Test Report for State Certification Testing
Clear Ballot Group ClearVote 2.1 Voting System

Version: 00 (Initial Release)

Date: 02/05/2020

SIGNATURES

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REVISIONS

Revision	Description	Date
00	Initial Release	02/05/2020

1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform state certification testing of the Clear Ballot Group ClearVote 2.1 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, as well as multiple state specific requirements.

1.1 Scope

The scope of this testing event will incorporate a sufficient spectrum of physical and functional tests to verify that certain ClearVote 2.1 features and applications, which have been modified from the previously EAC-certified baseline system, conform to the applicable EAC 2005 VVSG 1.0, and multiple state-specific requirements. To evaluate the test requirements, each section of the EAC 2005 VVSG was analyzed, along with the along with all state specific requirements, to determine the applicable tests.

Specifically, the testing event has the following goals:

- Verify that the ClearVote 2.1 System meets the applicable state-specific requirements for voting systems.

- Evaluate the ClearVote 2.1 System to the applicable requirements of the EAC 2005 VVSG *(Note: Testing was performed per the EAC 2005 VVSG, which encompasses the requirements for the evaluation of voting systems set forth in the FEC 2002 VSS; therefore, systems tested to the EAC 2005 VVSG will satisfy the requirements of the FEC 2002 VSS, which is required in some states).*

- Ensure the ClearVote 2.1 System provides support for all identified state-specific election management requirements (i.e., ballot design, results reporting, recounts, etc.).

- Simulate pre-election, Election Day, absentee, recounts, and postelection activities on the ClearVote 2.1 System and corresponding components of the EMS.

- Source Code Review, Compliance Builds, and Build Documentation Review

- Physical Configuration Audit (PCA), including System Loads and Hardening

- Functional Configuration Audit (FCA)

- System Integration Testing, including Accuracy Testing and Regression Testing

- Security Testing

Clear Ballot Group has identified the following modifications from the baseline system:

ClearDesign

- Enhancements:

  — The string "::Preview::" has changed to "Report" in the margin headers when printing reports.

  — ClearDesign now invalidates card layouts when the controlling contest for straight-party voting changes.

  — The controlling contest for straight-party voting now displays only the parties of candidates which appear on that individual ballot.

  — This release introduces a function that backs up and then clears the election logs.

  — ClearDesign truncates all empty tables when importing data to reset the IDs.

- Code-maintenance upgrades

- Fixed Defects:

  — You can now directly change the value of the Straight-Party Type field from Exclusive to One Touch. Previously, if the value of the Straight-Party field was Exclusive, you had to change it to another value before changing it to One Touch.

  — Bulleted and numbered lists in ballot elements, such as headers and contests, now appear the same on the screen and in print. Previously, lists appeared differently on the screen and in print.

  — The entity styles for Choice: Candidates no longer override the entity styles for Voter Groups.

  — The PrecinctReportingName and PrecinctName fields now export in the appropriate order in the ballot definition file (BDF).

  — Cards now filter correctly by ballot set for vote centers when you create a BDF.

  — ClearDesign has fixed the issue that prevented a user from changing a header type when the header was assigned to a specific ballot set.

ClearAccess

- Enhancements:

  — Conditional straight-party voting—only parties that have a candidate represented on a given ballot style are represented in the straight-party contest.

- Fixed defects

  — The Back button now works correctly on the Select Vote Center screen.

  — Previously, when you were logged in as an Election Administrator, a Change Vote Center button appeared on the No Election Loaded screen. Clicking this button did not accomplish anything. This button no longer appears.

  — In the System Log for ClearAccess, the header cell **Valid** has changed to **Validated**. This column describes the validation status of the transaction, which is one of the following:

    o Validated
    o Invalid HMAC
    o Error: *text describing the error*

  — Previously, ClearAccess read write-in names with no space between the write-in and the colon. This release has fixed this issue.

ClearCount

- Enhancements:

  — For straight-party contests, jurisdictions can set up ballots that list only the candidates who have a specified party affiliation. This feature is called *conditional straight-party voting* (SPV).

    o Reports correctly list the vote totals by style for straight-party contests. Reports indicate that a party does not have an oval by showing 0 votes for that party.

    o The Card Resolutions tool no longer allows users to show parties that do not have party ovals on a particular ballot style.

    o The XML output reflects these changes. If a style or geography does not have a vote oval for a party, the XML indicates 0 votes for that party.

― Allow manually resolved ovals to show on the Vote Visualization page:

　　o Users can now toggle between showing automatically adjudicated ovals, manually adjudicated ovals, or both.

　　o A border with a dashed line indicates a manually resolved oval.

― The Card Resolutions tool contains the following enhancements:

　　o Visual indicators enable users to differentiate between implicit and explicit votes in the Card Resolutions tool and Vote Visualization tool. This change affects both primary preference and straight-party contests.

　　o When a user saves a card in the Card Resolutions tool and no ovals have changed, ClearCount displays a message. This message has changed.

　　o When a user reopens a card in the Card Resolutions tool that was visually resolved as Multiple, the Card Resolutions tool shows how the card was resolved.

　　o Users can deselect an implicitly overridden choice.

― Add support for write-in name assignment:

　　o A new database table was added to support write-in names.

　　o All contests with write-ins have a default 'Invalid' write-in name.

　　o This release implements a back end for the contests with write-ins filter.

　　o There is a new Contents with Write-ins report that lists all contests that have write-in candidates and the total number of write-ins, assigned write-ins, and unassigned write-ins. Users access this page from the report menu.

　　o There is a new Write-in Candidates by Contest report page that lists all the write-in candidates, their number of assignments, and total votes.

　　o The Election Log records when write-in candidate names are added, changed, deleted and when assignments are made.

　　o There is a new Write-in Assignments tool that displays the write-in images and allows the user to assign the write-in image to a write-in name. Users access this page by using the hyperlink values on the Contents with Write-ins report.

— ClearCount no longer uses Flash. Menus that previously used Flash look different, but retain all previous options.

— ClearCount switched from the 'c' compile twain library to the pytwain library.

— ClearCount no longer supports Firefox.

— Unused precinct variables have been removed from the XML generation code.

— This release has moved the option for exporting an XML file from the election reports menu to the Election Administration page.

— In the Election Administration area, this release now offers the option for customers to upload their own XSLT file and use that file to export custom results based on that XSLT format.

— If you try to import an XSLT file without specifying a filename on the Election Administration area, ClearCount displays the following message: ERROR. No XSLT supplied.

— Cast Vote Record (CVR) now uses the ChoiceName and no longer uses the ChoiceShortName.

— The browser versions shipped with ClearCount have been updated.

- Fixed defects

  — In Google Chrome, Print Table for long reports is now larger to improve readability.

  — In Google Chrome, the bottom line of drop-down list was previously missing in the Allow Display of Vote Totals dialog. This issue is fixed.

  — With single-row cross-endorsement, when the bottom choice in the Card Resolutions tool wrapped, the height of Contest Editor previously did not adjust correctly. This issue is fixed.

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)", 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

- 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 2.1 documents submitted for this test campaign is listed in Section 4.6 of this Test Plan)*

1.2 Terms and Abbreviations

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

"ADA" – Americans with Disabilities Act 1990

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"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

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RFI" – Request for Interpretation

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

1.3   Background

Clear Ballot Group ("CBG") initiated the certification of the ClearVote 2.1 Voting System by submitting state requirements checklists and corresponding documentation and information. This submission was deemed complete and in abundant detail to warrant state certification testing. Pro V&V was then contracted to perform the required testing.

2.0   TESTING OVERVIEW

The evaluation of the ClearVote 2.1 Voting System incorporated a sufficient spectrum of physical and functional tests to verify that the modified system conformed 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, as well as multiple state-specific requirements. The evaluation successfully addressed each of the following test goals in the manner described in the table below:

Table 2-1: Testing Overview

Test Goal	Testing Response
Verify that the ClearVote 2.1 System meets the applicable state-specific requirements for voting systems	This was tested by evaluating the ClearVote 2.1 System to identified state-specific requirements for voting systems.

Table 2-1: Testing Overview *(continued)*

Test Goal	Testing Response
Evaluate the ClearVote 2.1 System to the applicable requirements of the EAC 2005 VVSG	All modifications were evaluated to the applicable requirements of the EAC 2005 VVSG.
Ensure the ClearVote 2.1 System provides support for all identified state-specific election management requirements (i.e., ballot design, results reporting, recounts, etc.)	This was tested by evaluating the ClearVote 2.1 System to specific election scenarios using a combination of different ballot programming approaches, ballot designs, ballot sizes, languages, and tabulators.
Simulate pre-election, Election Day, absentee, recounts, and postelection activities on the ClearVote 2.1 System and corresponding components of the EMS	The components of the ClearVote 2.1 System were tested in pre-election, Election Day, postelection and recount situations and evaluated against documented behavior and expected results for all scenarios.
Source Code Review, Compliance Builds, and Build Documentation Review	Trusted Builds were generated during the test campaign. The source code submitted by CBG was reviewed and successfully built using the submitted COTS and third-party software products. Additionally, build documentation was reviewed.
Physical Configuration Audit (PCA), including System Loads and Hardening	A PCA was performed to compare the voting system components and materials submitted for testing against the manufacturer's technical documentation to ensure everything was in agreement and correct.
Functional Configuration Audit (FCA)	FCA regression testing was performed on all submitted modifications to the baselined system.
System Integration Testing, including Accuracy Testing and Regression Testing	The components of the ClearVote 2.1 System were tested to address the integration of hardware and software. This testing focused on the compatibility of the voting system software components and subsystems with one another and with other voting system components.
Security Testing	The security assessment consisted of an administrative and physical security review.

2.1 Test Candidate

The following sections contain a product description and an overview of the design methodology of the ClearVote 2.1 Voting System, as taken from the Clear Ballot Group technical documentation.

2.1 System Overview

The ClearVote 2.1 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 reporting), 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 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 the ClearDesign software and hosting its election database and the web server that serves its election reports.

- DesignStation(s): One or more laptop or desktop computers 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.

- Network Switch: Used to connect the DesignStations to the DesignServer using a wired, closed Ethernet.

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 scanners. The ClearCount central-count 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.

- Network Switch: 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 network switch. This station can serve multiple uses: user administration, election administration, adjudication, and reporting.

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 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 images 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 browser-based 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.

ClearAccess

ClearAccess is an accessible touchscreen ballot marking device (BMD) used for the creation of paper ballots that can be scanned and tabulated by ClearCount. The ClearAccess software runs

on unmodified COTS laptop computers / tablets running a Windows operating system and supports specific models of accessible input devices.

2.2   Block Diagrams

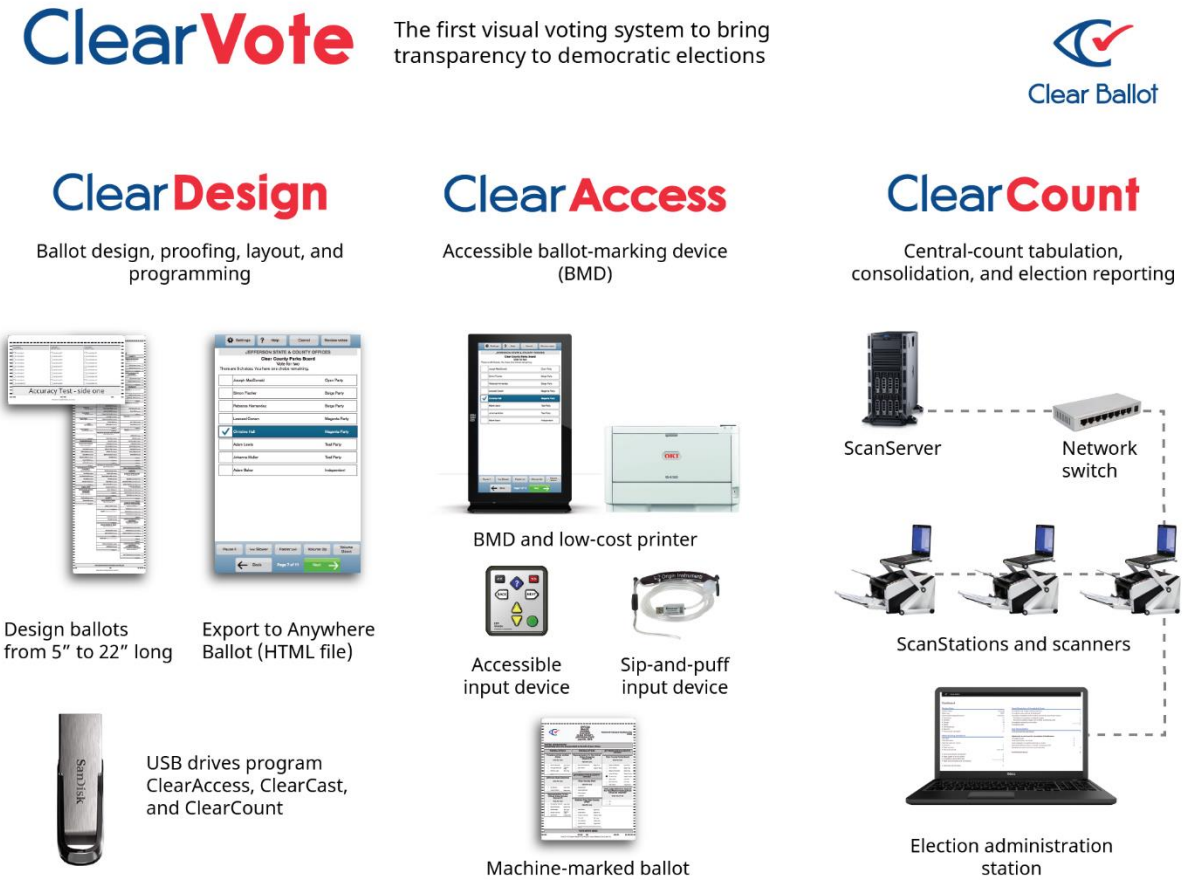The system overview of the submitted voting system is depicted in Figures 1-1 and 1-2.
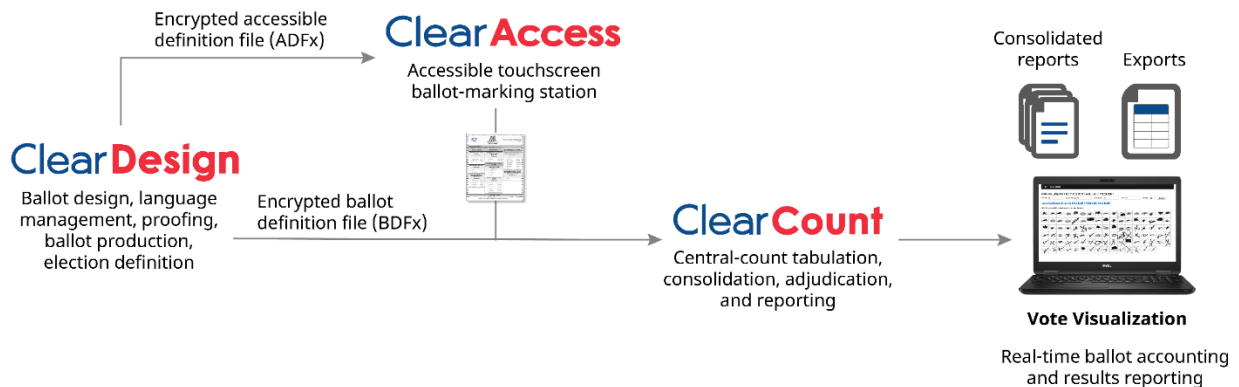

Figure 1-1. ClearVote 2.1 product family

Figure 1-2. ClearVote 2.1 component relationship

2.3 Test Configuration

The testing event utilized one setup of the ClearVote 2.1 System and its components. The following is a breakdown of the ClearVote 2.1 System components and configurations for the test setup:

Standard Testing Platform:

The standard testing platform consisted of one ClearVote 2.1 System in a standalone configuration. In the pre-election phase of testing, ballots were created utilizing ClearDesign, the EMS component of the ClearVote 2.1 System. Ballot styles were then imported into ClearAccess for ballot marking. Once ballots were marked and the polls were closed, ballot reconciliation procedures were performed and the ballots were tabulated by ClearCount, the central count tabulation and reporting component of the ClearVote 2.1 System.

3.0 MATERIALS REQUIRED FOR TESTING

The materials required for testing of the ClearVote 2.1 Voting System included all materials to enable the test campaign to occur. This included 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 provided by the manufacturer as part of the test campaign. The individual components are compiled to create the ClearVote 2.1 Voting System.

Table 3-1. ClearVote 2.1 Voting System Software

Firmware/Software	Version
ClearDesign Components, Version 2.1.0	
Windows	10 Pro 1607
Google Chrome	79.0.3945.79
Ubuntu	18.04.1 LTS
MySQL	5.7.28
Apache	2.4.18
libapache2-mod-fcgid	2.3.9
PhantomJS	1.9.8
Unzip	6.0.21
Samba	4.7.6
Python PIP	9.0.1
Zip	3.0.11
Pyinstaller	3.2.1
Python JSMIN	2.2.1
Python	2.7.17
Python webpy	0.38
Python MySQL DB	1.3.10
SQLAlchemy	1.3.3
Python Pillow	5.1.0
Python Flup	1.0.2
Python DBUtils	1.3
Python XLRD	1.2.0
Python FontTools library	3.41.0
Python RTF	0.2.1
OpenSSL (FIPS)	2.0.10
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	2.2.4
jquery-impromptu	6.2.3
jquery-qrcode	1.0
jquery-splitter	0.27.1
jquery-ui	1.12.1

Table 3-1. ClearVote 2.1 Voting System Software *(continued)*

Firmware/Software	Version
jscolor	1.4.2
tinymce	4.1.9
libmp3lame	0.5.0
jszip	3.2.0
papaparse	4.6.0
jsmin	12/4/2003
ClearAccess Components, Version 2.1.0	
Windows	10 Pro 1607
Google Chrome	78.0.3904.108
nsis	3.01
PyInstaller	3.2
Python	2.7.10
webpy	0.38
Python-future	0.15.2
pefile	2018.8.8
pywin	223
jquery	1.10.2
DataTables	1.10.16
jsmin	2003-12-04
Zebra scanner driver	3.04.0011
ClearCount Components, Version 2.1.3	
Windows	10 Pro 1607
Google Chrome	79.0.3945.79
Ubuntu	18.04.1 LTS
Apache	2.4.29
libapache2-mod-fcgid	2.3.9
Python(part of Ubuntu)	2.7.17
MySQLdb (part of Ubuntu)	5.7.29
PyInstaller	3.2.1
PollyReports	1.7.6
python-lxml	4.2.1-1ubuntu0.1
DataTable-Buttons	1.5.6
DataTable-Buttons-JSZip	2.5.0
DataTable-Buttons-Pdfmake	0.1.36
OpenSSL	1.1.0g
OpenSSL FIPS Object Module	2.0.10
JavaScript Bootstrap library	2.3.2

Table 3-1. ClearVote 2.1 Voting System Software *(continued)*

Firmware/Software	Version
JavaScript Chosen library	1.8.7
JavaScript jQuery library	1.10.2
J JavaScript jQuery-migrate library	1.2.1
JavaScript DataTables library	1.10.18
JavaScript FixedHeader library	3.1.4
JavaScript hotkeys library	0.8
JavaScript tooltip library	1.3
JavaScript pep library	1.0
JavaScript LESS library	1.3.3
Fujitsu fi-6400/fi-7800	PaperStream 1.30.0
Fujitsu fi-6800/fi-7900	PaperStream 10.10.710
Fujitsu fi-7180	PaperStream 1.4.0
Aptitude	0.8.10-6ubuntu1
auditd	2.8.2
debconf	1.5.66
pmount	0.9.23
Samba	4.7.6
udisks2	2.7.6
xserver-xorg-core	1.19.6
xinit	1.3.4
lightdm	1.26.0
xfce4	4.12.4
menu	2.1.47
menu-xdg	0.5
xubuntu-default-settings	18.04.6
xfce4-whiskermenu-plugin	2.1.5
xfce4-terminal	0.8.7.4
leafpad	0.8.18.1
exfat-fuse	1.2.8
exfat-utils	1.2.8
openssh-server	7.6p
screen	4.6.2
rsync	3.1.2
zip	3.0.11
unzip	6.0.21

3.2   Equipment

For COTS equipment, every effort was made to verify that the COTS equipment has not been modified for use. This was accomplished by performing research using the COTS equipment manufacturers' websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel evaluated 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 was compared to the system information found on each machine. Physical external and internal examinations were also performed when the equipment was easily accessible without the possibility of damage. Hard drives, RAM memory, and other components were examined to verify that the components matched the information found on the COTS equipment manufacturers' websites.

Table 3-2. ClearVote 2.1 Voting System Equipment

Component	Model	Serial Number
ClearDesign Components		
Dell Latitude Laptop (client)	5580, 5590, 5500	CF3L3G2, B5TD1N2, 3C3M9Y2
Dell OptiPlex (client)	7440, XE3 SFF	JXDFHH2
Dell Precision Tower (client)	T3620	GSKRMV2 & GSKSMN2
Dell PowerEdge Server (server)	T130, T140, T440, R440, T630	5G0YLN2, 8BFH3W2, H6JZLN2, GCHLHL2
Dell 27-inch Monitor	P2717H and P2719H	CWKZRS2 3MK2RS2
Dell 22-inch Monitor	P2217H and P2219H	FV8C8W2 DLV88W2
Cisco 8-Port Switch	SG250-08-K9-NA	PSZ21451MLJ
LG DVD Burner	GP65NB60	LG-DVD-001
Anker 10 port USB 3.0 Hub	AK-68ANHUB-B10A	22XGHFWC, 22XGHGKX
SySTOR Multiple USB Duplicator	SYS-USBD-11	ES-27095
Corsair Flash Padlock 3 32 GB	CMFPLA3B-32GB	N/A
SanDisk Extreme Go 64 GB USB	SDCZ800-064G-G46	N/A
SanDisk Ultra Flair 32 GB USB	SDCZ73-032G-A46, SDCZ73-032G-G46	N/A
ClearAccess Components		
ELO 15 inch AIO	E-Series (ESY15E2)	L17C014810 & A18C004080
Dell OptiPlex AIO	5250	HCGMGK2
Oki Data Laser Printer	B432dn	AK5B007647A0 & AK91021454C0

Table 3-2. ClearVote 2.1 Voting System Equipment *(continued)*

Component	Model	Serial Number
ELO 20 inch AIO	X-Series (ESY20X2)	D18Q000334, D18Q000335, B18Q001601, B18Q001599 & B18Q000597
Oki Data Laser Printer	B432dn-B	AK8C017016C0, AK8C017022C0
Dell Inspiron 15"	7573	80S1YD2
Clear Ballot Transport Case	CV-1022-2.0	Case-001
Clear Ballot UPS Transport Case	CV-1157-2.0	UPS-Case-001
Micrologic Tray Kit	B432TrayKit	CBG-MTK-001
Zebra Technologies Bar Code Scanner and cable	DS457-SR, CBL-58926-05	18059000501984, 18059000501981, 18095000500487, 18095000500491
Storm EZ Access Keypad	EZ-08-22201, EZ-08-22200	15000005, 20010073
Origin Instruments Sip/Puff Breeze with Headset	AC-0300-MU	CBG-SP-001, 002, 003
Samson Over-Ear Stereo Headphones	SASR350	SR350J8G390 & SR350J8G396
Clear Ballot Privacy Screen	CB-1097-1.5	CBG-PVS-001
Ergotron Neo-Flex	33-329-085	N/A
Corsair Flash Padlock 3 32 GB	CMFPLA3B-32GB	N/A
SanDisk Extreme Go 64 GB USB	SDCZ800-064G-G46	N/A
SanDisk Ultra Flair 32 GB USB	SDCZ73-032G-A46, SDCZ73-032G-G46	N/A
Wurth	742-711-32, 742-712-22, 742-717-22	FRT021 through FRT025
Polyamide Film Tape 1" 2 mil	CV-1210-2.0	N/A
Polyamide Film Tape 2" 2 mil	CV-1211-2.0	N/A
Polyamide Film Tape 4" 2 mil	CV-1212-2.0	N/A
APC Smart-UPS	SMT2200C	AS1809160852
Lifetime 4-Foot Folding Table	4428	FT-001
LG DVD Burner	GP65NB60	LG-DVD-002
CyberPower Smart App UPS	PR1500RT2U	PY3HZ2002933, PY3HZ2003000
ClearCount Components		
Dell Latitude Laptops (ScanStation)	5580, 5590, 5500	2F3L3G2, 9W5D1N2, JV3WXY2
Dell Precision Tower (Election Administration)	T3620	GSKQMN2

Table 3-2. ClearVote 2.1 Voting System Equipment *(continued)*

Component	Model	Serial Number
Dell Latitude Laptops (Election Administration)	5580, 5590, 5500	C9S22G2, 5M5D1N2
Dell PowerEdge Server (ScanServer)	T130, T140, T330, T440, R440	5G0ZLN2, 8BFJ3W2, FHV9RD2, H6J5MN2, 55FDB03
Dell OptiPlex (Election Administration)	7440, XE3 SFF	JXDFHH2, 93XDB03
Fujitsu Scanner	fi-7180	A20DC10302 & A20D000798
Fujitsu Scanner	fi-6800	A9HCA00737 & A9HCC00543
Fujitsu Scanner	fi-6400	AKHCC00362 & AKHCC00609
Fujitsu Scanner	fi-7800	C39C000034
Fujitsu Scanner	Fi-7900	C30C000270
LG DVD Burner	GP65NB60	LG-DVD-003
Western Digital 4 TB External HD	WDBFJK0040HBK-NESN, WDBBGB0040HBK-NESN	WCC7K7YF11ZD
Western Digital 8 TB External HD	WDBFJK0080HBK-NESN, WDBBGB0080HBK-NESN	75H4PXJD
Netac Keypad Encryption Portable Hard Disk	K390 (86024554)	R4JT22619T
Dell 27 inch Monitor	P2717H and P2719H	CWKZRS2 3MK2RS2
Dell 22 inch Monitor	P2217H and P2219H	7818672, FV8C8W2 DLV88W2
Cisco 8-Port Switch	SG250-08-K9-NA	PSZ21451MYX
Cisco 26-Port Switch	SG250-26-K9-NA	DNI203400A6 & DNI203400AW
Corsair Flash Padlock 3 32 GB	CMFPLA3B-32GB	N/A
SanDisk Extreme Go 64 GB USB	SDCZ800-064G-G46	N/A
SanDisk Ultra Flair 32 GB USB	SDCZ73-032G-A46, SDCZ73-032G-G46	N/A
Anker USB Hub	AK-68ANHUB-B10A	22XGHFWC, 22XGHGKX
APC Smart-UPS	SMT-1500C	3S1831X12280
WorkEZ Executive Scanning Shelf	WEEs (661799222990), WEEb (661799222983)	CBG-EZ-001, 002,003, & 004
StarTech 4-Port VGA KVM Switch w/Hub	SV431USB	G73011TG80247

Table 3-2. ClearVote 2.1 Voting System Equipment *(continued)*

Component	Model	Serial Number
Brother Laser Printer	HL-L2340DW	U63879M4N62861
Brother Laser Printer	HL-L2350DW	U6496A8N238333

3.3   Technical Data Package

A listing of all documents contained in the ClearVote 2.1 TDP is provided in Table 3-3.

Table 3-3. TDP Documents

Document Number	Description	Version
ClearVote Documents		
100101-10017	ClearVote 2.1 Approved Parts List	1.2.1
100067-10017	ClearVote 2.1 Ballot Stock and Printing Specification	1.0.12
100057-10017	ClearVote 2.1 Configuration Management Plan	1.0.17
100128-10017	ClearVote 2.1 Change Notes	1.0.2
100069-10017	ClearVote 2.1 Glossary	1.0.11
100058-10017	ClearVote 2.1 Personnel Deployment and Training Plan	1.0.12
100059-10017	ClearVote 2.1 Quality Assurance Program	1.0.13
100086-10017	ClearVote 2.1 Security Policy	1.0.13
100071-10017	ClearVote 2.1 System Overview	1.1.1
Document Number	**Description**	**Version**
100073-10017	ClearVote 2.1 Test and Verification Specification	1.0.13
ClearDesign Documents		
100011-10017	ClearDesign 2.1 Acceptance Test Checklist	1.0.7
100133-10017	ClearDesign 2.1 Accessible Definition File Guide	1.0.1
100062-10017	ClearDesign 2.1 Administration Guide	1.0.10
100131-10017	ClearDesign 2.1 Ballot Definition File Guide	1.0.1
100083-10017	ClearDesign 2.1 Build Procedures	1.0.8
100103-10017	ClearDesign 2.1 Database Specification	1.0.7
100046-10017	ClearDesign 2.1 Functionality Description	1.0.13
100098-10017	ClearDesign 2.1 Hardware Specification	1.0.11
100063-10017	ClearDesign 2.1 Installation Guide	1.0.24
100082-10017	ClearDesign 2.1 Maintenance Guide	1.0.11

Table 3-3. TDP Documents *(continued)*

Document Number	Description	Version
100045-10017	ClearDesign 2.1 Security Specification	1.0.13
100072-10017	ClearDesign 2.1 Software and Design Specification	1.0.19
100074-10017	ClearDesign 2.1 System Identification Guide	1.2
100043-10017	ClearDesign 2.1 System Overview	1.0.15
100041-10017	ClearDesign 2.1 User Guide	2.0.12
	ClearCount Documents	
100102-10017	ClearCount 2.1 Acceptance Test Checklist	1.0.11
100009-10017	ClearCount 2.1 Build Procedures	1.6.3
100005-10017	ClearCount 2.1 Database Specification	1.1
100004-10017	ClearCount 2.1 Election Administration Guide	1.0.18
100006-10017	ClearCount 2.1 Election Preparation and Installation Guide	1.2.11
100021-10017	ClearCount 2.1 Functionality Description	1.0.13
100022-10017	ClearCount 2.1 Hardware Specification	1.0.13
100023-10017	ClearCount 2.1 Maintenance Guide	1.0.14
100130-10017	ClearCount 2.1 Quick Guide XML Report Conversion Tool	---
100070-10017	ClearCount 2.1 Reporting Guide	1.1.1
100013-10017	ClearCount 2.1 Scanner Operator Guide	1.1.7
100026-10017	ClearCount 2.1 Security Specification	1.0.13
100019-10017	ClearCount 2.1 Software Design and Specification	1.0.14
100047-10017	ClearCount 2.1 System Identification Guide	1.2
100024-10017	ClearCount 2.1 System Operations Procedures	1.0.12
100025-10017	ClearCount 2.1 System Overview	1.0.13
	ClearAccess Documents	
100109-10017	ClearAccess 2.1 Acceptance Test Checklist	1.1.2
100051-10017	ClearAccess 2.1 Build Procedures	1.1.2
100049-10017	ClearAccess 2.1 Functionality Description	1.5.4
100126-10017	ClearAccess 2.1 Hardware Compliance Addendum	---
100085-10017	ClearAccess 2.1 Hardware Specification	1.5.2
100053-10017	ClearAccess 2.1 Installation Guide	1.7.6
100052-10017	ClearAccess 2.1 Maintenance Guide	1.8.2

Table 3-3. TDP Documents *(continued)*

Document Number	Description	Version
100054-10017	ClearAccess 2.1 Poll Worker Guide	1.8.3
100050-10017	ClearAccess 2.1 Security Specification	1.4.8
100099-10017	ClearAccess 2.1 Software Design and Specification	1.5.2
100055-10017	ClearAccess 2.1 Supervisor Guide	1.8.3
100038-10016	ClearAccess 2.1 System Identification Guide	1.3
100044-10017	ClearAccess 2.1 System Overview	1.6.5
100056-10017	ClearAccess 2.1 Voter Guide	1.1.5

3.4 Test Support Materials

The following materials were supplied by Clear Ballot to facilitate testing:

- USB Flash Drives, 32 and 64 GB capacity

- Test Decks

- Power Cords

- Ballot Paper, 60-pound cover or 90-pound index or similar paper for results reports

- Labels

- Other materials and equipment as required

4.0 TEST PROCESS AND RESULTS

Certification testing of the Clear Ballot Group ClearVote 2.1 Voting System submitted for evaluation was performed to verify that the ClearVote 2.1 System conforms to the State of Colorado Requirements. When provided, each state-specific requirement matrix was used as a guide to determine the specific tests to be performed.

All testing was conducted under the guidance of Pro V&V by personnel verified by Pro V&V to be qualified to perform the testing. The examination was performed at the Pro V&V, Inc. test facility located in Huntsville, AL.

4.1 Test Cases/Procedures

To verify that the system met the applicable requirements, Pro V&V utilized baseline test cases augmented with supplemental test cases designed specifically for the system being evaluated in this test campaign.

Prior to execution of the required test procedures, the system under test was subjected to testing initialization. The testing initialization established the baseline for testing and ensured that the testing candidate matched the expected testing candidate and that all equipment and supplies were present.

The following was 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 clean.

- 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.

The evaluation areas for this test engagement are summarized in the subsections below.

4.2 Test Results

The procedures that were utilized during the test engagement and the results obtained are summarized in the following paragraphs. During the evaluation, the test team made observations of general system behavior.

Source Code Review/Compliance Build – A source code review was performed in order to review the submitted source code to the specific requirements. Both manual and automated review techniques were used per EAC approved procedures. The Source Code Review included a Compliance Build of the submitted source code. To perform the Compliance Build, CBG-

submitted source code, COTS, and third-party software products were inspected and combined to create the executable code. Additionally, during the performance of the Compliance Build, the build documentation was reviewed.

Summary Findings:

At the conclusion of the Source Code Review, compliant source code was available for performance of the Trusted Build process. During execution of the Trusted Build, the source code submitted by Clear Ballot Group and reviewed by PRO V&V was successfully built using the submitted COTS and third-party software products, and the reviewed build documentation.

Functional Configuration Audit (FCA) – The FCA verifies the system meets the applicable state-specific requirements for voting systems as well as the applicable requirements of the EAC 2005 VVSG. During this area of testing, the specific functionality of the modified system under evaluation that is claimed by the manufacturer in their supplied change notes and scope was targeted to ensure the product functions as documented. This testing used both positive and negative test data to test the robustness of the system.

Regression testing was performed on all system components to verify that all functional and/or firmware modifications made during the test campaign did not adversely affect the system and its operation.

Summary Findings:

To perform the FCA, the modifications were evaluated against baseline test cases supplemented with specifically designed test cases. The FCA testing included verification of the submitted modifications detailed in the change notes. Two deficiencies were noted during the performance of the FCA. These deficiencies were addressed before completion of the test.

During execution of the test procedure, it was verified that the ClearVote 2.1 System successfully completed the functional tests with all actual results obtained during test execution matching the expected results.

System Integration – System level certification tests were performed to address the integration of the hardware and software. This testing focused 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 was configured as would be for normal field use.

Successful completion of system integration testing ensures the system provides support for all identified state-specific election management requirements (i.e., ballot design, results reporting, recounts, etc.). This is accomplished by simulating pre-election, Election Day, absentee, recounts, and postelection activities on the voting system and corresponding components of the EMS.

<u>Summary Findings:</u>

One General Election and One Primary Election were successfully exercised on the System, as described below:

One general election with the following breakdowns:

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

One primary election with the following breakdowns:

― Primary Election PRIM-02: Open Primary Election held in two precincts. This election contained thirteen contests compiled into three ballot styles. One contest is in all three ballot styles; all other contests are independent.

The ClearVote 2.1 System successfully passed the System Integration Test. During execution of the test procedure, it was verified that the ClearVote 2.1 System successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

<u>Accuracy</u> – The accuracy test ensured that each component of the system could 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 Systems, such as the ClearVote 2.1 System, the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests, and the conversion of those selections detected on the paper ballot converted into digital data. In an effort to achieve this and to verify the proper functionality of the units under test, the following methods were used to test components of the System:

The accuracy requirements for the ClearCount system were met by the execution of the standard accuracy test utilizing ClearAccess produced ballots. For the accuracy test, voting sessions were started using manual session activation.

The ClearCount system was tested by utilizing premarked ballots to achieve accuracy rate greater than 1,549,703 correct ballot positions.

<u>Summary Findings</u>

The ClearVote 2.1 System under test successfully passed the accuracy test. No functional issues were noted during the execution of this test and all results were imported, tabulated, and validated via the ClearCount reporting function.

Physical Configuration Audit (PCA) – The PCA compares the voting system components submitted for testing to the manufacturer's technical documentation. The PCA includes 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 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 software baseline

- Review the 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 ClearVote 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.

Security – The objective of the security testing was to evaluate the effectiveness of the System in detecting, preventing, recording, reporting, and recovering from security threats and to determine the overall security posture of each system component. During the execution of these test procedures, physical 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 System; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief;

identifying fraudulent or erroneous changes to the System; and protecting the secrecy in the voting process.

<u>Summary Findings</u>

Pro V&V performed a review of the submitted modifications and determined that test results from previous test campaigns would be used as a baseline and the focus of security testing for the ClearVote 2.1 system would be the physical and administrative security of the system. Physical Security was tested by setting up the system as described in the TDP and then examining the effectiveness and comprehensiveness of physical security measures. Administrative Security was tested by examining the system's documented security instructions and procedures for effectiveness and breadth.

4.3   Issues and Resolutions

Any problems that occurred during test performance that required a resolution from Clear Ballot Group was considered to be an issue. Any issues encountered were logged throughout the test campaign into the Pro V&V tracking system (Mantis) for disposition and resolution. In each instance, if applicable, the resolutions were verified to be resolved through all required means of testing (regression testing, source code review, and TDP update) as needed. Table 4.1 details the noted issues and their resolutions.

Table 4-1. Noted Issues

ID#	Test Category	Issue	Resolution
496	Functional Configuration Audit	When the scanner update script was executed, it was unable to correctly determine the scanner model and serial number. As a result, the scanner was unable to be used during testing.	Clear Ballot Group supplied a TwainDSM.dll file and instructions for installing it on the ScanStation laptop. This file allowed the Update Scanner script to properly obtain the Model and Serial Number from the scanner.
497	Functional Configuration Audit	The ClearCount Reporting module was unable to generate Results Report and Results export files from the ClearCount 2.1.2 application.	This issue was due to the fact that the lxml library, which was required by functionality added in ClearCount 2.1.2, was not present in the software build environment when the software build was performed. Adding the lxml library to the software environment, and rebuilding the software addressed the issue. This issue was addressed in ClearCount 2.1.3.

5.0 CONDITIONS OF SATISFACTION

The ClearVote 2.1 voting system was evaluated against the applicable EAC 2005 VVSG requirements and the identified state-specific requirements. Throughout this test campaign, Pro V&V executed tests, inspected resultant data and performed technical documentation reviews to ensure that each applicable requirement was met.

6.0 TEST FINDINGS

Based on the results obtained during the test campaign, Pro V&V determines that the ClearVote 2.1 System, as presented for evaluation, meets the applicable EAC 2005 VVSG requirements and the identified state specific requirements.