700 Boulevard South
Suite 102
Huntsville, AL 35802
Phone (256)713-1111
Fax (256)713-1112

Test Report for Certification Testing
Dominion Voting Systems D-Suite 5.11-CO

Version: 02

Date: 06/07/2019

EAC Lab Code 1501

NVLAP LAB CODE 200908-0

SIGNATURES

Approved by: Wendy Owens 10/7/19

Wendy Owens, VSTL Program Manager — Date

REVISIONS

Revision	Description	Date
00	Final Report-Initial Release	06/03/2019
01	Revised report to include usage of Microsoft SQL Server 2016 Standard on the EMS Express Server Configuration. Added reference to 2002 VSS in sections 1.0 and 4.0.	06/06/2019
02	Corrected version number for InterScan HiPro (page 10)	06/07/2019

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1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to evaluate the Dominion Democracy Suite (D-Suite) 5.11-CO 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, the Colorado Requirements Gap Analysis Matrix, which incorporates the 2002 VSS requirements, and the Colorado-specific requirements in the Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21. The D-Suite 5.11-CO system is a modification to the previously approved D-Suite 5.2-CO System.

1.1 References

- D-Suite 5.11-CO Colorado Testing Campaign Scope of Testing Document
- State of Colorado Requirements Matrix
- Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21
- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines"
- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, 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 150-2016)", dated July 2016
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Pro V&V, Inc. Quality Assurance Manual, Revision 7.0
- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)
- EAC Notices of Clarification (NOC) (listed on www.eac.gov)
- D-Suite 5.11-CO Technical Data Package *(A listing of the TDP documents submitted for this test campaign is listed in Section 3.2 of this Test Report)*

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

"BMD" – Ballot Marking Device

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ICC" – ImageCast Central

"ICX" – ImageCast X

"ISO" – International Organization for Standardization

"NOC" – Notice of Clarification

"PCA" – Physical Configuration Audit

"PCOS" – Precinct Count Optical Scan

"QA" – Quality Assurance

"RFI" – Request for Interpretation

"RTR" – Results Tally & Reporting

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

1.3 Background

The D-Suite 5.0 System (the predecessor of the D-Suite 5.2-CO System) was granted certification to the 2005 Voluntary Voting System Guidelines (VVSG) by the Election Assistance Commission (EAC) on February 8, 2017. The D-Suite 5.2-CO System is a modification of the D-

Suite 5.0 System. The D-Suite 5.2-CO System was previously tested to the State of Colorado requirements, the results of which are documented in Pro V&V report v. TR- 01-02-DVS-2017.02. The D-Suite 5.11-CO test campaign documented in this report expands upon the previously approved system.

1.4 Description and Overview of System Being Modified

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

The Democracy Suite 5.11-CO Voting System is a paper-based optical scan voting system consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), and the ImageCast X (ICX). Below is the description of the previously Colorado certified Democracy Suite 5.2-CO baseline system

Election Management System (EMS)

The Democracy Suite 5.2-CO EMS consists of various components running as either a front-end/client application or as a back-end/server application. A listing of the applications and a brief description of each is presented below.

Front-end/Client applications:

- 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 Precinct and ImageCast Central tabulators. This client component is installed on both the server and the client machines.

- 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.

- ImageCast Voter Activation: An application, installed on a workstation or laptop at the polling place, which allows the poll workers to program smart cards for voters. The smart cards are used to activate voting sessions on ImageCast X.

- 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.

Back-end/Server applications:

- 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.

- Smart Card Helper Service: A service that is installed on a workstation or laptop at the polling place, and provides required data format for programming smart cards for ImageCast devices, or, for jurisdiction's voting registration system in case of integration.

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) Ballot Marking Device (BMD)

The Democracy Suite ImageCast X ballot marking platform is a solution that is used for creation of paper cast vote records. These ballots can be scanned, reviewed, cast and tabulated at the polling location on an ImageCast Precinct device or later scanned and tabulated by the ImageCast Central optical ballot scanner. The ImageCast X also supports enhanced accessibility voting through optional accessories connected to the ImageCast X unit. The ICX is a proprietary application which runs on COTS tablets.

1.5 Description of Modification

Dominion Voting Systems has identified the following modifications from the previously certified system:

Election Management System

1. Supported by Windows Server 2016
2. Added performance improvements for generating large projects
3. Improved reporting module:
    - 1% Precinct manual recount export
    - CVR results per precinct export with undervotes and overvotes
    - Batch filter on election summary report
    - Persist "Skip Adjudication" setting value when loading results
4. Blank ballot ignored when unvoted RCV contest outstack condition is met in Adjudication
5. Adjudication activity report in CSV format added
6. Leading batch cards support in EED and ICC
7. Voter card status lookup functionality in ICVA
8. Ability to inactivate a voter card in ICVA
9. General report formatting improvements in RTR
10. New reporting module (reporting module, canvas report, summary report) in RTR

ImageCast Central

1. Added InterScan HiPro 821dd high-speed scanner

ImageCast X BMD

1. Upgraded AValue tablets to Android 8.1
2. Security enhancements
3. MCF option for poll worker screen to default to manual activation
4. Ability to test printer duplexer to be able to confirm printing on both sides of the paper
5. Ability to split contest across multiple columns, with an optional message
6. Ability to return to ICX application from Android settings (Samsung)
7. Allow only certified USB sticks to be used

8. Ability to choose if the selected text size is used for printing of the ballot or not

9. Do not bring up the default file manager upon inserting a USB stick (Samsung)

10. Removed hardcoded poll worker PIN

11. Source code obfuscation

12. Previous VoteSim File remains on machine after election data has been cleared

1.6 Scope of Testing

Pro V&V performed an evaluation of the results from the previous test campaign along with the changes made to the system to determine the scope of testing required for the submitted modification. It was determined the following tasks would be required to verify compliance of the submitted system:

- Physical Configuration Audit (PCA)

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

- 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.

- System Level Testing

  System Level Testing included the FCA, Accuracy, 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 5.11-CO functioned as a complete system. The Accuracy Test was performed to ensure the D-Suite 5.11-CO correctly captured, stored, consolidated, and reported the specific ballot selections, and absence of selections, for each ballot position.

- System Functional Regression Testing

  Regression testing was conducted on the D-Suite 5.11-CO to establish assurance that the modifications had no adverse impact on the compliance, integrity, or performance of the system.

- Usability and Accessibility Testing

  Usability and Accessibility testing was performed to evaluate that system to the requirements set forth in the EAC 2005 VVSG 1.0.

1.7 Testing Overview

The evaluation of the D-Suite 5.11-CO system was designed to evaluate the system to the requirements set forth for voting systems in the EAC 2005 VVSG 1.0. The goals were constructed to verify that the system conforms to the applicable EAC 2005 VVSG 1.0 requirements. The evaluation addressed each of the test goals in the following manner:

Table 2-1: Testing Overview

Test Goal	Testing Response
Verify that the D-Suite 5.11-CO System meets both the applicable requirements of the EAC 2005 VVSG 1.0 and the additional Colorado-specific requirements	This was tested by evaluating the D-Suite 5.11-CO System to specific election scenarios using a combination of different ballot programming approaches, ballot designs, ballot sizes, languages, and tabulators.
Security testing to verify and validate changes are in compliance to the requirements of the EAC 2005 VVSG	D-Suite 5.11-CO was set up as described in the TDP and subjected to physical access security testing.
Physical Configuration Audit (PCA), including System Setup, Loads, and Hardening	A PCA and Receipt Inspection were performed to compare the voting system components and materials submitted for testing against the manufacturer's technical documentation. The system setup, loads, and hardening was tested by comparing the voting system submitted for certification testing to the manufacturer's technical documentation.
Ensure that the D-Suite 5.11-CO provides support for all Colorado election management requirements (i.e. ballot design, results reporting, recounts, etc.)	The D-Suite 5.11-CO was tested in pre-election, Election Day, post-election and evaluated against documented behavior and expected results for all scenarios.

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

Test Goal	Testing Response
System Integration Testing, including Functional Configuration Audit (FCA), Accuracy Testing and Regression Testing	The D-Suite 5.5-CO 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. Accuracy testing was performed that included over 1,549,703 ballot positions on the system.
Usability and Accessibility Testing	The D-Suite 5.1-CO system was evaluated to the usability and accessibility requirements set forth in the EAC 2005 VVSG 1.0.
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.
Perform FCA Regression Testing	FCA functional regression testing was performed on all submitted modifications to the baselined system.

2.0 TEST CANDIDATE

The Democracy Suite 5.11-CO Voting System is a paper-based optical scan voting system consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), and the ImageCast X (ICX).

The following paragraphs provide information for the D-Suite 5.11-CO evaluated during this test campaign.

Election Administration

Democracy Suite Election Management System (EMS)

- Dominion Voting Systems Democracy Suite EMS 5.11.3.1, containing:

- Election Event Designer
- Results Tally and Reporting
- Audio Studio
- Application Server
- Data Center Manager
- File System Service
- Adjudication Service
- Election Data Translator
- Smart Card Helper Service

❖ Adjudication 5.11.3.1

❖ MCF version 5.11.2.2

❖ DCF version 5.11.3

COTS Hardware and Software

- EMS Standard Server Configuration
- Microsoft Windows Server 2016
  - Microsoft SQL Server 2016 Standard
  - Server computer system per *2.02 Democracy Suite System Configuration Overview*
- EMS Express Server Configuration
- Microsoft Windows 10 Professional
  - Microsoft SQL Server 2016 Standard
  - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
- Client Workstation Configuration
  - Microsoft Windows 10 Professional
  - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*

❖ EMS COTS Software common to Standard and Express configurations

- Microsoft.Net Framework 4.6.1
- 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
- Dallas 1-Wire Device Driver version 4.0.5 or newer
- RAID utility

- Adobe Reader DC or later

❖ Optional COTS Software for Standard and Express configurations

- Microsoft Windows Defender
- 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 (SHA-1) with USB Reader/Writer: Maxim DS9490R#
- Smart Card Reader: ACS ACR39U
- LCD monitor, keyboard, mouse, headset with microphone, audio adapter, networking switch – COTS computing accessories

• Election media

- iButton: Maxim DS1963S-F5+
- USB Memory Device: Apacer 8GB or 16GB, Centon 8 GB or 16 GB
- Smart Cards: ACOS-6-64

Central Count

❖ ICC software application: version 5.11.3.2

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 4.0.5, 64 bit (32 bit as needed)
- Canon: DR-X10C driver – 1.15 SP3
- Canon: DR-G1130 driver – 1.2 SP6
- Canon: DR-M160-II driver – 1.2 SP6
- InterScan HiPro 821dd - 1.2.0.5

COTS Hardware:

- ICC Scanner: Canon DR-X10C
- ICC Scanner: Canon DR-G1130
- ICC Scanner: Canon DR-M160II

- ICC Scanner: InterScan HiPro 821dd
- Desktop or All-in-One computer system per *2.02 Democracy Suite System Configuration Overview*

Precinct Vote Capture

ImageCast X with BMD (ICX BMD)

- Firmware version: 5.11.4.2
- Hardware version:
  - Samsung Galaxy Note Pro (12.2 in. screen)
  - Samsung Galaxy Tab Pro (12.2 in. screen)
  - Avalue SID-21V-Z37 (21.5 in. screen)
  - Accessible-Tactile Interface (ATI) box, version 1.1.0

COTS Hardware

- UPS: APC SMT-1500
- UPS: APC SMT-1500C
- Printer: HP M402dne Laser
- Hub: LavaLink STS-2UE (for Samsung tablets only)
- USB Memory Device: Apacer 8GB or 16 GB, Centon 8GB or 16GB, Apricorn ASK3-30GB or ASK3-120GB
- Smart Cards: ACOS-6-64

COTS Software

- Android 8.1 (Avalue)
- Android 4.4.2 (Samsung Galaxy Tab Pro Tablets)
- Android 5.0.2 (Samsung Galaxy Tab Pro Tablets)

Optional COTS Software

- None

Optional COTS products

- Headphone: Cyber Acoustics ACM-70 or equivalent
- Accessible Interface Box: Tecla Accessible Interface box
- Sip & puff: Enabling Device #972
- Sip & puff straws: #970K (Pkg of 10)
- Paddle switches: Enabling Device #971

- Paddle switches: AbleNet 10033400 (2x)

ImageCast X Voter Activation (ICVA)

- Software version: 5.11.3.1

COTS Hardware and Software

- Client Workstation Configuration
  - Microsoft Windows 10 Professional
  - Laptop computer system per *2.02 Democracy Suite System Configuration Overview*
- Smart Cards: ACOS-6-64
- USB Memory Device: Apacer 8GB or 16 GB, Centon 8GB or 16GB

For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. This was accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel 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 will be 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 manufacturer's websites.

2.1 System Limits

The system limits for the D-Suite 5.11-CO system remain unchanged from the previously certified D-Suite 5.2- CO System.

2.2 Supported Languages

The following languages have been stated to be supported by the D-Suite 5.11-CO System:

- Alaskan Native
- Aleut
- Athabascan
- Chinese
- English
- Eskimo
- Filipino
- French
- Hindi

- Japanese
- Khmer
- Korean
- Spanish
- Thai
- Bengali
- Vietnamese
- Native American
    - Apache, Jicarilla, Keres, Navajo, Seminole, Towa, Ute, Yuman

Due to the limited scope of the testing, only English and Spanish ballots were cast during functional testing. The accuracy of the translations between languages was not verified.

2.3 Supported Functionality

The Democracy Suite 5.11-CO 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
- Split Precincts
- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots

2.4 System Overview

The testing event utilized one setup of the D-Suite 5.11-CO System and its components as configured for normal use by the State of Colorado. A diagram depicting the D-Suite 5.11-CO is provided in Figure 2-1.

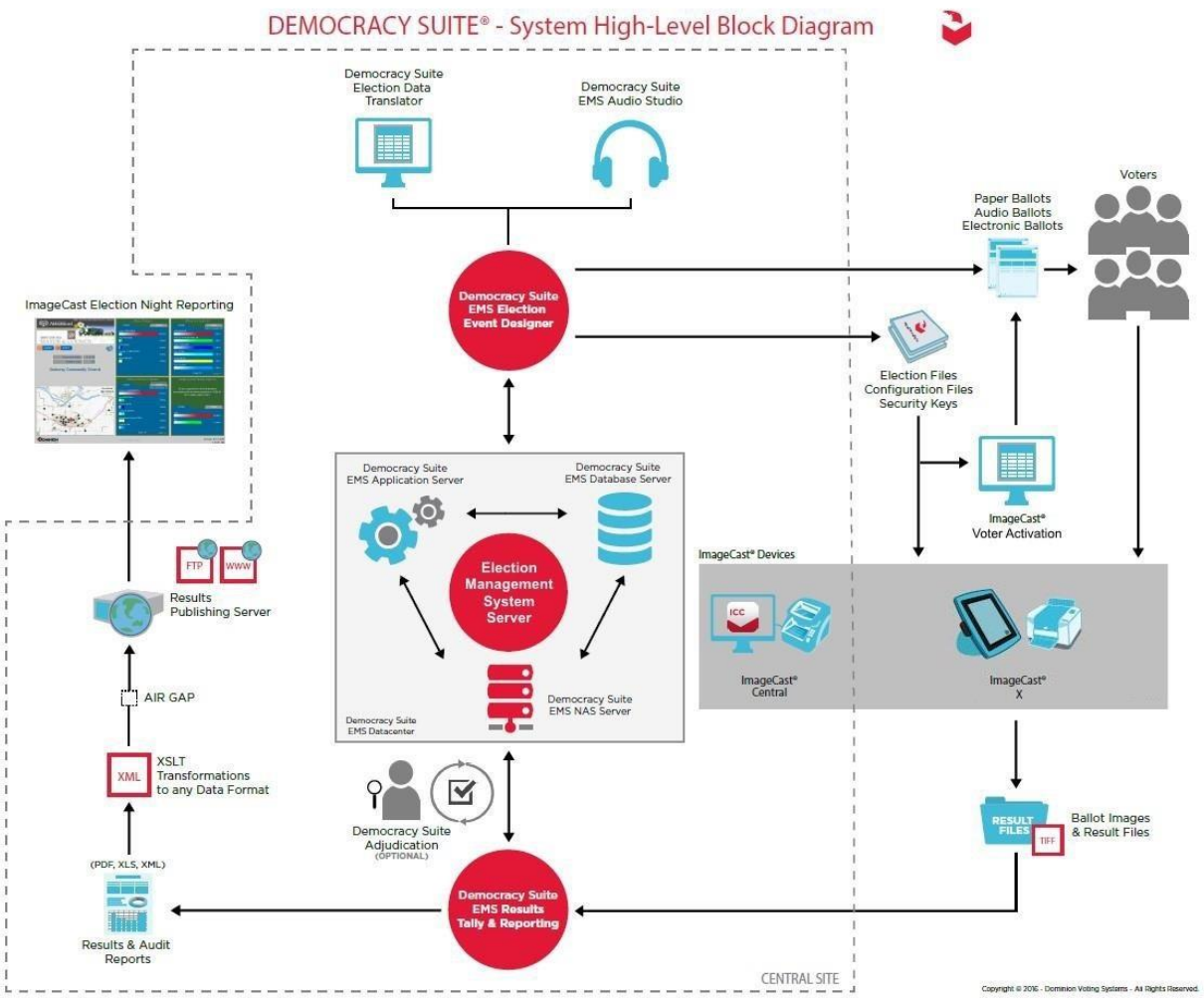

Figure 2-1 System Diagram

2.5 System Technical Data Package

Table 2-1: D-Suite 5.11-CO TDP Documents

Document Number	Document Description	Document Version
2.02	Democracy Suite System Overview	5.11-CO::7
2.03	Democracy Suite EMS Functionality Description	5.11-CO::6
2.03	Democracy Suite ImageCast Central Functionality Description	5.11-CO::4
2.03	Democracy Suite ImageCast X System Functionality Description	5.11-CO::4
2.05	Democracy Suite Adjudication Software Design and Specification	5.11-CO::2
2.05	Democracy Suite EMS Software Design and Specification	5.11-CO::6

Table 2-1: D-Suite 5.11-CO TDP Documents *(continued)*

Document Number	Document Description	Document Version
2.05	Democracy Suite ImageCast Central Software Design and Specifications	5.11-CO::4
2.05	Democracy Suite ImageCast X Software Design and Specification	5.11-CO::4
2.06	Democracy Suite System Security Specifications	5.11-CO::6
2.07	Democracy Suite System Test and Verification	5.11-CO::1
2.08	Democracy Suite Adjudication System Operation Procedures	5.11-CO::3
2.08	Democracy Suite EMS System Operations Procedures	5.11-CO::5
2.08	Democracy Suite ImageCast Central System Operation Procedures	5.11-CO::2
2.08	Democracy Suite ImageCast X System Operations Procedures	5.11-CO::5
2.09	Democracy Suite Adjudication System Maintenance Manual	5.11-CO::4
2.09	Democracy Suite EMS System Maintenance Manual	5.11-CO::3
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.11-CO::3
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.11-CO::1
2.11	Democracy Suite Configuration Management Process	5.11-CO::8
2.12	Democracy Suite Quality Assurance Program	5.11-CO::3
2.13	Democracy Suite System Change Notes	5.11-CO::6
Build Documents		
---	Democracy Suite ImageCast X Build	5.11-CO::4
---	Democracy Suite Windows Build Document	5.11-CO::7
DVS Supplemental Documents		
---	Democracy Suite C# Automated Code Review Process	5.11-CO::2
---	Democracy Suite ImageCast® C++ Coding Standard	5.11-CO::1
---	Java Coding Standards	5.11-CO::1
---	JavaScript Coding Standards	5.11-CO::1
---	Democracy Suite ImageCast Device Configuration Files	5.11-CO::1
---	Democracy Suite ImageCast Election Definition Files	5.11-CO::1
---	Democracy Suite ImageCast Printing and Finishing Specifications	5.11-CO::1
---	Democracy Suite ImageCast Total Results File Format	5.11-CO::1
---	Democracy Suite ImageCast X Machine Configuration File (MCF) Parameters Settings	5.11-CO::3

Table 2-1: D-Suite 5.11-CO TDP Documents *(continued)*

Document Number	Document Description	Document Version
---	Usability Test Report Of ImageCast X 5.0 with 36 Participants for VVSG	5.0
Installation and Configuration		
---	Democracy Suite EMS Client Workstation Installation and Configuration Procedure	5.11-CO::5
---	Democracy Suite EMS Express Installation and Configuration Procedure	5.11-CO::6
---	Democracy Suite EMS Standard System Installation and Configuration Procedure	5.11-CO::5
---	Democracy Suite ImageCast Central Installation and Configuration Procedures	5.11-CO::7
---	Democracy Suite ImageCast X System Installation and Configuration	5.11-CO::8
User Guides		
---	ImageCast Adjudication User Guide	5.11-CO::4
---	Democracy Suite EMS Audio Studio User Guide	5.11-CO::1
---	Democracy Suite EMS Election Data Translator User Guide	5.11-CO::4
---	Democracy Suite EMS Election Event Designer User Guide	5.11-CO::8
---	Democracy Suite ImageCast Central User Guide	5.11-CO::3
---	Democracy Suite EMS Voter Activation User Guide	5.11-CO::6
---	Democracy Suite ImageCast X User Guide	5.11-CO::9
---	Democracy Suite EMS Mobile Ballot Production User Guide	5.11-CO::1
---	Democracy Suite EMS Results Tally & Reporting User Guide	5.11-CO::7
COTS Manuals		
---	AbleNet_single_switch_manual.pdf	---
---	Tripp_Smart_Pro_SM1500RMXL2UTAA_Datasheet.pdf	---
---	SCAMAX-8x1-Document-Scanner-Brochure.pdf	---
---	SCAMAX_DocumentScanner_UserManual.pdf	---
---	OKI_C721_manual.pdf	---
---	OKI_C331_C531_users_guide.pdf	---
---	Lava_Hub_Manual.pdf	---
---	Kingston_FCR-HS4_data_sheet.pdf	---
---	InterScan_HiPro_821.pdf	---
---	HP_LaserJet_Pro_M402dne_Datasheet.pdf	---

Table 2-1: D-Suite 5.11-CO TDP Documents *(continued)*

Document Number	Document Description	Document Version
---	Galaxy_Tab_Pro_SM-T900_User_Manual.pdf	---
---	Galaxy_Tab_Pro_SM-P900_Health_and_Safety.pdf	---
---	Galaxy_Note_Pro_SM-P900__User_manual.pdf	---
---	Dell_Precision-t1700-workstation_owners-manual_en-us.pdf	---
---	Dell_Precision-3430-workstation_owners-manual2_en-us.pdf	---
---	Dell_Precision_T3420_Workstation_Owner_Manual.pdf	---
---	Dell_Poweredge_R640_Tech_Guide.pdf	---
---	Dell_Poweredge_R640_Owner_Manual.pdf	---
---	Dell_Poweredge_R630_Owner_Manual.pdf	---
---	DEll_PowerEdge_R630_Data_Sheet.pdf	---
---	Dell_P2419h-monitor_user's-guide_en-us.pdf	---
---	Dell_P2417H_Monitor_Users_Guide.pdf	---
---	Dell_Optiplex-7440-aio_Owners_Manual_en-us.pdf	---
---	Dell_optiplex-7060-desktop_Service-Manual2_en-us.pdf	---
---	Dell_OptiPlex 3050 AIO.pdf	---
---	Dell_Networking_X-Series_Datasheet.pdf	---
---	Dell_Latitude-3490-laptop_owners-manual4_en-us.pdf	---
---	Dell_latitude-3480-laptop_owners manual_en-us.pdf	---
---	Dell_latitude-3470-laptop_Owners_Manual.pdf	---
---	Dell_Latitude_E7470_Ultrabook_Owners_Manual.pdf	---
---	Canon_DRX10C_User_Manual.pdf	---
---	Canon_DR-G1130_User_Guide.pdf	---
---	Canon_DR-M160II_User_Guide.pdf	---
---	Avalue_SID-21V_QuickRef.pdf	---
---	Avalue_SID_21V_Z37_UserManual.pdf	---
---	Avalue_SID_21V_FactSheet.pdf	---
---	Avalue_SID_15V_Z37_UserManual.pdf	---
---	Avalue_SID_15V_QuickRef.pdf	---
---	Armodilo-Sphere-Specification-Sheet.pdf	---
---	Armodilo-Sphere-Mounting-Instructions.pdf	---
---	Armodilo-Original-Sphere-Setup-Guide.pdf	---

Table 2-1: D-Suite 5.11-CO TDP Documents *(continued)*

Document Number	Document Description	Document Version
---	APC_SMT1500C_UserGuide.pdf	---
---	APC_SMT1500_User_Guide.pdf	---
---	APC_BR1000G_User_Guide.pdf	---
---	ACOS6_Reference_Manual_v2.81.pdf	---

3.0 TEST PROCESS AND RESULTS

To evaluate the Democracy Suite 5.11-CO test requirements, each section of the EAC 2005 VVSG was analyzed to determine the applicable tests. The EAC 2005 VVSG Volume I Sections, along with the strategy of evaluation, are described below:

Section 2: Functional Requirements

The requirements in this section were tested during the FCA and System Integration Test. This evaluation utilized baseline test cases as well as specifically designed test cases and included predefined election definitions for the input data.

Section 3: Usability and Accessibility Requirements

The requirements in this section were tested during the Usability/Accessibility Testing.

Section 4: Hardware Requirements

The InterScan HiPro scanner is new to this configuration. To satisfy the hardware requirements for this state certification effort, results from a parallel test campaign (D-Suite 5.5-B EAC-certification) were utilized.

Section 5: Software Requirements

The requirements in this section were tested utilizing a combination of review and functional testing during the Source Code Review, Build Documentation Review, and FCA.

Section 6: Telecommunications Requirements

The requirements in this section were not tested during this test campaign.

Section 7: Security Requirements

The requirements in this section were tested during the Source Code Review, Security Tests, and FCA.

Section 8: Quality Assurance Requirements

The requirements in this section were not tested during this state certification effort as results were re-used from previous test campaigns.

Section 9: Configuration Management Requirements

The requirements in this section were not tested during this state certification effort as results were re-used from previous test campaigns.

Throughout the test campaign, Pro V&V personnel maintained a test log identifying the system and equipment under test and any records of deviations to the test plan along with the rationale for performing the deviations. Pro V&V also utilized an internal bug tracking system to record and track all issues and/or discrepancies noted during the test campaign

The following sections outline the test process that was followed to evaluate D-Suite 5.11-CO against the test goals defined in Section 2.0.

3.1 Test Configuration

The testing event utilized one setup of the D-Suite 5.11-CO System and its components. The following is a breakdown of the D-Suite 5.11-CO System components and configurations for the test setup:

Standard Testing Platform:

Individual ICX system were setup at various Voting Service and Polling Centers (VSPCs) for both early and Election Day voting. Each VSPC was supplied with an ICX Classic BMD unit connected to its accompanying printer, ATI handset, headphones, and Binary Input Devices (Sip and Puff device).

The central count location utilized a single InterScan HiPro 821dd high-speed scanner connected to a desktop PC with an iButton Reader/Writer. Additionally, the central count location housed an EMS Express server with the EMS applications installed, and accompanied by a SmartCard Reader/Writer and an iButton Reader/Writer. The Express Server was tested in two configurations: one with the SQL Server 2016 Express with Advanced Services and one with the SQL Server 2016 Standard.

3.2 Summary Findings and Recommendation

Summary findings for the System Level Testing (System Integration Testing, Accuracy, and FCA), PCA (including Security Review), and Source Code Review are detailed in the relevant sections of this report.

3.2.1 Source Code Review

Pro V&V reviewed the submitted source code to the EAC VVSG 1.0 and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V verified that the

submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met. The source code review was based on the source code changes made since the previous system was certified

A combination of Automated Source Code Review and Manual Source Code Review methods were used to review the changes in the source code from the previously certified system. In addition, 10% of the source code comments were manually reviewed.

Summary Findings

- Automated Source Code Review: The Automated Source Code Review was performed during the D-Suite 5.11-CO Compliance and Trusted Builds. No source code issues were found during the Automated Source Code review.

- Manual Source Code Review: The Manual Source Code review was performed on 10% of the comments for compliance to VVSG Volume Section 5.2.7. No source code issues were found during the Manual Source Code review.

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

- Trusted Build: The trusted build consisted of inspecting customer submitted source code, COTS, and third party software products and combining them to create the executable code. This inspection followed the documented process from the "United States Election Assistance Commission Voting System Test Laboratory Program Manual" Section 5.5 – 5.7. Performance of the trusted build includes the build documentation review. The Trusted Build was performed following the completion of the Functional Configuration Audit.

3.2.2 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 5.11-CO 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.

3.2.3 Security Testing

The objective of the security testing was to evaluate the security posture of the system that may have been affected by the changes implemented in this modification. The evaluation of the system was accomplished by utilizing a combination of documentation review, functional testing, and manual inspection. During the execution of a security penetration evaluation, the system was inspected to verify that various controls and measure were in place in order to meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

Summary Findings

During the security penetration evaluation, test personnel first verified that the manufacturer's TDP contained documented access and physical controls and then, following the manufacturer's documented procedures, configured the voting system for use and functionally verified that the documented controls were in place and were adequate to meet the stated requirements.

3.2.4 System Level Testing

System Level Testing included the Functional Configuration Audit (FCA), the Accuracy Test, and the System Integration Tests. The Accuracy Test and the 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, three primary and three general elections 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 5.11-CO 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 5.11-CO technical documentation. This included connecting all supporting equipment and peripherals as well as any physical security equipment such as locks and ties.

3.2.4.1 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

All functional tests were successfully executed. No issues were noted.

3.2.4.2 Accuracy

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

For paper-based voting systems, the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests and the conversion of those selections detected on the paper ballot converted into digital data.

Summary Findings

The D-Suite 5.11-CO system software successfully passed the Accuracy Test without issue. A total of 1,569,500 voting positions were voted on the system with all actual results obtained during test execution matching the expected results.

3.2.4.3 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 5.11-CO technical documentation.

Three General Elections and two Primary Elections were successfully exercised on the voting system, as described below:

General elections 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. 5 of the contests are in all 4 ballot styles. The other 15 contests are split between at least 2 of the precincts with a maximum of 4 different contest spread across the 4 precincts.

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

- General Election GEN-03: A basic election held in two precincts. This election contains eight contests and is compiled into two ballot styles. Four of the contests are in both ballot styles. The other four contests are split between the two precincts. This election is designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for two languages (English and Spanish).

Primary elections with the following breakdown:

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

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

The D-Suite 5.11-CO successfully passed the System Integration Test. During execution of the test procedure, it was verified that the D-Suite 5.11-CO successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

3.2.4.4 Regression Testing

Regression testing was conducted on the D-Suite 5.11-CO to establish assurance that the modifications had no adverse impact on the compliance, integrity, or performance of the system. No new faults or issues were found during regression testing.

3.2.5 Hardware Testing

The addition of the InterScan HiPro to the baselined system required Temperature/Power Variation testing to be performed to verify compliance to the requirements set forth in the EAC 2005 VVSG 1.0. To satisfy this requirement, results from a parallel test campaign (D-Suite 5.5-B EAC-certification) were utilized. These results are summarized below.

All testing was performed at the NTS Longmont facility located in Longmont, Colorado. All testing at the NTS Longmont facility was executed on-site by Pro V&V qualified personnel.

Summary Findings

Testing was performed on InterScan HiPro. The procedures and results for this testing are included in the following test report:

- Test Report No. PR097523, *presented in Attachment A*

The test results from this testing are summarized below:

Table 3-: Environmental Hardware Test Results

Standard/Method	Description	Criteria	Result
MIL-STD-810D, 501.2/502.2 VVSG Vol 1 4.1.2.13, 4.3.3, VVSG Vol 2 4.7.1	Reliability, Temp-Power Variation Testing	Normal Operation & No Data Loss	Pass

3.2.6 Usability and Accessibility

Usability and Accessibility Testing was conducted to verify the D-Suite 5.11-CO system met the usability and accessibility requirements set forth in the EAC 2005 VVSG 1.0.

Summary Findings

All applicable usability and accessibility requirements were met with no deficiencies noted.

4.0 CONCLUSION

Based on the results obtained during the test campaign, Pro V&V determines the D-Suite 5.11-CO, 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, the Colorado Requirements Gap Analysis Matrix, which incorporates the 2002 VSS requirements, and the Colorado-specific requirements in the Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21. Throughout the test campaign, as tests were executed, resultant data was inspected and technical documentation reviews were performed to ensure that each applicable requirement was met; therefore, fulfilling the test goals.

ATTACHMENT A

Hardware Test Report

Provided as separate document