

All software required for testing is identified in Section 1.6 of this test plan. Pro V&V will perform a comparison on the submitted source code against the previously certified versions. Pro V&V will review the submitted modified source code to the EAC VVSG 1.0 and the manufacturer-submitted coding standards.

3.2   Equipment

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

For COTS equipment, every effort will be made to verify that the COTS equipment has not been modified for use. This will be accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel will evaluate COTS hardware, system software and communications components for proven performance in commercial applications other than voting. For PCs, laptops, and servers, the service tag information will be compared to the system information found on each machine.

Physical external and internal examination will also be performed when the equipment is easily accessible without the possibility of damage. Hard drives, RAM memory, and other components will be examined to verify that the components match the information found on the COTS equipment manufacturer's websites.

3.3   Test Materials

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

- ExpressVote Activation Card Printer

- Security Seals/Locks/Sleeves

- CF Card Reader/Writer

- Headphone Covers

- Ethernet Switch

- Printer Paper

- Ballots and blank ballot grade paper

- Activation cards

- Ballot pens

- CF memory cards

- USB flash drives

3.4 Proprietary Data

All data and documentation considered by the manufacturer to be proprietary will be identified and documented in an independent submission along with a Notice of Protected Information.

4.0 TEST SPECIFICATIONS

Certification testing of EVS 6.0.3.0 submitted for evaluation will be performed to ensure the applicable requirements of the EAC VVSG 1.0 and the EAC Testing and Certification Program Manual, Version 2.0 are met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test will be incorporated in the test campaign. A complete listing of the EAC RFIs and NOCs is available on the EAC website.

4.1 Requirements (Strategy of Evaluation)

To evaluate the EVS 6.0.3.0 test requirements, the submitted modifications were evaluated against each section of the EAC VVSG 1.0 to determine the applicable tests to be performed. Based on this assessment, it was determined the following evaluations would be required to verify compliance of the modifications:

Section 1: Technical Documentation Package (TDP) Review

A TDP Review will be performed to ensure that all submitted modifications are accurately documented and that the documents meet the requirements of the EAC VVSG 1.0. The preliminary TDP review is performed to gather information concerning the system under test and its capabilities or design intentions. Additionally, a TDP review will be performed throughout the test campaign. The TDP Review includes the Initial Review, the Regulatory/Compliance Review, and the Final Review. This review is conducted to determine if the submitted technical documentation meets the regulatory, customer-stated, or end-user requirements and includes reviewing the documents for stated functionality and verification.

Section 2: Functional Requirements

The requirements in this section shall be tested during the FCA, Accuracy Test, and System Integration Test. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The FCA targets the specific functionality claimed by the manufacturer to ensure the product functions as documented. This testing uses both positive and negative test data to test the robustness of the system. The FCA encompasses an examination of manufacturer tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities apply throughout the election process. They include security, accuracy, integrity, system audit ability, election management system, vote tabulation, ballot counters, telecommunications, and data retention.

- Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.

- Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.

- Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; obtaining consolidated reports; and obtaining reports of audit trails.

- Maintenance, Transportation and Storage Capabilities: These capabilities are necessary to maintain, transport, and store voting system equipment.

The system integration testing addresses the integration of the hardware and software. This testing focuses on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. During test performance, the system is configured as would be for normal field use.

The accuracy test ensures that each component of the voting system can each process 1,549,703 consecutive ballot positions correctly within the allowable target error rate. The Accuracy test is designed to test the ability of the system to "capture, record, store, consolidate and report" specific selections and absences of a selection. The required accuracy is defined as an error rate. This rate is the maximum number of errors allowed while processing a specified volume of data.

Section 5: Software Requirements

The requirements in this section shall be tested utilizing a combination of review and functional testing during the source code review, TDP review, and FCA.

To perform the source code review, Pro V&V will review the submitted source code to the EAC VVSG 1.0 and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met. The source code review includes a compliance build and a trusted build of the submitted source code.

4.1.1 Rationale for 'Not Applicable' Requirements

All requirements that were excluded from the previous test campaign (EVS 6.0.2.0) were also deemed not applicable to this test campaign due to the submitted modifications not impacting the specific requirements.

4.2 Hardware Configuration and Design

The EVS 6.0.3.0 is an electronic voting system consisting of the following hardware: ExpressVote Universal Voting System Hardware 1.0 (ExpressVote HW1.0), ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1); DS450 high-speed central scanner and tabulator (DS450); DS200 precinct-based scanner and tabulator (DS200); DS850 high-throughput central scanner and tabulator (DS850); ExpressVote XL Full-Face Universal Voting System (ExpressVote XL); ExpressTouch Electronic Universal Voting System (ExpressTouch).

4.3 Software System Functions

The EVS 6.0.3.0 EMS is an application suite consisting of Electionware, Removable Media Service (RMS) and Event Log Service (ELS).

Electionware

Electionware is the election management software that provides end-to-end election management activities (from creating the ballots to reporting the voting results) through user interface.

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 flash drives so that ES&S applications such as Electionware can use that information for flash drive validation purposes.

Event Log Service (ELS)

ELS is an application that logs users' interactions with the EMS.

4.4 Test Case Design

Test cases are designed based on the manufacturer's design specifications and the relevant technical requirements set forth by the VVSG. Test cases shall be based on the following aspects of the voting system:

- Software module test case design and data

- Software functional test case design

- System level test case design

Test cases shall provide information regarding the sequence of actions to be performed for the execution of a test, the requirements being met, the test objective, test configuration, equipment needed, special requirements, assumptions, and pass/fail criteria. Once the test cases are finalized, they will be validated and published for use in the test campaign. The validation of the test case will be accomplished by technical review and approval. This validation will include the following: confirmation of adequate test coverage of all requirements; confirmation that test case results are not ambiguous and gave objective pass/fail criteria; and confirmation that any automated test suites will produce valid results.

4.4.1 Hardware Qualitative Design

The updates to the baselined system do not require hardware testing to be performed.

4.4.2 Hardware Environmental Test Case Design

Previous hardware examinations were performed on the certified baseline system (EVS 6.0.2.0) and/or previous certified versions of the EVS 6.0.3.0 components. The updates to the baselines system do not require additional hardware testing to be performed.

4.4.3 Software Module Test Case Design and Data

Pro V&V shall review the manufacturer's program analysis, documentation, and module test case design and shall evaluate the test cases for each module with respect to flow control parameters and entry/exit data. As needed, Pro V&V shall design additional test cases to satisfy the coverage criteria specified in Volume II, Section 7.2.1.

Component Level Testing will be implemented during the FCA for each component and subcomponent.

During the Source Code Review and Compliance Builds, Pro V&V will utilize limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) will be utilized for the individual software components.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted. If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected

results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.4 Software Functional Test Case Design and Data

Pro V&V shall review the manufacturer-submitted test plans and data to verify that the individual performance requirements specified in the EAC VVSG 1.0 and the TDP are reflected in the software. As part of this process, Pro V&V shall review the manufacturer's test case design and prepare a detailed matrix of system functions and the test cases that exercise them. Pro V&V shall also prepare a test procedure describing all test ballots, operator procedures, and the data content of output reports. Pro V&V shall define abnormal input data and operator actions and then design test cases to verify that the system is able to handle and recover from these abnormal conditions.

During this review, emphasis shall be placed on those functions where the manufacturer data on module development, such as the system release notes and comments within the source code, reflects significant debugging problems, and on functional tests that resulted in high error rates.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted.

If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.5 System-Level Test Case Design

System Level testing will be implemented to evaluate the complete system. This testing will include all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use.

For software system tests, the tests shall be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases shall be prepared independently to assess the response of the hardware and software to a range of conditions.

4.5 Test Specifications

Descriptions of the tests required to evaluate the EVS 6.0.3.0 to the scope defined in Section 1.5 are provided in the subsections below.

4.5.1 TDP Evaluation

In order to determine compliance of the modified TDP documents with the EAC VVSG 1.0, a limited TDP review shall be conducted. This review will focus on TDP documents that have been modified since the certification of the baseline system. The review will consist of a compliance review to determine if each regulatory, state, or manufacturer-stated requirement has been met

based on the context of each requirement. Results of the review of each document will be entered on the TDP Review Checklist and reported to the manufacturer for disposition of any anomalies. This process will be ongoing until all anomalies are resolved.

Any revised documents during the TDP review process will be compared with the previous document revision to determine changes made, and the document will be re-reviewed to determine whether subject requirements have been met.

A listing of all documents contained in the EVS 6.0.3.0 TDP is provided in Table 4-1.

Table 4-1. EVS 6.0.3.0 TDP Documents

Document ID	Description	Revision
00_Preface		
ESSSYS_6'0'3'0_L_RequirementsMatrix_QA	Requirements of the VVSG 1.0 Trace to Vendor Testing	1.0
ESSSYS_6'0'3'0_L_RequirementsMatrix_TDP	Requirements of the VVSG 1.0 Trace to Technical Data Package	1.0
01_System Overview		
ESSSYS_6'0'3'0_D_SysOvr	ES&S Voting System 6.0.3.0 System Overview	1.0
02_System Functionality Description		
ESSSYS_6'0'3'0_D_SFD	ES&S Voting System 6.0.3.0 System Functionality Description	1.0
03_System Hardware Specification		
DS200_1'2_SPC_HWSpec	DS200 Hardware Specification, Hardware Revision 1.2	3.5
DS200_1'3_SPC_HWSpec	DS200 Hardware Specification, Hardware Revision 1.3	4.6
DS450_1'0_SPC_HWSpec	DS450 Hardware Specification, Hardware Revision 1.0	1.9
DS850_1'0_SPC_HWSpec	DS850 Hardware Specification, Hardware Revision 1.0	1.9
ETOUCH_1'0_SPC_HWSpec	ExpressTouch Hardware Specification, Hardware Revision 1.0	1.1
EVOTE_1'0_SPC_HWSpec	ExpressVote Hardware Specification, Hardware Revision 1.0	3.10
EVOTE_2'1_SPC_HWSpec	ExpressVote Hardware Specification, Hardware Revision 2.1	1.3
EVOTEXL_1'0_SPC_HWSpec	ExpressVote XL Hardware Specification, Hardware Revision 1.0	1.1
03_System Hardware Specification – Approved Parts List		
DS200_1'2_L_APL	Approved Parts List: DS200 HW1.2	1.1
DS200_1'3_L_APL	Approved Parts List: DS200 HW 1.3	1.3
DS450_1'0_L_APL	Approved Parts List: DS450 HW 1.0	1.2

Table 4-1. EVS 6.0.3.0 TDP Documents *(continued)*

Document ID	Description	Revision
DS850_1'0_L_APL	Approved Parts List: DS850 HW 1.0	1.4
ETOUCH_1'0_L_APL	Approved Parts List: ExpressTouch HW Rev 1.0	1.0
EVOTE_1'0_L_APL	Approved Parts List: ExpressVote HW 1.0	2.1
EVOTE_2'1_L_APL	Approved Parts List: ExpressVote HW 2.1	2.4
EVOTEXL_1'0_L_APL	Approved Parts List: ExpressVote XL HW Rev 1.0	1.1
04_Software Design and Specification		
DS200_2'170'0'0_SDS	DS200 - Software Design Specification	1.4
DS450_3'1'0'0_SDS	DS450 - Software Design Specification	1.6
DS850_3'1'0'0_SDS	DS850 - Software Design Specification	1.4
ELS_1'6'0'0_SDS	Event Log Service – Software Design Specification	1.1
ETOUCH_1'0'0'0_SDS	ExpressTouch – Software Design Specification	1.6
EVOTE_1'5'0'0_SDS_HW1'0	ExpressVote 1.0 - Software Design Specification	1.4
EVOTE_2'4'0'0_SDS_HW2'1	ExpressVote 2.1 - Software Design Specification	1.6
ESSSYS_1'0_P_CodingStandards	Coding Standards	1.4
ESSSYS_1'0_P_SysDevProgram	System Development Program	1.5
ESSSYS_1'0_SPC_LicenseAgreements	License Agreements for Procured Software	1.6
EWARE_5'0'1'1_SDS	Electionware – Software Design Specification	1.0
EVOTEXL_1'0'0'0_SDS	ExpressVote XL – Software Design Specification	1.8
EWARE_99'3_D_PostGreSQL Descriptions_EVS6030	SDS Appendices - PostGreSQL Entity Descriptions	n/a
EWARE_99'5_D_XMLDiagrams_EVS6030	SDS Appendices - XML Diagrams	n/a
EWARE_99'6_D_MediaContents_6030	Election Media Content Overview	n/a
05_System Test and Verification		
ESSSYS_6'0'3'0_D_TESTPLAN	ES&S Voting System 6.0.3.0 System Test Plan	1.0
ETOUCH_1'0_D_CIFRpt.pdf	Usability Test Report: ExpressTouch Electronic Universal Voting System	---
DS200_1'3_D_CIFRpt.pdf	Usability Test Report: DS200 Precinct Ballot Scanner	---
EVOTE_1'0_D_CIFRpt.pdf	Usability Test Report: ExpressVote Universal Voting System	---
EVOTE_2'1_D_CIFRpt.pdf	Usability Test Report: ExpressVote Universal Voting System	---

Table 4-1. EVS 6.0.3.0 TDP Documents *(continued)*

Document ID	Description	Revision
EVOTEXL_1'0_D_CIFRpt.pdf	Usability Test Report: ExpressVote XL Full-Faced Universal Voting System	---
06_System Security Specification		
ESSSYS_6'0'3'0_SPC_Client WorkstationSetupConfigGuide	EMS Client Workstation Secure Setup & Configuration Guide	1.0
ESSSYS_6'0'3'0_SPC_EMSServerSetupConfigGuide	EMS Server Secure Setup & Configuration Guide	1.0
ESSSYS_1'0_SPC_SecBestPract	Best Practices for Physically Securing ES&S Equipment	1.11
ESSSYS_6'0'3'0_SPC_SecurityScriptDesc	Security Script Description	1.0
ESSSYS_6'0'3'0_SPC_StandaloneWorkstationSetupConfigGuide	EMS Standalone Workstation Secure Setup & Configuration Guide	1.0
ESSSYS_1'0_SPC_SystemSecurity_Local	Voting System Security Specification	1.3
06_System Security Specification – 01_VerificationProcedures&Scripts		
ESSSYS_6'0'3'0_D_VerProc_DS200	Verification Procedure: DS200 Precinct Scanner and Tabulator	1.0
ESSSYS_6'0'3'0_D_VerProc_DS450	Verification Procedure: DS450 High-Throughput Scanner & Tabulator	1.0
ESSSYS_6'0'3'0_D_VerProc_DS850	Verification Procedure: DS850 High-Speed Scanner & Tabulator	1.0
ESSSYS_6'0'3'0_D_VerProc_EVOTE_1'5'0'0_HW1'0	Verification Procedure: ExpressVote Hardware 1.0 from EVS 6.0.2.0	1.0
ESSSYS_6'0'3'0_D_VerProc_EVOTE_2'4'0'0_HW2'1	Verification Procedure: ExpressVote Hardware 2.1 from EVS 6.0.2.0	1.0
ESSSYS_6'0'3'0_D_VerProc_EVOTE_1'5'1'0_HW1'0	Verification Procedure: ExpressVote Hardware 1.0 from EVS 6.0.2.1	1.0
ESSSYS_6'0'3'0_D_VerProc_EVOTE_2'4'3'0_HW2'1	Verification Procedure: ExpressVote Hardware 2.1 from EVS 6.0.2.1	1.0
ESSSYS_6'0'3'0_D_VerProc_VerificationPCSetup	Verification Procedure: Verification PC Setup	1.0
ESSSYS_6'0'3'0_D_VerProc_EMS	Verification Procedure: Election Management System	1.0
ESSSYS_6'0'3'0_D_VerProc_ETOUCH	Verification Procedure: ExpressTouch	1.0
ESSSYS_6'0'3'0_D_VerProc_EVOTEXL_1'0'0'0	Verification Procedure: ExpressVote XL from EVS 6.0.2.0	1.0
06_System Security Specification – Validation File Lists		
DS200_2'17_L_ValFileList	Validation File List: DS200	1.2
DS450_3'1_L_ValFileList	Validation File List: DS450	1.2
DS850_3'1_L_ValFileList	Validation File List: DS850	1.3

Table 4-1. EVS 6.0.3.0 TDP Documents *(continued)*

Document ID	Description	Revision
EMS_5'0_L_ValFileList	Validation File List: Electionware	1.0
ETOUCH_1'0_L_ValFileList	Validation File List: ExpressTouch	1.1
EVOTEXL_1'0_L_ValFileList	Validation File List: ExpressVote XL	1.0
EVOTE_1'5_L_ValFileList_HW1'0	Validation File List: ExpressVote HW1.0	1.0
EVOTE_2'4_L_ValFileList_HW2'1	Validation File List: ExpressVote HW2.1	1.0
EVOTEP_1'5_L_ValFileList	Validation File List: ExpressVote HW1.0 Previewer	1.0
EVOTEP_2'4_L_ValFileList	Validation File List: ExpressVote HW2.1 Previewer	1.0
07_System Operations Procedures		
DS200_2'17'0'0_SOP	DS200 Operator's Guide, Firmware Version 2.17	2.2
DS450_3'1'0'0_SOP	DS450 Operator's Guide, Firmware Version 3.1	2.1
DS850_3'1'0'0_SOP	DS850 Operator's Guide, Firmware Version 3.1	2.1
ELS_1'6'0'0_SOP	EVS Event Log Service User's Guide, Software Version 1.6	1.1
ETOUCH_1'0'0'0_SOP	ExpressTouch Operator's Guide, Firmware Version 1.0	1.11
EVOTE_1'5'0'0_SOP_HW1'0	ExpressVote Operator's Guide, Hardware Version 1.0, Firmware Version 1.5.1.0 from EVS 6.0.2.0	1.13
EVOTE_2'4'0'0_SOP_HW2'1	ExpressVote Operator's Guide, Hardware Version 2.1, Firmware Version 2.4.3.0 from EVS 6.0.2.0	1.14
EVOTEXL_1'0'0'0_SOP	ExpressVote XL Operator's Guide, Firmware Version 1.0.3.0 from EVS 6.0.2.0	1.13
EVOTE_1'5'1'0_SOP_HW1'0	ExpressVote Operator's Guide, Hardware Version 1.0, Firmware Version 1.5.1.0 from EVS 6.0.2.1	1.1
EVOTE_2'4'3'0_SOP_HW2'1	ExpressVote Operator's Guide, Hardware Version 2.1, Firmware Version 2.4.3.0 from EVS 6.0.2.1	1.1
EVOTEXL_1'0'3'0_SOP	ExpressVote XL Operator's Guide, Hardware Version 1.0, Firmware Version 1.0.3.0 from EVS 6.0.2.1	1.1
EWARE_5'0'1'1_SOP_01Admin	Electionware Vol. I: Administrator Guide, Software Version 5.0.1.1	1.0
EWARE_5'0'1'1_SOP_02Define	Electionware Vol. II: Define User Guide, Software Version 5.0.1.1	1.0
EWARE_5'0'1'1_SOP_03Design	Electionware Vol. III: Design User Guide, Software Version 5.0.1.1	1.0
EWARE_5'0'1'1_SOP_04Deliver	Electionware Vol. IV: Deliver User Guide, Software Version 5.0.1.1	1.0
EWARE_5'0'1'1_SOP_05Results	Electionware Vol. V: Results User Guide, Software Version 5.0.1.1	1.0

Table 4-1. EVS 6.0.3.0 TDP Documents *(continued)*

Document ID	Description	Revision
EWARE_5'0'1'1_SOP_06Appendices	Electionware Vol. VI: Appendices, Software Version 5.0.1.1	1.0
08_System Maintenance Manuals		
DS200_2'17'0'0_SMM	DS200 Maintenance Manual, Firmware Version 2.17	1.4
DS450_3'1'0'0_SMM	DS450 Maintenance Manual, Firmware Version 3.1	1.5
DS850_3'1'0'0_SMM	DS850 Maintenance Manual, Firmware Version 3.1	1.6
ETOUCH_1'0'0'0_SMM	ExpressTouch Maintenance Manual, Firmware Version 1.0	1.7
EVOTE_1'5'0'0_SMM_HW1'0	ExpressVote Maintenance Manual, Firmware Version 1.5.0.0, Hardware Version 1.0 from EVS 6.0.2.0	1.3
EVOTE_2'4'0'0_SMM_HW2'1	ExpressVote Maintenance Manual, Firmware Version 2.4.0.0, Hardware Version 2.1 from EVS 6.0.2.0	1.4
EVOTEXL_1'0'0'0_SMM	ExpressVote XL Maintenance Manual, Firmware Version 1.0 from EVS 6.0.2.0	1.6
EVOTE_1'5'1'0_SMM_HW1'0	ExpressVote Maintenance Manual, Hardware Version 1.0, Firmware Version 1.5.1.0 from EVS 6.0.2.1	1.0
EVOTE_2'4'3'0_SMM_HW2'1	ExpressVote Maintenance Manual, Hardware Version 1.0, Firmware Version 2.4.3.0 from EVS 6.0.2.1	1.0
EVOTEXL_1'0'3'0_SMM	ExpressVote XL Maintenance Manual, Firmware Version 1.0.3.0 from EVS 6.0.2.1	1.0
09_Personnel Deployment and Training		
ESSSYS_1'0_P_TrainingProgram	Personnel Deployment and Training Program	1.1
10_Configuration Management Plan		
ESSSYS_1'0_P_CMProgram	Configuration Management Program	1.4
ESSSYS_1'0_P_TDProgram	Technical Documentation Program	1.3
11_QA Program		
ESSSYS_1'0_P_MNFQAProgram	Manufacturing Quality Assurance Program	1.7
ESSSYS_1'0_P_SWQAProgram	Software Quality Assurance Program	1.3
12_System Change Notes		
ESSSYS_6'0'3'0_D_ChangeNotes	ES&S Voting System 6.0.3.0 System Change Notes	1.0

Table 4-1. EVS 6.0.3.0 TDP Documents *(continued)*

Document ID	Description	Revision
	13_Attachments	
BPG_1'0_SOP	Ballot Production Guide for EVS	3.0

4.5.2   Source Code Review

Pro V&V will review the submitted source code to the EAC VVSG 1.0 and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

A combination of Automated Source Code Review and Manual Source Code Review methods will be used to review the changes in the source code from the previously certified EVS 6.0.2.0 and EVS 6.0.2.1 voting systems. In addition, 10% of the source code comments will be manually reviewed.

4.5.3   Physical Configuration Audit (PCA)

The Physical Configuration Audit (PCA) compares the voting system components submitted for qualification to the manufacturer's technical documentation, and shall include the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system

- Verify software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification

- If the hardware is non-COTS, Pro V&V shall review drawings, specifications, technical data, and test data associated with system hardware to establish system hardware baseline associated with software baseline

- Review manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests

- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation are subject to re-examination

4.5.4   Functional Configuration Audit (FCA)

The Functional Configuration Audit (FCA) encompasses an examination of manufacturer's tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP.

In addition to functioning according to the manufacturer's documentation, tests will be conducted to ensure all applicable EAC VVSG 1.0 requirements are met.

4.5.5   System Level Testing

System Level Testing will be implemented to evaluate the complete system. This testing will include all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. For software system tests, the tests will be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases will be prepared independently to assess the response of the hardware and software to a range of conditions. Pro V&V will review the manufacturer's program analysis, documentation, and module test case design and evaluate the test cases for each module with respect to flow control parameters and entry/exit data.

System Level Testing includes the evaluations of the following test areas: FCA, Accuracy Testing, and System Integration Testing.

Pro V&V defined the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted. If the system does not perform as expected, an analysis was performed to determine the cause. If needed, the test will be repeated in an attempt to reproduce the results. If the failure can't be reproduced and the expected results are not met, the system will be determined to have failed the test. If the results can't be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.5.5.1 Accuracy

The Accuracy test ensures that the voting system can each process 1,549,703 consecutive ballot positions correctly within the allowable target error rate.

The Accuracy test is designed to test the ability of the system to "capture, record, store, consolidate and report" specific selections and absences of a selection. The required accuracy is defined as an error rate. This rate is the maximum number of errors allowed while processing a specified volume of data. For paper-based voting systems, the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests and the conversion of those selections detected on the paper ballot converted into digital data. In an effort to achieve this and to verify the proper functionality of the units under test, the following methods will be used to test components of the voting system:

The accuracy requirements for the EVS 6.0.3.0 will be accomplished by the execution of the standard accuracy test utilizing pre-marked 14" vote summary cards.

4.5.5.2 System Integration

System Integration is a system level test that evaluates the integrated operation of both hardware and software. Compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment, shall be determined through functional tests integrating the voting system software with the remainder of the system.

Additionally, the system shall be configured exactly as it would for normal field use. This includes connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties.

Pro V&V personnel shall properly configure and test the system by following the procedures detailed in the EVS 6.0.3.0 technical documentation.

4.5.5.4 Regression Testing

Regression testing will be conducted on the EVS 6.0.3.0 to establish assurance that the modifications have no adverse impact on the compliance, integrity, or performance of the system.

5.0   TEST DATA

The following subsections provide information concerning test data recording and criteria.

5.1   Test Data Recording

All equipment utilized for test data recording shall be identified in the test data package. The output test data shall be recorded in an appropriate manner as to allow for data analysis. For source code and TDP reviews, results shall be compiled in reports and submitted to ES&S for resolution.

5.2   Test Data Criteria

The EVS 6.0.3.0 modifications shall be evaluated against all applicable requirements contained in the EAC VVSG 1.0. The acceptable range for system performance and the expected results for each test case shall be derived from the manufacturer-submitted technical documentation and the EAC VVSG 1.0.

6.0   TEST PROCEDURE AND CONDITIONS

The following subsections detail the facility requirements, test setup conditions, sequence of testing, and test operation procedures.

6.1   Facility Requirements

Unless otherwise annotated, all testing shall be conducted on-site at the ES&S facility located in Omaha, NE. All testing shall be performed by personnel verified by Pro V&V to be qualified to perform the test. Unless otherwise specified herein, testing shall be performed at the following standard ambient conditions and tolerances:
- Temperature: 68-75∘ F (±3.6∘F)

- Relative Humidity: Local Site Humidity

- Atmospheric Pressure: Local Site Pressure

- Time Allowable Tolerance: ±5%

6.2   Test Set-up

All voting system equipment shall be received and documented using Pro V&V proper QA procedures. If present, this damage shall be recorded, photographed, and reported to the ES&S Representative.

TDP items and all source code received shall be inventoried and maintained by Pro V&V during the test campaign.

During test performance, the system shall be configured as it would be for normal field use. This includes connecting all supporting equipment and peripherals.

6.3   Test Sequence

The EVS 6.0.3.0 will be evaluated against all applicable requirements in the EAC VVSG 1.0. There is no required sequence for test performance.

6.4   Test Operations Procedure

Pro V&V will identify PASS/FAIL criteria for each executed test case. The PASS/FAIL criteria will be based on the specific expected results of the system. In the case of an unexpected result that deviates from what is considered standard, normal, or expected, a root cause analysis will be performed.

Pro V&V will evaluate every EAC VVSG 1.0 requirement applicable to the submitted EVS 6.0.3.0 modifications. Any deficiencies noted will be reported to the EAC and the manufacturer. If it is determined that there is insufficient data to determine compliance, this Test Plan will be altered and additional testing will be performed.

APPENDIX A

PROJECT SCHEDULE

Task Name	Start Date	End Date	Duration	Predecessors
EAC Application & TRR	**05/11/20**	**05/19/20**	**7d**	
Application Submitted to EAC	05/11/20	05/11/20	1d	
TRR	05/18/20	05/18/20	1d	
Application Approval from EAC	05/19/20	05/19/20	1d	3
TDP	**05/14/20**	**05/20/20**	**5d**	
Initial Review	05/14/20	05/14/20	1d	
Compliance Review	05/15/20	05/19/20	3d	6
Final review	05/20/20	05/20/20	1d	7
Test Plan	**05/14/20**	**07/07/20**	**37d**	
Test Plan Creation	05/14/20	05/19/20	4d	
Vendor Review & Comments	05/20/20	05/20/20	1d	10
EAC Submission and Review	05/21/20	06/18/20	20d	11
VSTL Comment Review & Update	06/19/20	06/19/20	1d	12
EAC Submission & Review of Revision	06/22/20	07/06/20	10d	13
EAC Approved Test Plan	07/07/20	07/07/20	1d	14
Source Code	**05/12/20**	**05/19/20**	**6d**	
Automated Review	05/12/20	05/12/20	1d	
Source Code Review	05/12/20	05/12/20	1d	
Document Review	05/19/20	05/19/20	1d	
Compliance Build	05/19/20	05/19/20	1d	
System Delivery & Setup	**05/18/20**	**05/19/20**	**2d**	
PCA	05/18/20	05/18/20	1d	
System Setup	05/18/20	05/18/20	1d	
System Loads & Hardening	05/19/20	05/19/20	1d	
System Level Testing	**05/19/20**	**05/20/20**	**2d**	
FCA	05/19/20	05/19/20	1d	
Accuracy	05/19/20	05/20/20	2d	
System Integration	05/20/20	05/20/20	1d	
Test Report	**05/21/20**	**08/20/20**	**64d**	
Test Report Creation	05/21/20	06/04/20	10d	28
Vendor Review & Comments	06/05/20	06/05/20	1d	30
EAC Submission & Review	07/08/20	08/04/20	20d	15
VSTL Comment Review & Update	08/05/20	08/05/20	1d	32
EAC Submission & Review of Revision	08/06/20	08/19/20	10d	33
EAC Approved Test Report	08/20/20	08/20/20	1d	34