



# Test Plan

**Dominion Voting Systems**  
**D-Suite 5.17-CO**  
**Certification Testing**

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## 1.0 INTRODUCTION

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow to evaluate the Dominion Democracy Suite (D-Suite) 5.17-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. *Note: Colorado requires testing to the 2002 Voting Systems Standard (VSS) by statute; however, testing to the VVSG requirements is deemed sufficient since the requirements in the VSS and VVSG are almost identical.*

The system configuration is a modification baselined from the previously state certified D-Suite 5.13-A system, the modifications of which were evaluated during certification testing of the D-Suite 5.17 system configuration. This system is currently undergoing certification testing as an EAC test campaign. As of the date of this Test Plan, the final certification test report documenting successful completion of certification testing has been submitted to the EAC for review.

### 1.1 Scope

The scope of this testing event will incorporate a sufficient spectrum of physical and functional tests to verify that certain D-Suite 5.17-CO features and applications, which have been modified from the D-Suite 5.17 baseline, conform to the applicable EAC 2005 VVSG 1.0 requirements. D-Suite 5.17-CO includes modifications to the D-Suite 5.13-A system currently certified for use in the State of Colorado. These modifications were evaluated during the D-Suite 5.17 EAC test campaign.

Specifically, the testing event has the following goals:

- Verify that the D-Suite 5.17-CO System meets both the applicable requirements of the EAC 2005 VVSG 1.0 and the additional Colorado-specific requirements
- Perform Trusted Builds and Generate Hash Values
- Physical Configuration Audit (PCA), including System Loads and Hardening
- Technical Documentation Review
- Functional Configuration Audit (FCA), including functional testing of all submitted modifications and testing of Instant Runoff Voting
- System Integration Testing, including Accuracy Testing and Regression Testing

Dominion Voting Systems has identified the following modifications from the previously certified system 5.13-A system configuration:

#### General System Changes

- System and security updates to Democracy Suite

- Upgrade to Windows Server 2019 and SQL Server 2019
- New tool for performing automated hardening procedure of all Windows-based components
- Additional encryption of election databases on ICX
- ICX Smart Card Mutual Authentication and Secure Messaging
- Added additional election-specific information to the barcode on paper ballots
- Improved pseudo random number algorithm

#### Election Management System

- System and security upgrades to the EMS system:
  - Expanding use of Trusted Certificates
  - Additional Software Encryption of the SQL database
  - Blocked auto-play for all external media
- Election Event Designer: Added information about status of election files in the Tabulator list to indicate whether election media has been programmed or needs to be re-programmed
- Results Tally & Reporting: Added option to redact low turnout by precinct and/or counting group from CVR export for Primary Elections

#### Adjudication

- New Adjudication Activity Log and Export
- Added ability to perform Database Back-ups and Maintenance Procedure

#### ImageCast X

- Additional USB models added to list of accepted devices

## **1.2 Background**

The D-Suite 5.0 System (the base system of the D-Suite 5.17) was granted certification to the 2005 Voluntary Voting System Guidelines (VVSG) by the Election Assistance Commission (EAC) on February 8, 2017. The D-Suite 5.17 System (the predecessor of the D-Suite 5.17-CO) is a modification of subsequent systems tested as modifications to the original D-Suite 5.0 System. This 5.17-CO test campaign expands on the D-Suite 5.17 test campaign currently undergoing certification testing as an EAC test campaign.

## **1.3 References**

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

- D-Suite 5.17-CO (State Level) 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 (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 3.0
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 3.0
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-2020, “NVLAP Procedures and General Requirements (NIST Handbook 150-2020)”
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2017 Edition, “Voting System Testing (NIST Handbook 150-22-2017)”
- United States 107<sup>th</sup> 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](http://www.eac.gov))
- EAC Notices of Clarification (NOC) (listed on [www.eac.gov](http://www.eac.gov))
- D-Suite 5.17-CO Technical Data Package

#### **1.4 Terms and Abbreviations**

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

“ADA” – Americans with Disabilities Act 1990

“BMD” – Ballot Marking Device

“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

“ICP” – ImageCast Precinct

“ICX” – ImageCast X

“IRV” – Instant Runoff Voting

“ISO” – International Organization for Standardization

“NOC” – Notice of Clarification

“PCA” – Physical Configuration Audit

“QA” – Quality Assurance

“RCV” – Rank Choice Voting

“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

## **1.5 Testing Responsibilities**

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

### **1.5.1 Test Case Development**

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

## **2.0 TEST CANDIDATE**

*The system that is the baseline for the submitted modification is described in the following subsections. All information presented was derived from the D-Suite 5.17 Certification Test Report currently under review by the EAC and/or the System Overview.*

The Democracy Suite 5.17-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) BMD. Below is the description of the Democracy Suite 5.17 baseline system, which contains the same components descriptions for the Democracy Suite 5.17-CO system.

### **Election Management System (EMS)**

The Democracy Suite 5.17 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.
- **EMS Logger:** A stand-alone application that runs on client or server machines and is used to gather diagnostics for troubleshooting.

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 Election Device Manager: Application used for production and programming of election files, and other accompanying files, for ImageCast X terminals.
- 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.

### **Image Cast 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.

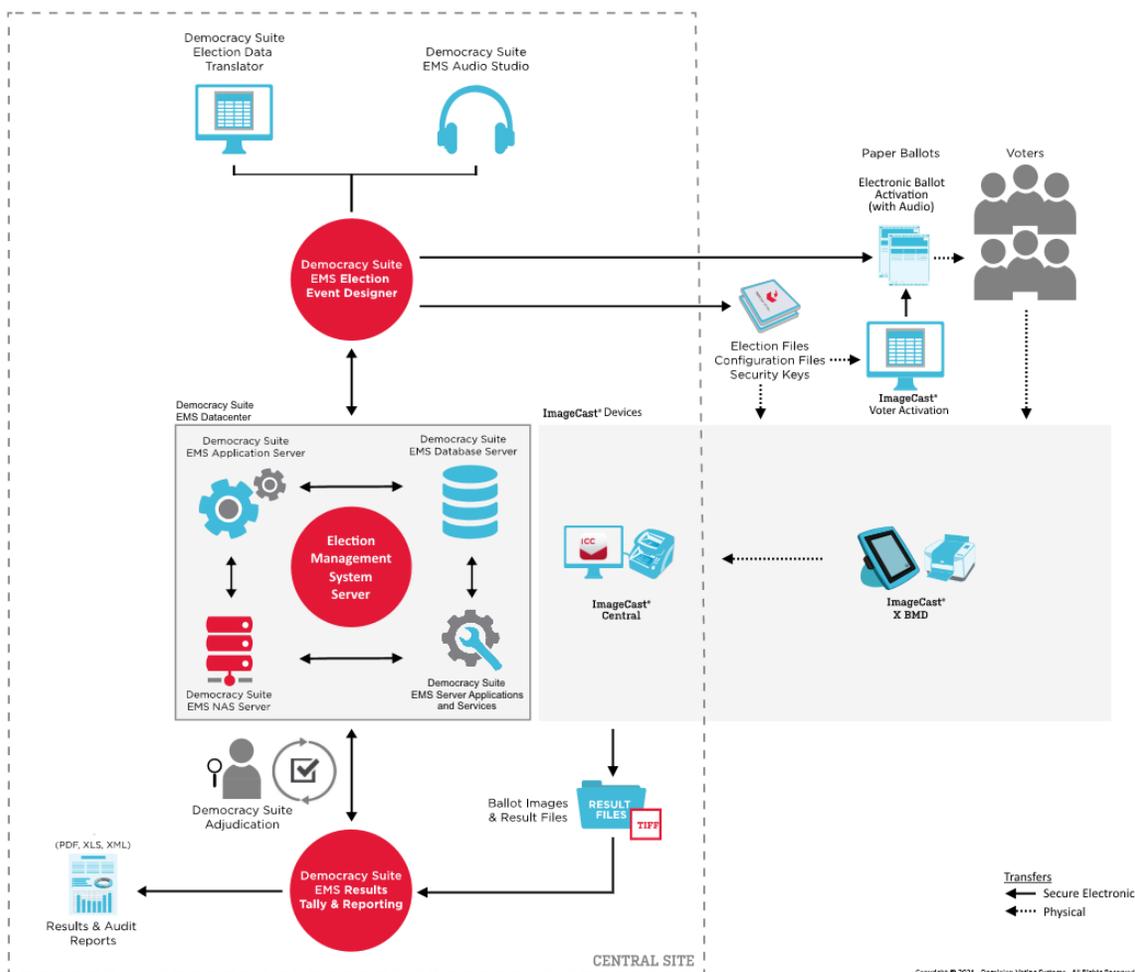
## **2.1 Test Candidate System Overview**

The testing event will utilize one setup of the D-Suite 5.17-CO System and its components as configured for normal use by the State of Colorado.

## **2.2 System Diagram**

A diagram depicting the D-Suite 5.17-CO is provided in Figure 1-1.

## DEMOCRACY SUITE® - System High-Level Block Diagram



**Figure 1-1 System Diagram**

### 2.3 System Limits

**Table 2-1. D-Suite 5.17-CO System Limits**

Characteristic	Limit by Configuration		Limiting Component
	Express	Standard	
Ballot positions	462**/292*	462**/292*	22-inch Ballot
Precincts in an election	250	1000	Memory
Contests in an election	250	1000	Memory

**Table 2-1. D-Suite 5.17-CO System Limits (continued)**

Characteristic	Limit by Configuration		Limiting Component
	Express	Standard	
Candidates/Counters in an election	2500	10000	Memory
Candidates/Counters in a precinct	462**/240*	462**/240*	22-inch Ballot
Candidates/Counters in a tabulator	2500	10000	Memory
Ballot Styles in an election	750	3000	Memory
Contests in a ballot style	156**/38*	156**/38*	22-inch Ballot
Candidates in a contest	231**/240*	231**/240*	22-inch Ballot
Ballot styles in a precinct	5	5	Memory
Number of political parties	30	30	Memory
“Vote for” in a contest	30**/24*	30**/24*	22-inch Ballot
Supported languages in an election	5	5	Memory
Number of write-ins	462**/24*	462**/24*	22-inch Ballot

\* Reflects the system limit for a ballot printed in landscape

\*\* Reflects the system limit for a ballot printed in portrait.

## 2.4 Supported Languages

The following languages have been stated to be supported by the D-Suite 5.17-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.

## **2.5 Supported Functionality**

The Democracy Suite 5.17-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
- Rank Choice Voting

## **2.6 Technical Data Package**

A listing of all documents contained in the D-Suite 5.17-CO TDP will be included in the Final Report.

## **3.0 TEST PROCESS**

The following procedure outlines the steps that the test team will execute to evaluate the D-Suite 5.17-CO System under the scope defined in Section 1.1.

### 3.1 General Information

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

### 3.2 Hardware and Software Required for Testing

Dominion Voting Systems will provide all required software and hardware to perform testing, as listed below:

#### **Democracy Suite 5.17-CO System Configuration Components**

##### Democracy Suite Election Management System (EMS)

- Dominion Voting Systems Democracy Suite EMS 5.17.17.1, containing:
  - Election Event Designer
  - Results Tally and Reporting
  - Audio Studio
  - Election Data Translator
  - Application Server Database Server
  - EMS Logger
  - NAS Server
  - EMS Server Applications & Services
    - Data Center Manager
    - File System Service
    - Adjudication Service 5.17.14.1
    - Smart Card Helper Service
- ❖ DCF version (ICP/ICC) DCF\_5.17.9.1\_20220916
- ❖ MCF version (ICX) MCF\_5.17.15.1\_20220920
- Optional Adjudication 5.17.14.1

##### *COTS Hardware and Software*

- EMS Standard Server Configuration
  - Microsoft Windows Server 2019
  - Microsoft SQL Server 2019 Standard with SP2

- Server computer system per *2.02 Democracy Suite System Configuration Overview*
  - Dell PowerEdge R640
  - Dell PowerEdge R630
  - Dell PowerEdge T630
  - Dell PowerEdge R710
- EMS Express Server Configuration
  - Microsoft Windows 10 Professional
  - Microsoft SQL Server 2019 Express with Advanced Services
  - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
    - Dell Precision 3460 XE
    - Dell Precision 3450 XE
    - Dell Precision 3440 XE
    - Dell Precision T3420
    - Dell Precision T1700
- Client Workstation Configuration
  - Microsoft Windows 10 Professional
  - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
    - Dell Precision 3460 XE
    - Dell Precision 3450 XE
    - Dell Precision 3440 XE
    - Dell Precision T3420
    - Dell Precision T1700
- EMS COTS Software common to Standard and Express configurations
  - Microsoft.Net Framework 4.8
  - Microsoft.Net Framework 3.5
  - Microsoft Visual C++ 2015 Redistributable
  - Java SE Runtime Environment 6.0 Update 20 or later
  - Dallas 1-Wire Device Driver version 4.1.0 or newer
  - Adobe Reader DC or later
- Optional COTS Software for Standard and Express configurations
  - Microsoft Windows Defender (Servers and Client Workstations)

- 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#
  - Smart Card Reader: Advanced Card Systems ACR38U
  - Smart Card Reader: Advanced Card Systems ACR39U
  - Smart Card Reader: HID Omnikey 3121 FIPS-201
  - LCD Monitor:
    - Dell P2422H
    - Dell P2419H
    - Dell P2417H
  - Ethernet Switch: Dell x1026
  - Ethernet Switch: Dell x1008
  - Ethernet Switch: Dell X1018
  - Ethernet Switch: Dell N1524
  - Ethernet Switch: Cisco 8-port Switch (CBS350-8T-E-2G)
  - Ethernet Switch: Cisco 24-port Switch (CBS350-24T-4G)
  - Mini-Server Rack: StarTech RK1236BKF
  - Rack Power Distribution Unit: APC AP9562
  - UPS:
    - Tripp Lite SMART1500RMXL2U
    - APC SMT1500 Smart-UPS
    - APC SMT1500C Smart-UPS
    - APC BR1000G
    - CyberPower PR1500LCD
    - CyberPower PR1500LCD-VTVM

- Keyboard, Mouse, Headset with microphone, Audio Adapter networking switch – COTS computing accessories
- EMS Report Printer: HP M404dn laser or equivalent
- EMS Report Printer: Canon LBP6230dw 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 (128GB): Apricorn AEGIS Secure Key 3NX PN: ASK3-NX-128GB
  - USB Memory Device (32GB): Apricorn AEGIS Secure Key 3NX PN: ASK3-NX-32GB
  - USB Memory Device (120GB): Apricorn AEGIS Secure Key PN: ASK3-120GB
  - USB Memory Device (30GB): Apricorn AEGIS Secure Key PN: ASK3-30GB
  - USB Memory Device (16GB): Centon (BiCS4) PN: C4-CT-U3P2-16.3
  - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
  - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
  - USB Memory Device (8GB): Centon (BiCS4) PN: C4-CT-U3P2-8.3
  - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
  - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
  - Smart Cards: ACOS-6-64

### **ImageCast Voter Activation (ICVA)**

- Software version: 5.17.17.1

#### *COTS Hardware and Software*

- Client Workstation Configuration
  - Microsoft Windows 10 Professional
  - Desktop computer system per 2.02 *Democracy Suite System Configuration Overview*
    - Dell Latitude 3330
    - Dell Latitude 3420
    - Dell Latitude 3410
    - Dell Latitude 3400
    - Dell Latitude 3490
    - Dell Latitude e3480
    - Dell Latitude e3470

- Dell Latitude e7450
  - Dell Latitude e7470
- Auxiliary Equipment:
  - Smart Card Reader: Advanced Card Systems ACR38U
  - Smart Card Reader: Advanced Card Systems ACR39U
  - Smart Card Reader: HID Omnikey 3121 FIPS-201
- Election Media:
  - USB Memory Device (16GB): Centon (BiCS4) PN: C4-CT-U3P2-16.3
  - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
  - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
  - USB Memory Device (8GB): Centon (BiCS4) PN: C4-CT-U3P2-8.3
  - USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
  - USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
  - Smart Cards: ACOS-6-64

### **ImageCast Central Count (ICC)**

- ICC software application: version 5.17.15.1
- 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 4.1.0 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-X10C driver - version 1.15 SP3
  - Canon: DR-M160-II driver - version 1.2 SP6
  - InoTec: HiPro 821 driver - version 1.3.0.4
- COTS Hardware:
- ICC Scanner: Canon DR-G2140
    - Imprinter (optional)
  - ICC Scanner: Canon DR-G1130

- Imprinter (optional)
- ICC Scanner: Canon DR-X10C
- ICC Scanner: Canon DR-M160-II
- 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 Precision 3460 XE
    - Dell Precision 3450 XE
    - Dell Precision 3440 XE
    - Touch Monitor: Planar PCT2235
    - Dell OptiPlex 3050 AIO
    - Dell OptiPlex 7440 AIO
    - Dell OptiPlex 9030 AIO
- InoTec HiPro Scanner Client Workstation Configuration:
  - Desktop computer system per *2.02 Democracy Suite System Configuration Overview*
    - Dell OptiPlex XE4
    - Dell OptiPlex XE3
    - Dell OptiPlex 7060
    - Dell OptiPlex 7050
    - Lenovo 11GCPAR1US (touch monitor)
    - Lenovo 10QXPAR1US (touch monitor)
    - Dell P2418HT (touch monitor)
- Auxiliary Equipment:
  - iButton to 1-Wire USB Adapter: Dallas Maxim DS1402-RP8+
  - iButton Reader/Writer: Dallas Maxim DS9490R#
- Election Media:
  - iButton: Dallas Maxim DS1963S-F5+ (with Key Ring Mount DS9093A+)
  - USB Memory Device (16GB): Centon (BiCS4) PN: C4-CT-U3P2-16.3
  - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1
  - USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM

- USB Memory Device (8GB): Centon (BiCS4) PN: C4-CT-U3P2-8.3
- USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
- USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
- Compact Flash Memory Cards (16GB): Centon C4-CM-CF-16.4

### **ImageCast X with BMD (ICX BMD)**

- Firmware version: 5.17.17.1
- Hardware version:
  - Avalue SID-21V-Z37 (21.5 in. screen-Classic)

#### Optional Hardware

- Accessible-Tactile Interface (ATI-USB) box
- ICX Classic BMD Transport Bag
- ICX Privacy Screen
- ICX Voting Booth

#### COTS Hardware

- UPS:
  - APC SMT-1500
  - APC SMT-1500C
  - CyberPower PR1500LCD
  - CyberPower PR1500LCD-VTVM
- Printer:
  - Avision Ap3061
  - HP M402dne
  - HP M404dn
- Election Media
  - USB Memory Device (128GB): Apricorn AEGIS Secure Key 3NX PN: ASK3-NX-128GB
  - USB Memory Device (32GB): Apricorn AEGIS Secure Key 3NX PN: ASK3-NX-32GB
  - USB Memory Device (120GB): Apricorn AEGIS Secure Key PN: ASK3-120GB
  - USB Memory Device (30GB): Apricorn AEGIS Secure Key PN: ASK3-30GB
  - USB Memory Device (16GB): Centon (BiCS4) PN: C4-CT-U3P2-16.3
  - USB Memory Device (16GB): Centon S4-CM-U3P2-16.1

- USB Memory Device (16GB): Apacer EH353-M APHA016GAG0CG-3TM
- USB Memory Device (8GB): Centon (BiCS4) PN: C4-CT-U3P2-8.3
- USB Memory Device (8GB): Centon S4-CM-U3P2-8.1
- USB Memory Device (8GB): Apacer EH353-M APHA008GAG0CG-3TM
- Smart Cards: ACOS-6-64

#### COTS Software

- Android 8.1.0-2.2.4
- 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)

### 3.2.1 Test Support Equipment/Materials

Dominion Voting Systems will provide all supporting materials necessary to facilitate testing.

### 3.3 Strategy of Evaluations

To evaluate the Democracy Suite 5.17-CO test requirements, each section of the EAC 2005 VVSG will be analyzed to determine the applicable tests. The EAC 2005 VVSG Volume I Sections, along with the strategy of evaluation, are described in the following paragraphs.

#### Section 2: Functional Requirements

The requirements in this section will be tested during the FCA and System Integration Test. This evaluation will utilize baseline test cases. Test cases will be specifically designed to evaluate the previously identified submitted modifications that include:

- Adding support for the DR X10-C
- Adding support for Instant Runoff Voting

Additionally, test cases will be designed to test the following Colorado-specific requirements:

- Abstract Reporting
- Ballot-Level Cast Vote Records and Exports
- Election Night Reporting Data and Exports

#### Section 3: Usability and Accessibility Requirements

The requirements in this section will not be tested during this state certification effort as results shall be re-used from the 5.17 test campaign or previous test campaigns. It was not included in the scope because there were no changes.

#### Section 4: Hardware Requirements

The requirements in this section will not be tested during this state certification effort as results shall be re-used from the 5.17 test campaign or previous test campaigns. It was not included in the scope because there were no changes.

#### Section 5: Software Requirements

No source code changes were submitted as part of this evaluation. The requirements in this section will be evaluated for re-use from the D-Suite 5.17 test campaign or previous test campaigns.

#### Section 6: Telecommunications Requirements

The requirements in this section will not be tested due to Colorado Rule 20.6.1(f) prohibiting the use of modems.

#### Section 7: Security Requirements

The requirements in this section will not be tested during this state certification effort as results shall be re-used from previous test campaigns. The submitted modifications do not require additional testing to be performed.

#### Section 8: Quality Assurance Requirements

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

#### Section 9: Configuration Management Requirements

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

Throughout the test campaign, Pro V&V personnel shall maintain 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 shall also utilize an internal bug tracking system to record and track all issues and/or discrepancies noted during the test campaign.

### **3.4 Test Procedures**

Pro V&V will develop test procedures designed to evaluate the system being tested against the stated requirements. The test procedures can be executed independently. The test procedures are high-level process documents that provide an overview of the testing to be performed. Test cases are utilized within test procedures, as applicable.

The procedures that will be utilized for this test engagement are summarized below:

#### **Source Code Review**

No source code changes were submitted as part of this evaluation. The requirements in this section will be evaluated for re-use from the D-Suite 5.17 test campaign.

#### **Functional Configuration Audit (FCA)**

This area of testing targets the specific functionality claimed by the manufacturer to ensure the product functions as documented. This testing uses both positive and negative test data to test the robustness of the system.

The FCA encompasses an examination of manufacturer 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 (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities apply throughout the election process. They include security, accuracy, integrity, system audit ability, election management system, vote tabulation, ballot counters, telecommunications, and data retention.
- Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.
- Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.
- Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; obtaining consolidated reports; and obtaining reports of audit trails.

- Maintenance, Transportation and Storage Capabilities: These capabilities are necessary to maintain, transport, and store voting system equipment.

### **Accuracy**

The accuracy test ensures that the voting system components can process ballot positions within the allowable target error rate. This test is designed to test the ability of the system to “capture, record, store, consolidate, and report” specific voter selections and absences of a selection. The maximum acceptable error rate in the test process is one in 500,000 ballot positions.

### **System Integration**

The system level certification tests address the integration of the hardware and software. This testing focuses 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 is configured as would be for normal field use.

- Regression Testing – Regression testing will be performed on all system components to verify that all functional and/or firmware modifications made during the test campaign did not adversely affect the system and its operation.
- Physical Configuration Audit (PCA) – The PCA compares the voting system components submitted for testing to the manufacturer’s technical documentation. The PCA includes the following activities:
  - Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer’s documentation is sufficient for the user to install, validate, operate, and maintain the 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
  - Review drawings, specifications, technical data, and test data associated with system hardware (if non-COTS) to establish system hardware baseline associated with software baseline.
  - Review manufacturer 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.

## **4.0 TEST DATA**

The output test data will be collected and stored in an appropriate manner as to allow for data analysis. Actual results from executed tests will be recorded in real-time in Test Execution Logs.

## **5.0 CONDITIONS OF SATISFACTION**

The voting system will be evaluated against 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 this test campaign, Pro V&V will execute tests, inspect resultant data and perform technical documentation reviews to ensure that each applicable requirement is met.

## **6.0 TEST FINDINGS**

At test conclusion, a Test Report, completed Requirements Matrix, and associated test cases will be generated documenting all findings. Pro V&V will follow standard requirements for the format of the Test Report. The Recommendation section of the Test Report will follow the requirements of the NIST 150 Handbook for opinions and interpretations.

**APPENDIX A**  
**TEST CASE DESCRIPTIONS**

**TableA-1 Test Case Descriptions**

<b>Test Case</b>	<b>Description</b>	<b>Test Campaign</b>
<i>General System Changes</i>		
Upgrade to Windows Server 2019 and SQL Server 2019	Specifically designed test case created to evaluate the modification.	5.17*
New tool for performing automated hardening procedure of all Windows-based components	Specifically designed test case created to evaluate the modification.	5.17*
Addition encryption of election databases on ICX	Specifically designed test case created to evaluate the modification.	5.17*
ICX Smart Card Mutual Authentication and Secure Messaging	Specifically designed test case created to evaluate the modification.	5.17*
Added additional election-specific information to the barcode on paper ballots	Specifically designed test case created to evaluate the modification.	5.17*
Improved pseudo random number algorithm	Specifically designed test case created to evaluate the modification.	5.17*
Expanding use of Trusted Certificates	Specifically designed test case created to evaluate the modification.	5.17*
Additional Software Encryption of the SQL database	Specifically designed test case created to evaluate the modification.	5.17*
Blocked auto-play for all external media	Specifically designed test case created to evaluate the modification.	5.17*
EED – Added information about status of election files in the Tabulator list to indicate whether election media has been programmed or needs to be re-programmed.	Specifically designed test case created to evaluate the modification.	5.17*
RTR – Added option to redact low turnout by precinct and/or counting group from CVR export for Primary Elections	Specifically designed test case created to evaluate the modification.	5.17*
ADJ – New Adjudication Activity Log and Export	Specifically designed test case created to evaluate the modification.	5.17*
ADJ – Added ability to perform Database Back-ups and Maintenance Procedure	Specifically designed test case created to evaluate the modification.	5.17*
ICX – Additional USB models added to list of accepted devices.	Specifically designed test case created to evaluate the modification.	5.17*
Adding Instant Runoff Voting	Specifically designed test case created to evaluate the modification.	5.17-CO
Adding support for the Canon DR X10-C Scanner	Specifically designed test case created to evaluate the modification.	5.17-CO
<i>Colorado-Specific Requirements</i>		
Colorado Requirements Matrix – Abstract Reporting	Specifically designed test case created to evaluate the modification.	5.17-CO
Colorado Requirements Matrix – Ballot-Level Cast Vote Records and Exports	Specifically designed test case created to evaluate the modification.	5.17-CO
Colorado Requirements Matrix – Election Night Reporting Data and Exports	Specifically designed test case created to evaluate the modification.	5.17-CO

*\*D-Suite 5.17 has been granted EAC certification. Test cases designated with an \* were designed during the D-Suite 5.17 test campaign, the results of which are utilized to satisfy test requirements for this test campaign. Only the D-Suite 5.17-CO test cases listed above will be designed and executed for this test campaign.*