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Test Report 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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REVISIONS

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1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform 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. Certification testing of EVS 6.0.3.0 was performed to ensure the applicable requirements of the EAC VVSG 1.0 and the EAC Testing and Certification Program Manual, Version 2.0 were met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test were incorporated in the test campaign.

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.

The EVS 6.0.3.0 EAC-approved test plan, which is available for viewing on the EAC's website at www.eac.gov, was utilized as the guiding document during test performance. Since test plan approval, and as testing progressed, minor system modifications, such as revised system documentation, were incorporated. This test report reflects all of the testing completed and details the final versions of all technical documentation and system components and supersedes the approved test plan.

Unless otherwise annotated, all testing was conducted on-site at the ES&S facility located in Omaha, NE, by personnel verified by Pro V&V to be qualified to perform the test.

1.1 Description and Overview of EAC Certified System Being Modified

EVS 6.0.3.0 is a modification to a previously certified system and has not yet been fielded. The EAC-certified system that is the baseline for EVS 6.0.3.0 is EVS 6.0.2.0. 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.*

All information presented was derived from the previous Certification Test Report, the EAC Certificate of Conformance and/or the System Overview.

EVS 6.0.2.0 is 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 is 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 Version	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)

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

System Component	Software or Firmware Version	Hardware Version(s)	Description
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, 1.0.3.0*	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

* 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)

Table 1-2. EVS 6.0.2.0 EAC Certified System Components – COTS Software *(continued)*

Manufacturer	Application	Version
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-core3sdsdv5i64.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 1-3. 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

Table 1-3. EVS 6.0.2.0 EAC Certified System Components – COTS Hardware *(continued)*

Manufacturer	Hardware	Model/Version
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

1.2 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
- EAC “Approval of Voting System Testing Application Package” letter dated May 18, 2020
- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)

- EAC Notices of Clarification (NOC) (listed on www.eac.gov)
- SLI Compliance Report No. ESY-18003-CTR-01, Version 1.2
- EAC Certificate of Conformance ES&S EVS 6.0.2.0, dated October 4, 2018
- EAC Grant of Certification, ESSEVS6020, dated October 4, 2018
- ES&S Technical Data Package (*A listing of the EVS 6.0.3.0 documents submitted for this test campaign is listed in Section 3.1 of this Test Report*)

1.3 Terms and Abbreviations

This subsection lists terms and abbreviations relevant to this test campaign.

“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

2.0 CERTIFICATION TEST BACKGROUND

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. Based on this evaluation, Pro V&V determined that testing from the previous test campaign would establish the baseline and that the focus of this test campaign would be on the documented system updates.

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

2.1 Revision History

The table below details the version history of the EVS 6.0.3.0 System:

Table 2-1. EVS 6.0.3.0 System Revision History

System Version	Certification Type	Baseline System	Certification Number
EVS 6.0.0.0	New System	--- (Original System)---	ESSEVS6000
EVS 6.0.2.0	Modification	EVS 6.0.0.0	ESSEVS6020
EVS 6.0.2.1	Modification	EVS 6.0.0.0	ESSEVS6021
EVS 6.0.3.0	Modification	EVS 6.0.2.0	ESSEVS6030*

*Upon grant of certification by the EAC

2.2 Scope of Testing

The scope of testing focused on evaluating the modifications detailed in Section 2.2.2.1 of this Test Report. 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)

2.2.1 Modification Overview

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.

To verify the submitted modifications were successfully addressed throughout the test campaign, each modification was tracked and verified to be addressed during the execution of the relevant test area. For example, source code changes were verified during the source code review. Modifications requiring functional test verification were evaluated by executing the standard Accuracy Test, the System Integration Test, or during performance of the FCA. Modifications that were not adequately evaluated during the performance of these tests were subjected to specifically designed test cases. Additionally, Pro V&V functionally verified that all enhancements implemented did not adversely impact system performance.

2.2.1.1 Detailed List of Changes

The list below includes specific changes between the current EVS 6.0.3.0 and the baseline of the EVS 6.0.2.0:

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.

2.2.2 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 2-2. EVS 6.0.3.0 System Components – Proprietary

System Component	Software or Firmware Version	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
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

Table 2-2. EVS 6.0.3.0 System Components – Proprietary (continued)

System Component	Software or Firmware Version	Hardware Version(s)	Description
ExpressTouch Voting Booth	---	---	Stationary Voting Booth (Model 98-00081)
SecureSetup	2.0.0.1	---	Proprietary Hardening Script

Table 2-3. 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-core3sds5i64.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 2-4. 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

Table 2-4. EVS 6.0.3.0 System Components – COTS Hardware (continued)

Manufacturer	Hardware	Model/Version
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
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

Table 2-5. EVS 6.0.3.0 System Components – COTS Hardware

Manufacturer	Hardware	Model/Version
Symbol	QR Code scanner (External)	DS9208
Dell	DS450 Report Printer	S2810dn
OKI	DS450 and DS850 Report Printer	B431DN, B431DN, B432DN
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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2.2.2.2 Supported Functionality

EVS 6.0.3.0 was verified to support the following voting variations:

- General Election
- Closed Primary
- Open 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

2.2.2.3 Supported Languages

Support for the following languages was verified during this test campaign or during testing of the baselined system:

- 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 was verified; however, only English and Spanish language ballots were cast during the performance of functional testing. Additionally, one character based language (Chinese) was tested during System Integration Testing.

2.2.2.4 System Limits

The system limits verified to be supported by the EVS 6.0.3.0 during this test campaign or during testing of the baselined system are provided in the table below.

Table 2-6. 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".

Electionware Paper Ballot Limitations

1. The paper ballot code channel, which is the series of black boxes that appear between the timing track and ballot contents, limits the number of available ballot variations depending on how a jurisdiction uses this code to differentiate ballots. The code can be used to differentiate ballots using three different fields defined as: Sequence (available codes 1-16,300), Type (available codes 1-30) or Split (available codes 1-18).
2. 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.

DS200 Limitations

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.

2.2.3 VVSG

EVS 6.0.3.0 was evaluated against the relevant requirements contained in the EAC VVSG 1.0.

2.2.4 RFIs

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

2.2.5 NOCs

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

3.0 TEST FINDINGS AND RECOMMENDATIONS

EVS 6.0.3.0 was evaluated against the relevant requirements contained in the EAC 2005 VVSG, Volumes I and II. The focus of this test campaign was on the modifications to the voting system configuration that included upgrades to the components of the baselined system. 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.

The summary findings and recommendations for each area of testing are provided in the following sections.

3.1 Summary Findings and Recommendation

Summary findings for the System Level Testing (System Integration Testing, Accuracy, and Limited FCA), PCA, and Source Code Review are detailed in the relevant sections of this report. In addition to these areas of testing, a TDP Review was performed, as described below.

Technical Documentation Package (TDP) Review

In order to determine compliance of the modified TDP documents with the EAC VVSG 1.0, a limited TDP review was conducted. This review focused on TDP documents that have been modified since the certification of the baseline system. The review consisted of a compliance review to verify that each regulatory, state, or manufacturer-stated requirement had been met based on the context of each requirement.

Results of the review of each document were entered on the TDP Review Checklist and reported to the manufacturer for disposition of any anomalies. This process was ongoing until all anomalies were resolved. Any revised documents during the TDP review process were compared with the previous document revision to determine changes made, and the document was re-reviewed to determine whether subject requirements had been met. A listing of all documents contained in the EVS 6.0.3.0 TDP is provided in Table 3-1.

Table 3-1. EVS 6.0.3.0 TDP Documents

Document ID	Description	Revision
<i>00_Preface</i>		
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
<i>01_System Overview</i>		
ESSSYS_6'0'3'0_D_SysOvr	ES&S Voting System 6.0.3.0 System Overview	1.3
<i>02_System Functionality Description</i>		
ESSSYS_6'0'3'0_D_SFD	ES&S Voting System 6.0.3.0 System Functionality Description	1.0

Table 3-1. EVS 6.0.3.0 TDP Documents (continued)

Document ID	Description	Revision
<i>03_System Hardware Specification</i>		
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
<i>03_System Hardware Specification – Approved Parts List</i>		
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
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
<i>04_Software Design and Specification</i>		
DS200_2'17'0'0_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	ExpressVote 1.0 - Software Design Specification	1.4
EVOTE_1'5'1'0_SDS	ExpressVote 1.0 - Software Design Specification	1.0
EVOTE_2'4'0'0_SDS	ExpressVote 2.1 - Software Design Specification	1.6
EVOTE_2'4'3'0_SDS	ExpressVote 2.1 - Software Design Specification	1.0

Table 3-1. EVS 6.0.3.0 TDP Documents (continued)

Document ID	Description	Revision
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
EVOTEXL_1'0'1'0_SDS	ExpressVote XL – Software Design Specification	1.0
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
<i>05_System Test and Verification</i>		
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	---
EVOTEXL_1'0_D_CIFRpt.pdf	Usability Test Report: ExpressVote XL Full-Faced Universal Voting System	---
<i>06_System Security Specification</i>		
ESSSYS_6'0'3'0_SPC_Client WorkstationSetupConfigGuide	EMS Client Workstation Secure Setup & Configuration Guide	1.1
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	1.1
ESSSYS_1'0_SPC_SystemSecurity_Local	Voting System Security Specification	1.3
<i>06_System Security Specification – 01_VerificationProcedures&Scripts</i>		

Table 3-1. EVS 6.0.3.0 TDP Documents (continued)

Document ID	Description	Revision
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
ESSSYS_6'0'3'0_D_VerProc_EVOTEXL_1'0'1'0	Verification Procedure: ExpressVote XL from EVS 6.0.2.1	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
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	1.1
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	1.1
EVOTE_1'5_L_ValFileList_Previewer	Validation File List: ExpressVote HW1.0 Previewer	1.0
EVOTE_2'4_L_ValFileList_Previewer	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

Table 3-1. EVS 6.0.3.0 TDP Documents (continued)

Document ID	Description	Revision
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
EWARE_5'0'1'1_SOP_06Appendices	Electionware Vol. VI: Appendices, Software Version 5.0.1.1	1.0
<i>08_System Maintenance Manuals</i>		
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

Table 3-1. EVS 6.0.3.0 TDP Documents (continued)

Document ID	Description	Revision
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
<i>09 Personnel Deployment and Training</i>		
ESSSYS_1'0_P_TrainingProgram	Personnel Deployment and Training Program	1.1
<i>10 Configuration Management Plan</i>		
ESSSYS_1'0_P_CMProgram	Configuration Management Program	1.4
ESSSYS_1'0_P_TDProgram	Technical Documentation Program	1.3
<i>11 QA Program</i>		
ESSSYS_1'0_P_MNFQAProgram	Manufacturing Quality Assurance Program	1.7
ESSSYS_1'0_P_SWQAProgram	Software Quality Assurance Program	1.3
<i>12 System Change Notes</i>		
ESSSYS_6'0'3'0_D_ChangeNotes	ES&S Voting System 6.0.3.0 System Change Notes	1.1
<i>13 Attachments</i>		
BPG_1'0_SOP	Ballot Production Guide for EVS	3.0

3.1.1 Source Code Review

Pro V&V reviewed 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 verified that the submitted documentation was sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

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

Summary Findings

- Automated Source Code Review: The Automated Source Code Review was performed during the EVS 6.0.3.0 Trusted Builds. No source code issues were found during the Automated Source Code review.
- Manual Source Code Review: The Manual Source Code review was performed on 10% of the comments for compliance to VVSG Volume Section 5.2.7. No source code issues were found during the Manual Source Code review.
- Trusted Build: The trusted build consisted of inspecting customer submitted source code, COTS, and third-party software products and combining them to create the executable code. This inspection followed the documented process from the “United States Election Assistance Commission Voting System Test Laboratory Program Manual” Section 5.5 – 5.7. Performance of the trusted build includes the build documentation review. The Trusted Build was performed following the completion of the Functional Configuration Audit.

3.1.2 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

Summary Findings

During execution of the test procedure, the components of the EVS 6.0.3.0 system were documented by component name, model, serial number, major component, and any other relevant

information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release. At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented.

3.1.3 System Level Testing

System Level Testing was implemented to evaluate the complete system. System Level Testing for this campaign included the evaluations of the following test areas: FCA, Accuracy Testing, and System Integration Testing. This testing included 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 were designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases were prepared independently to assess the response of the hardware and software to a range of conditions. Pro V&V reviewed 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 included 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 performed as expected, the results were accepted. If the system did not perform as expected, an analysis was performed to determine the cause. If needed, the test was repeated in an attempt to reproduce the results. If the failure could not be reproduced and the expected results were not met, the system was determined to have failed the test. If the results could not be reproduced, the test continued. All errors encountered were documented and tracked through resolution

3.1.3.1 Functional Configuration Audit (FCA)

The Functional Configuration Audit (FCA) encompassed 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 were conducted to ensure all applicable EAC VVSG 1.0 requirements were met. Regression testing was also conducted on the EVS 6.0.3.0 to establish assurance that the modifications had no adverse impact on the compliance, integrity, or performance of the system.

Summary Findings

All functional tests were successfully executed. During execution of the test procedures, it was verified that the EVS 6.0.3.0 system successfully completed the FCA by functioning according to

the manufacturer's documentation, with all actual results obtained during test execution matching the expected results.

3.1.3.2 Accuracy

The Accuracy Test ensured that the voting system could 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.

The accuracy requirements for the EVS 6.0.3.0 were accomplished by the execution of an accuracy test utilizing hand marked 14” ballots and pre-marked 14” vote summary cards. All of the voting equipment was utilized during this test and the totals were consolidated into the EMS.

Summary Findings

EVS 6.0.3.0 successfully passed the Accuracy Test without issue. During test performance, all actual results obtained during test execution matched the expected results.

3.1.3.3 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.

Summary Findings

During test performance, the system was configured as it would for normal field use. This included 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 properly configured the system by following the procedures detailed in the EVS 6.0.3.0 technical documentation. During System Integration testing, two General Elections and two Primary Elections were successfully exercised on the voting system, as described below:

Two general elections with the following breakdowns:

- General Election GEN-01: A General Election with Straight Party held in three precincts, one of which is a split precinct. This election contains 19 contests compiled into four ballot styles. Five of the contests are in all four ballot styles. The other 15 contests are split between at least two of the precincts with a maximum of four different contest spread across the three precincts.
- General Election GEN-03: A General Election held in two precincts. This election contains eight contests and compiled into two ballot styles. Four of the contests are in both ballot

styles. The other four contests are split between the two precincts. This election is designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

Two primary elections with the following breakdowns:

- Primary Election PRIM-02: Open Primary Election held in two precincts. This election contained thirteen contests compiled into three ballot styles. One contest is in all three ballot styles; all other contests are independent.
- Primary Election PRIM-03: A Closed Primary Election held in two precincts. This election contains 10 contests and is compiled into two ballot styles. Two of the contests are in both ballot styles. The other eight contests are split between the two parties' ballots. This election is designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

The EVS 6.0.3.0 system successfully passed the System Integration Test. During execution of the test procedure, it was verified that the EVS 6.0.3.0 system successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

3.2 Anomalies and Resolutions

When a result is encountered during test performance that deviates from what is standard or expected, a root cause analysis is performed. Pro V&V considers it an anomaly if no root cause can be determined. In instances in which a root cause is established, the results are then considered deficiencies. No anomalies occurred during the testing of the EVS 6.0.3.0.

3.3 Deficiencies and Resolutions

Any violation of the specified requirement or a result is encountered during testing that deviates from what is standard or expected in which a root cause is established is considered a deficiency. Upon occurrence, deficiencies are logged throughout the test campaign for disposition and resolution. No deficiencies were encountered during testing of the EVS 6.0.3.0.

4.0 RECOMMENDATION FOR CERTIFICATION

EVS 6.0.3.0, as presented for testing, successfully met the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. During System Integration testing, Pro V&V, Inc. determined the EVS 6.0.3.0 functioned as a complete system. Additionally, Pro V&V determined that the submitted modifications were minor in nature based on the scope of testing required to verify successful implementation. As a result of the test findings, Pro V&V recommends the EAC grant EVS 6.0.3.0, identified in Section 2.2.2 of this report, certification to the EAC VVSG 1.0.

APPENDIX A

ANCILLARY SYSTEMS

Ancillary systems represent products and utilities that are not part of the EAC certified configuration, however, they may be used to facilitate testing.

Ancillary systems include:

- Ballot Production - Balotar

Balotar is an ancillary secure printing product which receives artworks PDFs and BOF files from Electionware Capture. Balotar is specifically designed to automatically generate and print ad hoc ballots.

- Electronic Pollbook

The ExpressPoll electronic pollbook system gives poll workers a simple-to-operate device for voter check-in and verification. ExpressPoll stores registered voter information for precincts, districts, or entire jurisdictions. Poll workers enter an identifying piece of information onto the large touch screen to verify that a voter is registered. The voter registration data can be shared with the ExpressLink application.

- ExpressLink System

ExpressLink System is an ancillary system comprised of three components: the ExpressLink application loaded on a workstation, the ExpressVote Activation Card Printer and the ExpressTouch smart card writer.

- 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. The ExpressLink application receives Ballot on Demand data bundle files from Electionware Package and electronic Pollbook systems. ExpressLink uses this information to format the ballot style code for an ExpressVote activation card. The ExpressLink application communicates with the ExpressVote activation card printer to print the ballot style code on the activation card. This ballot style code activates the voter's authorized ballot when the activation card is inserted into the ExpressVote. This process also applies to the activation cards used in the ExpressVote XL. The ExpressLink application receives smart card credential data bundle files from Electionware Package. ExpressLink uses this information to program the ballot style code on a vote session activator card using the smart card writer. This ballot style code activates the voter's authorized ballot when the vote session activator card is inserted into the ExpressTouch.
- ExpressVote Activation Card Printer is a small, thermal, on demand printer used to print the ballot activation code on the ExpressVote activation card. This printer connects to the ExpressLink laptop via USB connection.
- ExpressTouch Smart Card Writer is a small device used to program the ballot activation code on the ExpressTouch vote session activator card. This device connects to the ExpressLink laptop via USB connection.

- Electionware Toolbox

Electionware Toolbox is a set of utilities that can be integrated into the Electionware EMS to enhance the software usability experience and streamline various processes. These add-on utilities include Test Deck, Text to Speech and Media Restore

- Test Deck module provides a means for the election official to test the election on each machine that will be used for voting. Vote patterns can be created with automatic ballot marking, and then the ballots can be printed and scanned through the ES&S ballot tabulators to test logic and accuracy of the counting. Additionally, a test pattern file can be created for the ExpressTouch, ExpressVote or ExpressVote XL that allows automated logic and accuracy testing on the universal voting machine. Test Deck significantly reduces the time, effort, and cost associated with accurate testing and verification of voting and tabulation on the machines used within a jurisdiction.
- The Text to Speech module provides a simplified method for creating the audio wave files that make up the audible ballot. These audio wave files may be used with ES&S hardware that is ADA compatible, such as the ExpressVote. This utility makes the conversion process less time consuming than utilizing the traditional microphone and scripting method.
- The Media Restore module is used to prepare ES&S-certified USB media flash drives for use with Electionware by securely clearing all data and then restoring to the FAT32 format.

**Table A-1
Ancillary Systems**

System Component	Software or Firmware Version	Hardware Version(s)
Ballot Production Software (Balotar)	1.0	---
Balotar Compact	---	OKI C712
ExpressRunoff	1.0.2.0	---
ExpressPoll	7.0.1.0 (or greater)	Microsoft Surface Go
ExpressLink	1.5.0.0	---
ExpressVote Activation Card Printer	---	1.0
ExpressTouch Smart Card Writer	---	ST-U100C
Electionware Toolbox – Test Deck	3.6.0.0	---
Electionware Toolbox – Text to Speech	3.6.0.0	---
Electionware Toolbox – Media Restore	3.6.0.0	---