PRO V&V

Test Report

**Dominion Voting Systems
Democracy Suite (D-Suite) System
Version 5.2-CO
Certification Testing**

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1 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) 5.2-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 and the voting systems requirements set forth by the State of Colorado.

1.1 References

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

- D-Suite 5.2-CO (Colorado State Level) Testing Campaign Scope of Testing Document dated 2017-03-06

- State of Colorado Requirements Matrix

- Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21

- 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, 2006 Edition, "NVLAP Procedures and General Requirements (NIST Handbook 150)", dated February 2006

- 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 Democracy Suite 5.2-CO Technical Data Package *(A listing of the D-Suite 5.2-CO documents submitted for this test campaign is listed in Section 2.4 of this Test Plan)*

1.2 Terms and Abbreviations

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

"ADA" – Americans with Disabilities Act 1990

"ATI" – Audio Tactile Interface

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"DRE" – Direct Record Electronic

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"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 Democracy Suite 5.2-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 D-Suite 5.2-CO includes functional and usability enhancements to further address the State of Colorado requirements, as listed below:

 Election Management System

1. Changed EMS components to utilize Windows Authentication instead of SQL Server Authentication.

2. Added ability for system to utilize self-encrypting drives as an additional security feature.

3. All components now running on combination of Windows 10, Windows Server 2012R2, with SQL Server 2016. Also included are scripts for security hardening procedures.

4. Added ability to configure how common cards are consolidated and to track precinct information for consolidated cards.

5. Added ability to create a convention for the ballot ID, artwork file name and description.

6.   Added ability to generate one or more ballots without generating all ballots in the election project.

7.   Added the ability to produce election definition in final form for the ImageCast X voting application.

8. Added ability to produce and modify a configuration file for ImageCast X.

9. Allowed the application to program the USB Flash Device with necessary resources used for setting up an ImageCast X voting device.

10. Extended the styling capabilities for Ballot Type, Translations, Contest and Contest Heading sections and dialogs to allow the EED User to style content for voting screens and printed artifacts. This also includes a new set of template keywords.

11. Added a new section for listing and modifying settings for Screen Ballots for display on the ImageCast X voting application.

12. Renamed existing "Ballots" Section to "Ballot Cards", serving to separate settings from "Screen Ballots".

13. Added ability to preview a screen ballot when an ICX device is connected via USB.

14. Modified the specification of available area for Write-in detection, which is passed through the election files to the optical scan tabulators.

15. Improved reporting ability to break-down results per precinct for consolidated ballots.

16. Added new report export providing information on cast vote records.

17. Added new report export providing information on what precincts each batch of results contains.

18. Added ability to select multiple precincts for the Summary Report.

19. Added ability to indicate in a project whether disabled contests and candidates should appear in the Election Summary and Statement of Votes Cast reports.

20. Added ability to bypass adjudication for early voting results.

21. Added ability to import subsets of data using the application: New languages and translations, template assignment, and tabulators.

22. Modified Contest and Contest Heading tables to allow enhance styling capabilities for ImageCast X.

23. Improved Adjudication Stop/Resume function to be more robust.

ImageCast Central

1. Replaced the Kofax module with a TWAIN interface.

2. Added an option to force ICC to overrun a preset number of ballots every time scanning stops mid-batch.

3. Simplified the switching between election projects in ICC.

4. Application now runs on Windows 10 operating system.

ImageCast X

1. Added a vote simulator for use during Logic & Accuracy Testing.

2. Added ability to display more than one contest on a screen.

3. Added ability to display a heading for a single or a group of contests on the screen.

4. Added ability to align the contest cell left, right or center, along with support for font size, bold, italic and underline text.

5. Added ability to playback audio for screen contents for languages that do not have Text-to-Speech support.

6. Modified the printing of the QR Ballot so it now has the human readable part printed in an OCR-friendly font.

7. Improved ability to print voter's selection on the BMD printer in non-Latin languages (e.g., Chinese).

8. Added support for using Legal-sized paper size on the BMD printer

ImageCast Voter Activation

1. Streamlined workflow – less clicks to activate voter card

2 Testing Overview

The evaluation of the D-Suite 5.2-CO System was designed to achieve the goals set forth in the Test Plan. The goals were constructed to verify that certain D-Suite 5.2-CO features and applications, which have been modified from the EAC certified 5.0 baseline, conform to the applicable EAC 2005 VVSG 1.0 requirements and the State of Colorado requirements. The evaluation addressed each of the following test goals in the following manner:

Table 2-1: Testing Overview

Test Goal	Testing Response
Perform Source Code Review, Generate Compliance Builds of the D-Suite application components, and perform a Build Documentation Review	Trusted Builds were generated for Colorado 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.
Verify that the D-Suite 5.2-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 5.2-CO System to specific election scenarios using a combination of different ballot programming approaches, ballot designs, ballot sizes, languages, and tabulators.
Ensure that the D-Suite 5.2-CO provides support for all Colorado election management requirements (i.e. ballot design, results reporting, recounts, etc.)	This was tested by evaluating the D-Suite 5.2-CO System against the applicable requirements of the Colorado Gap Analysis Matrix for voting systems.
Simulate pre-election, Election Day, absentee, recounts, and post-election activities on the D-Suite 5.2-CO System during Functional Configutaion Audit (FCA).	The components of the D-Suite System were tested in pre-election, Election Day, post-election and recount situations and evaluated against documented behavior and expected results for all scenarios.
Perform Security Testing	The security assessment performed by Pro V& V consisted of network port enumeration, installed software enumeration collected from the systems' registries via script, vulnerability scanning, and configuration compliance checking.

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

Test Goal	Testing Response
Complete System Integration Testing, including Accuracy Testing	The components of the D-Suite System were tested to address the integration of hardware and software. This testing focused on the compatibility of the voting system software components and subsystems with one another and with other voting system components. Accuracy Testing was performed to verify that the voting system components could process ballot positions within the allowable target error rate by testing the ability of the system to "capture, record, store, consolidate, and report" specific voter selections and absences of a selection.

2.1 Test Candidate

The Democracy Suite 5.2-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).

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.

Election Administration

Democracy Suite Election Management System (EMS)

- Dominion Voting Systems Democracy Suite EMS 5.2.16.1, containing:

    - Election Event Designer

    - Results Tally and Reporting

    - Audio Studio

    - Application Server

    - Data Center Manager

    - File System Service

    - Adjudication Service

    - Election Data Translator

    - Adjudication

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

- 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 4.5

  - 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)

- 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 (SHA-1) with USB Reader/Writer: Maxim DS9490R#

- Compact Flash Reader: Lexar Professional USB 3.0 Dual-Slot Card Reader or equivalent

- LCD monitor, keyboard, mouse, headset with microphone, audio adapter, networking switch – COTS computing accessories

- Election media

  - iButton: Maxim DS1963S-F5+

  - DVS Compact Flash Memory Cards: 4GB, 8GB, 16GB, or 32GB

  - USB Memory Device: 4GB, 8GB, or 16GB

  - Smart Cards: ACOS-6-64

Central Count

- ICC software application: version 5.2.0.707

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-X10C driver - version 1.15 w/ SP1

- Canon: DR-G1130 driver - version 1.0.0.1

- Canon: DR-M160-II driver - version 1.2.5582

COTS Hardware:

- ICC Scanner: Canon DR-X10C

- ICC Scanner: Canon DR-G1130

- ICC Scanner: Canon DR-M160-II

- 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: 5.2.6297.27275

- Hardware version:

    - Samsung Galaxy Note Pro (12.2 in. screen)

    - Samsung Galaxy Tab Pro (12.2 in. screen)

Optional Hardware

- Accessible-Tactile Interface (ATI-USB) box

COTS Hardware

- UPS: APC SMT-1500

- Printer: HP M402dne Laser

- Smart Cards: ACOS-6-64

COTS Software

- Android 5.0 (Samsung)

- Android 4.4.2 (Samsung)

Optional COTS Software

- None

Optional COTS products

- Headphone: Cyber Acoustics ACM-70 or equivalent

- Accessible Interface Box: Tecla Accessible Interface box

- Joystick: Komodo OpenLab 4-way Joystick

- 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: 5.2.16.1

COTS Hardware and Software

- Client Laptop Configuration

– Microsoft Windows 10 Professional

– Desktop computer system per *2.02 Democracy Suite System Configuration Overview*

- Smart Cards: ACOS-6-64

2.1.1 Supported Languages

The following languages have been stated by D-Suite 5.2-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 will be cast during functional testing. The accuracy of the translations between languages will not be verified.

2.1.2 Supported Functionality

The Democracy Suite 5.2-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

2.2 Testing Configuration

The testing event utilized one setup of the D-Suite 5.2-CO System and its components as configured for normal use by the State of Colorado. The following is a breakdown of the D-Suite 5.2-CO System components and configurations for the test setup:

Standard Testing Platform:

Individual ICX systems were set up at various Voting Service and Polling Centers (VSPCs) for both early and election day voting. Each VSPC was supplied with a laptop computer containing the ImageCast Voter Activation (ICVA) application, multiple COTS tablet devices loaded with the ICX client application, printers connected to the ICX tablets, and accessibility devices.

The central count location utilized multiple Canon DR-G1130, DR-X10C, or DR-M160II scanners connected to ICC workstations and ImageCast Adjudication clients. Additionally, the central count location housed an EMS server containing all of the D-Suite Server components listed above. ImageCast Adjudication, Election Event Designer (EED), and Results Tally and Reporting (RTR) clients required Ethernet connectivity with the EMS server.

2.3 Test Support Equipment/Materials

All test support equipment and materials required to facilitate testing were supplied by Dominion.

2.4 Technical Data Package

This subsection lists all manufacturer provided documentation that is relevant to the system being tested.

Table 2-2. TDP Documents

Document Number	Description	Version
Adjudication Documents		
2.05	Democracy Suite Adjudication Software Design and Specification	5.2-CO::76
2.08	Democracy Suite Adjudication System Operation Procedures	5.2-CO::126
2.09	Democracy Suite Adjudication System Maintenance Manual	5.2-CO::59
Democracy Suite Documents		
2.02	Democracy Suite System Overview	5.2-CO::70
2.06	Democracy Suite System Security Specification	5.2-CO::483
2.07	Democracy Suite System Test and Verification	5.2-CO::144
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.2-CO::86
2.11	Democracy Suite Configuration Management Process	5.2-CO::292
2.12	Democracy Suite Quality Assurance Program	5.2-CO::113
2.13	Democracy Suite System Change Notes	5.2-CO::46
EMS Documents		
2.03	Democracy Suite EMS Functional Description	5.2-CO::319
2.05	Democracy Suite EMS Software Design and Specification	5.2-CO::268
2.08	Democracy Suite EMS System Operations Procedures	5.2-CO::680
2.09	Democracy Suite EMS System Maintenance Manual	5.2-CO::100
---	Democracy Suite EMS System Installation and Configuration Procedure	5.2-CO::126
ImageCast Central Documents		
2.03	Democracy Suite ImageCast Central Functionality Description	5.2-CO::133
2.05	Democracy Suite ImageCast Central Software Design and Specification	5.2-CO::77
2.08	Democracy Suite ImageCast Central System Operation Procedures	5.2-CO::166
---	Democracy Suite ImageCast Central Installation and Configuration Procedure	5.2-CO::84
ImageCast X Documents		
2.03	Democracy Suite ImageCast X Functionality Description	5.2CO.6

Table 2-2. TDP Documents *(continued)*

Document Number	Description	Version
2.05	Democracy Suite ImageCast X Software Design and Specification	5.2CO.6
2.08	Democracy Suite ImageCast X System Operation Procedures	5.2CO.7
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.2CO.6
---	Democracy Suite ImageCast X Installation and Configuration Procedure	5.2CO.7
User Guides		
---	Democracy Suite ImageCast Adjudication User Guide	5.2-CO::108
---	Democracy Suite EMS Audio Studio User Guide	5.2-CO::24
---	Democracy Suite EMS Election Data Translator User Guide	5.2-CO::66
---	Democracy Suite EMS Election Event Designer User Guide	5.2-CO::155
---	Democracy Suite EMS Mobile Ballot Production User Guide	5.2-CO::34
---	Democracy Suite EMS Results Tally and Reporting User Guide	5.2-CO::84
---	Democracy Suite ImageCast Central User Guide	5.2-CO::94
---	Democracy Suite ImageCast Voter Activation User Guide	5.2-CO::34
---	ImageCast X Ballot Marking Device User Guide	5.2CO.6
Supplementary Documents		
---	AT4 Wireless Test Report No. (NIE) 39698RSE.001 (Tecla Shield)	---
---	Cyber Acoustics ACM-70B Stereo Headphones Product Sheet	---
---	Democracy Suite ImageCast C++ Coding Standard	5.2-CO::22
---	Democracy Suite C# Automated Code Review Process	5.2-CO::17
---	Dell Latitude E7470 Owner's Manual	Rev. A02
---	Dell P2417H Monitor User's Guide	Rev. A01
---	Dell OptiPlex 7440 AIO Owner's Manual	Rev. A01
---	Dell Networking X-Series Specification Sheet	Ver. 1.9
---	Canon DR-G1130 User Manual	---
---	Canon DR-M160II User Manual	---
---	Canon DR-X10C User Manual	---
---	Dominion Voting Systems Java Coding Standards	1.0
---	Dominion Voting Systems JavaScript Coding Standards	1.0
---	Democracy Suite ImageCast Device Configuration Files	5.2-CO::64

Table 2-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Democracy Suite ImageCast Printing and Finishing Specification	5.2-CO::55
---	Democracy Suite ImageCast Total Results File Format	5.2-CO::25
---	Democracy Suite ImageCast Election Definition Files	5.2-CO::35
---	HP LaserJet Pro M203 User Guide	---
---	HP LaserJet Pro M402dn Datasheet	Rev. 2
---	HP LaserJet Pro M402dne Datasheet	---
---	Dell Precision Tower 3420 Owner's Manual	Rev. A00
---	Google Java Style Dominion XML	---
---	Dell PowerEdge R620 Owners's Manual	Rev. A05
---	Dell PowerEdge R630 Regulatory Compliance Sheet	Rev. A10
---	Dell PowerEdge R630 Owners's Manual	Rev. A03
---	APC Back-UPS BE600M1 User Manual	---
---	APC Back-UPS Pro BR1000G User Manual	---
---	APC Back-UPS SMT1500 User Manual	---
---	Samsung Galaxy Note Pro SM-P900 User Manual	---
---	Tripp Lite SmartPro SM1500RMXL2UTAA Datasheet	---
---	Tripp Lite SmartPro SM3000RMXL2UTAA Datasheet	---
---	LAVA STS Product Family User Manual	Rev. A01
---	AOC USB Monitor E1659Fwu User Manual	---
Build Documents		
---	Democracy Suite EMS Software Build Document	5.2::4
---	ImageCast X Build	5.2.5

3 Test Process and Results

The following sections outline the test process that was followed to evaluate the D-Suite 5.2-CO System under the scope defined in Section 1.4.

3.1 General Information

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

3.2 Test Cases/Procedures

To verify that the system met the applicable requirements, Pro V&V utilized baseline test cases augmented with supplemental test cases designed specifically for the system being evaluated in this test campaign. Pro V&V developed specific test cases to include a review of the ICX ballot QR Code to ensure it does not include any voter identity data as well as a test case to ensure that there is no voting/personal information contained on the voter card and the ICX after a voter session has concluded.

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

The following tasks were completed during the testing initialization:

- Ensured proper system of equipment. Checked network connections, power cords, keys, etc.

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

- Verified the presence of only the documented COTS.

- Ensured removable media is clean.

- Ensured batteries are fully charged.

- Inspected supplies and test decks.

- Recorded protective counter on all tabulators.

- Reviewed physical security measures of all equipment.

- Recorded basic observations of the testing setup and review.

- Recorded serial numbers of equipment.

- Retained proof of version numbers.

3.3 Test Results

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

Source Code Review/Trusted Build – A source code review was performed in order to review the submitted source code to the specific requirements. Both manual and automated review technics 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 for Colorado, 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.

Functional Configuration Audit (FCA) – During this area of testing, the specific functionality of the system under evaluation that is claimed by the manufacturer was targeted to ensure the product functions as documented. This testing used both positive and negative test data to test the robustness of the system.

Summary Findings:

During the test case design phase of the FCA, a number of issues were identified and submitted to Dominion for resolution. Dominion addressed these issues with source code changes as well as other forms of remediation as required. All discrepancies noted were resolved prior to performance of the FCA. During performance of the FCA, test cases were executed to verify that the QR Code printed on the ICX ballot does not include any voter identity data, as well as to verify that no voting/personal information is contained on the voter card or the ICX after conclusion of a voter session.

Accuracy – An accuracy test was performed to ensure that the voting system components could process ballot positions within the allowable target error rate. This test was designed to test the ability of the system to "capture, record, store, consolidate, and report" specific voter selections and absences of a selection.

Summary Findings:

To perform the Accuracy Test, ballots generated during the reliability test were scanned by the ICC and a results report was generated. Each ballot had 525 ballot positions and a total of 3000 ballots were scanned resulting in a total of 1,575,000 ballot positions being read accurately. During execution of the test procedure, it was verified that the D-Suite 5.2-CO System with ICX successfully completed the accuracy test with all actual results obtained during test execution matching the expected results.

While importing results into the RTR application, it was discovered that loading results from a directory when using a Centon Datastick Pro USB thumb drive, directories would sometimes appear in the directory list twice. This issue did not adversely affect the functionality of the system; however, the occurrence could cause confusion to the user. Upon evaluation, it appeared that the issue stemmed from a known issue in the Windows 10 Operating System and not from the RTR application.

System Integration – System level certification tests were performed to address the integration of the hardware and software. This testing focused on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. During test performance, the system was configured as would be for normal field use.

Summary Findings:

To perform the System Integration test, three General Elections and three Primary Elections were designed in the EED application. The elections were then loaded onto ICX ballot marking devices. Ballots were marked using the ICX units and were read by the ICC. The results were sent to RTR for results reporting. During execution of the test procedure, it was verified that the D-Suite 5.2-CO System with ICX successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

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

Summary Findings:

Regression Testing was performed to verify that functional testing discrepancies discovered during the test case design process for the Functional Configuration Audit were addressed by Dominion. Each discrepancy was tested to verify that it functions correctly as described in the TDP. During execution of the test procedure, it was verified that the D-Suite 5.2-CO System successfully completed the functional regression test with all actual results obtained during test execution matching the expected results.

Physical Configuration Audit (PCA) – A PCA was performed to compare the voting system components submitted for testing to the manufacturer's technical documentation. The PCA was

conducted in two phases: Initial and Final. The Initial PCA was conducted in order to baseline the system prior to test campaign commencement. The Final PCA was conducted in order to verify the final software and hardware configurations.

Summary Findings:

During execution of the test procedure, the components of the D-Suite 5.2-CO System were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release. At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented.

Security – 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, Vulnerability Scanning, Installed Software Enumeration, Port Enumeration, and SCAP Compliance Checking was performed on the D-Suite 5.2-CO voting system. The security of the system components were analyzed using automated scanners.

Pro V&V provided the results of the automated scans to Dominion for response and/or resolution. Pro V&V accepts the analysis provided by Dominion. Pro V&V finds that the D-Suite 5.2-CO voting system is in compliance with the 2002 VSS and the requirements of the State of Colorado.

3.4   Conditions of Satisfaction

The voting system was evaluated against the Colorado Requirements 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 conditions of satisfaction. The Matrix which includes verification that the conditions of satisfaction were met is included in Attachment A.

4 Conclusions

Based on the results obtained during the test campaign, Pro V&V determines the D-Suite 5.2-CO System, as presented for evaluation, meets the requirements for voting systems of the State of Colorado as prescribed in the Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21.

Attachment A – Requirements Matrix

(Colorado Requirement Matrix provided separately as

Colorado Requirements Matrix-DVS5.2-CO)