Test Report for EAC 2005 VVSG Certification Testing
Unisyn Voting Solutions OpenElect 2.1 Voting System

EAC Project Number: UNS10121966-2.1

Version: 02

Date: 10/17/2019

U.S. Election Assistance Commission

VSTL

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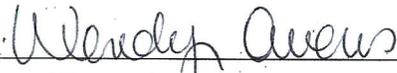
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SIGNATURES

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REVISIONS

Revision	Description	Date
00	Initial Release	10/01/2019
01	Update version number in Table 3-1	10/08/2019
02	Added model numbers to Table 4-4	10/17/2019

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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 Unisyn Voting Solutions OpenElect Voting System (OVS) Version 2.1 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 the OVS Version 2.1 Voting System submitted for evaluation was performed to ensure the applicable requirements of the EAC 2005 VVSG 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, Unisyn submitted an application package to the EAC for certification of the OpenElect 2.1 Voting System. The application was accepted by the EAC and the project was assigned the unique Project Number of UNS10121966-2.1.

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 OVS 2.0.A is a paper ballot voting system using touch screen and scan technology to scan and validate ballots, provide voter assisted ballots to accommodate voters with special needs, and tabulate results. The OCS, FVT, OVO, OVI-VC, and OVCS components of the OVS 2.0.A have previously been tested as part of the OVS 2.0 test campaign. The OVS 2.0.A consists of the following major components:

- **OpenElect Central Suite (OCS)**

- **OpenElect Voting Optical (OVO)**

- **OpenElect Voting Interface – Vote Center (OVI-VC)**

- **FreedomVote Tablet (FVT)**

- **OpenElect Voting Central Scan (OVCS)**

The OVO, FVT, and OVI-VC are the OVS components designed to accept voter input. The FVT and OVI-VC are the OVS ballot marking devices (BMDs). The OVO can collect and tally precinct votes, generate reports, and store election data internally. The OVCS is the bulk scanner used for mail-in ballots, provisional ballots, and recounts.

Open Elect Central Suite (OCS)

The OCS System supports elections on the OVO, OVI-VC, FVT, and OVCS systems. The Election Management System (EMS) consists of the following components running as either a front-end/client application or as a back-end/server application:

Ballot Layout Manager (BLM) – uses a database to create and store precinct and district information and an interface to create, check, translate, and produce the ballot styles needed by a jurisdiction for an election. The BLM output is printer ready artwork of all ballots in all languages and the Unisyn election definition file.

Election Manager (EM) – converts the Unisyn election definition file to a Unisyn-specific XML format and prepares compressed, encrypted election files for output to CD or USB. The EM allows the jurisdiction to add voting device specific options for elections, i.e. whether to check the contests for undervotes, and whether to allow or disallow certain features such as sounds, party icons, reports, etc. The EM also creates and manages Supervisor and Maintenance technician logins and passwords.

Tabulator Client (TC) – retrieves vote files and ballot images from a Transport Media (TM) device (USB), stores them on its disk, and transfers the files to the Tabulator and notifies the Tabulator that a new file is present.

Tabulator (Tab) – receives and validates uploaded voting data and provides a status of uploaded files as well as handling Rank Choice Voting (RCV) functionality. It also updates the database with adjudicated ballots from the Auditor application. The Tabulator maintains the Tabulator database, which stores the results from all precincts.

Auditor – accesses ballot images and data from the OVCS and TC PCs to allow jurisdiction personnel to evaluate ballots with questionable or erroneous marks and change votes in accordance to the voter's perceived intent. The Auditor can also be used to process write-in votes. All changes are uploaded to the Tabulator database and actions are password controlled.

Tabulator Reports (TR) – accesses data from the Tabulator database to generate the necessary reports.

OpenElect Voting Optical (OVO)

The OVO is a full-page dual-sided optical scan precinct scanner that scans and validates voter ballot pages and provides a summary of all ballot pages cast. The election is loaded from an Election TM. On Election Day, an OVO at each poll location scans and validates voters' ballots, and provides precinct tabulation and reporting. The OVO runs Logic Tests and Training Elections in addition to General and Primary Elections. The OVO unit can also paired with OVI-VC and FVT units for early voting to scan and tabulate early voting ballots and election support at voting centers.

OVO units can be used at election headquarters to read absentee, provisional or recount ballots in smaller jurisdictions.

The OVO consists of the following components:

- **Personal Computer (PC) -** Computer component (with a touch panel display) has the OVO application installed that manages data and provides a user interface for voting and maintenance.

A new election loaded via a Transport Media (TM) sets passwords, parameters, and ballot styles for that election. (Valid ballots for a poll location are reinitialized or set on Election Day startup by scanning a ballot header card).

- **Transport Media (TM)** – 1 GB or larger USB thumb drive that provides the means of transporting audit, optional ballot page images and results files from the precinct on Election Night to Election Headquarters where the central count system resides.

- **Ballot Reader -** Dual-sided scanner connected to the PC to scan data from marked ballot pages. The Ballot Reader ejects accepted ballot pages into an attached ballot box or rejects unaccepted ballot pages back out to the voter.

- **Printer -** 58 mm thermal receipt printer connected to the PC to print voter receipts and reports at the OVO.

- **UPS** - Uninterruptible power supply is provided as part of the system.
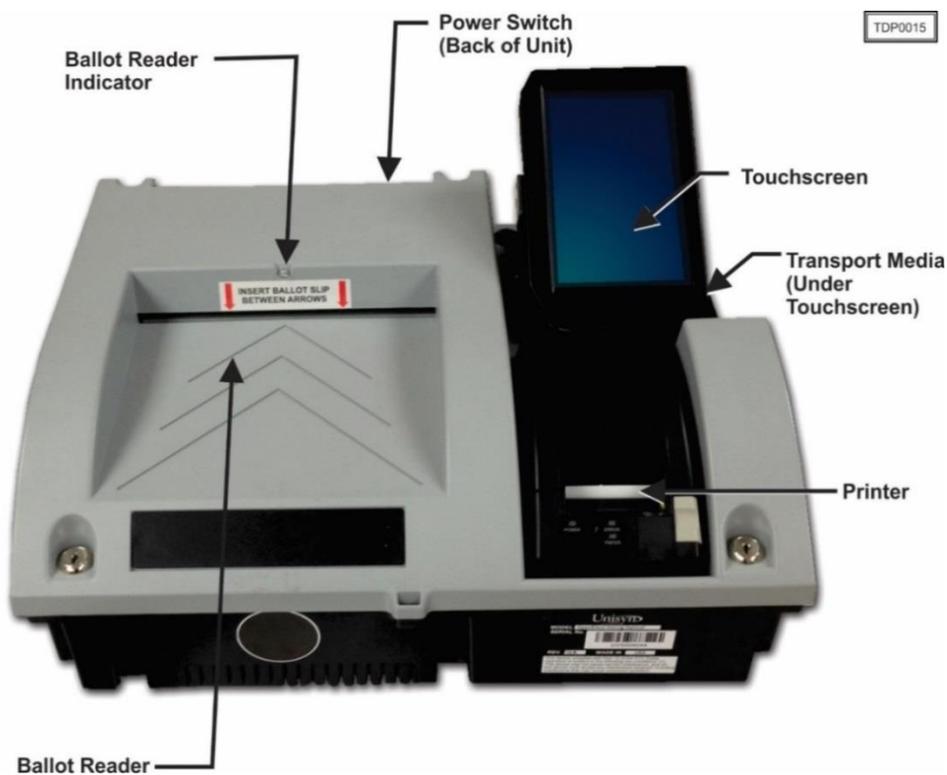
Figure 1-1. OVO

OpenElect Voting Interface – Vote Center (OVI-VC)

The OVI-VC is a ballot marking device (BMD) that supports both ADA and Regional Early Voting requirements. The OVI-VC has a 15-inch display and is equipped to assist voters, with varying abilities, to prepare their ballots independently and privately. It presents each contest on the correct ballot to the voter in visual and, if needed, audio formats. The OVI-VC gives voters the option to use an audio ballot, ADA keypad, sip and puff binary device, and touchscreen with varying font sizes to make their selections.

Once the voter has made their selections, they are prompted to review their ballot selections. After the validation process is complete, the OVI-VC then prints the ballot and the voter inserts it into the OVO to cast their vote. When authorized, the OVI-VC provides for write-in candidates.

Each OVI-VC can support multiple languages for both visual and audio ballots, allowing the voter to choose their preferred language.

The OVI-VC consists of the following components:

- **Personal Computer (PC)** - Computer component (with a touch panel display) has the OVO application installed that manages data and provides user interfaces for voting and maintenance. A new election loaded via a Transport Media (TM) sets passwords, parameters, audio, and ballot styles for that election.

- **Transport Media (TM)** - USB device with 1 GB or larger storage provides the means of transporting audit files to the OCS system.

- **Printer –** 82.5 mm thermal receipt printer is connected to the PC to print BMD Ballots and reports at the OVI-VC.

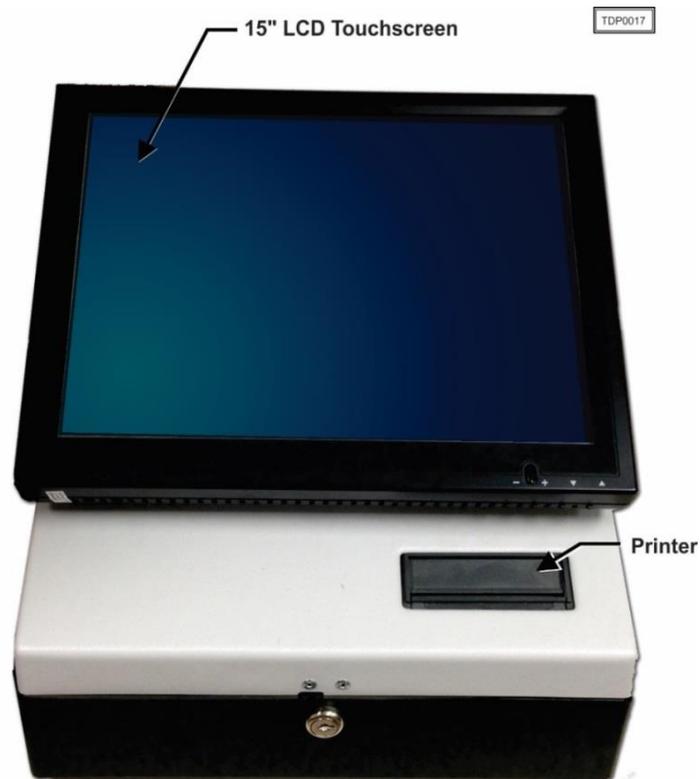- **UPS** - Uninterruptible power supply is provided as part of the system.

Figure 1-2. OVI-VC

Freedom-Vote Tablet (FVT)

The FVT is a tablet ballot marking device that enables voters make their vote selections and to print their voted ballot. It can be used on Election Day or during an early voting period. Like the OVI-VC, the FVT is ADA compliant. It assists voters, with varying levels of ability, through the voting process, ballot review, and printing functions. The FVT presents each contest on the ballot style to the voter in visual and/or audio formats. It facilitates special needs voters through a variety of methods including wheelchair access, sip and puff, zoom-in ballot function and audio assistance for the visually impaired. The voter with limited vision can navigate through the ballot using an audio ballot and the ADA keypad or touchscreen to input their selections. Once the ballot is printed, it is taken to the OVO to be cast. Each FVT can support multiple languages for both visual and audio ballots, allowing the voter to choose their preferred language.

The FVT consists of the following components:

- **Tablet** – The Android tablet has a 13.3 in. touchscreen and comes with pre-installed software that provides user interfaces for voting and maintenance. Election files generated by the EM are loaded manually via a USB. The election files will allow the jurisdiction to determine the FVT's mode such as early voting or training, sets passwords, parameters, audio, and ballot styles for that election.

- **Barcode Reader -** 2D USB Barcode reader will read the 2D barcodes produced by the EM such as the initialize barcode and administrative/maintenance barcodes. It will also read the 'populate' barcode produced by other qualified systems.

- **USB Hub** – A four port USB hub is installed in the FVT case to connect the printer, barcode scanner, and keypad to the tablet.

- **Printer** – 82.5 mm thermal receipt printer is connected to the Tablet to print BMD ballots and reports.

- **Optional ADA Devices** – 10-key keypad with Sip and Puff Interface, Headphones, Sip and Puff Device.
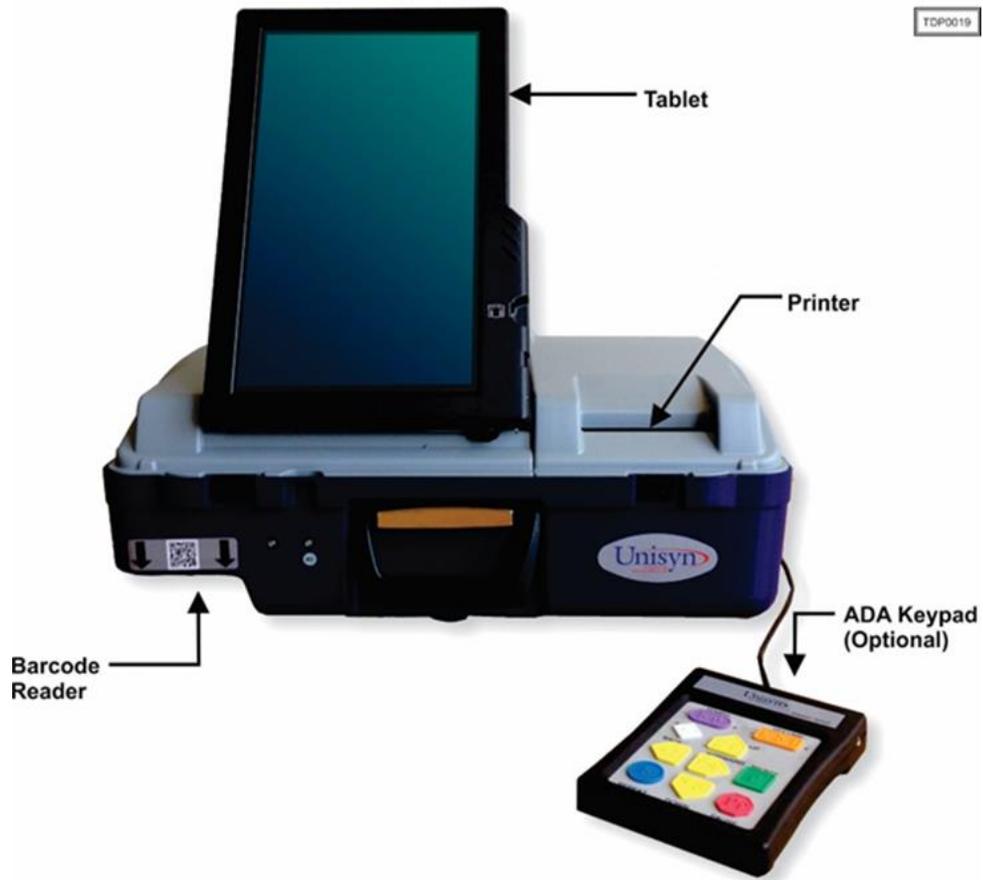
Figure 1-3. FVT

OpenElect Voting Central Scan (OVCS)

The OVCS units reside at election headquarters designated to read absentee, provisional or recount ballots in large jurisdictions or read the entire election's ballots at a central count location in smaller jurisdictions. The OVCS also captures Write-in data images and produces a Write-in image report for manual processing upon request. The OVCS system consists of the following components:

- **PC Desktop** – A desktop PC configuration with the following minimum characteristics:

    - PC: 1.8 GHz Processor, 2 GB RAM, 250GB (or larger) Hard Drive, USB Ports, Network Interface Port (Ethernet), CDRW/DVD, Video Port

    - 16:9 LCD

    - Keyboard and Mouse

- **Bulk Scanner** – A dual-sided scanner (either Canon model DR-M160II or model DR-X10C) that is connected to the PC to scan data from marked ballots.
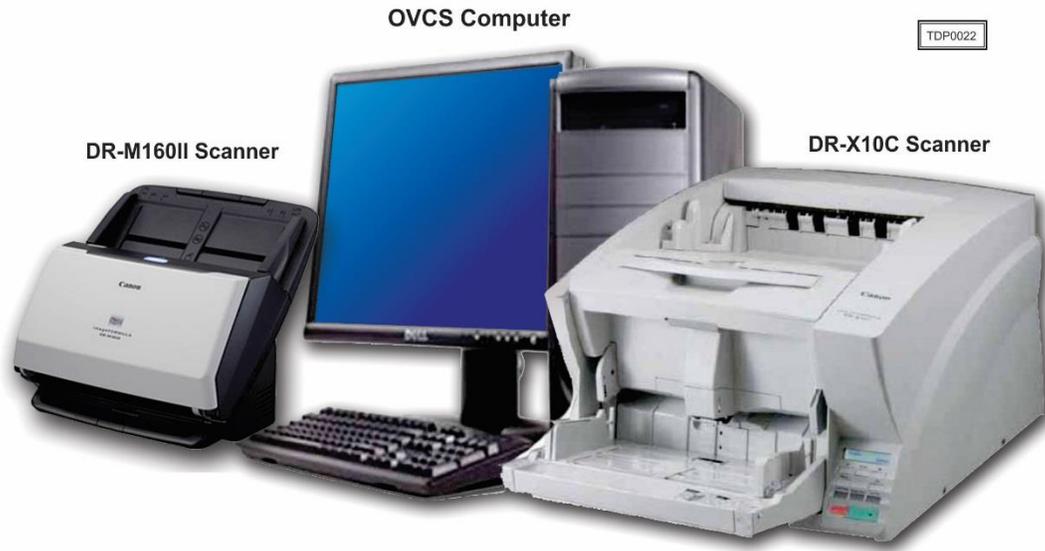
Figure 1-4. OVCS

1.1.1 Baseline Certified System

The baseline system for this modification is the OVS 2.0.A Voting System. The tables below describe the certified equipment and firmware versions. Detailed descriptions of the OVS 2.0.A test campaign are contained in Pro V&V Report No.TR-01-01-UNI-003-01.01 Rev. A, which is available for viewing on the EAC's website at www.eac.gov.

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

Table 1-1. OVS 2.0.A COTS Software Components

FVT, OVO and OVI-VC Device Software	Version
CentOS Linux (OVO and OVI-VC)	6.3
Java JRE + Unlimited Cryptographic Extension	1.6.0_02
Android OS (FVT)	4.4.4

Table 1-2. OCS and OVCS COTS Software Components

OCS and OVCS Device Software	Version
CentOS Linux	6.5 and 6.8
Java JRE + Unlimited Cryptographic Extension	1.6.0_02
Apache-Tomcat Application Server	6.0.13
MySQL Database (BLM, EM, A, and Tab only)	5.0.45-7

Table 1-2. OCS and OVCS COTS Software Components *(continued)*

OCS and OVCS Device Software	Version
JasperReports	2.0.5
OpenVPN	2.4.4
OpenSSL	1.0.1f
OpenSSL FIPS Object Module	2.0.10 (cert #1747)

Table 1-3. Voting System COTS Hardware

Hardware	Make	Model
OVO		
Duplex Ballot Scanner		
Duplex Ballot Scanner	PDI Scan	Pagescan III
Scanner Power Adapter	eUrasia Power	uA36-1024
58 mm Thermal Printer		
58 mm Thermal Printer	Citizen Printer	CT-5281
Printer Power Adapter	Citizen Printer	28AD4
Computer		
Chassis	Morex	Morex 2699
DC/DC converter	Morex	MX-0608F
Chassis Fans	Young Lin Tech	DFB404012M
Motherboard	Jetway	JNF9D-2550
Memory	SuperTalent - Onboard RAM	W1333SA2GV
Hard Drive	Western Digital	WD5000AZLX
AC Adapter	EDAC	EA 10951c-120
1 Gb USB TM		
Innodisk	1 Gb USB	DEUA1-01G172AC1SB-B088
Delkin	1 Gb USB	UY0GTFLSY-XN000-D
7" LCD Touchscreen Display		
7" LCD Touchscreen Display	Xenarc Technologies	700TSV
AC Power In Module		
AC Power In Module	Delta	Emi 10BEEG3G
OVI-VC		
Sip and Puff (Optional)		
Sip and Puff (Optional)	Origin Instruments	AirVoter
Headphone (Optional)		
Headphone (Optional)	Koss On-Ear Headphones	KPH5
15 in LCD Touchscreen Display		
15 in LCD Touchscreen Display	GVision	P15BX-OB-4690
82.5 mm Thermal Printer		
82.5 mm Thermal Printer	Star	TSP743IID-24, serial interface
Printer Adapter	Star	PS60A-24B 1
Computer		
Power Adapter Kit	DC-DC Converter	MX-0608F

Table 1-3. Voting System COTS Hardware *(continued)*

Hardware	Make	Model
Motherboard	Jetway	JNF9D-2550
Hard Drive	Western Digital	WD5000AZLX
Adapter	EDAC	EA 10951c-120
1 Gb USB TM		
Innodisk	1 Gb USB	DEUA1-01G172AC1SB-B088
Delkin	1 Gb USB	UY0GTFLSY-XN000-D
AC Power In Module		
AC Power In Module	Delta	Emi 10BEEG3G
OVCS		
Large Volume Scanner		
Large Volume Scanner	Canon	DR-X10C
Desktop Scanner		
Desktop Scanner	Canon	DR-M160II
FVT		
13.3 in Touchscreen Tablet		
13.3 in Touchscreen Tablet	Android Tablet	GVision - T13
Tablets Battery Charger	Sager Power System	GC30B-4P1J
82.5 mm Thermal Printer		
82.5 mm Thermal Printer	Star	TSP743IIU-24
Printer Adapter	Star	PS60A-24B 1
Barcode Reader 1D,2D series		
Barcode Reader 1D,2D series	Newland	FM420
USB Hub		
USB Hub	D-Link	DUB-H4
Hub Adapter	Meanwell	PSD-15A-05
1 Gb USB TM		
Innodisk	1 Gb USB	DEUA1-01G172AC1SB-B088
Delkin	1 Gb USB	UY0GTFLSY-XN000-D
Micro SD		
Micro SD	San Disk	4 GB Edge
Battery		
Battery Pack 12 V 6.0 AH	Powers Sonic	PSH-1255-FR
Adapter	Mean Well	GC30B-4PIL
AC Power In Module		
AC Power In Module	Delta	Emi 10BEEG3G
Sip and Puff (Optional)		
Sip and Puff	Origin Instruments	AirVoter
Headphone (Optional)		
Headphone	Koss On-Ear Headphones	KPH5
Headphone	Sony	MDR-210LP
USB to Ethernet RJ45 Adapter (Optional)		
USB to Ethernet RJ45 Adapter	D-Link	DUB-E100

Table 1-3. Voting System COTS Hardware *(continued)*

Hardware	Make	Model
UPS		
Minuteman Power Technologies	Para Systems, Inc.	Entrepid Series

Table 1-4. OVCS System COTS Software Components

OVS Hardware	Version
Desktop for non-redundant solutions	Dell OptiPlex
Desktop for redundant solutions	Dell Precision
Canon Scanner (OVCS)	Canon DR-X10C or DR-M160II
Laptop	Dell Latitude

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 7.0

- Election Assistance Commission "Approval of Voting System Testing Application Package" letter dated May 15, 2019

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

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

- Pro V&V Test Report No. TR-01-01-UNI-003-01.01 Final, "Test Report for EAC 2005 VVSG Certification Testing Unisyn Voting Solutions OpenElect 2.0.A Voting System"

- OpenElect Voting System Release Notes, System 2.0.A to 2.1, Version 1.2

- Unisyn Voting Solutions Technical Data Package *(A listing of the OpenElect 2.1 documents submitted for this test campaign is listed in Section 4.6 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

"BLM" – Ballot Layout Manager

"BMD" – Ballot Marking Device

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"DRE" – Direct Record Electronic

"EAC" – United States Election Assistance Commission

"EM" – Election Manager

"EMS" – Election Management System

"EOS" - Election Operating System

"ES" – Election Server

"FCA" – Functional Configuration Audit

"FVT" – FreedomVote Tablet

"LAT" – Logic and Accuracy Test

"NOC" – Notice of Clarification

"OCS" – OpenElect Central Suite

"OVCS" – OpenElect Voting Central Scan

"OVI-VC" – OpenElect Voting Interface – Vote Center

"OVO" – OpenElect Voting Optical

"OVS" – OpenElect Voting System

"PC" – Personal Computer

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RFI" – Request for Interpretation

"RCV" – Rank Choice Voting

"SS" – Software Server

"TC" – Tabulator Client

"TDP" – Technical Data Package

"TM" – Transport Media (USB Thumb Drive)

"TR" – Tabulator Reports

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

2.0 CERTIFICATION TEST BACKGROUND

OVS 2.1 is a modification of a previously certified system (OVS 2.0.A). Pro V&V performed an evaluation of results from the previous test campaign to determine the scope of testing required for certification of the OVS 2.1. 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.

2.1 Revision History

The table below details the version history of the OVS 2.1 System:

Table 2-1. OVS 2.1 System Revision History

System Version	Certification Type	Baseline System	Certification Number
OVS 2.0	New System	--- (Original System)---	UNS10121966-2.0
OVS 2.0.A	Modification	OVS 2.0	UNS10121966-2.0.A
OVS 2.1	Modification	OVS 2.0.A	* UNS10121966-2.1

*Upon grant of certification by the EAC

2.2 Scope of Testing

Testing from the previous test campaign was used to establish the baseline. The focus of this test campaign is on the introduction of end user enhancements and enhancements implemented based on the results of Vulnerability and Penetration testing conducted by DHS.

Based on the submitted modifications, 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 (Functional Configuration Audit (FCA), Regression Testing, System Integration, Security, and Accuracy)

- Technical Documentation Package (TDP) Review

- Physical Configuration Audit, including System Loads and Hardening

- Usability Testing

- Security Testing

2.2.1 Modification Overview

The OVS 2.1 Voting System is a modified voting system configuration that contains updates to various components of the OpenElect Voting System. This release incorporates specific enhancement requests primarily centered on improving the end user experience. It also includes enhancements based on results of Vulnerability and Penetration testing conducted by DHS. Additionally, two laptop models were added for hosting the EMS applications, resulting in the addition of EOS 4.0.03.

2.2.1.1 Detailed List of Changes

The list below includes the submitted software changes between the OVS 2.1 system and the baseline of the OVS 2.0.A Voting System as derived from the *OpenElect Voting System Release Notes, System 2.0.A to 2.1, Version 1.2*:

Auditor (A)

- Add ability for end user to write-in candidate's name in the Auditor application

Ballot Layout Manager (BLM)

- Allow color for the non-partisan party to be changed

- Added support for a superuser user to load a new registration key at any time

- Implemented rotation based on voter registration data, generate a precinct/contest report for all elections, regardless of rotation

- Implemented Decline to State (DTS) function to allow non-partisan voters to selection from a list of DTS parties

- Update ballot design to follow the EAC best practices

- Move sound scripts to BLM

- Increase button text character limits for the OVO and FVT in order to accommodate translated text

- Translate all voter facing messages for the FVT

- Add the target color, Red or Black, to the Ballot's PDF name

- Change target color in drop down from 'Grey' to 'Black'

- Target example in Header Graphics made to match new ballot design

- Increase accuracy of text measurement when comparing against allocated space on ballot for Measure and Instruction Block text

- Change Election Proof Report to correctly represent full page width instruction blocks and measures

- On the Translation tab, create separate translations for the OVO and FVT for the final voting screen

- Update Screen Reader introduction hint text to correctly describe method to show and hide the screen in Screen Reader mode

- Option to combined PDF of all printable ballots

- Ballot Text supports inline size tags for varied font sizes

- Allow dynamic flow across columns for measure text

- Add the ability to have a variable data field in the header that describes the ballot, for example General Election Ballot or Measures Only Ballot

- Adding option for split merging, to allow for splits to merge to highest split instead of automatically to parent

- Merge Duplicate Splits offers two ways to roll-up splits by duplicate ballot style in the build process

- Enable OVO checking of one-time use barcodes

- Allow Contest Headers to use up to 1000 characters and support all inline style tags

- Add additional translations for OVO screens such as Ballot Page Not Cast or Ballot Jam

- In the BLM Translation table added the ability to create a blank field or to add the text "No Translation"

Election Manager (EM)

- Add readme file to election export to allow identification of election without having to decrypt files

- Add an option to the Election Manager's Common Options screen to print the candidate with the most votes in a contest in bold on the OVO and OVCS tally report

- Increment the EM portion of the election parameter version number when EM party icon is changed

- Move sound script management interface to the BLM to avoid moving between two applications to correct/test sound files

- Include ballot style listed on QR barcode when election is exported by ballot style

- Adjust election version number when machines list in election are changed to allow better detection

- Allow user to select font size layout for the text on the Precinct Barcode Report

- Enable sound script editing

- Enable Audio Script report button regardless of "Require Sound Files" option

- Allow custom image on Thank You screen

- Implement new TM USB handling with secure delete of files and signed unisyn_tm.vol file and clear previous error messages.

- Create election_info.txt file to contain election settings for reference without decryption

- Remove ambiguous letters and numbers, such as I and O, from auto-generated passwords (however, the Election Password entered by a user is not required to follow this rule)

- Remove 'Enter Alert Report Header Title' from OVO options screen, this text can be customized in the BLM Translations screen

FreedomVote Tablet (FVT)

- Handle formatting tags in the Instruction blocks

- Add the ability to perform a diagnostic test on the Text-to-Speech function

- Add system application API to allow the date and time to be changed from within the FVT application

- Add Election Type, Straight Ticket type, Retraction ID (if Set), Stub ID (if Set), and Android Build Number to the Machine Info Report

- Allow Custom image on Thank You screen

- Added support of the use of Mixed case (first letter capitalized, rest lower case) in accordance with best practices.

- Change Write-in entry screen's BACK button action to a cancel function

- Decline to State (DTS) functionality

- Skip invalid machine key files during setup

- Translate All Voter Facing Messages

- Update FVT Star printer driver

- Update "Machine Type" from BMT to FVT on Machine Info screen

- Update sound play handling to be more extensible (if a secondary language sound file does not exist it will default to the English sound file)

- Change 'Done' and 'Print' buttons on the screen to green color

- Remove picture of phone with barcode on Main and Start screens

- In Diagnostics Auto Test, when Cancel button pressed, show a confirmation message (yes/no) to exit

- Update the keypad layout to swap the right arrow and the Enter keys

- Display Android build version on the Machine Info Screen and Machine Info Report

- Add FVT application validation/verification handling

- Adjust color contrast on FVT as suggested by accessibility group

- On the FVT ballot screen the Done and Print buttons are not available until the voter is required to use them

- Added process to delete the previous election in the event that the FVT was stored with an election still loaded and the password has been misplaced

- Fixed defect where Header border not drawing correctly in screen group

- Improve spacing on Initialization barcode ticket and add formatting options that have been set

- Use PNG images for buttons on the bottom of the voting screen

- Change alert indicator color for undervotes and no selection on summary screen from RED to YELLOW

- FVT locks out all desktop access. The only user with access is a Supervisor who has access to the special file in place on a Unisyn provided TM, in addition to requiring password

- Update FVT to enable system power off feature

- Machine keystore password should be updated on install to be devices specific

- Update TM file cleaning process to a secure delete

- Text associated with BLANK candidate entry is displaying twice with Formatted Description only layout

- Remove ability to change Machine Name on setup screen

- Ballot Text needs to support inline size tags for varied sizes in a single block

- Allow Provisional Ballots to be printed on the FVT

- Enable OVO checking of one-time use barcodes for better security

- Allow the 'Done' button text on the FVT final voting screen to be changed in the BLM Translations, for example the text could be 'Review'

- Headers are increased (reference BLM)

- Redesigned the layout of the Settings screen to improve its usability (the more often used font size options were moved to the top of the screen)

OpenElect Voting Interface (OVI-VC)

- Implement 'Decline to State' function - allow Non-partisan voter to select from valid list of DTS parties

- Sound played after the ballot is printed is in the language selected

- Handle formatting tags in Instruction Blocks

- Allow translation for Multiple Screen Header Text, such as Ballot Title, Summary Title, and Instruction Title

OpenElect Voting Central Scan (OVCS)

- Add ability to enter custom names for OVCS sessions

- Allow export of OVCS session data to a TM for upload with the TC

- Adjust the definition of a mark and implement changes to support

- Add option to print in bold the candidate with the most votes in a contest on the tally report

- Process two column ballots with and without RCV with separate definition to improve performance

- Rotate the BMD full ballot image display in the write-in report to make it more readable

- Update TM file cleaning process to a secure delete

- Will recognize FVT Provisional ballots as provisional "P" ballots and not as BMD "D" ballots and handle accordingly

- Upload button is disabled after sorting any column in descending order in session list

OpenElect Voting Optical Scan (OVO)

- Add option to print in bold the candidate with the most votes in a contest on the tally report

- Create report which shows precinct count totals while the voting session is open

- Adjust the definition of a mark and implement changes to support

- Upgraded the OVO Printer Drivers to fix the "Printer is not connected" message after the printer paper has been changed

- Improved file cleaning process for TMs to ensure that all files are securely deleted

- Will recognize FVT Provisional ballots as provisional "P" ballots and not as BMD "D" ballots and handle accordingly

- Will recognize the FVT's Ballot Verification Number (BVN) in the second barcode on an FVT ballot to prevent ballots from being cast a second time

Tabulator

- Implement Single Transferable Vote handling

- Allow automatic blanking of "0" in Voter Registration field

- Add "Elimination Only" option for RCV multiple seats method

- Append number of votes required to win (vote threshold) value to end of contest title in RCV tally report

- Add clarity to how RCV results are calculated for the exhausted ballots

- When "Multiple Deletions" is selected for tie breaking, if multiple deletion during tally process leads to continuing candidates less than seat number, automatically switch to manual elimination (eliminate one at a time)

- Voter Registration totals entered by party

- Voter Registration Totals Entered by Parent or Child

- Increase maximum Manual Entry from 5,000 to 10,000

Tabulator Reports (TR)

- Add option to print in bold the candidate with the most votes in a contest on the tally report

- Ensure that long contest titles are displayed on report

- Handle Voter registration totals entered by party

- When saving a report, the selected file format's extension (PDF or HTML) is automatically added to the end of the file name

Tabulator Client

- Handle OVCS session data to be uploaded from TM

- Improved file cleaning process for TMs to ensure that all files are securely deleted

All OCS Applications

- Change 'X' icon on dialog box to perform Cancel function instead of 'OK' function

- Handle formatting tags in the Instruction blocks

- Update Window Favicon to display the correct application logo instead of the default Java logo

- Display more specific error message when an expired registration key is selected

- When the Print button is selected for reports, it will first save the report to a file and then print the report

- Allow special characters for all OCS application passwords

OCS Installer

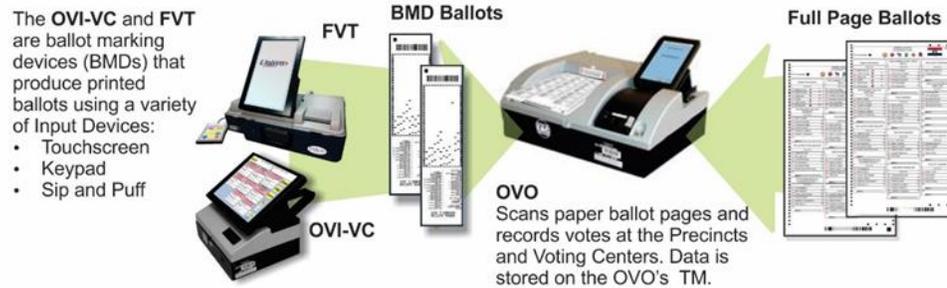- Prevent the 2.1 OCS application release from being installed on EOS 1.1 (CentOS 5.7) systems
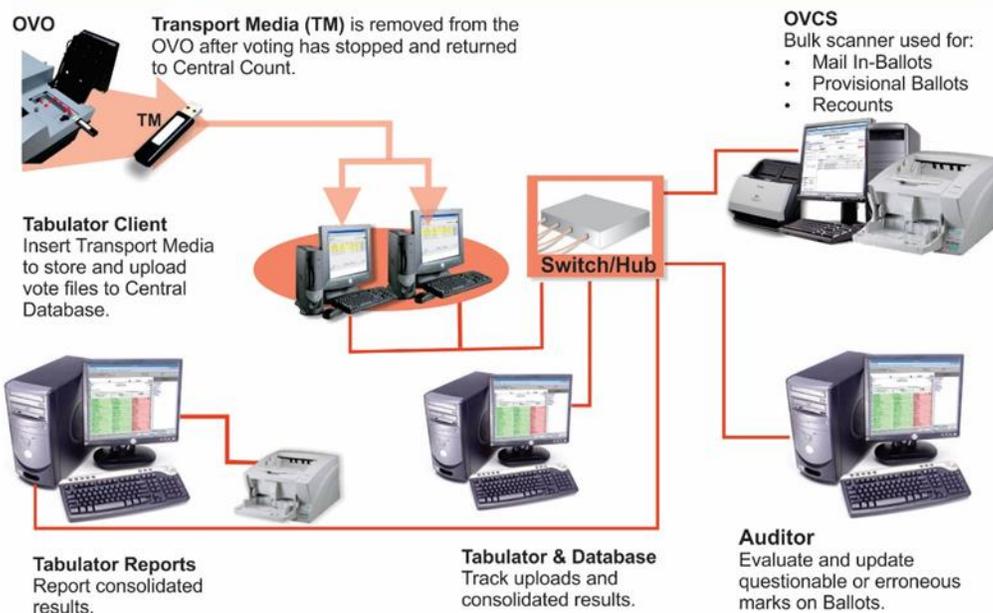
2.2.2 Block Diagram

Figure 1-5. OVS 2.1 System Components Overview

2.2.3   System Limits

Unisyn defined the following system performance characteristic limits for the OVS 2.1:

- The OCS and OVCS Software are intended for use by a single jurisdiction with one set of districts, voting centers, and precincts at any given time.

- The OCS and OVCS designed for handling up to 20 consecutive elections.

- Ten elections may be stored in the OCS database simultaneously.

- The system allows 400 ballot styles for an election.

- One OVO can be initialized for use with ballots up to 50 precincts, or All Precincts.

- An OVI-VC and FVT can present all precincts to the voter.

- The system allows voting by precinct and split precinct.

- The OVO provides several voting sessions to accommodate different ballot counting purposes. Only one session can be used at a time:

    - **Election Day** voting at the polls and voting centers

    - **Training Election** voting for training or sales purposes

    - **Logic Test** voting to test data and tabulation

    - **Absentee** session

    - **Recount** session

    - **Provisional** session

    - **Regional Early Voting** session

- The OVO provides the following System Performance:

    - Expected speed (per ballot page)   5 seconds to ballot page confirm

    - Throughput capacity (per ballot page)   6 ballot pages per minute

    - Maximum Volume   5,000 ballot pages

    - Ballot Pages

        - 11" ballot page:

            — Maximum number of voting positions per ballot page (11 inch ballot pages, without Rank Choice Voting): 228

            — Maximum number of voting positions per ballot page (11 inch ballot pages, with Rank Choice Voting): 456

        - 14" ballot page:

            — Maximum number of voting positions per ballot page (14 inch ballot pages, without Rank Choice Voting): 300

- — Maximum number of voting positions per ballot page (14 inch ballot pages, with Rank Choice Voting): 600
    - ▪ 17" ballot page:
        - — Maximum number of voting positions per ballot page (17 inch ballot pages, without Rank Choice Voting): 372
        - — Maximum number of voting positions per ballot page (17 inch ballot pages, with Rank Choice Voting): 744
    - ▪ 19" ballot page:
        - — Maximum number of voting positions per ballot page (19 inch ballot pages, without Rank Choice Voting): 420
        - — Maximum number of voting positions per ballot page (19 inch ballot pages, with Rank Choice Voting): 840

- Maximum number of ballot styles: 50 ballot styles per OVO session if individually entered with a maximum of 400 ballot style choices. For All Precinct sessions, all ballot styles are accepted by the OVO.

- The OVCS provides several voting sessions to accommodate different ballot counting purposes. Only one session can be used at a time:
    - – Normal - Election Day Tabulation
        - ▪ Election Day Tabulation
        - ▪ Recount
        - ▪ Training
    - – Logic and Accuracy Test (LAT) voting to test data and tabulation
    - – Absentee session
    - – Provisional session
    - – Write-In only session

- The OVCS large scanner provides the following System Performance:
    - – Max Ballot pages per batch   500
    - – Max Ballot pages per session   5,000
    - – Expected speed (ballot pages per hour)   2,100 ballot pages per hour
    - – Maximum number of ballot styles: 400 ballot style choices

In the end-to-end OVS, a single election is limited to:

- Up to 12 political parties (including non-partisan) voting their own ballot in a Primary Election. Up to 12 political parties (including non-partisan) voting in a General Straight Ticket Election. Twenty-four parties may appear on the ballot for candidates.

- Up to 2,000 precincts.

- Up to 120 candidates per contest, with a limit of 3,000 combined count of candidates and contests.

- Up to 15 language translations (applies to ballot pages).

- Up to 3 ballot pages per ballot.

- Up to 5,000 ballot pages processed (cast votes) at an OVO during a single voting period.

2.2.4 Supported Languages

The OVS 2.1 Voting System supports the following languages types:

- Hindi

- Chinese

- English

- Japanese

- Korean

- Navajo

- Spanish

- Thai

- Bilingual (Spanish and English)

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.

2.2.5 Supported Functionality

The OVS 2.1 is designed to support the following voting variations:

- General Election
- Closed Primary
- Open Primary
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Straight Party Voting (*including Pennsylvania and Indiana Rules*)
- Presidential-only Voting

- Split Precincts

- Multiple Selection Contests: Vote for N of M

- Ballot Rotation

- Cross Party Endorsement

- Multi-Page Ballots

- Multi-Party Candidate Endorsements

- Provisional or Challenged Ballots

- Single Transferrable Vote

- Proportional Rotation

- Absentee Ballots

- Recount Tabulation

- Ranked Choice Voting (RCV)

2.2.6 VVSG

The OVS 2.1 was evaluated against the relevant requirements contained in the EAC 2005 VVSG, Volumes I and II.

2.2.7 RFIs

There are no RFIs released by the EAC as of the date of this Test Report that pertain to this test campaign that were not already implemented into the certified baseline system.

2.2.8 NOCs

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

3.0 TEST FINDINGS AND RECOMMENDATIONS

The OVS 2.1 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. The summary findings and recommendations for each area of testing are provided in the following sections.

3.1 Summary Findings and Recommendations

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 OVS 2.1 TDP is provided in Table 3-1.

Table 3-1. OVS 2.1 TDP Documents

Document Number	Description	Version	Release
04-00512	Technical Data Package-Document List and Version Control	1.0	2.1
04-00446	OVS System Overview	1.3	2.1
04-00444	System Functionality Description	1.0	2.1
04-00458	System Hardware Specification	1.1	2.1
04-00464	Software Design and Specification	1.1	2.1
04-00447	System Security Specification	1.0	2.1
04-00453	System Test and Verification Plan	1.0	2.1
04-00460	Systems Operations Procedure: Warehouse Technician's Guide	1.0	2.1
04-00459	System Maintenance Procedures	1.0	2.1
04-00445	Personnel Training and Deployment Requirements	1.0	2.1
04-00448	Configuration Management Plan	1.0	2.1
04-00454	Quality Assurance Plan	1.0	2.1
04-00469	Final QA Report	1.0	2.1
04-00427	Election Manager User Guide	1.2	2.1
04-00428	Ballot Layout Manager User Guide	1.3	2.1
04-00431	Tabulator Client User Guide	1.1	2.1
04-00432	Tabulator User Guide	1.0	2.1
04-00433	Tabulator Reports User Guide	1.0	2.1
04-00495	OVCS User Guide	1.3	2.1
04-00530	Auditor Users Guide	1.0	2.1
04-00549	EOS Linux and OCS Installation Guide	1.6	2.1
04-00449	System Coding Standards	1.0	2.1
04-00462	Election Day Troubleshooter's Guide	1.0	2.1
04-00463	Election Day Poll Worker's Guide	1.1	2.1
04-00494	OVS Acronyms	1.0	2.1
04-00503	OVS Paper Specification	1.0	2.1
04-00553	Trusted Build – Applications 2.1	2.8	2.1
04-00594	OpenElect Voting System Release Notes, 2.0.A to 2.1	1.2	2.1
04-00513	System Hardware Verification	1.0	2.1

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

Pro V&V reviewed the submitted source code to the EAC 2005 VVSG 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 modified 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.

Summary Findings

- Automated Source Code Review: The Automated Source Code Review was performed during the OCS applications, OVO, OVI-VC, FVT, and OVCS Compliance and 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 prior to the Compliance and Trusted Builds. The Manual Source Code was a comparison between the previously certified source code and the source code submitted for this test campaign.

- Compliance Build: The compliance build was performed following the compliance review. Once the compliance review was performed and the source was deemed stable enough to proceed with testing, the source code and all additional packages were compiled into a Compliance Build.

- 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.*

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 included 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 reviewed drawings, specifications, technical data, and test data associated with system hardware to establish a system hardware baseline associated with the 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 OVS 2.1 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 included the limited Functional Configuration Audit (FCA), Regression Testing, Accuracy Testing, and the System Integration Tests. System Level testing was implemented to evaluate the complete system. The system was configured exactly as it would for normal field use. This testing included all proprietary components and COTS components (software, hardware, and peripherals) in both the EMS Standard and EMS Express system configurations. For software system tests, the tests were designed according to the stated 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.

System Integration testing evaluated 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, was determined through functional tests integrating the voting system software with the remainder of the system.

The FCA for this test campaign included an assessment of the submitted modifications and tests conducted to verify that the system hardware and software performed as described in the manufacturer's documentation.

This evaluation utilized baseline test cases as well as specifically designed test cases and included predefined election definitions for the input data. The System Integration Tests were performed to verify the OVS 2.1 functioned as a complete system.

The accuracy test ensured that each component of the voting system could each process 1,549,703 consecutive ballot positions correctly within the allowable target error rate. The Accuracy test was 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 was 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.

Summary Findings

Accuracy Testing: During Accuracy Testing, the OVO and OVCS were tested by utilizing a combination of hand marked (70%) and pre-marked (30%) ballots to achieve accuracy rate greater than 1,549,703 correct ballot positions. The OVI-VC and FVT were utilized to create ballots that were implemented as part of the pre-marked test deck.

The OVS 2.1 System successfully passed the Accuracy Test. During execution of the test procedure, it was verified that the OVS 2.1 System successfully completed the test with all actual results obtained during test execution matching the expected results.

System Integration Testing: To evaluate the integration of the system components and to perform the necessary regression testing, 3 General Elections and 3 Primary Elections were successfully exercised on the voting system, as described below:

Three general elections with the following breakdowns:

— General Election GEN-01: A basic election held in 4 precincts, one of which is a split precinct. This election contains 19 contests compiled into 4 ballot styles. 5 of the contests are in all 4 ballot styles. The other 15 contests are split between at least 2 of the precincts with a maximum of 4 different contest spread across the 4 precincts.

— General Election GEN-02: A basic election held in 3 precincts. This election contains 15 contests compiled into 3 ballot styles. 10 of the contests are in all 3 ballot styles with the other five split across the 3 precincts.

— General Election GEN-03: A basic election held in 2 precincts. This election contains 8 contests and compiled into 2 ballot styles. 4 of the contests are in both ballot styles. The other 4 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.

Three primary elections with the following breakdowns:

— Primary Election PRIM-01: Open Primary Election in two precincts. This election contained thirty contests compiled into five ballot styles. Each ballot style contains 6 contests.

— 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 basic election held in 2 precincts. This election contains 10 contests and is compiled into 2 ballot styles. 2 of the contests are in both ballot styles. The other 8 contests are split between the two parties' ballots. This Primary 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 OVS 2.1 System successfully passed the System Integration Test. During execution of the test procedure, it was verified that the OVS 2.1 System successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

Functional Configuration Audit (FCA): A Functional Configuration Audit was performed on the OpenElect 2.1 system to test the functional changes made to the system. Specially designed test cases were executed to assess that the changes perform as described in the system documentation.

Regression Testing: Using new software builds and updated documentation, all of the deficiencies listed in Table 3-2 were addressed.

3.1.4 Usability and Accessibility Testing

Usability & Accessibility testing was performed to evaluate the OVS 2.1 System to the applicable requirements. The usability testing focused on the usability of the OVS 2.1 system. Usability was defined generally as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. The Accessibility portion of testing evaluated the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B).

Summary Findings

The OVS 2.1 System successfully met the requirements of the Usability & Accessibility evaluation.

3.1.5 Security Testing

The objective of the security testing was to evaluate the effectiveness of the voting system in detecting, preventing, recording, reporting, and recovering from security threats and to determine the overall security posture of each system component. For this test campaign logical security testing was performed to verify that the EOS 4.0.03 OS introduced in this test campaign is properly configured per the recommendations provided in the Security Content Automation Protocol (SCAP) specifications.

Summary Findings:

Configuration Compliance Checking: An attempt was made to utilize the OpenSCAP Workbench utility to test the evaluation targets against the SCAP Checklists developed for Red Hat Enterprise Linux (RHEL). The RHEL content was used since there are no SCAP content specifications available for CentOS. It is common industry practice to substitute the RHEL SCAP content in evaluating CentOS.

During the testing, it was discovered that the security features that had been implemented on the Unisyn systems prohibited the use of the OpenSCAP Workbench tool. An attempt was made to

manually obtain the packages needed for offline installation. However, the systems also does not have a compiler resident in order to make the package. The automated scans could not be conducted without significant modification to the systems which revert the security mechanisms in place; therefore, the SCAP checklists where evaluated manually. The assessor obtained the vendor's compliance checklist matrix (CIS_CentOS_Linux_7_Benchmark_V2.2.0), evaluated its content completeness to the published checklists, and verified that the systems implemented all items as stated. The results of the Security Test were reported to the manufacturer for disposition of any anomalies. This process was repeated until all anomalies were resolved.

The OVS 2.1 System successfully met the requirements of the Security evaluation.

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 OVS 2.1 System.

3.3   Deficiencies and Resolutions

Any violation of the specified requirement or a result is encountered during test performance that deviates from what is standard or expected in which a root cause is established is considered to be a deficiency. Upon occurrence, deficiencies are logged throughout the test campaign for disposition and resolution. All deficiencies encountered during the Unisyn OVS 2.1 test campaign were successfully resolved. In each instance, the resolutions were verified to be resolved through all required means of testing (regression testing, source code review, and TDP update) as needed.

The noted deficiencies are listed in Table 3-2.

Table 3-2. Noted Deficiencies

Deficiency #	Description of Deficiency	Resolution
BLM-1	Creating a contest with a large quantity of text in the Contest Title field but no text in the Report Title field causes the Election XML file to fail to be parsed by the Election Manager application when importing, and the Report Title field to be un-editable in BLM.	Addressed in the Ballot Layout Manager application Version 2.1
BLM-2	Entering Chinese text into translation fields in the BLM application, causes backslashes to be inserted in front of each character. Additionally, editing then exiting the translation field will add additional backslashes in front of each character.	Addressed in the Ballot Layout Manager application Version 2.1
EM-1	The Election Manager application does not properly support Contest Titles with 1000 characters. Upon attempting to import such an election, the application displays an error stating that the import could not be completed.	Addressed in the Election Manager application Version 2.1_R4

Table 3-2. Noted Deficiencies *(continued)*

Deficiency #	Description of Deficiency	Resolution
TR-1	Three of the reports generated by the Tabulator Report application do no properly append the file format extension to the filename when saving the reports.	Addressed in the Tabulator Reports application Version 2.1_R4
TR-2	The "Bold Candidate with Most Votes" option does not properly highlight candidates who receive a thousand votes or more.	Addressed in the Tabulator Reports application Version 2.1
FVT-1	Resolving a Printer Error while at a Ballot Review screen, causes the Review Screen Instruction audio to play while printing, instead of audio stating that the voter's ballot is being printed.	Addressed in the FreedomVote application Version 2.1_R3
OVI-VC-1	Alternate language ballots printed from the OVI-VC, do not print the Election Title on the BMD ballot even though the Translation is properly set.	Addressed in the OVI-VC application Version 2.1_R4
OVCS-1	The Accuracy Test Attempt #1 for the OVCS Mini, Canon DR-M160II scanner), failed due to a significant number of Double Feed Errors being encountered during testing (The system halted scanning and properly handled the errors, thus maintaining the accuracy of the test).	Unisyn Voting Solutions performed a Root Cause Analysis to determine the cause of the issue. The issue was addressed by adding a Document Feed Extension Support, and a roller bar to the scanner unit, as well as stating that no more than 20 ballots should be fed into the scanner at one time.

4.0   RECOMMENDATION FOR CERTIFICATION

The OVS 2.1 Voting System, 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. Additionally, Pro V&V, Inc. has determined that the OVS 2.1 functioned as a complete system during System Integration Testing. Based on the test findings, Pro V&V recommends the EAC grant the OVS 2.1, identified in the following tables, certification to the EAC VVSG 1.0.

Table 4-1. OVS 2.1 COTS Software Components

FVT, OVO and OVI-VC Device Software	Version
CentOS Linux (OVO and OVI-VC)	6.3
Java JRE + Unlimited Cryptographic Extension	1.6.0_02
Android OS (FVT)	4.4.4

Table 4-2. OCS and OVCS COTS Software Components

OCS and OVCS Device Software	Version
CentOS Linux	6.5 and 6.8 and 7.6
Java JRE + Unlimited Cryptographic Extension	1.6.0_02
Apache-Tomcat Application Server	6.0.13
MySQL Database (BLM, EM, A, and Tab only)	5.0.45-7
JasperReports	2.0.5
OpenVPN	2.4.4
OpenSSL	1.0.1f
OpenSSL FIPS Object Module	2.0.10 (cert #1747)

Table 4-3. Voting System COTS Hardware

Hardware	Make	Model
OVO		
Duplex Ballot Scanner		
Duplex Ballot Scanner	PDI Scan	Pagescan III
Scanner Power Adapter	eUrasia Power	uA36-1024
58 mm Thermal Printer		
58 mm Thermal Printer	Citizen Printer	CT-5281
Printer Power Adapter	Citizen Printer	28AD4
Computer		
Chassis	Morex	Morex 2699
DC/DC converter	Morex	MX-0608F
Chassis Fans	Young Lin Tech	DFB404012M
Motherboard	Jetway	JNF9D-2550
Memory	SuperTalent - Onboard RAM	W1333SA2GV
Hard Drive	Western Digital	WD5000AZLX
AC Adapter	EDAC	EA 10951c-120
1 Gb USB TM		
Innodisk	1 Gb USB	DEUA1-01G172AC1SB-B088
Delkin	1 Gb USB	UY0GTFLSY-XN000-D
7" LCD Touchscreen Display		
7" LCD Touchscreen Display	Xenarc Technologies	700TSV
AC Power In Module		
AC Power In Module	Delta	Emi 10BEEG3G
OVI-VC		
Sip and Puff (Optional)		
Sip and Puff (Optional)	Origin Instruments	AirVoter
Headphone (Optional)		
Headphone (Optional)	Koss On-Ear Headphones	KPH5
15 in LCD Touchscreen Display		
15 in LCD Touchscreen Display	GVision	P15BX-OB-4690

Table 4-3. Voting System COTS Hardware *(continued)*

Hardware	Make	Model
82.5 mm Thermal Printer		
82.5 mm Thermal Printer	Star	TSP743IID-24, serial interface
Printer Adapter	Star	PS60A-24B 1
Computer		
Power Adapter Kit	DC-DC Converter	MX-0608F
Motherboard	Jetway	JNF9D-2550
Hard Drive	Western Digital	WD5000AZLX
Adapter	EDAC	EA 10951c-120
1 Gb USB TM		
Innodisk	1 Gb USB	DEUA1-01G172AC1SB-B88
Delkin	1 Gb USB	UY0GTFLSY-XN000-D
AC Power In Module		
AC Power In Module	Delta	Emi 10BEEG3G
OVCS		
Large Volume Scanner		
Large Volume Scanner	Canon	DR-X10C
Desktop Scanner		
Desktop Scanner	Canon	DR-M160II
FVT		
13.3 in Touchscreen Tablet		
13.3 in Touchscreen Tablet	Android Tablet	GVision - T13
Tablets Battery Charger	Sager Power System	GC30B-4P1J
82.5 mm Thermal Printer		
82.5 mm Thermal Printer	Star	TSP743IIU-24
Printer Adapter	Star	PS60A-24B 1
Barcode Reader 1D,2D series		
Barcode Reader 1D,2D series	Newland	FM420
USB Hub		
USB Hub	D-Link	DUB-H4
Hub Adapter	Meanwell	PSD-15A-05
1 Gb USB TM		
Innodisk	1 Gb USB	DEUA1-01G172AC1SB-B088
Delkin	1 Gb USB	UY0GTFLSY-XN000-D
Micro SD		
Micro SD	San Disk	4 GB Edge
Battery		
Battery Pack 12 V 6.0 AH	Powers Sonic	PSH-1255-FR
Adapter	Mean Well	GC30B-4PIL
AC Power In Module		
AC Power In Module	Delta	Emi 10BEEG3G

Table 4-3. Voting System COTS Hardware *(continued)*

Hardware	Make	Model
Sip and Puff (Optional)		
Sip and Puff	Origin Instruments	AirVoter
Headphone (Optional)		
Headphone	Koss On-Ear Headphones	KPH7
USB to Ethernet RJ45 Adapter (Optional)		
USB to Ethernet RJ45 Adapter	D-Link	DUB-E100
UPS		
Minuteman Power Technologies	Para Systems, Inc.	Entrepid Series

Table 4-4. OVCS System COTS Software Components

OVS Hardware	Version
Desktop for non-redundant solutions	Dell OptiPlex 360, 755, 7010, D075/XE2
Desktop for redundant solutions	Dell PrecisionT3500, T3600, T5810, T5820, 3420
Canon Scanner (OVCS)	Canon DR-X10C or DR-M160II
Laptop	Dell Latitude E5500, E5540, E5570, E5590, E5500 v2, Dell XPS m1530,HP 2000

ATTACHMENT A

AS-RUN TEST PLAN

Pro V&V Document No. TP-01-01-UNI-005-01.02, "Test Plan for EAC 2005 VVSG Certification Testing Unisyn Voting Solutions OpenElect 2.1 Voting System"