Elections Division
Office of the Secretary of State

Report of the Secretary of State on the Examination of:

Clear Ballot Group Clear Vote 2.2 Voting System

January 2022

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Overview

Application

On October 13, 2021, Clear Ballot Group, Inc. completed the vendor application for voting system certification and the ClearVote 2.2. Copies of operating and maintenance manuals, training materials, technical and operational specifications were provided.

Modification of Certified Voting System

The EAC Certified System that is the baseline for the submitted modification is the ClearVote 2.0 System. Detailed descriptions of the ClearVote 2.0 test campaign are contained in Pro V&V Report TR-CBT-004-02.03 which is available for viewing on the EAC's website at www.eac.gov.

The ClearVote 2.2 Voting System is a digital-based optical scan voting system consisting of the following major components: ClearDesign (ballot design and EMS), Clear Access (accessible voting and ballot marking device), ClearCast (precinct count and tabulation), and ClearCount (central count, tabulation, and election reporting).

National Certification

ClearVote 2.2 received EAC Certification on December 23, 2021.

Hardware & Software

The ScanServer computer hosts the primary database and the ClearCount server and client software that recognizes and analyzes ballots. It can be a desktop or laptop computer. Minimum requirements include:

- 4-core, 8-thread processor
- At least 8 GB of RAM
- At least 500-1 TB of disk space
- Gigabit LAN connection
- USB 3.0 ports for backing up databases on external hard drives

When a jurisdiction installs or updates a ClearCount product, the installer program replaces the ScanServer computer's operating system with Linux. Therefore, the operating system originally installed on the ScanServer computer is unimportant.

A desktop or laptop computer enabled with a USB 2.0 or later port that can successfully run the listed software is required for use in ScanStation. One computer is needed for each scanner in concurrent use.

Table 4-1. ClearVote 2.2

Firmware/Software	Version
ClearDesign Components, Version 2.2.4	
Windows	10 Pro 1607
Google Chrome	87.0.4280.141
Ubuntu	18.04.5
MySQL	5.7.31
Apache	2.4.29
libapache2-mod-fcgid	2.3.9-1
PhantomJS	1.9.8
Unzip	6.0.21

Firmware/Software	Version
Samba	4.7.6
Python PIP	9.0.1
Zip	3.0.11
Pyinstaller	3.2.1
Python JSMIN	2.2.1
Python	2.7.15
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	3.4.1
Python RTF	0.2.1
OpenSSL (FIPS)	2.0.10
OpenSSL	1.1.1
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
jscolor	1.4.2
tinymce	4.1.9
jslibmp3lame	0.5.0

jszip	3.2.0
paparser	4.6.0
jsmin	4.6

ClearAccess Components, Version 2.2.2

Windows	10 Pro 1607
Google Chrome	93.0.4577.63

Firmware/Software	***Version***
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	2019-10-30
Zebra scanner driver	3.07.0004
EloPOS driver pack	12/5/2019
pyserial	3.2.1

ClearCast Components, Version 2.2.9

Ubuntu	18.04.5 LTS
chromium-browser	92.0.4515.159
pyinstaller	3.2.1
openssl-fips	2.0.10
openssl	1.0.2g
libScanAPI.a	2.0.0.0
DataTables	1.10.16
JTSage DateBox	4.0.0
jQuery.NumPad	1.4
jQuery	1.12.4
jquery.ui	1.11.3

ClearCast Go Components, Version 2.2.a

Ubuntu	18.04.6 LTS
Linux kernel	5.4.52
U-boot	2020.10
rk3399_loader	1.24.126
rk3399_bl31	1.35
trust_merger	1.0 (2015-06-15)
boot_merger	1.31
Rk3399_ddr-800MHz	1.25
Rk3399_miniloader	1.26

rkdeveloptool	1.2
chromium-browser	92.0.4515.159

Firmware/Software	***Version***
libssl	1.0_1.0.2n
openssl	1.0.0_1.0.2n
libScanAPI.a	1.0.0.1
DataTables	1.10.16
JTSage DateBox	4.0.0
jQuery.NumPad	1.4
jQuery	1.12.4
jquery.ui	1.11.3

ClearCount Components, Version 2.2.4

Windows	10 Pro 1607
Google Chrome	87.0.4280.141
Ubuntu	18.04.5 LTS
sqlalchemy	1.3.4
six	1.15.0
Python-dateutil	2.8.1
Apache	2.4.29
libapache2-mod-fcgid	2.3.9-1
Python(part of Ubuntu)	2.7.15~rcl-1
MySQLdb (part of Ubuntu)	5.7.31
PyInstaller	3.2.1
PollyReports	1.7.6
OpenSSL	1.1.1
OpenSSL FIPS Object Module	2.0.10
JavaScript Bootstrap library	2.3.2, & 4.3.1
JavaScript Chosen library	1.8.7
JavaScript jQuery library	1.10.2J
J JavaScript jQuery-migrate library	1.2.1
JavaScript jQuery hotkeys library	0.8
JavaScript jQuery tooltip library	1.3
JavaScript jQuery splliter library	0.28.3
JavaScript DataTables library	1.10.18
JavaScript DataTables Buttons	1.5.6
JavaScript DataTables Buttons ColVis Library	1.0.8
JavaScript DataTables Buttons html5 library	1.3.3
JavaScript DataTables FixedHeader library	3.1.4
JavaScript DataTables pdfmaker library	0.1.36

JavaScript vue library	2.6.10

Firmware/Software	***Version***
JavaScript bootstrap-vue library	2.0.2
Fujitsu fi-6400	PaperStream IP (TWAIN) 2.10.3
Fujitsu fi-6800	PaperStream IP (TWAIN) 2.10.3
Fujitsu fi-7180	PaperStream IP (TWAIN) 2.10.3
Fujitsu fi-7800	PaperStream IP (TWAIN) 2.10.3
Fujitsu fi-7900	PaperStream IP (TWAIN) 2.10.3
auditd	2.8.2-1
debconf	1.5.66
pmount	0.9.23
Samba	4.7.6
udisks	2.7.6

Component	***Model***	***Serial Number***
ClearAccess Components		
ELO 15 inch EloPOS	EPS15E3	J193011873
ELO 15 inch AIO	E-Series (ESY15E2)	A18C004080
Dell OptiPlex AIO	5250	HCGMGK2
ELO 20 inch AIO	X-Series (ESY20X2)	D18Q000334
Dell Inspiron 15”	7573	80S1YD2
Oki Data Laser Printer	B432dn	AK5B007647A0 & AK91021454C0
Zebra Technologies Bar Code Scanner	DS457-SR	18059000501984
Storm EZ Access Keypad	EZ08-22201	15000005, 15000007, 15020478
Storm EZ Access Keypad	EZ08-22000	20010073
Origin Instruments Sip/Puff Breeze with Headset	AC-0313-MUV, AC-0300-MU	CBG-SP-001, 002, 003
Samson Over-Ear Stereo Headphones	SASR350	SR350J8G390 & SR350J8G396
Monoprice Over the Ear Pro Headphones	8323	CBG-mono-001, 002, 003
Hamilton Buhl Over-Ear Stereo Headphones	HA7	CBG-HP-001 & CBG-HP-002
Ergotron Neo-Flex	Widescreen Lift Stand	33-329-085
Wearson LCD Stand	Adjustable LCD Monitor Stand	WS-03A
Corsair Flash Padlock 3 32 GB	Secure USB 3.0 Flash Drive	CMFPLA3B-32GB
Corsair Flash Voyager GTX	3.1 USB Drive	CMFVYGTX3C-128GB

Kingston Data Traveler Elite G2	3.0 USB Drive	DTEG2/64GB
SanDisk Extreme Go 64 GB USB	3.0 USB Drive	SDCZ800-064G-G46
SanDisk Extreme Pro 64 GB USB	3.0 USB Drive	SDCZ880-128G-G46
SanDisk Ultra Flair 32 GB USB	3.0 USB Drive	SDCZ73-032G-A46, SDCZ73-032G-G46
CyberPower Smart App UPS	PR1500RT2U	PY3HZ2002933, PY3HZ2003000
APC Smart-UPS	SMT2200	AS1602232215
ClearCount Components		
Dell PowerEdge Server (ScanServer)	T130, T140, T330, T440, R440	5G0ZLN2, 8BFJ3W2, FHV9RD2, H6J5MN2, 55FDB03

Component	***Model***	***Serial Number***
Lenovo ThinkServer (ScanServer)	TS140	MJ0472UV
Dell Precision Tower (Election Administration)	T3620	GSKQMN2
Dell OptiPlex (Election Administration)	7440, XE3 SFF	JXDFHH2, 93YDB03
Dell Latitude Laptop (ScanStation)	5580, 5590, 5500, 5511	2F3L3G2, 5M5DIN2, 35YL9Y2, 13KWY33
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
SanDisk Extreme Go 64 GB USB	3.0 USB Drive	SDCZ800-064G-G46
SanDisk Extreme Pro 64 GB USB	3.0 USB Drive	SDCZ880-128G-G46
SanDisk Ultra Flair 32 GB USB	3.0 USB Drive	SDCZ73-032G-A46, SDCZ73-032G-G46
CyberPower Smart App UPS	PR1500RT2U	PY3HZ2002933, PY3HZ2003000
Cisco 8-Port Switch	SG250-08	PSZ21451MYX
Cisco Catalyst 8-Port Switch	C1000-8T-2G-L	PSZ240319T3
Cisco 24-Port Switch	C1000-24T-4X-L	FCW2417A0E6
NetGear 8-Port Switch	FVS318G	40F266BA00280

TP-LINK 4-Port Switch	TL-R600VPN	2157090000334
Cisco 26-Port Switch	SG250-26	DNI203400A6 & DNI203400AW
TRENDNet 8-Port Switch	TEG-S80G	C217Z28001195
Corsair Flash Padlock 3 32 GB	Secure USB 3.0 Flash Drive	CMFPLA3B-32GB
Corsair Flash Voyager GTX	3.1 USB Drive	CMFVYGTX3C-128GB
Kingston Data Traveler Elite G2	3.0 USB Drive	DTEG2/64GB
APC Smart-UPS	SMT-1500C	3S1831X12280
ClearCast Components		
ClearCast	Model D Revision 4	CCD041903778, CCD041904024
ClearCast Go	Model E Revision 5	CCER0401004, CCER0401006
Corsair Flash Padlock 3 32 GB	Secure USB 3.0 Flash Drive	CMFPLA3B-32GB

Component	**Model**	**Serial Number**
Corsair Flash Voyager GTX	3.1 USB Drive	CMFVYGTX3C-128GB
Kingston Data Traveler Elite G2	3.0 USB Drive	DTEG2/64GB
SanDisk Extreme Go 64 GB USB	3.0 USB Drive	SDCZ800-064G-G46
SanDisk Extreme Pro 64 GB USB	3.0 USB Drive	SDCZ880-128G-G46
SanDisk Ultra Flair 32 GB USB	3.0 USB Drive	SDCZ73-032G-A46, SDCZ73-032G-G46
Ballot Bag	CV-1032-1.5, CV-1032-2.0	bag001, bag002
Ballot Box	CV-1033-1.5, CV-1033-2.0	box001, box002

Testing & Inspection

Testing and evaluation of ClearVote 2.2 was conducted at the Elections Division in Olympia, WA on January 19, 2022. Examining the system for the Office of the Secretary of State was Paul Raines and Kelly Moselage, C&T/SOC Specialist, and Jeff Records, Security Operations Center.

Due to ClearVote 2.2 going through Voting System Test Laboratory (VSTL) testing and submitted to the EAC for National Certification, a two-phase testing program was developed and approved by Secretary of State staff for state certification testing.

Delivery acceptance testing of the equipment and software to determine if the correct model and versions of the equipment and software are delivered and that the equipment, software and system operate as documented by the vendor.

Election Results Testing to ensure that the equipment, software, and system perform each of the functions required by federal, state and local law in order to administer an election from the beginning to the end.

Executive Summary of Findings by Secretary of State Staff

Voting System Accuracy

ClearVote 2.2 successfully and accurately tabulated all ballots including manually voted ballots from the accessible voting units. Results were manually audited and reviewed.

Results Reporting

ClearVote 2.2 was able to produce the state required reports for election results by precinct and cumulative. Performance improvements made to this version of ClearVote allow for the generation of those reports much faster than before. That is especially important for elections with many districts and many candidates such as King County.

Presidential Primary

ClearVote 2.2 can perform all the functions necessary to comply with current state requirements for the Presidential Primary. It can detect cross-party voting in a Presidential Primary without manual intervention.

Change Note Highlights

ClearDesign 2.2.4

All BDF and ADF files are now automatically encrypted in this version, identified by the "x" at the end of the files. Clear Design now assigns a unique election identifier, the "Election Ballot Code," to the BDFx, ADFx, and the code channel at the back of ballots for a specific election, which ensures that ballots from a previous election will be rejected by the system. The code channel printed on the back of the ballot contains that value encoded in binary form as the right most 21 bits of the ID marks.

The system now supports multiple languages on the same ballot.

This release ensures that cryptographic functions are using the FIPS compliant libraries.

ClearAccess 2.2.2

The accessible ballot marking device now comes in a rolling hard box rather than just the tabletop version. The commercial-off-the-shelf (COTS) touchscreen has been upgraded to Elo's newest hardware model.

This model has disabled wireless hardware. Based on the Test report from Pro V&V the findings and data provided from the Radiated Emissions Testing within the specified ranges, Pro V&V, to the best of its knowledge, did not note any evidence of transmission for either intended or unintended communication during the test event. This was found to be consistent for all components under test, which were tested in their certified and hardened configuration. It shall be noted some components did have Wi-Fi and Bluetooth hardware present; however, this capability was disabled during the hardening process. It is recommended that all fielded and future components be physically examined to ensure they are configured in the certified and hardened state prior to operating within an election event.

ClearCount 2.2.4

The ClearCount Election Results XML file now contains a breakdown of ballots cast in each precinct per party. ClearCount reports in PDF format now show the number of precincts reporting at the contest level.

The COTS laptops for ClearCount's CountStation and ScanStation have been upgraded to Dell's newest hardware model.

This release validates that all cryptographic functions, including simple hashes, use the FIPS certified cryptographic library.

Executive Summary of Findings of Secretary of State Staff

System Security

ClearDesign and ClearCount require a server that stores the election data. That connection to the server is via a HTTPS connection through a VPN router capable of IP/MAC/Domain name filtering and other high security features. This is ideal for completely locking down the internal network in large counties.

All laptops and computers will be hardened to restrict only 'approved' applications to be opened on each workstation along with securing and protecting other important areas of that workstation.

The ClearAccess devices will come with a bezel that will cover and protect the exposed ports and only expose those require for accessibility and power. Those ports can be protected via a tamper evident seal when not in use.

All software and media has an easy to view hash value that will ensure that the device's software has not changed since its last install. Additional system and election event logs can be accessed to view any activity on that device. Furthermore, users can be given roles or credentials that limit their ability to perform any action on the system.

When ClearBallot products start up, they check that the cryptographic module is operating in FIPS mode. If not, the produce displays an error message and will not proceed.

Physical Security

An excerpt from Clear Ballot's security recommendations is:

When the components of the ClearCount system are not in use, they must be stored in a locked area under the custody and control of the jurisdiction. Access to this area must be controlled by the jurisdiction so the system cannot be accessed by unauthorized individuals and so that any breaches in security can be recognized through the auditing functions of the system.

When in storage or in use, the ClearCount system must be kept within a controlled area where only individuals authorized by the jurisdiction to handle and process ballots or maintain the voting system can come into direct contact with the ballots or components of the system. Each jurisdiction must also follow all jurisdictional and state rules for the handling and processing of ballots in addition to this Clear Ballot procedure. This means that at least one security method is employed to provide deterrence and physical security:

- Receptionists or guards with a gate or other barrier to the scanning area.
- Security cameras.
- Electronic door locking mechanisms such as ID cards or key fobs that record the identity of the device used or person to unlock the door.
- A locking computer rack or other cabinet to contain components of the ClearCount system.

Accessible Voting

ClearAccess has an accessible voting unit that is touchscreen, can be used with the provided accessible switches or the voter's sip-n-puff or other USB assistive device. Once the voter has completed voting, their ballot is printed onto regular ballot paper. Depending on the county's procedures and in compliance with all other state elections law, the voter could then put their ballot into a return envelope and put into a ballot drop box and processed with all other ballots returned by mail or in drop boxes. The vote is not captured electronically so this device **is not** a direct recording electronic (DRE) voting unit so this device does not need to be audited separately. The votes on ClearAccess will be a part of the post-election audit as the ballots can be mixed in with all other ballots.

Ballot Processing

ClearCount is a central, high-speed, digital 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. Only Fujitsu scanners were tested at the lab. King County uses IBML scanners. The state will coordinate with King County to complete state certification testing.

The ClearCount central-count system running on an Ubuntu Linux operating system, with Ethernet connections to workstations running the Windows operating system consists of the physical components listed below. All the components are unmodified COTS that are connected via a wired, closed, and isolated network not connected to any other systems or the Internet.

Write-Ins

ClearVote 2.2 allows for entering write-in candidates after results have been enabled. Write-in candidates do not have to be on a qualified or declared list prior to ballot processing.

System Limitations

The system limits that CBG has stated to be supported by the ClearVote 2.2 Voting System are listed in the tables below.

Table 2-2. 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 2.2 Voting System were verified to be as follows:

Table 2-3. 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 2-4. System Limits for ClearCount Scanner Model	**Sustained (not burst speed) ballots per hour**					
8.5x5	8.5x11	8.5x14	8.5x17	8.5x19	8.5x22	Typical county size (central count)
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)
fi-7800	5364	5028	3842	3556	3136	1566 Large (>100k voters)
fi-7900	6746	5635	4129	3926	3175	3108 Large (>100k voters)

ClearCount can have a maximum of 10 ScanStation/Scanner pairs.

Conclusion

After an evaluation of the system, Paul Raines and Kelly Moselage, Certification and Training Specialists, and Jeff Records, Security Operation Center Lead, believe the system and its components meet current Washington State requirements for Presidential Primary, Special, Primary, and General Elections as well as security, accuracy, and transparency.