Test Plan for EAC 2005 VVSG Certification Testing
Clear Ballot Group ClearVote 1.5 Voting System

EAC Project Number: CBG1500

Version: As-Run Rev B

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U.S. Election Assistance Commission

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SIGNATURES

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REVISIONS

Revision	Description	Date
NR	Initial Release	09/05/2018
As-Run	Updated version to reflect as-run testing	12/04/18
Rev A	Updated based on EAC comments	12/20/18
Rev. B	Updated to reflect revised documents	2/21/2019

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1.0   INTRODUCTION

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow to perform certification testing during a system modification campaign for the Clear Ballot Group (CBG) ClearVote 1.5 Voting System to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Prior to submitting the voting system for testing, CBG submitted an application package to the EAC for certification of the ClearVote 1.5 Voting System. The application was accepted by the EAC and the project was assigned the unique Project Number of CBG1500.

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

1.1   Description and Overview of EAC System Being Modified

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

The following subsections describe the baselined ClearVote 1.4 System. The following sections contain a product description and an overview of the design methodology of the ClearVote 1.4 Voting System, as taken from the Clear Ballot Group technical documentation.

The ClearVote 1.4 Voting System is a paper-based optical scan voting system consisting of the following major components: ClearDesign (ballot design and EMS), ClearCount (central count, tabulation, and election reporting), ClearCast (precinct count and tabulation), and ClearAccess (accessible voting and ballot marking device).

ClearDesign

ClearDesign is an Election Management System consisting of an interactive set of applications which are responsible for all pre-voting activities necessary for defining and managing elections. This includes ballot design, ballot proofing, ballot layout, and ballot production. The ClearDesign system consists of the physical components listed below. All of the components and generation of voting machine election definition file packages are unmodified COTS that are connected via a wired, closed, and isolated network not connected to any other systems or the Internet.

- DesignServer: A laptop or desktop computer running Ubuntu with the ClearDesign software and hosting the election database.

- DesignStation(s): One or more laptop or desktop running Windows used to connect to the DesignServer. A browser is used to perform the necessary tasks. A user with administration privileges will be able to define users and manage the elections.

- Router: Used to connect the DesignStations to the DesignServer using a wired, closed Ethernet-based network.

ClearCount

ClearCount is a central, high-speed, optical scan ballot tabulator coupled with ballot processing applications. The ClearCount software runs on unmodified COTS laptop or desktop computers running the Windows operating system and supports specific models of Fujitsu scanners. The ClearCount central-count system running an Ubuntu Linux operating system, with Ethernet connections to workstations running the Windows operating system consists of the physical components listed below. All of the components are unmodified COTS that are connected via a wired, closed, and isolated network not connected to any other systems or the Internet.

- ScanServer: A laptop or desktop computer running the ClearCount software and hosting its election database and the web server that serves its election reports.

- ScanStation(s): One or more laptop or desktop/scanner pairs used to scan and tabulate ballots.

- Router: Used to connect the ScanStations to the ScanServer using a wired, closed Ethernet.

- Election Administration Station and/or Adjudication Station: One or more Windows laptop or desktop computers installed with browser software, linked by a wired Ethernet connection to the ScanServer using the router. This station can serve multiple uses: user administration, election administration, adjudication, and reporting. This station is also used to consolidate the vote totals and ballot images from the ClearCast precinct tabulator. The vote totals and ballot images are consolidated by the ClearCount Software via the ClearCast USB drive.

All files that make up the ClearCount software reside on a single ScanServer that is shared by all client ScanStations. The Tabulator software is executed by the ScanStations at run-time from files that reside on the ScanServer. The only software programs that have to be installed on ScanStations, apart from the Windows operating system, are the Fujitsu ScandAll Pro software and drivers required by the scanner hardware.

The ClearCount software consists of the following components:

- Tabulator: The Tabulator application handles ballot tabulation. The Tabulator software is stored on the ScanServer and an instance of Tabulator runs on each ScanStation. The Tabulator program analyzes the incoming image and transfers them to the local output folder named CBGBallotImages. The ScanServer retrieves the images from the folder and uploads them into the Election database.

- Election Database: A centralized election database that resides on the ScanServer and collects the output of each Tabulator.

- Election Reports: A browser-based suite of reports that provides election results and analysis and allows election officials to review individual ballot images. A web server on the ScanServer serves the reports.

- Card Resolutions tool: A web application that allows election officials to review and appropriately resolve unreadable voted ballots.

- User and Election Database Management through web applications: On the User Administration dashboard, the administrator can add, rename, or delete users, assign permissions, and change user passwords. On the Election Administration dashboard, the administrator can create or delete an election, set an election as active, and backup or restore an election.

ClearCast

The ClearCast tabulator is a precinct count ballot scanning solution suitable for early and election in-person voting, including processing ballots printed by the ClearAccess accessible ballot marking device. The ClearCast application runs on the precinct count-based tabulator, and is used to scan, count and tally marked ballots. Its functionality is divided into three essential modes, Election Mode (Early Voting and/or Election Day), which is used to process voter cast ballots, Pre-Election Mode, this occurs prior to Election Mode, and is used to test all system functionality subsequent to the start of the election, and Post-Election Mode, which is used to perform administrative functions following the close of the election.

ClearAccess

ClearAccess is an accessible touchscreen ballot marking device (BMD) used for the creation of paper ballots that can be scanned and tabulated by ClearCast or ClearCount. The ClearAccess components of the ClearVote 1.4 voting system uses both unmodified and modified off-the-self hardware. Laptop and desktop computers are combined with personal assistive devices, printers, and uninterruptible power supplies to form a ballot-marking device.

1.1.1 Baseline Certified System

The baseline system for this modification is the ClearVote 1.4 Voting System. The tables below describe the certified equipment and firmware versions.

Detailed descriptions of the ClearVote 1.4 test campaign are contained in Pro V&V Report No. TR-01-01-CBG-001-01.01, Rev. C, which is available for viewing on the EAC's website at www.eac.gov.

The individual components listed below are compiled to create the ClearVote 1.4 voting system (ClearCast 1.4, ClearCount 1.4, ClearDesign 1.4, and ClearAccess 1.4).

Table 1-1. Voting System Software

Firmware/Software	Version
ClearDesign Components, Version 1.4.3	
Windows	10 Pro 1607
Google Chrome	55.0.2883.87
Ubuntu	14.04.4 LTS
MySQL	5.5.55
Apache	2.4.7
libapache2-mod-fcgid	2.3.9
PhantomJS	1.9.0
Usbmount	0.0.22
Unzip	6.0.9
Samba	4.3.11
Python PIP	1.5.4
Zip	3.0.8

Table 1-1. Voting System Software *(continued)*

Firmware/Software	Version
Pyinstaller	3.0
Python JSMIN	2.2.1
Python	2.7.6
Python webpy	0.38
Python MySQL DB	1.2.3
SQLAlchemy	1.0.15
Python Pillow	2.3.0
Python Flup	1.0.2
Python DBUtils	1.1
Python XLRD	0.9.4
Python FontTools library	3.0
Python RTF	0.2.1
OpenSSL FIPS Object Module	2.0.10
OpenSSL (standard)	1.0.2g
DataTable	1.10.5
DataTable-TableTools	2.2.3
DataTable-ColVis	1.1.1
DataTable-ColReorder	1.1.2
DataTablePlugins	1.10.10
bootstrap	3.0.0
jquery	1.10.2
jquery-impromptu	5.2.3
jquery-qrcode	1.0
jquery-splitter	0.14.0
jquery-ui	1.10.4
jscolor	1.4.2
tinymce	4.1.9
fastclick	1.0.4
libmp3lame	0.5.0
jszip	3.1.2
papaparse	4.1.2
jsmin	12/4/2003
ClearAccess Components, Version 1.4.1	
Windows	10 Pro 1607
Google Chrome	61.0.3163.100
nsis	3.01

Table 1-1. Voting System Software *(continued)*

Firmware/Software	Version
PyInstaller	3.2
Python	2.7.10
webpy	0.38
Python-future	0.15.2
pefile	2016.3.28
pywin	220
jquery	1.10.5
DataTables	1.10.5
ColVis	1.1.1
ColReorder	1.1.2
jsmin	2003-12-04
Brother printer driver	1.0.1.0
Okidata printer driver	1.0.0.0
ClearCast Components, Version 1.4.2	
scanner_control	0.0.28
UPSBatteryMontior	1.0
Ubuntu	14.04.5 LTS
google_chrome	62.0.3202.75-1
zeromq	4.2.0
arduino tools	1.8.0
adafruit tools	1.4.9
pyinstaller	3.2.1
OpenSSL FIPS Object Module	2.0.10
OpenSSL (standard)	1.0.1f
libPDIScan.so	7.1.0
pdi_ps3_drv_scanner.ko	2.0.5
DataTables	1.10.5
JTSage DateBox	4.0.0
jQuery.NumPad	1.4
jQuery	1.10.2
jquery.ui	1.11.3
ClearCount Components, Version 1.4.2	
Windows	10 Pro 1607
Google Chrome	55.0.2883.87
Ubuntu	16.04.1 LTS
Apache	2.4.18
libapache2-mod-fcgid	2.3.9

Table 1-1. Voting System Software *(continued)*

Firmware/Software	Version
Python(part of Ubuntu)	2.7.12
Pillow (part of Ubuntu)	3.1.2
MySQLdb (part of Ubuntu)	1.3.7
PyInstaller	3.2.1
PollyReports	1.7.6
OpenSSL FIPS Object Module	2.0.10
OpenSSL (standard)	1.0.2g
JavaScript Bootstrap library	2.3.2
JavaScript Chosen library	1.0.0
JavaScript jQuery library	1.10.2
J JavaScript jQuery-migrate library	1.2.1
JavaScript DataTables library	1.9.4
ColVis	1.0.8
JavaScript TableTools library	2.1.5
ZeroClipboard	1.0.4-TableTools2
JavaScript FixedHeader library	2.0.6
JavaScript hotkeys library	1.0
JavaScript tooltip library	1.3
JavaScript pep library	1.0
JavaScript LESS library	1.3.3
Fujitsu fi-6400	PaperStream 1.30.0
Fujitsu fi-6800	PaperStream 10.10.710
Fujitsu fi-7180	PaperStream 1.4.0

Table 1-2. Voting System Equipment

Component	Model	Serial Number
ClearDesign Components		
Dell Latitude Laptop	5580	7L6M3G2
Dell PowerEdge Server	T630	2K5YFK2, JLPYHK2, & JLPXWK2
Dell 24 inch Monitor	SE2416H	FVWV5G2
Dell 22 inch Monitor	E2216HV	36765D2 & 90665D2
Dell Mini Tower	T3620	IHCLXK2 & IHCKXK2
TP-LINK VPN Router	TL-R600VPN	2149342000209, 2166306000413, & 2168351001114
Lenovo USB Portable DVD Burner	LN-8A6NH11B	8SSDX0H33226L1CB7107099
Brother Printer	HL-L2340DW	U63879A7N416353

Table 1-2. Voting System Equipment *(continued)*

Component	Model	Serial Number
ClearAccess Components		
Dell OptiPlex AIO	5250	6PW4GK2, BPYXCH2, HGCMGK2, & 6PWZFK2
Dell 15" Inspiron	7000 series	80S1YD2, 7TT1YD2, & 22S1YD2
Brother Laser Printer	HL-L2340DW	U63879M4N62861, U63879M4N628617, U63879A7N416353, & U63879M4N628535
Oki Data Laser Printer	B432dn	AK5B007647A0, AK76030925A0, AK76030928A0, AK62030437A0, AK62030440A0, & AK76030928A0
Storm EZ Access Keypad	EZ08-222013	15000005, 15000007, & 15020478
Origin Instruments Sip/Puff Breeze with Headset	AC-0313-H2	CBG-SP-001, CBG-SP-002, & CBG-SP-003
Hamilton Buhl Over-Ear Stereo Headphones	HA7	CBG-HP-001 & CBG-HP-002
ElectionSource Table Top Voting Booth (Privacy Screen)	VB-60B	CBG-VB-001
APC Smart-UPS	SMT2200	AS1602232215, AS1721142050, AS1638230963, AS1721132721, & AS1625141816
Ergotron Stand for Dell OptiPlex 5250 AIO (portrait mode)	Neo Flex	1274839-0061 & 1358124-0005
Wurth Ferrite (for Oki printer)	742-416-33S	742-416-33S-CBG1
Wurth Ferrite (for Brother printer)	742-416-22S	742-416-22S-CBG1
3M EMI Copper Foil Shielding Tape, , ¼ inch	1181	1181-CBG1
Lexan or acrylic plastic cover (8 mm)	2"x4"	Cover-CBG1
ClearCount Components		
Dell Latitude Laptop (multiple units)	5580	2F3L3G2, C9S22G2, CF3L3G2, 90356H2, BDH46H2, 8TM46H2, 4PM46H2, 4QM46H2, 3CH46H2, & FPM46H2
Dell PowerEdge Server	T330	5RRFGK2, 5712JK2, & FHV9RD2
Dell OptiPlex AIO	7440	JXDFHH2, JXDFDH2, & 64WPXG2
Dell Precision Workstation	T3620	GW6XHH2 & H0PZFK2
Fujitsu Scanner	fi-7180	A20DC10302, A20DC10378, A20D000798, & A20DC08933

Table 1-2. Voting System Equipment *(continued)*

Component	Model	Serial Number
Fujitsu Scanner	fi-6800	A9HCC00543, A9HCC00535, & 100295
Fujitsu Scanner	fi-6400	AKHCC00609, AKHCC00337, & AKHCC00362
Lenovo USB Portable DVD Burner	LN-8A6NH11B	8SSDX0H33226L1CB7107099
Dell 22 inch Monitor	E2216HV	GD965D2
Dell 22 inch Monitor	P2217	7818672
Dell 22 inch Monitor	S2240M	CN-0CFGKT-64180-58B-0X3T
Dell 27 inch Monitor	P2717H	CDMS672 & HPWD072
Cisco Catalyst Switch (1 Gigabit Router or Switch)	2960-X Series	FCW2039B6QF & FCW2110A1E0
TP-LINK Easy Smart Switch (1 Gigabit Router or Switch)	TL-SG108E	216C319009010 & 216C319009012
NetGear ProSafe VPN Firewall (1 Gigabit Router or Switch)	FVS318G	40F266BA00280
APC Smart-UPS	SMT1500	3S1525X07491, 3S1525X07421, & 4B1448P39979
Western Digital External Hard Drive	WDBBGB0040HBK	WCC7K5CHA3DK
EZ Scanning Shelf (fi-6400 or fi-6800)	Model: WorkEZ	CBG-EZ-001, CBG-EZ-002, CBG-EZ-003, & CBG-EZ-004
ClearCast Components		
ClearCast	Model: 1 Version A	Cast0011, Cast0014, Cast0015, Cast0017, Cast0018, and Cast0020
Ballot Box	1224UBB-CB	CBG-BB-001, CBG-BB-002

1.1.2   Description of Modification

The ClearVote 1.5 is a modified voting system configuration that includes upgrades to the ClearCast, ClearAccess, ClearCount, and ClearDesign components of the ClearVote 1.4 system. The modifications include the following specific changes between the ClearVote 1.5 system and the previously certified baseline ClearVote 1.4 system, as taken from the ClearVote Change Notes. Detailed information on how the modifications will be addressed is included in Section 1.1.5.

The submitted modifications include the following:

Overview

- Added new support when ballots require judge's initials

- Added new merge device-count feature

- PA straight party rules

- Support for ballot stubs
- Support for consolidated precincts

ClearAccess

- Added two new hardware versions of the Elo Touchscreen computer
- Updated Brother printer
- Added a new barcode scanning feature that includes the following enhancements:
  - Scanning a barcode that selects the precinct split
  - Processing input from a barcode scanner
  - Barcode scanner icon in the status bar
  - Changes to the voting workflow when ClearAccess detects a barcode scanner

ClearCast

- New ClearCast Precinct Tabulator hardware
- Improvements to the UI and minor clarifications
- Power-up sequence added
- New warning when a USB drive is low on space

ClearCount

- Merge of device counts and new reporting of merged units
- Added new client laptop and server hardware models
- Vote Centers page and outstanding merge results
- Updating the number of paper scanners in the BDF
- ContestFullName field removed from BDF
- Per election access levels
- Corrected issue concerning incorrect redaction of Statement of Votes Cast PDF report

ClearDesign

- Tracking the number of devices associated with each vote center
- Upgraded to Ubuntu 16.04.4
- Added new client laptop and server hardware models
- New Placement option for card headers: Front of First Card Only
- New abbreviation for the standard ballot set
- Password recovery for administrators
- Entity settings related to text for each configured language
- New Line Height options less than 1
- New options for the Entity Types filter in the System Logs view
- Flash is no longer needed on DesignStations
- Improvement to the audio editor

- Ensure that ovals on the front and back of a ballot do not line up

- Improvement to the process for translating language text files

- Ending the Contest/Header background color on the last line of text

- Support for North Carolina's SEIMS file format

- Support for Washington's EIMS VR file format

- For recorded audio, the "space" played for all device audio

1.1.3   Initial Assessment

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

- Source Code Review, Compliance Build, Trusted Build, and Build Document Review
- System Level Testing
    — System Integration
    — Accuracy
    — Volume and Stress
- Technical Documentation Package (TDP) Review
- Functional Configuration Audit (FCA)
- Hardware Testing
- Usability and Accessibility Testing
- Security Testing

1.1.4   Regression Test

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

1.1.5   System Modification Evaluation

The submitted modifications to the ClearVote 1.5 System consist primarily of minor software changes to accommodate defect resolutions and enhancements. New hardware changes to ClearCast and ClearAccess are also submitted for this evaluation.

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

corrected issues from the baseline system are not present in the modified system and that all enhancements implemented did not adversely impact system performance.

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 Handbook 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 July 12, 2018

- Pro V&V Test Report No. TR-01-01-CBG-001-01.01 Rev. C, "Test Report for EAC 2005 VVSG Certification Testing Clear Ballot Group ClearVote 1.4 Voting System", dated 01/29/18

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

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

- Clear Ballot Group's Technical Data Package *(A listing of the ClearVote 1.5 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

"BMD" – Ballot Marking Device

"CBG" – Clear Ballot Group

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"DRE" – Direct Record Electronic

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ISO" – International Organization for Standardization

"NOC" – Notice of Clarification

"PC" – Personal Computer

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RAM" – Random Access Memory

"RFI" – Request for Interpretation

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

1.4   Project Schedule

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

1.5   Scope of Testing

The scope of testing focused on evaluating the modifications detailed in Section 1.1.2 of this Test Plan. Primarily, these modifications focused on upgrades to the components of the previously certified ClearVote 1.4. To determine the ClearVote 1.5 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), including System Loads & Hardening
    — Technical Documentation Package (TDP) Review
    — Accuracy Testing
    — Volume and Stress
- EAC VVSG 1.0 Volume 1, Section 3: Usability and Accessibility Requirements
    — Usability and Accessibility Testing
    — Technical Documentation Package (TDP) Review

- EAC VVSG 1.0 Volume 1, Section 4: Hardware Requirements
    - Environmental Requirements
        - All Electrical Tests (ClearCast and ClearAccess)
        - All Environmental Tests (ClearCast and ClearAccess)
        - Safety Testing (ClearCast)
        - Technical Documentation Package (TDP) Review
- 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)
- EAC VVSG 1.0 Volume 1, Section 7: Security Requirements
    - Security Testing
    - Technical Documentation Package (TDP) Review
    - Functional Configuration Audit (FCA)

1.5.1 Block Diagram

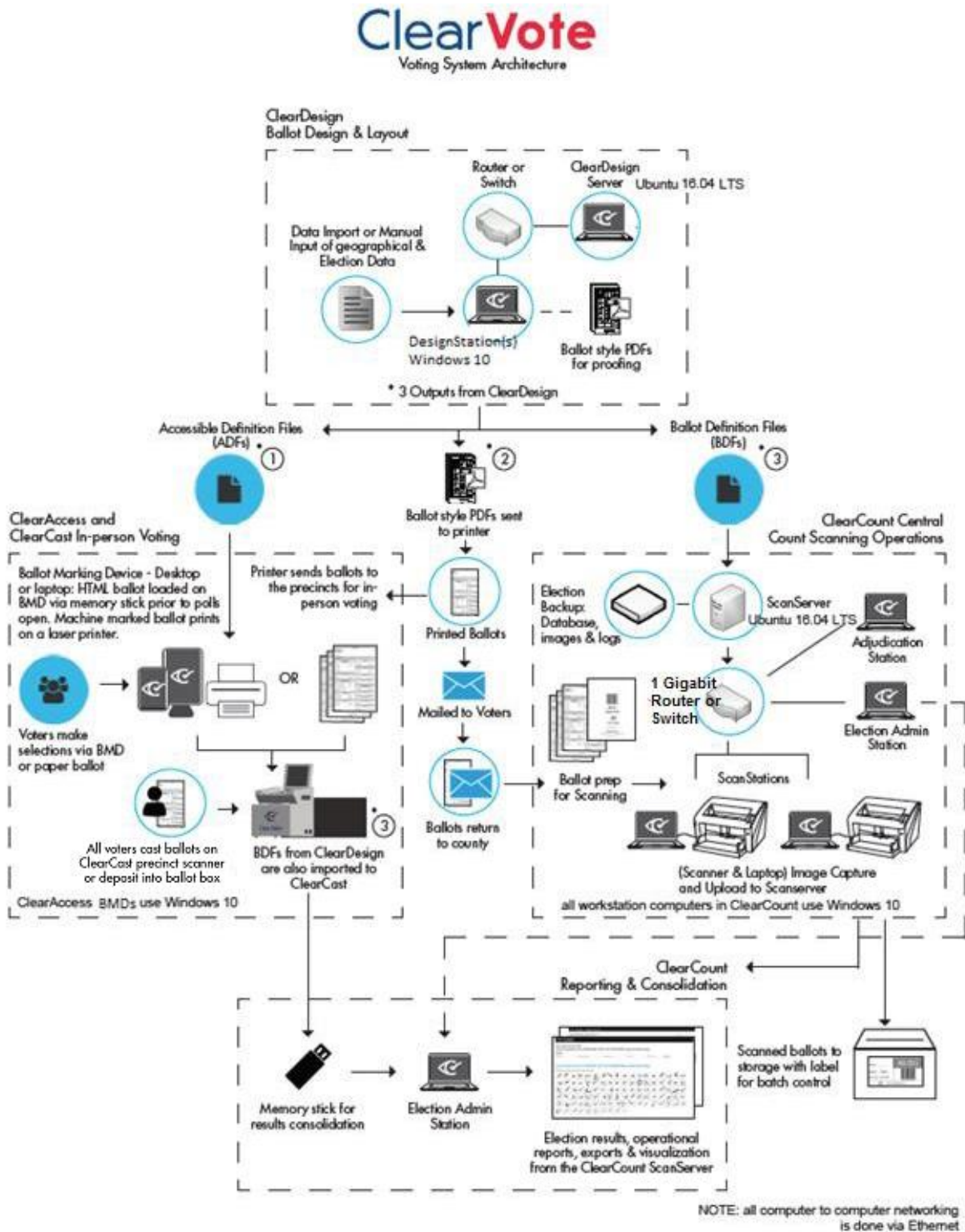The system overview of the submitted voting system is depicted in Figure 1-1.

Figure 1-1. ClearVote 1.5 System Overview

1.5.2 System Limits

The system limits that CBG has stated to be supported by the ClearVote 1.5 Voting System are listed in the tables below.

Table 1-3. System Limits for ClearDesign

Characteristic	Limit
Precincts in an election	3200
Contests in an election	3200
Candidates/Counters in an election	3200
Ballot Styles in an election	3200
Contests in a ballot style	60
Candidates in a contest	300
Ballot styles in a precinct	50
Number of political parties	50
"vote for" in a contest	50
Supported languages in an election	15
Number of write-ins	50

The maximum ballot positions for the ClearVote 1.5 Voting System are as follows:

Table 1-4. Maximum Oval Positions for ClearDesign

Ballot Size	Oval positions per side
5 inch	60
11 inch	180
14 inch	240
17 inch	300
19 inch	360
22 inch	420

Table 1-5. System Limits for ClearCount

Scanner Model	Sustained (not burst speed) ballots per hour						Typical county size (central count)
	8.5x5	8.5x11	8.5x14	8.5x17	8.5x19	8.5x22	
fi-6400	5592	3624	2928	2448	2350	2236	Large (>100k voters)
fi-6800	7822	5508	4155	3352	3000	2800	Large (>100k voters)
fi-7180	3396	2040	1692	1400	1300	1200	Small (<25k voters)
ClearCount can have a maximum of 10 ScanStation/Scanner pairs							

1.5.3 Supported Languages

The submitted voting system supports:

- English
- Spanish
- Chinese
- Korean
- Vietnamese
- Danish
- Dutch
- Flemish
- French
- German
- Italian
- Japanese
- Norwegian
- Portuguese
- Swedish

Due to the limited scope of testing, only English and Spanish language ballots will be cast during the performance of functional testing. Additionally, one character based language (Chinese) will be tested during System Integration Testing.

1.5.4 Supported Functionality

The ClearVote 1.5 is designed to support the following voting variations:

- General Election
- Primary Election (Open and Closed)
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Straight Party Voting
- Split Precincts
- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots

1.5.5 VVSG

The ClearVote 1.5 shall be evaluated against the relevant requirements contained in the EAC VVSG 1.0.

1.5.6 RFIs

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

1.5.7 NOCs

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

2.0 PRE-CERTIFICATION TESTING AND ISSUES

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

The following pre-certification testing has been performed on an "At-Risk" basis:

Technical Date Package (TDP) Review
An initial TDP review was performed on the documents submitted for this test campaign. The initial review is an abbreviated review performed in order to determine if the documents contain sufficient information.

Physical Configuration Audit (PCA)
An initial PCA has been performed to baseline the system prior to test campaign commencement. The PCA was performed by documenting each hardware and software component of the voting system by name, model, serial number, major component, and any other relevant information needed for identification. Photographs of each hardware component were also taken.

2.1 Evaluation of Prior VSTL Testing

Pro V&V evaluated to the published Final Test Report for the ClearVote 1.4 in order to baseline the current system under test.

2.2 Evaluation of Prior Non-VSTL Testing

No prior non-VSTL testing of the ClearVote 1.5 modifications were considered for this test campaign

2.3 Known Field Issues

The ClearVote 1.5 is a modification to a previously certified system and has not been fielded for use.

3.0 MATERIALS REQUIRED FOR TESTING

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

The materials required for testing of the ClearVote 1.5 Voting System include all materials to enable the test campaign to occur. This includes the applicable hardware and software as well as the TDP, test support materials, and deliverable materials, as described in the following subsections.

3.1 Software

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign. The individual components are compiled to create the ClearVote 1.5 Voting System (ClearCast 1.5, ClearCount 1.5, ClearDesign 1.5, and ClearAccess 1.5).

Table 3-1. ClearVote 1.5 Voting System Software

Firmware/Software	Version
ClearDesign Components, Version 1.5.1	
Windows	10 Pro 1607
Google Chrome	55.0.2883.87
Ubuntu	16.04.4 LTS
MySQL	5.7.21
Apache	2.4.18
libapache2-mod-fcgid	2.3.9
PhantomJS	1.9.8
Usbmount	0.0.22
Unzip	6.0.20
Samba	4.3.11
Python PIP	8.1.1
Zip	3.0.11
Pyinstaller	3.2.1
Python JSMIN	2.2.1
Python	2.7.12
Python webpy	0.38
Python MySQL DB	1.3.7
SQLAlchemy	1.0.15
Python Pillow	3.1.2
Python Flup	1.0.2
Python DBUtils	1.1
Python XLRD	0.9.4
Python FontTools library	3.0
Python RTF	0.2.1

Table 3-1. ClearVote 1.5 Voting System Software *(continued)*

Firmware/Software	Version
OpenSSL (FIPS)	2.0.1
OpenSSL	1.0.2g
DataTable	1.10.16
DataTable-Buttons	1.4.2
DataTable-Buttons-JSZip	2.5.0
DataTable-Buttons-Pdfmake	0.1.32
DataTablePlugins	1.10.16
bootstrap	3.0.0
jquery	1.10.2
jquery-impromptu	5.2.3
jquery-qrcode	1.0
jquery-splitter	0.14.0
jquery-ui	1.10.4
jscolor	1.4.2
tinymce	4.1.9
fastclick	1.0.4
libmp3lame	0.5.0
jszip	3.1.2
papaparse	4.1.2
jsmin	12/4/2003
ClearAccess Components, Version 1.5.1	
Windows	10 Pro 1607
Google Chrome	61.0.3163.100
nsis	3.01
PyInstaller	3.2
Python	2.7.10
webpy	0.38
Python-future	0.15.2
pefile	2016.3.28
pywin	223
jquery	1.10.5
DataTables	1.10.5
ColVis	1.1.1
ColReorder	1.1.2
jsmin	2003-12-04
Brother printer driver	1.0.1.0
Okidata printer driver	1.0.0.0

Table 3-1. ClearVote 1.5 Voting System Software *(continued)*

Firmware/Software	Version
Zebra CoreScanner Driver	3.03.0001
ClearCast Components, Version 1.5.1	
scanner_control	0.0.33
Ubuntu	18.04.4 LTS
google_chrome	70.0.3538.110
zeromq	4.2.3
pyinstaller	3.2.1
openssl-fips	2.0.10
openssl	1.1.0g
libScanAPI.a	1.1.3
DataTables	1.10.5
JTSage DateBox	4.0.0
jQuery.NumPad	1.4
jQuery	1.12.4
jquery.ui	1.11.3
ClearCount Components, Version 1.7.1	
Windows	10 Pro 1607
Google Chrome	55.0.2883.87
Ubuntu	16.04.1 LTS
Apache	2.4.18
libapache2-mod-fcgid	2.3.9
Python(part of Ubuntu)	2.7.12
Pillow (part of Ubuntu)	3.1.2
MySQLdb (part of Ubuntu)	1.3.7
PyInstaller	3.2.1
PollyReports	1.7.6
OpenSSL	1.0.2g
OpenSSL FIPS Object Module	2.0.10
JavaScript Bootstrap library	2.3.2
JavaScript Chosen library	1.0.0
JavaScript jQuery library	1.10.2
J JavaScript jQuery-migrate library	1.2.1
JavaScript DataTables library	1.9.4
ColVis	1.0.8
JavaScript TableTools library	2.1.5
ZeroClipboard	1.0.4-TableTools2
JavaScript FixedHeader library	2.0.6

Table 3-1. ClearVote 1.5 Voting System Software *(continued)*

Firmware/Software	Version
JavaScript hotkeys library	0.8
JavaScript tooltip library	1.3
JavaScript pep library	1.0
JavaScript LESS library	1.3.3
Fujitsu fi-6400	PaperStream 1.30.0
Fujitsu fi-6800	PaperStream 10.10.710
Fujitsu fi-7180	PaperStream 1.4.0

3.2   Equipment

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

For COTS equipment, every effort will be made to verify that the COTS equipment has not been modified for use. This will be accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel will evaluate COTS hardware, system software and communications components for proven performance in commercial applications other than voting. For PCs, laptops, and servers, the service tag information will be compared to the system information found on each machine. Physical external and internal examination will also be performed when the equipment is easily accessible without the possibility of damage. Hard drives, RAM memory, and other components will be examined to verify that the components match the information found on the COTS equipment manufacturer's websites.

Table 3-2. ClearVote 1.5 Voting System Equipment

Component	Model	Serial Number
ClearDesign Components		
Dell Latitude (client)	5590	9W5D1N2
Dell Precision (client)	T3620	GSKRMV2 & GSKSMN2
Dell PowerEdge (server)	T440	H6JZLN2
Dell PowerEdge (server)	T130	5G0YLN2
Dell 24 inch Monitor	SE2416H	FVWV5G2
Dell 22 inch Monitors	E2216HV	36765D2 & 90665D2
Cisco 8-Port Switch	SG250-08	PSZ21451MLJ
Lenovo USB DVD Burner	LN-8A6NH11B	8SSDX0H33226L1CB7107099
Sabrent 13 port USB 2.0 Hub	HB-U14P	1996
Zebra Technologies Bar Code Scanner	DS457	18059000501984, 18059000501981, 18095000500487, 18095000500491

Table 3-2. ClearVote 1.5 Voting System Equipment *(continued)*

Component	Model	Serial Number
SySTOR Multiple USB Duplicator	SYS-USBD-11	ES-27095
ClearAccess Components		
ELO 15 inch AIO	E-Series (15E2)	L17C014810 & K17C012858
ELO 20 inch AIO	X-Series (20X2)	B18Q001599 & B18Q000597
Brother Laser Printer	HL-L2350DW	U64964A8N238333 & U64964A8N238334
Oki Data Laser Printer	B432dn	AK5B007647A0
Storm EZ Access Keypad	EZ08-222013	15000005, 15000007, 15020478
Origin Instruments Sip/Puff Breeze with Headset	AC-0313-H2	CBG-SP-001, 002, 003
Monoprice Over the Ear Pro Headphones	8323	CBG-mono-001, 002, 003
ElectionSource Table Top Voting Booth (Privacy Screen)	VB-60B	CBG-VB-001
3M EMI Copper Foil Shielding Tape, , ¼ inch	1181	1181-CBG1
Lexan or acrylic plastic cover (8 mm)	2"x4"	Cover-CBG1
3/4" 2 mil Kapton tape	S-17213	CBG-KAP01
APC Smart-UPS	SMT2200C	AS1809160852
ClearCount Components		
Dell Latitude Laptops (client)	5590	5M5D1N2, 3T8D1N2, 4P4F1N2, B5TD1N2, DP5D1N2, FV8D1N2
Dell Precision Tower (client)	T3620	GSKQMN2
Dell PowerEdge Server (server)	T440	H6J5MN2
Dell PowerEdge Server (server)	T130	5G0ZLN2
Fujitsu Scanner	fi-7180	A20DC10302 & A20D000798
Fujitsu Scanner	fi-6800	A9HCA00737 & A9HCC00543
Fujitsu Scanner	fi-6400	AKHCC00362 & AKHCC00609
Lenovo USB DVD Burner	LN-8A6NH11B	8SSDX0H33226L1CB7107099
Western Digital 4 TB External HD	WDBFJK0040HBK-NESN	WCC7K7YF11ZD
Western Digital 8 TB External HD	WDBFJK0040HBK-NESN	75H4PXJD
Netac Keypad Encryption Portable Hard Disk	K390	R4JT22619T
CORSAIR Flash Padlock 3	CMFPLA3B-32GB	CBG-Pad-002

Table 3-2. ClearVote 1.5 Voting System Equipment *(continued)*

Component	Model	Serial Number
Dell 24 inch Monitor	P2415Q	3TZSJ92
Dell 22 inch Monitor	P2217	7818672
Dell 22 inch Monitor	S2240M	CN-0CFGKT-64180-58B-0X3T
Cisco 8-Port Switch	SG250-08	PSZ21451MYX
Cisco 26-Port Switch	SG250-26	DNI203400A6 & DNI203400AW
NETGEAR 8-Port Gigabit VPN Firewall	FVS318G	40F266BA00280
TP-LINK 5-Port Gigabit Switch	TL-SG105E	216C319009010
Sabrent 13 port USB 2.0 Hub	HB-U14P	1997
APC Smart-UPS	SMT1500	3S1525X07491
Lenovo USB DVD Burner	LN-8A6NH11B	8SSDX0H33226L1CB7107099
EZ Scanning Shelves	Model: WorkEZ	CBG-EZ-001, 002,003, & 004
ClearCast Components		
ClearCast	Model D, Revision 4	CCD1902007 CCD1902009, CCD1902010, CCD1902013
Ballot Bag	CBG-BAG-002	BAG001, BAG002, BAG003, BAG004
CORSAIR Flash Padlock 3	CMFPLA3B-32GB	CBG-Pad-001 through 010

3.3   Test Materials

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

The following materials are expected to be supplied by Clear Ballot to facilitate testing:

- USB flash drives, 32 GB capacity (CORSAIR Flash Padlock 3, SanDisk Ultra Flair)
- test decks, ballot paper
- 3 in. thermal paper, 24 lb. bond or similar paper for results reports
- power cords, video cables, USB cables, and Ethernet cables
- security seals, security ties
- laminated inserts
- ballot marking devices.
- Other materials and equipment as required

3.4   Deliverable Materials

This subsection lists the materials identified by the manufacturer as materials deliverable to the end user for the system being tested.

Table 3-3. Voting System Deliverables

Material	Version	Description
ClearDesign	1.5	EMS Software
ClearAccess	1.5	BMD software
ClearCount	1.5	Central Count and Tabulation Software
ClearCast	1.5	Precinct Count Software
ClearVote 1.5 TDP*	1.5	Technical Data Package

*Listed in Section 4.6

3.5   Proprietary Data

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

4.0   TEST SPECIFICATIONS

Certification testing of the Clear Ballot Group ClearVote 1.5 Voting System submitted for evaluation will be performed to ensure the applicable requirements of the EAC 2005 VVSG and the EAC Testing and Certification Program Manual, Version 2.0, are met. Additionally, all EAC Requests for Interpretation (RFI) and Notices of Clarification (NOC) relevant to the system under test will be incorporated in the test campaign. A complete listing of the EAC RFIs and NOCs is available on the EAC website.

4.1   Requirements (Strategy of Evaluation)

To evaluate the ClearVote 1.5 test requirements, the submitted modifications were evaluated against each section of the EAC VVSG 1.0 to determine the applicable tests to be performed. Based on this assessment, it was determined the following evaluations would be required to verify compliance of the modifications:

Limited Technical Documentation Package (TDP) Review

A limited TDP Review will be performed to ensure that all submitted modifications are accurately documented and that the documents meet the requirements of the EAC 2005 VVSG.

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

The source code review will be based on the source code changes made since the previous system was certified.

Physical Configuration Audit (PCA)

A PCA will be performed to compare the voting system submitted for certification testing to the manufacturer's technical documentation. The purpose of the PCA will be to verify that the submitted hardware is unmodified from the previously certified voting system

Limited Functional Configuration Audit (FCA)

The FCA for this test campaign will include an assessment of the submitted modifications and will include inputs of both normal and abnormal data during test performance. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data. As part of the FCA, one primary and one general election will be executed to verify that each of the submitted modifications have been successfully implemented.

Hardware Testing

The hardware tests specified in the VVSG are divided into two categories: non-operating and operating. The non-operating tests apply to the elements of the system that are intended for use at poll site locations and are intended to simulate the storage and transport of equipment between the storage facility and the polling location. The Operating tests apply to the entire system, including hardware components that are used as part of the voting system telecommunications capability, and are intended to simulate conditions that the voting system may encounter during operation. Prior to and immediately following each required non-operating and operating test, the system shall be subjected to an operational status check.

The requirements in this section shall be tested and/or evaluated by personnel verified by Pro V&V to be qualified to perform the testing.

System Integration Test

The system integration tests will be performed to ensure the ClearVote 1.5 functions as a complete system. The system integration testing addresses the integration of the hardware and software. This testing focuses on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. During test performance, the system is configured as would be for normal field use.

Accuracy Test

An Accuracy Test will be performed to ensure the ClearVote 1.5 correctly captures, stores, consolidates, and reports the specific ballot selections, and absence of selections, for each ballot position. Due to the limited scope of testing, Accuracy testing will be performed on the ClearCount component only; results from the previous certification campaign will be used to satisfy this requirement for the unmodified system components.

Usability and Accessibility

The requirements in this section shall be tested during the Usability and Accessibility Testing. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The usability testing focuses on the usability of the system being tested. Usability is 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. In the context of voting,

the primary user is the voter, the product is the voting system, and the task is the correct recording of the voter ballot selections. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others, and the voter selections should be private. Accessibility evaluates the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B).

Security

During the security testing, the system shall be inspected for various controls and measure that are in place to meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

4.1.1 Rationale for 'Not Applicable' Requirements

All requirements that were excluded from the previous test campaign (ClearVote 1.4) were also deemed not applicable to this test campaign due to the submitted modifications not impacting the specific requirements.

4.2 Hardware Configuration and Design

The hardware configuration and design for the modification are unchanged from the baseline system. The ClearVote 1.5 Voting System is a paper-based voting system that consists of the following major components: ClearDesign, ClearAccess, ClearCast, and ClearCount. ClearVote is comprised of one proprietary hardware component (ClearCast) and two COTS hardware components (ClearCount) and (ClearAccess). All ClearDesign functions are managed by proprietary software running on COTS PCs/laptops/servers, which is excluded from hardware testing.

ClearCast – The ClearCast component will be subjected to the full suite of hardware and electrical testing required by the EAC 2005 VVSG as well as Usability, Security, Maintainability, Availability, Safety, and Accuracy Testing.

ClearAccess – The ClearAccess component will be subjected to the full suite of hardware and electrical testing required by the EAC 2005 VVSG as well as Usability, Security, Maintainability, Availability, and Accuracy Testing.

ClearCount – The ClearCount component is unmodified COTS equipment and is exempt from non-operational hardware testing. ClearCount was previously subjected to Temperature/Power Variation Testing in conjunction with the ClearCast and ClearAccess in addition to being utilized in functional and system level testing such as accuracy, volume and stress, and system integration during the test campaign, the results of which are contained in the final certification test report for the baselined system.

4.3 Software System Functions

The ClearVote 1.5 Election Management System (EMS) consists of a set of applications responsible for all pre-voting and post-voting activities used in election definition and management process. The ClearVote 1.5 EMS applications are as follows:

- ClearDesign
- ClearCount

4.4   Test Case Design

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

- Hardware qualitative examination design

- Hardware environmental test case design

- Software module test case design and data

- Software functional test case design

- System level test case design

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

Prior to execution of the required test cases, the system under test will undergo testing initialization. The testing initialization will seek to establish the baseline for testing and ensure that the testing candidate matches the expected testing candidate and that all equipment and supplies are present.
The following will be completed during the testing initialization:

- Ensure proper system of equipment. Check network connections, power cords, keys, etc.

- Check version numbers of (system) software and firmware on all components.

- Verify the presence of only the documented COTS.

- Ensure removable media is formatted and does not contain any data.

- Ensure batteries are fully charged.

- Inspect supplies and test decks.

- Record protective counter on all tabulators.

- Review physical security measures of all equipment.

- Record basic observations of the testing setup and review.

- Record serial numbers of equipment.

- Retain proof of version numbers.

4.4.1   Hardware Qualitative Examination Design

Previous hardware examinations were performed on the certified baseline system (ClearVote 1.4). The updates to the modified system (ClearVote 1.5) require the following hardware testing to be performed.

Electrical Tests:

- Electrical Power Disturbance – ClearCast, ClearAccess
- Electromagnetic Radiation – ClearCast, ClearAccess
- Electrostatic Disruption – ClearCast, ClearAccess
- Electromagnetic Susceptibility – ClearCast, ClearAccess
- Electrical Fast Transient – ClearCast, ClearAccess
- Lightning Surge – ClearCast, ClearAccess
- Conducted RF Immunity – ClearCast, ClearAccess
- Magnetic Fields Immunity – ClearCast, ClearAccess
- Electrical Supply – ClearCast, ClearAccess

Environmental Tests:

- Bench Handling – ClearCast, ClearAccess
- Vibration – ClearCast, ClearAccess
- Low Temperature – ClearCast, ClearAccess
- High Temperature – ClearCast, ClearAccess
- Humidity – ClearCast, ClearAccess
- Temperature Power Variation - ClearCast, ClearAccess
- Acoustic – ClearAccess
- Safety – ClearCast

4.4.2   Hardware Environmental Test Case Design

Previous hardware examinations were performed on the certified baseline system (ClearVote 1.4). The updates to the modified system (ClearVote 1.5) shall be subjected to the tests specified in Section 4.4.1. Testing will be performed by personnel verified by Pro V&V to be qualified to perform the test. Pro V&V will utilize NTS Longmont for the performance of the electrical and environmental tests. All pre/post-tests shall be conducted by Pro V&V personnel.

4.4.3   Software Module Test Case Design and Data

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

Component Level Testing will be implemented during the FCA for each component and subcomponent. During the Source Code Review and Compliance Builds, Pro V&V will utilize limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) will be utilized for the individual software components.

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

4.4.4   Software Functional Test Case Design and Data

Pro V&V shall review the manufacturer-submitted test plans and data to verify that the individual performance requirements specified in the EAC 2005 VVSG and the TDP are reflected in the software. As part of this process, Pro V&V shall review the manufacturer's test case design and prepare a detailed matrix of system functions and the test cases that exercise them. During this review, emphasis shall be placed on those functions where the manufacturer data on module development reflects significant debugging problems, and on functional tests that resulted in high error rates.

Pro V&V shall also prepare a test procedure describing all test ballots, operator procedures, and the data content of output reports. Pro V&V shall define abnormal input data and operator actions and then design test cases to verify that the system is able to handle and recover from these abnormal conditions. Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted. If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.5   System-Level Test Case Design

System Level testing will be implemented to evaluate the complete system. This testing will include all proprietary components (software, hardware, and peripherals) and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. For software system tests, the tests shall be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases shall be prepared independently to assess the response of the hardware and software to a range of conditions.

4.5   Security Functions

A complete security evaluation was performed on the baselined system. The evaluation of the baselined system was accomplished by utilizing a combination of documentation review, functional testing, source code review, automated network and vulnerability scanners, as well as manual inspection. Test cases were developed in an attempt to defeat the access controls and

security measures documented in the system TDP. During the execution of these test procedures, the physical, technical, and administrative security controls were evaluated to determine if the security posture of the system components meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process. Tests conducted verified that the security mechanisms specified in the TDP Security Specification were implemented and adequately protect the system. Administrative Security was tested by examining the system's documented security instructions and procedures for effectiveness and breadth. Logical Security was tested as part of FCA by conducting the following tests on system components: Vulnerability Scans, SCAP Scans, and Physical Bypass Attempts.

To meet the objectives of this test campaign, the modified components will be evaluated to determine the effectiveness of their physical security measures and to determine if the modification adversely impacted results from the baseline test campaign.

4.6 TDP Evaluation

In order to determine compliance of the modified TDP documents with the EAC 2005 VVSG, a limited TDP review shall be conducted. This review will focus on TDP documents that have been modified since the certification of the baseline system. The review will consist of a compliance review to determine if each regulatory, state, or manufacturer-stated requirement has been met based on the context of each requirement. Results of the review of each document will be entered on the TDP Review Checklist and reported to the manufacturer for disposition of any anomalies. This process will be ongoing until all anomalies are resolved. Any revised documents during the TDP review process will be compared with the previous document revision to determine changes made, and the document will be re-reviewed to determine whether subject requirements have been met.

A listing of all documents contained in the ClearVote 1.5 TDP is provided in Table 4-1.

Table 4-1. TDP Documents

Document Number	Description	Version
ClearVote Documents		
100101	ClearVote 1.5 Approved Parts List	1.1.8
100067	ClearVote 1.5 Ballot Stock and Printing Specification	1.0.10
100057	ClearVote 1.5 Configuration Management Plan	1.0.15
100069	ClearVote 1.5 Glossary	1.0.9
100058	ClearVote 1.5 Personnel Deployment and Training Plan	1.0.10
100059	ClearVote 1.5 Quality Assurance Program	1.0.11

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

Document Number	Description	Version
100086	ClearVote 1.5 Security Policy	1.0.11
100071	ClearVote 1.5 System Overview	1.0.14
100073	ClearVote 1.5 Test and Verification Specification	1.0.11
100128	ClearVote 1.5 Change Notes	1.0.8
ClearDesign Documents		
100011	ClearDesign 1.5 Acceptance Test Checklist	1.0.5
100062	ClearDesign 1.5 Administration Guide	1.0.8
100083	ClearDesign 1.5 Build Procedures	1.0.6
100103	ClearDesign 1.5 Database Specifications	1.0.5
100046	ClearDesign 1.5 Functionality Description	1.0.11
100098	ClearDesign 1.5 Hardware Specification	1.0.9
100063	ClearDesign 1.5 Installation Guide	1.0.21
100082	ClearDesign 1.5 Maintenance Guide	1.0.9
100045	ClearDesign 1.5 Security Specification	1.0.11
100072	ClearDesign 1.5 Software Design and Specification	1.0.16
100043	ClearDesign 1.5 System Overview	1.0.12
100041	ClearDesign 1.5 User Guide	2.0.7
100074	ClearDesign 1.5 System Identification Guide	1.0.14
ClearCount Documents		
100102	ClearCount 1.5 Acceptance Test Checklist	1.0.8
100009	ClearCount 1.5 Build Procedures	1.4.6
100005	ClearCount 1.5 Database Specification	1.0.7
100004	ClearCount 1.5 Election Administration Guide	1.0.16
100006	ClearCount 1.5 Election Preparation and Installation Guide	1.2.5
100021	ClearCount 1.5 Functionality Description	1.0.11
100022	ClearCount 1.5 Hardware Specification	1.0.11
100023	ClearCount 1.5 Maintenance Guide	1.0.12
100070	ClearCount 1.5 Reporting Guide	1.0.10
100013	ClearCount 1.5 Scanner Operator Guide	1.1.5
100026	ClearCount 1.5 Security Specification	1.0.11
100019	ClearCount 1.5 Software Design and Specification	1.0.12

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

Document Number	Description	Version
100024	ClearCount 1.5 System Operations Procedures	1.0.10
100025	ClearCount 1.5 System Overview	1.0.11
100130	ClearCount 1.5 Quick Guide XML Report Conversion Tool	---
100047	ClearCount 1.5 System Identification Guide	1.0.8
ClearCast Documents		
100095	ClearCast 1.5 Acceptance Test Checklist	1.2.5
100027	ClearCast 1.5 Poll Worker Quick Guide	---
100094	ClearCast 1.5 Build Procedures	1.2.2
100079	ClearCast 1.5 Functionality Description	1.5.1
100080	ClearCast 1.5 Installation Guide	1.3.2
100081	ClearCast 1.5 Hardware Specification	1.4.2
100089	ClearCast 1.5 Maintenance Guide	1.7
100090	ClearCast 1.5 Poll Worker Guide	1.6.3
100084	ClearCast 1.5 Security Specification	1.4.2
100093	ClearCast 1.5 Software Design and Specification	1.4.1
100100	ClearCast 1.5 Supervisor Guide	1.7.3
100078	ClearCast 1.5 System Overview	1.4.3
100097	ClearCast 1.5 System Identification Guide	1.0.4
ClearAccess Documents		
100109	ClearAccess 1.5 Acceptance Test Checklist	1.0.3
100051	ClearAccess 1.5 Build Procedures	1.1
100049	ClearAccess 1.5 Functionality Description	1.5.2
100085	ClearAccess 1.5 Hardware Specification	1.5
100053	ClearAccess 1.5 Installation Guide	1.6.5
100052	ClearAccess 1.5 Maintenance Guide	1.7
100054	ClearAccess 1.5 Poll Worker Guide	1.7.1
100035	ClearAccess Poll Worker Instructions (poster)	1.0
100033	ClearAccess Poll Worker Instructions-Multi Day Voting (poster)	1.0
10020	ClearAccess Simplified Voter Instructions (poster)	1.0
100050	ClearAccess 1.5 Security Specification	1.4.4
100099	ClearAccess 1.5 Software Design and Specification	1.4.3

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

Document Number	Description	Version
100055	ClearAccess 1.5 Supervisor Guide	1.7.3
100038	ClearAccess 1.5 System Identification Guide	1.1.2
100044	ClearAccess 1.5 System Overview	1.6
100056	ClearAccess 1.5 Voter Guide	1.1.2
100126	ClearAccess Hardware Compliance Addendum	N/A

4.7   Source Code Review

Pro V&V will review the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable:
(1) A review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

4.8   QA & CM System Review

The Clear Ballot Group Quality and Configuration Management Manuals shall be reviewed for their fulfillment of Volume I, Sections 8 and 9, and the requirements specified in Volume II, Section 2.

The requirements for these sections establish the quality assurance and configuration standards for voting systems to which manufacturers must conform and require voting system manufacturers to implement a quality assurance and configuration management program that is conformant with recognized ISO standards. As part of the review process, the Clear Ballot Group TDP documents will be reviewed to determine if the stated policies are being followed.

4.9   PCA

The physical configuration audit compares the voting system components submitted for qualification to the manufacturer's technical documentation, and shall include the following activities:

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

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

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

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

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

4.10   FCA

The functional configuration audit encompasses an examination of manufacturer's tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP.

In addition to functioning according to the manufacturer's documentation tests will be conducted to insure all applicable EAC 2005 VVSG requirements are met.

4.11   Accuracy

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

4.12   Volume & Stress

Tests to investigate the system's response to conditions that tend to overload the system's capacity to process, store, and report data. The test parameters will focus on the system's stated limits and the ballot logic for areas such as the maximum number of active voting positions, maximum number of ballot styles, maximum candidates, maximum contests, and stated limits within the EMS. This test will be utilized to ensure the system can achieve the manufacturer's TDP claims of what the system can support. Testing will be performed by exercising an election definition and test cases developed specifically to test for volume and stress conditions of the system being tested.

4.13   System Integration

System Level test for the integrated operation of both hardware and software. Compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment, shall be determined through functional tests integrating the voting system software with the remainder of the system.

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

Pro V&V personnel shall properly configure and test the system by following the procedures detailed in the ClearVote 1.5 voting system technical documentation.

5.0   TEST DATA

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

5.1 Data Recording

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

5.2 Test Data Criteria

The ClearVote 1.5 Voting System shall be evaluated against all applicable requirements contained in the EAC 2005 VVSG. The acceptable range for system performance and the expected results for each test case shall be derived from the manufacturer-submitted technical documentation and the EAC 2005 VVSG.

5.3 Test Data Reduction

Test data shall be processed and recorded in the test log book and the relevant Test Cases.

6.0 TEST PROCEDURE AND CONDITIONS

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

6.1 Facility Requirements

Unless otherwise annotated, all testing shall be conducted at the Pro V&V test facility located in Huntsville, AL, by personnel verified by Pro V&V to be qualified to perform the test.

Unless otherwise specified herein, testing shall be performed at the following standard ambient conditions and tolerances:

- Temperature: 68-75∘ F (±4∘F)
- Relative Humidity: Local Site Humidity
- Atmospheric Pressure: Local Site Pressure
- Time Allowable Tolerance: ±5%

Testing performed at third-party laboratories will be subject to the test parameters and tolerances defined by VVSG. If not specified in VVSG, the test facilities' standard parameters and tolerances will be used. These will be reported in the final Test Report.

6.2 Test Set-up

All voting system equipment shall be received and documented using Pro V&V proper QA procedures. Upon receipt of all hardware, an inspection will be performed to verify that the equipment received is free from obvious signs of damage and/or degradation that may have occurred during transit. If present, this damage shall be recorded, photographed, and reported to the Clear Ballot Group Representative. Additionally, a comparison shall be made between the recorded serial numbers/part numbers and those listed on shipper's manifest and any

discrepancies shall be reported to the Clear Ballot Group Representative. TDP items and all source code received shall be inventoried and maintained by Pro V&V during the test campaign.

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

6.3   Test Sequence

The ClearVote 1.5 Voting System will be evaluated against all applicable requirements in the EAC 2005 VVSG. There is no required sequence for test performance.

6.4   Test Operations Procedure

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

Pro V&V will evaluate every applicable EAC 2005 VVSG requirement. Any deficiencies noted will be reported to the EAC and the manufacturer. If it is determined that there is insufficient data to determine compliance, this test plan will be altered and additional testing will be performed.

APPENDIX A
PROJECT SCHEDULE

Task Name	Start Date	End Date	Assigned To	% Complete	Durat...	Predecessors	Status
− TDP	03/30/18	11/30/18		100%	172d		Complete
Initial Review	03/30/18	06/08/18	Alan	100%	50d		Complete
Compliance Review	06/11/18	10/15/18	Alan	100%	88d	2	Complete
Final review	10/16/18	11/30/18	Alan	100%	34d	3	Complete
− Test Plan	07/24/18	10/22/18		100%	64d		Complete
Test Plan Creation	07/24/18	08/03/18	Wendy	100%	9d		Complete
Vendor Review & Comments	08/06/18	08/31/18	Wendy	100%	20d	6	Complete
EAC Submission and Review	09/04/18	10/01/18	Wendy	100%	20d	7	Complete
EAC Comment Review & Update	10/02/18	10/08/18	Wendy	100%	5d	8	Complete
EAC Submission & Review of Revision	10/09/18	10/18/18	Wendy	100%	8d	9	Complete
EAC Approved Test Plan	10/19/18	10/22/18	Wendy	100%	2d	10	Complete
− Source Code	04/23/18	03/20/19		100%	234d		Complete
Automated Review	04/23/18	04/24/18	Jack	100%	2d		Complete
Source Code Review	04/25/18	05/14/18	Jack	100%	14d	13	Complete
Source Code Re-Review	05/15/18	05/17/18	Jack	100%	3d	14	Complete
Document Review	05/18/18	05/22/18	Jack	100%	3d	15	Complete
Compliance Build	09/03/18	03/20/19	Stephen	100%	143d		Complete
− System Delivery & Setup	04/16/18	09/21/18		100%	111d		Complete
PCA	04/16/18	09/21/18	Stephen	100%	111d		Complete
System Setup	04/23/18	09/21/18	Stephen	100%	106d		Complete
System Loads & Hardening	04/26/18	09/21/18	Stephen	100%	103d		Complete
− Hardware Testing	05/07/18	11/30/18		100%	146d		Complete
Electrical Testing	05/08/18	05/29/18	Stephen	100%	15d		Complete
Environmental Testing	05/07/18	05/25/18	Stephen	100%	15d		Complete
Temp Power	06/04/18	06/08/18	Stephen	100%	5d		Complete
Electrical Testing (ClearCast)	09/06/18	09/12/18	Stephen	100%	5d		Complete
Environmental Testing (ClearCast)	09/05/18	09/21/18	Stephen	100%	13d		Complete
Temp Power (ClearCast)	09/24/18	09/28/18	Stephen	100%	5d	27	Complete
Temp Power (ClearCast) 2nd test	10/22/18	10/26/18	Stephen	100%	5d		Complete
Electrical Supply	10/01/18	10/02/18	Stephen	100%	2d	28	Complete
Maintainability	10/03/18	10/04/18	Stephen	100%	2d	30	Complete

Task Name	Start Date	End Date	Assigned To	% Complete	Durat...	Predecessors	Status
Acoustic Testing	10/05/18	10/05/18	Stephen	100%	1d	31	Complete
Product Safety	09/04/18	11/30/18	Stephen	100%	64d		Complete
– System Level Testing	08/03/18	11/20/18		100%	77d		Complete
FCA	08/03/18	09/14/18	Stephen	100%	30d		Complete
Usability	09/17/18	09/18/18	Stephen	100%	2d	35	Complete
Accessibility	09/17/18	09/18/18	Stephen	100%	2d	35	Complete
Volume & Stress	09/19/18	09/24/18	Stephen	100%	4d	37	Complete
Accuracy	09/25/18	09/28/18	Stephen	100%	4d	38	Complete
FCA (ClearCast)	10/01/18	10/10/18	Stephen	100%	8d	39	Complete
Volume & Stress (ClearCast)	10/11/18	10/12/18	Stephen	100%	2d	40	Complete
Accuracy (ClearCast)	10/15/18	10/15/18	Stephen	100%	1d	41	Complete
Regression Testing	10/16/18	10/16/18	Stephen	100%	1d	42	Complete
Trusted Build	11/09/18	11/12/18	Jack	100%	2d		Complete
System Loads & Hardening	11/13/18	11/14/18	Stephen	100%	2d	44	Complete
Security (inlcude SCAP)	10/15/18	10/19/18	Stephen	100%	5d		Complete
System Integration	11/15/18	11/20/18	Stephen	100%	4d	45	Complete
– Test Report	11/19/18	01/22/19		24%	47d		In Progress
Test Report Creation	11/19/18	11/29/18	Wendy	100%	9d		Complete
Vendor Review & Comments	11/30/18	12/03/18	Wendy	100%	2d		Complete
EAC Submission & Review	12/05/18	01/01/19	Wendy	0%	20d		In Progress
EAC Comment Review & Update	01/03/19	01/07/19	Wendy	0%	3d		Not Started
EAC Submission & Review of Revision	01/08/19	01/21/19	Wendy	0%	10d	52	Not Started
EAC Approved Test Report	01/22/19	01/22/19	Wendy	0%	1d	53	Not Started