



Test Report

**Dominion Voting Systems
Democracy Suite (D-Suite) System
Version 5.5-CS
State Certification Testing**

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1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to evaluate the Dominion Democracy Suite (D-Suite) 5.5-CS 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.

1.1 References

The documents listed below were utilized in the development of this Test Report:

- Election Assistance Commission (EAC) 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, “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, Version 7.0
- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)
- EAC Notices of Clarification (NOC) (listed on www.eac.gov)
- Dominion Voting Systems D-Suite 5.5-CS (State Level) Testing Campaign Scope
- Dominion Voting Systems Technical Data Package (A listing of the D-Suite 5.5-CS documents submitted for this test campaign is listed in Section 3.3 of this Test Report)
- Pro V&V Report No.TR-01-01-DVS-38-01.01, Rev. 01

1.2 Terms and Abbreviations

The terms and abbreviations applicable to the development of this Test Report are listed below:

- “BMD” – Ballot Marking Device
- “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
- “ICC” – ImageCast Central
- “ICE” – ImageCast Evolution
- “ICX” – ImageCast X
- “ICP” – ImageCast Precinct
- “PCOS” – Precinct Count Optical Scan
- “ISO” – International Organization for Standardization
- “NOC” – Notice of Clarification
- “QA” – Quality Assurance
- “RFI” – Request for Interpretation
- “VSTL” – Voting System Test Laboratory
- “VVSG” – Voluntary Voting System Guidelines

1.3 Background

The D-Suite 5.5-CS system is a modification baselined from the current EAC-certified D-Suite 5.5-C system configuration. The D-Suite 5.5-C system was granted certification to the 2005 Voluntary Voting System Guidelines (VVSG) by the Election Assistance Commission (EAC) on July 9, 2020. Detailed descriptions of the D-Suite 5.5-C test campaign are contained in Pro V&V Report No. TR-01-01-DVS-38-01.01, Rev. 01, which is available for viewing on the EAC’s website at www.eac.gov.

The Democracy Suite 5.5-CS Voting System is a paper-based optical scan voting system consisting of the following major components:

- Election Management System (EMS)
- Adjudication
- ImageCast Central (ICC) optical ballot scanner
- ImageCast Precinct (ICP, ICP-A, and ICP BMD Audio) precinct count tabulator
- ImageCast Precinct (ICP2) precinct count tabulator
- ImageCast X (ICX) BMD ballot marking device
- ImageCast Voter Activation (ICVA)
- Image Cast Evolution (ICE)
- ImageCast X (ICX) DRE

1.4 Scope

Pro V&V performed an analysis of the D-Suite 5.5-C system configuration to determine the scope of testing required to verify successful implementation of all submitted state-level features. The scope of the test campaign included tests designed to verify that features included in D-Suite 5.5-CS that were not part of the previously certified system conform to the applicable EAC 2005 VVSG 1.0 requirements. The submitted modifications are listed below:

1. ICP BMD Audio to provide a printed ballot when using the Audio/ATI interface on the ICP unit using standard voting.
2. Modem transmission of election results from ICP units via the following methods:
 - a. PCOS cellular modeming.
 - b. PCOS analog modeming.
 - c. RTM.
3. Modem transmission of election results from ICE units via the following methods:
 - a. PCOS cellular modeming.
 - b. PCOS analog modeming.

- c. RTM.
4. Modem transmission of election results from ICP2 units via the following methods:
 - a. PCOS cellular modeming.
 - b. PCOS analog modeming
 - c. RTM
5. Modem receiving of elections through the following methods:
 - a. USB analog modem RAS configuration with ImageCast Listener and RTR (for use with the PCOS analog modems).
6. ImageCast Listener and RTR (for use with the PCOS cellular modems and RTM).

Based on evaluation of the baselined system, Pro V&V determined that the tests listed below would be required to verify successful system implementation of all modifications.

- Technical Data Package (TDP) Review

A limited TDP Review was performed to ensure that all submitted modifications were 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 was based on the source code changes made since the previous system was certified. Build document review was performed to ensure that all required equipment and software were current during the building process. A compliance build was created after the reviews. Once the integrity of the compliance build was verified, the trusted build was created.

- Physical Configuration Audit (PCA)

A PCA was performed to compare the voting system submitted for certification testing to the manufacturer's technical documentation.

- System Level Testing, including Regression Testing

System Level Testing included the Functional Configuration Audit (FCA) and System Integration tests. The FCA for this test campaign included an assessment of the submitted modifications and tests designed to verify that the modifications were implemented as intended and did not adversely affect system performance. The System Integration tests were performed to ensure the D-Suite 5.5-CS functioned as a complete system.

- Telecommunications Testing

Modem transmission of election results was verified from ICP, ICP2, and ICE via PCOS cellular modeming, PCOS analog modeming, and RTM. Modem receiving of elections was verified through USB analog modem RAS configuration with ImageCast Listener and RTR and also through ImageCast Listener and RTR.

- Usability Testing

The ICP BMD Audio was subjected to Usability testing to evaluate that the applicable usability requirements set forth in the EAC 2005 VVSG 1.0 were met.

- Electrical Supply

The ICP BMD Audio was subjected to an electrical supply test in accordance with the EAC 2005 VVSG 1.0.

2.0 TESTING OVERVIEW

The evaluation of the D-Suite 5.5-CS System was designed to evaluate the voting system to the requirements set forth for voting systems in the EAC 2005 VVSG. The goals were constructed to verify that certain D-Suite 5.5-CS features and applications, which have been modified from the previously tested system, conform to the applicable EAC 2005 VVSG 1.0 requirements. The evaluation addressed each of the following test goals in the following manner:

Table 2-1: Testing Overview

Test Goal	Testing Response
Perform TDP Modification Review	A cursory review of the modified documents was performed to ensure that adequate system information exists.
Perform PCA & Receipt Inspection	A PCA and Receipt Inspection were 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.
Usability Testing	The ICP BMD Audio was subjected to Usability testing to evaluate that the applicable usability requirements set forth in the EAC 2005 VVSG 1.0 were met

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

Test Goal	Testing Response
Perform Source Code Review, Compliance/Trusted Builds, and Documentation Review	Trusted Builds were generated during the test campaign. The source code submitted by Dominion was reviewed by Pro V&V and was successfully built using the submitted COTS and third party software products. Additionally, build documentation was reviewed.
Verified that the D-Suite 5.5-CS meets the applicable requirements of the EAC 2005 VVSG 1.0.	Testing evaluated the D-Suite 5.5-CS system to election scenarios using a combination of different ballot programming approaches, ballot designs, ballot sizes, languages, and tabulators.
Electrical Supply	The ICP BMD Audio was subjected to an electrical supply test in accordance with the EAC 2005 VVSG 1.0
Perform System Setup, Loads, and Hardening	The system setup, loads, and hardening was tested by comparing the voting system submitted for certification testing to the manufacturer's technical documentation.
Simulate election activities on the D-Suite 5.5-CS during Functional Configuration Audit (FCA)	The D-Suite 5.5-CS system was tested in pre-election, Election Day, post-election and evaluated against documented behavior and expected results for all scenarios.
Perform FCA Regression Testing	FCA functional regression testing was performed on all submitted modifications to the baselined system.
System Integration Testing	The D-Suite 5.5-CS was tested 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 voting system components.

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

Test Goal	Testing Response
Verify modem transmission and receiving.	Modem transmission of election results was verified from ICE, ICP, and ICP2 via PCOS cellular modeming, PCOS analog modeming, and RTM. Modem receiving of elections was verified through USB analog modem RAS configuration with ImageCast Listener and RTR for PCOS analog modeming and also through ImageCast Listener and RTR for PCOS cellular modeming and RTM.

2.1 Test Candidate

The D-Suite 5.5-CS Voting System is a paper-based optical scan voting system. The D-Suite 5.5-CS consists of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP and ICP2), the ImageCast X (ICX) DRE w/ Reports Printer, ImageCast X (ICX) DRE w/VVPAT, the ImageCast Evolution (ICE), and the ImageCast X (ICX) BMD.

Election Management System (EMS)

The Democracy Suite 5.5-CS EMS consists of various components running as either a front-end/client application or as a back-end/server application. A listing of the complete applications and a brief description of each is presented below.

- **EMS Adjudication:** Represents the client component responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators and adjudication of write-in selections from ImageCast X and ImageCast Central tabulators. This client component is installed on both the server and the client machines. *(Note: The EMS Adjudication feature is optional)*
- **EMS Audio Studio:** A client application that represents an end-user helper application used to record audio files for a given election project. As such, it is utilized during the pre-voting phase of the election cycle.
- **EMS Election Data Translator:** End-user application used to export election data from election project and import election data into election project.
- **EMS Election Event Designer:** A client application that integrates election definition functionality together with ballot styling capabilities and represents a main pre-voting phase end-user application.
- **EMS Results Tally and Reporting:** A client application that integrates election results acquisition, validation, tabulation, reporting, and publishing capabilities and represents the main post-voting phase end-user application.

- ImageCast Voter Activation (ICVA): Application installed on a workstation or laptop at the polling place that allows the poll workers to program smart cards for voters.
- EMS Adjudication Service: Represents a server side application which provides ballot information such as contests, candidates and their coordinates from EMS to the Adjudication application.
- EMS Application Server: Represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files, etc.
- EMS Database Server: Represents a server side RDBMS repository of the election project database which holds all the election project data, including pre-voting and post-voting data.
- EMS Data Center Manager: A server application that represents a system level configuration application used in EMS back-end data center configuration.
- EMS File System Service: A back-end application that acts as a stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards, reading raw partition on ICP CF card, etc.
- EMS NAS Server: Represents a server side file repository of the election project file based artifacts, such as ballots, audio files, reports, log files, election files, etc.
- SmartCard Helper Service: A service that is installed on a workstation for laptop at the polling place, and provides required data format for programming smart cards of ImageCast devices, or, for jurisdiction's voting registration system in case of integration.
- ImageCast Listener Server: Set of server and client components, responsible for the authentication, verification and validation of the results transmitted via wireless for the ImageCast Precinct 2 tabulator during the election.
- Results Transfer Manager: Client application for the secure transmission of results cartridges transmitted remotely to the ImageCast Listener server.

ImageCast Central (ICC) Count Scanner

The ICC is a high-speed, central ballot scan tabulator based on Commercial off the Shelf (COTS) hardware, coupled with the custom-made ballot processing application software. It is used for high speed scanning and counting of paper ballots.

ImageCast X (ICX)

The Democracy Suite ImageCast X (ICX) consists exclusively of COTS available hardware and operating system, while the applications installed on top customize its behavior to turn it into a Ballot Marking Device (BMD) or a Direct-Recording Electronic (DRE) device with or without a Voter Verifiable Paper Audit Trail (VVPAT). ICX application is the application that verifies voter's session eligibility, using the smart card and then presents the appropriate ballot to the voter.

When a voter is satisfied with choices selected, ICX application verifies them and produces an Electronic Mobile Ballot or stores the votes onto a memory device. The ICX is designed to perform the following functions:

- Ballot marking and printing of electronic mobile ballots (in BMD mode)
- Ballot review and second chance voting
- Accessible voting and ballot marking
- Saving voting results (in DRE mode)
- Printing votes on a voter verifiable paper audit trail device (when VVPAT is in use)

ImageCast Precinct (ICP)

The ImageCast Precinct (ICP) device is a precinct optical scan ballot counter designed to provide three major functionalities: ballot scanning and tabulation, accessible voting, and ballot review and second chance voting. The ICP is used in conjunction with ImageCast compatible ballot storage boxes. The system is designed to scan marked paper ballots printed on standard or secure paper stock, interpret voter marks on the paper ballot, and safely store and tabulate each vote from each paper ballot. The ICP also supports enhanced accessibility voting through optional accessories connected to the ImageCast unit.

ImageCast Precinct (ICP2)

The ImageCast Precinct (ICP2) device is a precinct-based optical scan ballot counter designed to provide two major functionalities: ballot scanning and tabulation and ballot review and second chance voting. The ICP2 is used in conjunction with ImageCast compatible ballot storage boxes. The system is designed to scan marked paper ballots printed on standard or secure paper stock, interpret voter marks on the paper ballot, and safely store and tabulate each vote from each paper ballot.

Second Chance voting refers to scenarios in which an error has been detected on the voter's paper ballot (e.g., blank ballot, undervoted ballot, overvoted ballot, misread ballot, cross-over voted ballot), and the ICP2 notifies the voter by displaying a message or providing an audio visual cue, that one of these situations has been detected, and offers the voter an opportunity to reject and fix their ballot, or to cast the ballot as-is.

The Ballot Review feature allows a voter to review their vote selections using a visual representation, which displays to the voter a complete listing of all contests contained on the ballot and an indication of the results which will be recorded for each contest once the voter's ballot is cast.

The Tabulation of paper ballots cast by voters is performed when the polls are closed on the ICP2 unit and the unit tabulates the results, generates results files for aggregation into RTR, and prints a results report containing the results of the ballots cast.

For poll worker functions the ICP2 contains a small touch-screen LCD to allow the poll worker to initiate polling place activities, diagnostics and reports.

ImageCast Evolution (ICE)

The ICE device is a precinct-level optical scan ballot counter designed to perform three major functions: ballot scanning and tabulation, ballot review and second chance voting, and accessible voting and ballot marking.

The 5.5-CS system configuration specifications are detailed below:

Election Administration

Democracy Suite Election Management System (EMS)

❖ Dominion Voting Systems Democracy Suite EMS 5.5.40.2, containing:

- Election Event Designer
- Results Tally and Reporting
- Audio Studio
- Application Server
- Election Device Management Server
- Data Center Manager
- File System Service
- Adjudication Service 5.5.40.1
- Election Data Translator
- Results Transfer Manager

❖ Optional Adjudication 5.5.40.1

❖ Optional Listener (ICL) 5.5.40.1

❖ DCF version (ICP/ICC) DCF_5.5.41.3_20200507

❖ MBS version (ICE) ICE_5.5.6.3_5.5-CS_20200504

❖ MBS version (ICP2) ICP2_5.5.2.1_5.5-CS_20200415

❖ MCF version (ICX) MCF_5.5.15.1_20200306

COTS Hardware and Software

- EMS Standard Server Configuration
 - Microsoft Windows Server 2012 R2
 - Microsoft SQL Server 2016 Standard
 - Server computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell PowerEdge R640
 - Dell PowerEdge R630
 - Dell PowerEdge R620
- EMS Express Server Configuration
 - Microsoft Windows 10 Professional
 - Microsoft SQL Server 2016 Express with Advanced Services
 - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell Precision 3431
 - Dell Precision 3430
 - Dell Precision T3420
- Client Workstation Configuration
 - Microsoft Windows 10 Professional
 - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell Precision 3431
 - Dell Precision 3430
 - Dell Precision T3420
 - Dell Precision T1700
 - Dell Latitude 3400

- Dell Latitude 3490
 - Dell Latitude e3480
 - Dell Latitude e3470
 - Dell Latitude e7450
- Listener Standard Server Configuration (optional)
 - Microsoft Windows Server 2012 R2
 - Server computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell PowerEdge R340
 - Dell PowerEdge R330
 - Dell PowerEdge R320
 - Firewall: WatchGuard M200/M270 or equivalent
- Listener Express Server Configuration (optional)
 - Microsoft Windows Server 2012 R2
 - Server computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell PowerEdge R340
 - Dell PowerEdge R330
 - Dell PowerEdge R320
 - Firewall: WatchGuard T30/T40 or equivalent
- RAS Server Configuration (optional)
 - Microsoft Windows Server 2012 R2
 - Server computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell PowerEdge R340
 - Dell PowerEdge R330
 - Dell PowerEdge R320

- Hub: USB 3.0, 9-port Hub or equivalent
- Modem: MultiTech MT9234MU-CDC-XR 56K USB (v.92)
- Modem: StarTech USB56KEMH2 (v.92)
- EMS COTS Software common to Standard and Express configurations
 - Microsoft.Net Framework 4.5
 - Microsoft.Net Framework 3.5
 - Microsoft IIS (part of the Windows installation, not a separate item)
 - Microsoft Visual J# 2.0
 - Microsoft Visual C++ 2015 Redistributable
 - Java SE Runtime Environment 6.0 Update 20 or later
 - Dallas 1-Wire Device Driver version 4.03 or newer
 - RAID utility
 - Adobe Reader DC or later
- Optional COTS Software for Standard and Express configurations
- Microsoft Windows Defender (Express Server and Client Workstations)
 - Avast! anti-virus software (Standard Server)
 - Cepstral Voices (English, Spanish, etc.) 6.2.3
 - Microsoft Excel 2010 or later
 - Additional Fonts (Arial narrow fonts, 2.37a)
 - UPS drivers
 - Printer drivers
- Auxiliary Equipment
 - iButton to 1-Wire USB Adapter: Dallas Maxim DS1402-RP8+
 - iButton Reader/Writer: Dallas Maxim DS9490R#

- Compact Flash Reader: Lexar Professional USB 3.0 Dual-Slot Card Reader
- Compact Flash Reader: Kingston USB 3.0 High-Speed Media Reader
- Compact Flash Reader: Hoodman Steel USB3
- Smart Card Reader: Advanced Card Systems ACR38U
- Smart Card Reader: Advanced Card Systems ACR39U
- LCD Monitor:
 - Dell P2419H
 - Dell P2417H
 - Dell KM632
 - Dell P2414Hb
 - Dell U2414H
- Ethernet Switch:
 - Dell X1026
 - Dell X1008
- Mini-Server Rack: StarTech RK1236BKF
- Rack Power Distribution Unit: APC AP9562
- UPS:
 - Tripp Lite SMART1500RMXL2U
 - APC SMT1500 Smart-UPS
 - APC SMT1500C Smart-UPS
 - APC BE600M1
 - APC BR1000G
 - CyberPower PR1500LCD

- Keyboard, Mouse, Headset with microphone, Audio Adapter networking switch – COTS computing accessories
- EMS Report Printer: Canon LBP6230DW laser, HP M404dn, or equivalent
- Election media
 - iButton (Pollworker): Dallas Maxim DS1963S-F5+ (w/Black Key Ring Mount DS9093A+)
 - Compact Flash Memory Cards (16GB): Centon C4-CM-CF-16.4
 - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
 - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
 - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
 - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
 - USB Memory Device (4GB): Verbatim 97087
 - Smart Cards: ACOS-6-64

ImageCast Voter Activation (ICVA)

- Software version: 5.5.40.2

COTS Hardware and Software

- Client Workstation Configuration
 - Microsoft Windows 10 Professional
 - Desktop computer system per 2.02 *Democracy Suite System Configuration Overview*
 - Dell Latitude 3400
 - Dell Latitude 3490
 - Dell Latitude e3480
 - Dell Latitude e3470
 - Dell Latitude e7450
- Auxiliary Equipment:

- Smart Card Reader: Advanced Card Systems ACR38U
- Smart Card Reader: Advanced Card Systems ACR39U
- Election Media:
 - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
 - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
 - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
 - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
 - USB Memory Device (4GB): Verbatim 97087
 - Smart Cards: ACOS-6-64

Results Transfer Manager (RTM) (optional)

- Software version: 5.5.40.2

COTS Hardware and Software

- Client Workstation Configuration
 - Microsoft Windows 10 Professional
 - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell Latitude 3400
 - Dell Latitude 3490
 - Dell Latitude e3480
 - Dell Latitude e3470
 - Dell Latitude e7450
- Auxiliary Equipment:
 - Memory Card Reader : Lexar Professional USB 3.0 Dual-Slot Card Reader
 - Memory Card Reader : Kingston USB 3.0 High-Speed Media Reader
 - Memory Card Reader: Hoodman Steel USB3

- Election Media:
 - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
 - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
 - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
 - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
 - USB Memory Device (4GB): Verbatim 97087
 - Smart Cards: ACOS-6-64

Central Count

ImageCast Central Count (ICC)

- ❖ ICC software application: version 5.5.41.0002

COTS Software

- ICC COTS computer operating system: Windows 10 (64-bit) Professional edition
- Microsoft Windows Defender
- Microsoft Visual C++ 2015 Redistributable
- Dallas Maxim: 1-wire driver - version 4.03 or newer, 64 bit (32 bit as needed)
- Canon: DR-G2140 driver - version 1.1 SP2
- Canon: DR-G1130 driver - version 1.2 SP6
- Canon: DR-M160-II driver - version 1.2 SP6
- Canon: DR-M260 driver - version 1.1 SP2
- InoTec: HiPro 821 driver - version 1.2.0.5

COTS Hardware:

- ICC Scanner: Canon DR-G1130
 - Imprinter (optional)
- ICC Scanner: Canon DR-G2140

- Imprinter (optional)
- ICC Scanner: Canon DR-M160-II
- ICC Scanner: Canon DR-M260
- ICC Scanner: InoTec HiPro 821 with integrated imprinter
- Canon Scanner Client Workstation Configuration:
 - Desktop or All-in-One computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell OptiPlex 5270 AIO
 - Dell OptiPlex 3050 AIO
 - Dell OptiPlex 7440 AIO
 - Dell OptiPlex 9030 AIO
 - Dell OptiPlex 9020 AIO
 - Dell OptiPlex 9010 AIO
- InoTec HiPro Scanner Client Workstation Configuration:
 - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
 - Dell OptiPlex 7070
 - Dell OptiPlex 7060
 - Dell OptiPlex 7050
 - Lenovo 10QXPAR1US (monitor)
 - Dell P2418HT (monitor)
- Auxiliary Equipment:
 - iButton to 1-Wire USB Adapter: Dallas Maxim DS1402-RP8+
 - iButton Reader/Writer: Dallas Maxim DS9490R#
 - Compact Flash Reader: Lexar Professional USB 3.0 Dual-Slot Card Reader

- Compact Flash Reader: Kingston USB 3.0 High-Speed Media Reader
- Compact Flash Reader: Hoodman Steel USB3)
- Election media
 - iButton: Dallas Maxim DS1963S-F5+ (with Key Ring Mount DS9093A+)
 - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
 - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
 - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
 - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
 - USB Memory Device (4GB): Verbatim 97087
 - Compact Flash Memory Cards (32GB): RiTek RDCF32G-233XMCB2-i
 - Compact Flash Memory Cards (32GB): SanDisk SDCFX-032G
 - Compact Flash Memory Cards (16GB): Centon C4-CM-CF-16.4
 - Compact Flash Memory Cards (16GB): RiTek RDCF16G-233XMCB2-i
 - Compact Flash Memory Cards (16GB): SanDisk SDCFX-016G
 - Compact Flash Memory Cards (8GB): RiTek RDCF8G-233XMCB2-i
 - Compact Flash Memory Cards (8GB): SanDisk SDCFHS-008G
 - Compact Flash Memory Cards (4GB): RiTek RDCF4G-233XMCB2-i
 - Compact Flash Memory Cards (4GB): SanDisk SDCFHS-004G

Precinct Vote Capture

ImageCast X with BMD (ICX BMD)

- ❖ Firmware version: 5.5.15.2
- ❖ Hardware version:
 - Avalue SID-15V-Z37 (15.6 in. screen-Classic)
 - Avalue SID-21V-Z37 (21.5 in. screen-Classic)

- Avalue HID-21V-BTX (21.5 in. screen-Prime) (steel or aluminum chassis)

Optional Hardware:

- Accessible-Tactile Interface (ATI-USB) box
- ICX Classic BMD Transport Bag
- ICX Prime BMD Transport Bag
- ICX Privacy Screen
- ICX Voting Booth
- ICX Prime Battery Charger – Dual Bay

COTS Hardware

- UPS:
 - APC SMT-1500
 - APC SMT-1500C
 - CyberPower PR1500LCD
 - CyberPower PR1500LCD-VTVM
 - Weli WIUL-3KVA
- Printer:
 - HP M402dn
 - HP M402dne
 - HP M501dn
- Election Media:
 - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
 - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
 - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
 - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM

- USB Memory Device (4GB): Verbatim 97087
- Smart Cards: ACOS-6-64

COTS Software

- Android 4.4.4-098 (Avalue Classic)
- Android 5.1.1-1.17.3 (Avalue Prime)
- Google TTS

Optional COTS Software

- None

Optional COTS Hardware

- Headphone: Cyber Acoustics ACM-70, ACM-70B or equivalent
- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971
- Paddle switches: AbleNet 10033400 (2x)
- Paddle Switch Cable: Hosa Technology YMM-261 (for use with AbleNet switches)

ImageCast X DRE with VVPAT (ICX DRE w/VVPAT)

- ❖ Firmware version: 5.5.15.2
- ❖ Hardware versions:
 - Avalue HID-21V-BTX (21.5 in. screen-Prime) (steel or aluminum chassis)

Optional Hardware

- Accessible-Tactile Interface (ATI-USB) box
- ICX Prime VVPAT Transport Bag
- ICX Privacy Screen

- ICX Voting Booth
- ICX Prime Battery Charger – Dual Bay

COTS Hardware

- VVPAT Printer: KFI 702-75250014A (V1)
- VVPAT Printer: KFI 702-75250014C (V1-C)
- Election Media:
 - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
 - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
 - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
 - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
 - USB Memory Device (4GB): Verbatim 97087
 - Smart Cards: ACOS-6-64

COTS Software

- Android 5.1.1-1.17.3 (Avalue Prime)
- Google TTS

Optional COTS Software

- None

Optional COTS products

- Headphone: Cyber Acoustics ACM-70, ACM-70B, or equivalent
- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971
- Paddle switches: AbleNet 10033400 (2x)

- Paddle Switch Cable: Hosa Technology YMM-261 (for use with AbleNet switches)

ImageCast X DRE with Report Printer (ICX DRE w/Rpt Ptr)

- ❖ Software version: 5.5.15.2
- ❖ Hardware version:
 - Avalue HID-21V-BTX (21.5 in. screen-Prime) (steel or aluminum chassis)

Optional Hardware

- Accessible-Tactile Interface (ATI-USB) box
- ICX Prime Transport Bag
- ICX Privacy Screen
- ICX Voting Booth
- ICX Prime Battery Charger – Dual Bay

COTS Hardware

- Report Printer: Seiko RP-D10
- Election Media:
 - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
 - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
 - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
 - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
 - USB Memory Device (4GB): Verbatim 97087
 - Smart Cards: ACOS-6-64

COTS Software

- Android 5.1.1-1.17.3 (Avalue Prime)
- Google TTS

Optional COTS Software

- None

Optional COTS Hardware

- Headphone: Cyber Acoustics ACM-70, ACM-70B or equivalent
- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971
- Paddle switches: AbleNet 10033400 (2x)
- Paddle Switch Cable: Hosa Technology YMM-261 (for use with AbleNet switches)

ImageCast Evolution (ICE)

- ❖ Firmware version: 5.5.6.5
- ❖ Hardware version: PCOS 410A
 - IR Sensor Board Firmware version: 1.0.003
 - Motherboard FPGA version: 1.1.5
 - Scanner Board FPGA version: 1.1.2
 - Logger Controller version: 2.0.2
 - Power Controller version: 3.0.5
 - Integrated Printer Controller version: 4.1.6
 - Bootloader version: 1.3.4.63
 - Ballot Box Options
 - Stackable Molded Plastic: BOX-410A
 - Foldable Coroplast Plastic: BOX-420A

Optional Hardware

- Accessible-Tactile Interface (ATI) box
- Light Pole for Ballot Boxes

COTS Software

- None

COTS Hardware

- Election media:
 - iButton (Pollworker): Dallas Maxim DS1963S-F5+ (w/Black Key Ring Mount DS9093A+)
 - iButton (Admin/Tech): Dallas Maxim DS1963S-F5+ (w/Yellow Key Ring Mount DS9093AY+)
 - Compact Flash Memory Cards (32GB): RiTek RDCF32G-233XMCB2-i
 - Compact Flash Memory Cards (32GB): SanDisk SDCFX-032G
 - Compact Flash Memory Cards (16GB): Centon C4-CM-CF-16.4
 - Compact Flash Memory Cards (16GB): RiTek RDCF16G-233XMCB2-i
 - Compact Flash Memory Cards (16GB): SanDisk SDCFX-016G
 - Compact Flash Memory Cards (8GB): RiTek RDCF8G-233XMCB2-i
 - Compact Flash Memory Cards (4GB): RiTek RDCF4G-233XMCB2-i

Optional COTS Software

- None

Optional COTS Hardware

- Headphone: Cyber Acoustics ACM-70, ACM-70B or equivalent
- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971

- Paddle switches: AbleNet 10033400 (2x)
- Paddle Switch Cable: Hosa Technology YMM-261 (for use with AbleNet switches)
- Cellular Modems
 - MultiTech MTD-H5 (3G)
 - MultiTech MTD-H5-2.0 (3G)
 - PanTech UML295 4G LTE (4G)
 - MultiTech MTCM-LNA3-B03 (4G)
 - Antenna: Abracon LTE MIMO AEACBD081014-M698
 - Skyus DS 4G LTE (4G)
 - Antenna: Taoglas TG-08 Mini Whip
- Analog Modems:
 - StarTech USB56KEMH2 (v.92)
 - MultiTech MT9234MU-CDC-XR 56K USB (v.92)
 - Zoom 3095 56K USB (v.92)

ImageCast Evolution (ICE w/Dual Monitor)

- ❖ Firmware version: 5.5.6.5
- ❖ Hardware version: PCOS 410A
 - IR Sensor Board Firmware version: 1.0.003
 - Motherboard FPGA version: 1.1.5
 - Scanner Board FPGA version: 1.1.2
 - Logger Controller version: 2.0.2
 - Power Controller version: 3.0.5
 - Integrated Printer Controller version: 4.1.6
 - Bootloader version: 1.3.4.63

- Accessible-Tactile Interface (ATI) box (w/ 15 ft. cable)
- Ballot Box Options
 - Stackable Molded Plastic: BOX-410A
 - Foldable Coroplast Plastic: BOX-420A

Optional Hardware

- Light Pole for Ballot Boxes

COTS Software

- None

COTS Hardware

- Secondary Monitor: AOC e1649FWU
- Secondary Monitor: Display Logic LM15.6-USB-DV.B
- Cable, USB, 10 ft.: TE Connectivity 1496476-4
- Cable, USB, 10 ft.: Keyjoy 131-000004
- Headphone: Cyber Acoustics ACM-70, ACM-70B or equivalent
- Election media:
 - iButton (Pollworker): Dallas Maxim DS1963S-F5+ (w/Black Key Ring Mount DS9093A+)
 - iButton (Admin/Tech): Dallas Maxim DS1963S-F5+ (w/Yellow Key Ring Mount DS9093AY+)
 - Compact Flash Memory Cards (32GB): RiTek RDCF32G-233XMCB2-i
 - Compact Flash Memory Cards (32GB): SanDisk SDCFX-032G
 - Compact Flash Memory Cards (16GB): Centon C4-CM-CF-16.4
 - Compact Flash Memory Cards (16GB): RiTek RDCF16G-233XMCB2-i
 - Compact Flash Memory Cards (16GB): SanDisk SDCFX-016G

- Compact Flash Memory Cards (8GB): RiTek RDCF8G-233XMCB2-i
- Compact Flash Memory Cards (4GB): RiTek RDCF4G-233XMCB2-i

Optional COTS Software

- None

Optional COTS Hardware

- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971
- Paddle switches: AbleNet 10033400 (2x)
- Paddle Switch Cable: Hosa Technology YMM-261 (for use with AbleNet switches)
- Cellular Modems
 - MultiTech MTD-H5 (3G)
 - MultiTech MTD-H5-2.0 (3G)
 - PanTech UML295 4G LTE (4G)
 - MultiTech MTCM-LNA3-B03 (4G)
 - Antenna: Abracon LTE MIMO AEACBD081014-M698
 - Skyus DS 4G LTE (4G)
 - Antenna: Taoglas TG-08 Mini Whip
- Analog Modems:
 - StarTech USB56KEMH2 (v.92)
 - MultiTech MT9234MU-CDC-XR 56K USB (v.92)
 - Zoom 3095 56K USB (v.92)

ImageCast Precinct (ICP)

- ❖ Firmware version: 5.5.41.3

❖ Hardware version: PCOS-320A, PCOS-320C, PCOS-321C (with internal analog modem)

- Ballot Box Options
 - Stackable Molded Plastic: BOX-330A
 - Foldable Coroplast Plastic: BOX-340C (without Latch)
 - Foldable Coroplast Plastic: BOX-341C (with Latch)
 - Collapsible Plastic: ElectionSource IM-COLLAPSIBLE BIN
 - Accessories: ICP Baseplate Adapter Kit for all listed Ballot Boxes

Optional Hardware

- Accessible-Tactile Interface (ATI) box

COTS Software

- Boot Loader (COLILO) 20040221

COTS Hardware

- Election media:
 - iButton (Pollworker): Dallas Maxim DS1963S-F5+ (w/Black Key Ring Mount DS9093A+)
 - iButton (Admin/Tech): Dallas Maxim DS1963S-F5+ (w/Yellow Key Ring Mount DS9093AY+)
 - Compact Flash Memory Cards (32GB): RiTek RDCF32G-233XMCB2-i
 - Compact Flash Memory Cards (32GB): SanDisk SDCFX-032G
 - Compact Flash Memory Cards (16GB): Centon C4-CM-CF-16.4
 - Compact Flash Memory Cards (16GB): RiTek RDCF16G-233XMCB2-i
 - Compact Flash Memory Cards (16GB): SanDisk SDCFX-016G
 - Compact Flash Memory Cards (8GB): RiTek RDCF8G-233XMCB2-i
 - Compact Flash Memory Cards (4GB): RiTek RDCF4G-233XMCB2-i
 - Compact Flash Memory Cards (8GB): SanDisk SDCFHS-008G

- Compact Flash Memory Cards (4GB): SanDisk SDCFHS-004G

Optional COTS Software

- None

Optional COTS Hardware

- Headphone: Cyber Acoustics ACM-70, ACM-70B or equivalent
- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971
- Paddle switches: AbleNet 10033400 (2x)
- Paddle Switch Cable: Hosa Technology YMM-261 (for use with AbleNet switches)
- Cellular Modems
 - CellGo 3G DVS (3G)
 - MultiTech MTCM-LNA4-B01 (4G)
 - Antenna: MultiTech ANLTE4-2HRA

ImageCast Precinct (ICP BMD Audio)

- ❖ Firmware version: 5.5.41.3
- ❖ Hardware version: PCOS-320A, PCOS-320C, PCOS-321C (with internal analog modem)
 - Ballot Box Options
 - Stackable Molded Plastic: BOX-330A
 - Foldable Coroplast Plastic: BOX-340C (without Latch)
 - Foldable Coroplast Plastic: BOX-341C (with Latch)
 - Collapsible Plastic: ElectionSource IM-COLLAPSIBLE BIN
 - Accessories: ICP Baseplate Adapter Kit for all listed Ballot Boxes
 - BMD Printers

- HP Office Jet 7110 Printer (with auto-duplexer)
- UPS
 - APC Smart-UPS SMC1000
 - APC Smart-UPS SMT1500
 - APC Smart-UPS SMT1500C
 - CyberPower PR1500LCD
 - CyberPower PR1500LCD-VTVM
- Accessible-Tactile Interface (ATI) box

Optional Hardware

- None

COTS Software

- Boot Loader (COLILO) 20040221

COTS Hardware

- Headphone: Cyber Acoustics ACM-70, ACM-70B or equivalent
- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971
- Paddle switches: AbleNet 10033400 (2x)
- Paddle Switch Cable: Hosa Technology YMM-261 (for use with AbleNet switches)
- Election media:
 - iButton (Pollworker): Dallas Maxim DS1963S-F5+ (w/Black Key Ring Mount DS9093A+)
 - iButton (Admin/Tech): Dallas Maxim DS1963S-F5+ (w/Blue Key Ring Mount DS9093AB+)

- Compact Flash Memory Cards (32GB): RiTek RDCF32G-233XMCB2-i
- Compact Flash Memory Cards (32GB): SanDisk SDCFX-032G
- Compact Flash Memory Cards (16GB): Centon C4-CM-CF-16.4
- Compact Flash Memory Cards (16GB): RiTek RDCF16G-233XMCB2-i
- Compact Flash Memory Cards (16GB): SanDisk SDCFX-016G
- Compact Flash Memory Cards (8GB): RiTek RDCF8G-233XMCB2-i
- Compact Flash Memory Cards (4GB): RiTek RDCF4G-233XMCB2-i
- Compact Flash Memory Cards (8GB): SanDisk SDCFHS-008G
- Compact Flash Memory Cards (4GB): SanDisk SDCFHS-004G

Optional COTS Software

- None

Optional COTS Hardware

- Cellular Modems
 - CellGo 3G DVS (3G)
 - MultiTech MTCM-LNA4-B01 (4G)
 - Antenna: MultiTech ANLTE4-2HRA

ImageCast Precinct (ICP2)

- ❖ Firmware version: 5.5.2.1
- ❖ Hardware version: PCOS-330A
 - Ballot Box Options
 - Stackable Molded Plastic: BOX-350A
 - Foldable Coroplast Plastic: BOX-340C (without Latch)
 - Foldable Coroplast Plastic: BOX-341C (with Latch)
 - Collapsible Plastic: ElectionSource IM-COLLAPSIBLE BIN

Optional Hardware

- None

COTS Software

- None

COTS Hardware

- Election media:
 - iButton (Pollworker): Dallas Maxim DS1963S-F5+ (w/Black Key Ring Mount DS9093A+)
 - iButton (Admin/Tech): Dallas Maxim DS1963S-F5+ (w/Yellow Key Ring Mount DS9093AY+)
 - SDHC Memory Cards (8GB):
 - Centon S4-CM-SDHU1-8G-002
 - Centon C4-CM-SDU1-8.2

Optional COTS Software

- None

Optional COTS Hardware

- Cellular Modems
 - MultiTech MTD-H5 (3G)
 - MultiTech MTD-H5-2.0 (3G)
 - PanTech UML295 4G LTE (4G)
 - MultiTech MTCM-LNA3-B03 (4G)
 - Antenna: Abracon LTE MIMO AEACBD081014-M698
 - Skyus DS 4G LTE (4G)
 - Antenna: Taoglas TG-08 Mini Whip

- Analog Modems
 - StarTech USB56KEMH2 (v.92)
 - MultiTech MT9234MU-CDC-XR 56K USB (v.92)
 - Zoom 3095 56K USB (v.92)

2.1.2 Supported Languages

The following languages have been stated to be supported by the D-Suite 5.5-CS system:

- Alaskan Native
- Bengali
- Chinese
- English
- Eskimo
- Filipino
- French
- Hindi
- Japanese
- Khmer
- Spanish
- Tagalong
- Thai
- Vietnamese
- Native American
 - Apache, Jicarilla, Keres, Navajo, Seminole, Towa, Ute, Yuman

2.1.3 Supported Functionality

The Democracy Suite 5.5-CS is designed to support the following voting variations:

- General Election

- Closed Primary
- Open Primary
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Ballot Rotation
- Straight Party Voting
- Cross-party Endorsement
- Split Precincts
- Vote for N of M
- Recall issues, with options
- Ranked order voting
- Provisional or Challenged Ballots

3.0 TEST PROCESS AND RESULTS

The following sections outline the test process that was followed to evaluate the D-Suite 5.5-CS System under the scope defined in Section 1.4.

3.1 General Information

All testing was conducted under the guidance or oversight of Pro V&V by personnel verified by Pro V&V to be qualified to perform the testing.

3.2 Test Configuration

The central location housed an EMS standard and an EMS express server containing all of the D-Suite Express Server and Standard Server components listed above. The polling locations utilized two ICP tabulators configured with internal and cellular modems, two ICE tabulators configured with analog and cellular modems, two ICP2 tabulators configured with analog and cellular modems, one ICP BMD Audio, one ICX Prime BMD, and accessibility equipment.

3.3 Summary Findings

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

Technical Documentation Package (TDP) Review

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

A listing of all documents contained in the D-Suite 5.5-CS TDP is provided in Table 3-1.

Table 3-1: D-Suite 5.5-CS TDP Documents

Document Number	Description	Version
<i>Build Documents</i>		
---	Democracy Suite ImageCast Evolution Firmware Build, Prerequisites Setup and Installation	5.5-CS::105
---	Democracy Suite ImageCast Precinct Firmware Build and Install	5.5-CS::114
---	Democracy Suite ImageCast Precinct 2 Build Environment and Prerequisite Setup, Firmware Build and Installation	5.5-CS::35
---	Democracy Suite ImageCast X Build	5.5-CS::36
---	Democracy Suite Windows Build Document	5.5-CS::50
<i>D-Suite Documents</i>		
2.02	Democracy Suite System Overview	5.5-CS::203
2.03	Democracy Suite EMS Functional Description	5.5-CS::400
2.03	Democracy Suite ImageCast Central Functionality Description	5.5-CS::215
2.03	Democracy Suite ImageCast Evolution Functionality Description	5.5-CS::132
2.03	Democracy Suite ImageCast Listener Functionality Description	5.5-CS::50
2.03	Democracy Suite ImageCast Precinct Functionality Description	5.5-CS::200
2.03	Democracy Suite ImageCast Precinct 2 Functionality Description	5.5-CS::17
2.03	Democracy Suite ImageCast X System Functionality Description	5.5-CS::98
2.04.1	Democracy Suite ImageCast Precinct System Hardware Characteristics	5.5-CS::115

Table 3-1: D-Suite 5.5-CS TDP Documents *(continued)*

Document Number	Description	Version
2.04	Democracy Suite ImageCast Evolution System Hardware Specifications	5.5-CS::341
2.04	Democracy Suite ImageCast Precinct System Hardware Specifications	5.5-CS::170
2.04	Democracy Suite ImageCast Precinct 2 System Hardware Specifications	5.5-CS::18
2.05	Democracy Suite Adjudication Software Design and Specification	5.5-CS::141
2.05	Democracy Suite EMS Software Design and Specification	5.5-CS::347
2.05	Democracy Suite ImageCast Central Software Design and Specification	5.5-CS::142
2.05	Democracy Suite ImageCast Evolution Software Design and Specifications	5.5-CS::186
2.05	Democracy Suite ImageCast Listener Software Design and Specification	5.5-CS::51
2.05	Democracy Suite ImageCast Precinct Software Design and Specification	5.5-CS::172
2.05	Democracy Suite ImageCast Precinct 2 Software Design and Specifications	5.5-CS::23
2.05	Democracy Suite ImageCast X Software Design Specification	5.5-CS::101
2.06	Democracy Suite System Security Specification	5.5-CS::592
2.07	Democracy Suite System Test and Verification	5.5-CS::213
2.08	Democracy Suite Adjudication System Operation Procedures	5.5-CS::188
2.08	Democracy Suite EMS System Operations Procedures	5.5-CS::747
2.08	Democracy Suite ImageCast Central System Operation Procedures	5.5-CS::231
2.08	Democracy Suite ImageCast Evolution System Operation Procedures	5.5-CS::254
2.08	Democracy Suite ImageCast Listener System Operation Procedures	5.5-CS::197
2.08	Democracy Suite ImageCast Precinct System Operation Procedures	5.5-CS::299
2.08	Democracy Suite ImageCast Precinct 2 System Operation Procedures	5.5-CS::25
2.08	Democracy Suite ImageCast X System Operations Procedures	5.5-CS::89
2.09	Democracy Suite Adjudication System Maintenance Manual	5.5-CS::122
2.09	Democracy Suite EMS System Maintenance Manual	5.5-CS::166
2.09	Democracy Suite ImageCast Evolution System Maintenance Manual	5.5-CS::174
2.09	Democracy Suite ImageCast Listener System Maintenance Manual	5.5-CS::41
2.09	Democracy Suite ImageCast Precinct System Maintenance Manual	5.5-CS::143

Table 3-1: D-Suite 5.5-CS TDP Documents *(continued)*

Document Number	Description	Version
2.09	Democracy Suite ImageCast Precinct 2 System Maintenance Manual	5.5-CS::20
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.5-CS::80
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.5-CS::149
2.11	Democracy Suite Configuration Management Process	5.5-CS::450
2.12	Democracy Suite Quality Assurance Program	5.5-CS::177
2.13	Democracy Suite System Change Notes	5.5-CS::197
<i>Installation and Configuration</i>		
---	Democracy Suite EMS System Installation and Configuration Procedure	5.5-CS::394
---	Democracy Suite ImageCast Central Installation and Configuration Procedure	5.5-CS::260
---	Democracy Suite ImageCast X System Installation and Configuration	5.5-CS::95
<i>DVS Supplemental</i>		
---	Democracy Suite ImageCast C++ Coding Standard	5.5-CS::76
---	Democracy Suite C# Automated Code Review Process	5.5-CS::71
---	Java Coding Standards	1.0
---	JavaScript Coding Standards	1.0
---	Democracy Suite EMS RAS with USB Modems Installation and Configuration	5.5-CS::65
---	Democracy Suite EMS RAS Installation and Configuration	5.5-CS::78
---	SD_Google Java Style Dominion	1.0
---	Democracy Suite ImageCast Device Configuration Files	5.5-CS::120
---	Democracy Suite ImageCast Election Definition Files	5.5-CS::101
---	Democracy Suite ImageCast Printing and Finishing Specification	5.5-CS::121
---	Democracy Suite ImageCast Total Results File Format	5.5-CS::77
---	Democracy Suite ImageCast Evolution Firmware Installation Procedure	5.5-CS::109
---	Democracy Suite ImageCast Evolution Level One (L1) Maintenance Manual	5.5-CS::143
---	Democracy Suite ImageCast Evolution Machine Behavior Settings	5.5-CS::111
---	Usability Study of Dominion Voting Systems ImageCast Evolution Versions 4.1.1.1 and 4.6.1.1	1.0.0::37

Table 3-1: D-Suite 5.5-CS TDP Documents *(continued)*

Document Number	Description	Version
---	Democracy Suite ImageCast Precinct Extracting Firmware Contents	5.5-CS::57
---	Democracy Suite ImageCast Precinct Firmware Update Procedure	5.5-CS::88
---	Democracy Suite ImageCast Precinct Level One (L1) Maintenance Manual	5.5-CS::83
---	Democracy Suite ImageCast Precinct Technical Guide	5.5-CS::70
---	Usability Test Report Of ImageCast Precinct 5.0 With 36 Participants for VVSG 1.0	5.0::10
---	Democracy Suite ImageCast Precinct 2 Extracting Firmware Contents and Verifying SHA256 Values	5.5-CS::21
---	Democracy Suite ImageCast Precinct 2 Level One (L1) Maintenance Manual	5.5-CS::25
---	Democracy Suite Image Cast Precinct 2 Machine Behavior Settings	5.5-CS::24
---	Democracy Suite ImageCast X Machine Configuration File (MCF) Parameters Settings	5.5-CS::33
---	Usability Test Report Of ImageCast X 5.0 With 36 Participants for VVSG 1.0	5.0::13
---	Common Industry Format for Usability Test Report ImageCast X 5.2 with VVPAT	5.5::1
---	Democracy Suite System Identification Guide	5.5-CS::386
<i>COTS Supplemental</i>		
---	Ablenet Single Switch Quickstart Guide	B
---	Dell PowerEdge R320 Owner Manual	---
---	Abracon Datasheet Antenna	---
---	CA ACM-70B Stereo Headphones	---
---	ACS AC0S6 Multi-Application and Purse Card Functional Specifications	1.04
---	ACS ACR38x CCID Smart Card Reader Reference Manual	6.05
---	ACS ACR39 Series PC-linked Smart Card Readers Reference Manual	1.04
---	AOC USB Monitor User Manual E1659Fwu	---
---	APC Installation and Operation Rack Power Distribution Unit AP9562	990-1215D001
---	APC User Manual Back-UPS BE600M1	EN 990-5679
---	APC Installation and Operation Back-UPS Pro BR1000G	EN 990-3804B
---	APC Smart-UPS Installation Guide SMT1500	EN 990-3535F-001

Table 3-1: D-Suite 5.5-CS TDP Documents *(continued)*

Document Number	Description	Version
---	APC Operation Manual Smart-UPS Uninterruptible Power Supply	EN 990-3534F
---	APC Operation Manual Smart-UPS Uninterruptible Power Supply	EN 990-5442B
---	Avalue HID-21V-BTX Factsheet	---
---	Avalue HID-21V-BTX-A1R User Manual	2.0
---	Avalue SID-15V Quick Reference Guide	1st Ed
---	Avalue SID-15V-Z37-A1R User Manual	1.0
---	Avalue SID-21V Fact Sheet	---
---	Avalue SID-21V-Z37-A1R User Manual	1.0
---	Avalue SID-21V Quick Reference Guide	1st Ed
---	Canon DR-G1130 User Guide	CE-IM-910-E1.00
---	Canon DR-G2140 DR-G2110 DR-2090 User Manual	6T3-0034-E1.10
---	Canon DR-M160II User Manual	CE-IM-0953-E1.00
---	Canon DR-M260 User Manual	CE-IM-0991-E1.00
---	Canon imageClass LBP6230dw Spec Sheet	---
---	Canon imageClass LBP6230dw Startup	---
---	CyberPower Smart App Sinewave Series PR1500LCD User's Manual	---
---	Dell Latitude 3400 Setup and specifications guide	Rev. A00
---	Dell Latitude 3470 Owner's Manual	Rev. A00
---	Dell Latitude 3480 Owner's Manual	Rev. A00
---	Dell Latitude 3490 Owner's Manual	Rev. A01
---	Dell Latitude E7450 Owner's Manual	Rev. A02
---	Dell Latitude E7470 Owner's Manual	Rev. A02
---	Dell Networking X-Series Spec Sheet	1.9
---	Dell Networking X1000 and X4000 Series Switches User Guide	Rev. A06
---	Dell OptiPlex 3050 All-in-One Owner's Manual	Rev. A00
---	Dell OptiPlex 5270 All-in-One Setup and specifications guide	Rev. A00
---	Dell OptiPlex 7050 Tower Owner's Manual	Rev. A01

Table 3-1: D-Suite 5.5-CS TDP Documents *(continued)*

Document Number	Description	Version
---	Dell OptiPlex 7060 Small form Factor Setup and specifications guide	Rev. A01
---	Dell OptiPlex 7070 Tower Setup and Specifications	Rev. A00
---	Dell OptiPlex 7440 All-In-One Owner's Manual	Rev. A01
---	Dell OptiPlex 9010/7010 Desktop Owner's Manual	Rev. A02
---	Dell OptiPlex 9020 Small Form Factor Owner's Manual	Rev. A01
---	Dell OptiPlex 9030 All-In-One Owner's Manual	Rev. A01
---	Dell P2417H Monitor User's Guide	Rev. A01
---	Dell P2418HT User's Guide	Rev. A00
---	Dell P2419H Monitor User's Guide	Rev. A00
---	Dell PowerEdge R330 Owner's Manual	Rev. A02
---	Dell EMC PowerEdge R340 Installation and Service Manual	Rev. A00
---	Dell EMC PowerEdge R340 Technical Specifications Guide	Rev. A00
---	Dell PowerEdge R620 Owner's Manual	Rev. A05
---	Dell PowerEdge R630 Owner's Manual	Rev. A03
---	Dell EMC PowerEdge R640 Installation and Service Manual	Rev. A01
---	Dell EMC PowerEdge R640 Technical Guide	Rev. A00
---	Dell EMC PowerEdge T640 Installation and Service Manual	Rev. A08
---	Dell Precision 3430 Small form Factor Service Manual	Rev. A00
---	Dell Precision 3431 Small Form Factor Setup and specifications guide	Rev. A00
---	Dell Precision T1700 Mini-Tower Owner's Manual	Rev. A00
---	Dell Precision Tower 3420 Owner's Manual	Rev. A00
---	DisplayLink DL-1x5 Series High Performance USB Virtual Graphics	---
---	HP Laser Jet Pro M402, M403 User Guide	2
---	HP Officejet 7110 User Guide	3
---	IOGEAR Quick Start Guide 2/4-Port USB Cable KVM Switch	---
---	HP Laser Jet Pro M501 User Guide	3
---	Dominion Voting Voter-verified paper audit trail Model: VRP3 User Manual Safety precautions	---
---	Kingston USB 3.0 High-Speed Media Reader	---

Table 3-1: D-Suite 5.5-CS TDP Documents *(continued)*

Document Number	Description	Version
---	Lexar Professional USB 3.0 Dual-Slot Reader	---
---	MultiTech MultiMobile USB V.92 Portable USB Modem User Guide	C
---	MultiTech MultiConnect Cell User Guide	---
---	MultiTech MultiConnect microCell MTCM-LAT3 and -LSP3 User Guide	---
---	OKI C332dn User's Guide	Rev4
---	OKI C612 C712 User's Guide	Rev3
---	OKI C931 User's Manual	Rev7
---	Lenovo ThinkCentre TIO24Gen3Touch User Guide	1st Ed
---	SCAMAX 8x1 Ultra High Performance Scanner	---
---	SCAMAX Document Scanner User Manual Type:H12	2019.12
U0013135 3706	Seiko SII Thermal Printer RP-D10 Series User's Guide	---
---	SIIG USB 3.0 9-Port Aluminum Hub & 2.1A Charging Port Installation Guide	---
---	Skyus DS/DS2 by Inseego Quick Start Guide	Rev 1
---	StarTech 56K USB Dial-up and Fax Modem-V.92-External-Hardware Based	---
---	StarTech 56K USB Dial-up and Fax Modem-V.92-External Quick Start Guide	---
---	TAOGLAS TG.08.0113 Specification	---
---	Tripp-Lite SmartPro 1500 Owner's Manual	---
---	Tripp-Lite SmartPro 3000 2U Rack-Mount	---
---	Verizon USB Modem -UML295 User Guide	---
---	WatchGuard Firebox M200 & M300 Hardware Guide	Rev E
---	WatchGuard Firebox M200/M300 Quick Start Guide	Rev C
---	WatchGuard Firebox T30 & T50 Hardware Guide	Rev D
---	WatchGuard Firebox T30/T50 Wireless Quick Start Guide	Rev C
---	WatchGuard Firebox M270 Hardware Guide	Rev A
---	WatchGuard Firebox M270 Quick Start Guide	Rev B
---	WatchGuard Firebox T40 Hardware Guide	---
---	WatchGuard Firebox T40 Quick Start Guide	Rev A
---	Tripp Lite SmartPro Data Sheet	---

Table 3-1: D-Suite 5.5-CS TDP Documents *(continued)*

Document Number	Description	Version
---	Programming Research High-Integrity C++ Coding Standard Manual	2.2
---	HIC++ Standards Model for C++	9.5.4
---	HP LaserJet Pro M402dn Datasheet	Rev. 2
---	Programming Research High-Integrity C++ Coding Standard Manual	2.2
---	HP LaserJet Pro M402dne Datasheet	---
<i>User Guides</i>		
---	Democracy Suite ImageCast Adjudication User Guide	5.5-CS::144
---	Democracy Suite EMS Automated Test Deck User Guide	5.5-CS::10
---	Democracy Suite EMS Audio Studio User Guide	5.5-CS::41
---	Democracy Suite EMS Election Data Translator User Guide	5.5-CS::92
---	Democracy Suite EMS Election Event Designer User Guide	5.5-CS::361
---	Democracy Suite ImageCast Central User Guide	5.5-CS::140
---	Democracy Suite ImageCast Precinct Ballot Marking Device User Guide	5.5-CS::3
---	Democracy Suite ImageCast Precinct User Guide	5.5-CS::60
---	Democracy Suite ImageCast Precinct 2 User Guide	5.5-CS::10
---	Democracy Suite EMS ImageCast Voter Activation User Guide	5.5-CS::56
---	Democracy Suite ImageCast X User Guide	5.5-CS::255
---	Democracy Suite EMS Result Transfer Manager User Guide	5.5-CS::121
---	Democracy Suite EMS Results Tally & Reporting User Guide	5.5-CS::148

3.3.1 Source Code Review

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 and a Trusted Build of the submitted source code.

To perform the Trusted Build, Dominion-submitted source code, COTS, and Third Party software products were inspected and combined to create the executable code. Additionally, during the performance of the Trusted 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 Dominion and reviewed by Pro V&V was successfully built using the submitted COTS and third party software products, and the reviewed build documentation.

3.3.2 Physical Configuration Audit (PCA)

The Physical Configuration Audit (PCA) compares the voting system components submitted for certification testing to the manufacturer's technical documentation. The purpose of the PCA was to verify that the submitted hardware is unmodified from the previously certified voting system. The PCA included the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system
- Verify software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification
- If the hardware is non-COTS, Pro V&V reviewed drawings, specifications, technical data, and test data associated with system hardware to establish a system hardware baseline associated with the software baseline
- Review manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests
- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation, are subject to re-examination

Summary Findings

During execution of the test procedure, the components of the D-Suite 5.5-CS system were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release.

At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented.

3.3.3 System Level Testing

System Level Testing included the Functional Configuration Audit (FCA) and the System Integration Tests. System Integration tests were performed as part of the regression test requirements for this campaign. System Level testing was implemented to evaluate the complete system. This testing included all proprietary components and COTS components (software, hardware, and peripherals). For software system tests, the tests were designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases were prepared independently to assess the response of the hardware and software to a range of conditions.

The FCA for this test campaign included an assessment of the submitted modification and included inputs of both normal and abnormal data during test performance. This evaluation utilized baseline test cases as well as specifically designed test cases and included predefined election definitions for the input data. As part of the FCA, one primary and one general election were executed to verify that each of the submitted modifications had been successfully implemented. The System Integration Tests were performed to verify the D-Suite 5.5-CS functioned as a complete system.

During System Level Testing, the system was configured exactly as it would for normal field use per the procedures detailed in the D-Suite 5.5-CS system technical documentation. This included connecting all supporting equipment and peripherals as well as any physical security equipment such as locks and ties.

3.3.3.1 Functional Configuration Audit (FCA)

The Functional Configuration Audit (FCA) 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 were conducted to ensure all applicable EAC VVSG 1.0 requirements were met.

Summary Findings

The D-Suite 5.5-CS system successfully passed the FCA. During execution of the test procedure, it was verified that the D-Suite 5.5-CS system successfully completed the FCA with all actual results obtained during test execution matching the expected results.

3.3.3.2 System Integration

System Integration is a system level test that evaluates the integrated operation of both hardware and software. System Integration tests the compatibility of the voting system software components, or subsystems, with one another and with other components of the voting system environment. This functional test evaluates the integration of the voting system software with the remainder of the system.

Summary Findings

During test performance, the system was configured as it would be for normal field use. Pro V&V personnel properly configured and tested the system by following the procedures detailed in the D-Suite

5.5-CS technical documentation. One General Election and one Primary Election were successfully exercised on the voting system, as described below:

General election with the following breakdown:

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

Primary election with the following breakdown:

- 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 D-Suite 5.5-CS system successfully passed the System Integration Test. During execution of the test procedure, it was verified that the D-Suite 5.5-CS system successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

3.3.3.3 Regression Testing

Regression testing was conducted on the D-Suite 5.5-CS to establish assurance that the modifications had no adverse impact on the compliance, integrity, or performance of the system.

Summary Findings

No new faults or issues were found during regression testing.

3.3.4 Telecommunications Testing

Telecommunications testing consisting of modem transmission and modem receiving was performed, as described below. Testing was conducted on-site at the Dominion facility and witnessed by Pro V&V via teleconferencing.

Modem Transmission – PCOS Modems and RTM

- Dialup/Analog: Use ICP PCOS-321C internal modem
- Cellular: Use ICP CellGo 3G cellular modem to transfer test results
- Cellular: Use ICP MultTech-MTC-NLA4 cellular modem to transfer results
- Dialup/Analog: Use ICP 2 StarTech USB56KEMH2 analog modem to transfer test results.
- Dialup/Analog: Use ICP2 Zoom 3095 56K USB

- Dialup/Analog: Use ICP2 Multitech Mt9234MU-CDC-XR 56K USB
- Cellular: Use ICP2 Multitech Modem MTD-H5 cellular modem to transfer test results.
- Cellular: Use ICP2 Multitech MTCM-LNA3-B03 cellular modem to transfer test results.
- Cellular: Use ICP2 Skyus DS2 cellular modem to transfer test results.
- Cellular: Use ICP2 PanTech UML295 4G LTE cellular modem to transfer results
- Dialup/Analog: Use ICE StarTech USB56KEMH2 analog modem to transfer test results.
- Dialup/Analog: Use ICE Zoom 3095 56K USB
- Dialup/Analog: Use ICE 2 Multitech Mt9234MU-CDC-XR 56K USB
- Cellular: Use ICE Multitech Modem MTD-H5 cellular modem to transfer test results.
- Cellular: Use ICE Multitech MTCM-LNA3-B03 cellular modem to transfer test results.
- Cellular: Use ICE Skyus DS2 cellular modem to transfer test results.
- Cellular: Use ICE PanTech UML295 4G LTE cellular modem to transfer results
- Results Transfer Manager (RTM): Use RTM Utility to transfer test results.

Modem Receiving – ICL (Cellular)

- Use the ImageCast Listener configuration (without RAS) to receive RTM results and PCOS cellular modem results, and produce RTR reports.

Summary Findings:

During execution of the testing, the system accurately transmitted and received results via modeming. Results were imported into the D-Suite 5.5-CS and verified that all results were correct. This process was repeated for all modems listed above for testing.

3.3.5 Usability Testing

The ICP BMD Audio was subjected to Usability testing to evaluate that the applicable usability requirements set forth in the EAC 2005 VVSG 1.0 were met.

Summary Findings:

The D-Suite 5.5-CS System successfully met the requirements of the Usability evaluation.

3.3.6 Electrical Supply Testing

The ICP BMD Audio was subjected to an electrical supply test in accordance with the EAC 2005 VVSG 1.0.

Summary Findings:

During execution of the testing, the D-Suite 5.5-CS system performed as required.

4.0 CONCLUSIONS

Based on the results obtained during the test campaign and the re-use of testing from the previous D-Suite certification test campaigns, where applicable, Pro V&V determines the D-Suite 5.5-CS System, as presented for evaluation, meets the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0.