Test Report

Dominion Voting Systems
Democracy Suite (D-Suite) System
Version 4.19
State of Colorado
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 perform certification testing of the Dominion Voting Systems Democracy Suite 4.19 System to the requirements set forth for voting systems by the State of Colorado.

1.1 References

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

- Pro V&V, Inc. Test Plan "Dominion Voting Systems Democracy Suite (D-Suite) System Version 4.19 State of Colorado Certification Testing", dated April 30, 2015
- Colorado Secretary of State Election Rules [8 CCR 1505-1] Rule 21
- Colorado Requirements Gap Analysis Matrix
- Dominion Voting D-Suite 4.19 Testing Project Scope
- Dominion Voting Document 2.02 – Democracy Suite System Overview, Version 4.19::323 dated April 6, 2015
- Dominion Voting Document 2.03 – Democracy Suite ImageCast X Functionality Description, Version 4.19::4, dated April 6, 2015
- Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG)
- Federal Election Commission (FEC) 2002 Voting Systems Standards (VSS)
- Help America Vote Act (HAVA) of 2002, Public Law 107-252, 42 U.S.C. § 15301 *et seq.*

1.2 Terms and Abbreviations

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

"BMD" – Ballot Marking Device

"COTS" – Commercial Off-The-Shelf

"Dominion" – Dominion Voting Systems

"D-Suite" – Democracy Suite

"EAC" – Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"ICC" – ImageCast Central

"ICX" – ImageCast X

"PCA" – Physical Configuration Audit

"TDP" – Technical Data Package

"UI" – User Interface

"2002 VSS" – 2002 Voting System Standards

"2005 VVSG" – 2005 Voluntary Voting System Guidelines

1.3 Background

On November 25, 2014, the Election Assistance Commission ("EAC") granted certification of the D-Suite 4.14-D System (the predecessor of the D-Suite 4.19 System) to the 2005 Voluntary Voting System Guidelines ("2005 VVSG"). The D-Suite 4.19 System includes Democracy Suite Election Management System ("EMS") System, the ImageCast Adjudication, and the ImageCast Central ("ICC") System that were tested as part of the previous test effort, as well as the ImageCast X ("ICX") System that has been added as part of the current test campaign in order to satisfy the State of Colorado requirements.

Per Dominion, the complete list of modifications that were made to the D-Suite 4.14-D System that resulted in the D-Suite 4.19 System are summarized below:

- Added ICX component
- For Adjudication, added the ability to adjudicate ICX ballots including the ability to resolve write-ins and report appropriately
- Made the following changes to the ICC:
    - Modified to be compatible with Windows 8.1 operating system
    - Added ability to process vote information printed in QR barcode
    - Added capability for user to open problem ballots when scanning is paused

- Modified UI buttons to scale based on Window size
- Added a progress bar during report generation
- Added primary and secondary path sets to log header

- Made the following modification to the EMS:
  - Modified to be compatible with Windows Server 2012, Windows 8.1, and SQL Server 2012
  - Added support for programming new ICX components

2 Testing Overview

The evaluation of the D-Suite 4.19 System was designed to achieve the goals set forth in the Test Plan. The goals were constructed to verify that the D-Suite 4.19 System with ICX conforms to the State of Colorado Requirements. The evaluation successfully addressed each of the test goals in the following manner:

Table 2-1: Testing Overview

Test Goal	Testing Response
Generate Trusted Builds for Colorado (equivalent to the EAC Compliance builds) of the new ICX application software components, ICC tabulator application software, and Adjudication application software, as well as a new Trusted Build of the D-Suite EMS application	Trusted Builds were generated for Colorado (EAC equivalent Compliance Builds) 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 4.19 System with ICX meets the requirements of the modified 2002 VSS with the additional Colorado-specific requirements	This was tested by evaluating the D-Suite 4.19 System to specific election scenarios using a combination of different ballot programming approaches, ballot designs, ballot sizes, languages, and tabulators.

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

Test Goal	Testing Response
Ensure the D-Suite 4.19 System with ICX provides support for all Colorado election management requirements (i.e. ballot design, results reporting, recounts, etc.).	This was tested by evaluating the D-Suite 4.19 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 4.19 System with ICX and corresponding components of the EMS	The components of the D-Suite 4.19 System with ICX were tested in pre-election, Election Day, post-election and recount situations and evaluated against documented behavior and expected results for all scenarios.

2.1 Test Candidate

The Democracy Suite 4.19 with ImageCast X System consists of a central count solution along with accessible ballot marking devices utilizing COTS tablets which produce voter-verifiable ballots that can be read by central count scanners.

The D-Suite 4.19 System consists of the major components listed below:

Democracy Suite EMS System

The Democracy Suite EMS is a set of applications that are responsible for all pre-voting and post-voting groups of activities in the process of defining and managing elections.

ImageCast Central (ICC) System

The ICC System consists of a central, COTS high-speed, optical scan ballot tabulator coupled with ballot processing applications.

ImageCast X (ICX) System

The ICX is a ballot marking device (BMD) used for the creation of paper ballots that can be scanned and tabulated by the ICC.

The following tables provide the software and hardware components of the D-Suite 4.19 System with ICX that were evaluated during this test effort:

Table 2.1-1: Firmware/Software Versions

State of Colorado **Certification of D-Suite 4.19 System**	**Firmware/Software Version**
D-Suite 4.19 EMS Software Platform Components	
Election Event Designer (EED)	4.19.01
Application Server (APPS)	4.19.01
Audio Studio (AS)	4.19.01
Data Center Manager (DCM)	4.19.01
Election Data Translator (EDT)	4.19.01
File System Service (FSS)	4.19.01
Results Tally and Reporting (RTR)	4.19.01
EMS Adjudication Components: - EMS Adjudication Service (runs on EMS Server) - DVS Adjudication Service (runs on EMS Server) - DVS Adjudication Client (runs on Windows 8.1)	 4.19.01 2.5.4 2.5.4

Table 2.1-1: Firmware/Software Versions *(continued)*

State of Colorado **Certification of D-Suite 4.19 System**	**Firmware/Software** **Version**
Database Server	Microsoft SQL Server 2012, Microsoft SQL Server 2012 Express
NAS Server	Windows Server 2012
EMS Client Application Software Components	Microsoft Windows 8.1
D-Suite 4.19 ICC Software Components	
ImageCast Central (ICC) Application	4.19.2
Image-Analysis DLL	4.19.2
Microsoft Windows	8.1
D-Suite 4.19 ICX Software Platform Components	
ImageCast X (ICX) Client Application	4.19.7
RV Admin	4.19.8
RV App Services	4.19.8
Microsoft Windows	8.1

Table 2.1-1: Firmware/Software Versions *(continued)*

State of Colorado Certification of D-Suite 4.19 System	Firmware/Software Version
Microsoft SQL Server	2012 Express with advance services
Android KitKat	4.4.2

Table 2.1-2: Hardware Versions

State of Colorado Certification of D-Suite 4.19 System	Hardware Version
D-Suite 4.19 ICC	
ImageCast Central (ICC) Scanner	Canon DR-G1130
ImageCast Central (ICC) Workstation Computer	DELL 9020 AIO or DELL 9030 AIO
D-Suite 4.19 ICX	
Tablet, with 4.4 Kitkat, 32GB 12.2in. Display, Black	Samsung Galaxy Tab Pro 12.2, 32GB, Black
Printer, Ballots	DELL B2360dn

Table 2.1-2: Hardware Versions *(continued)*

State of Colorado **Certification of D-Suite 4.19 System**	**Hardware** **Version**
Printer, Ballots	Canon B6230dw
Tablet Enclosure, Black	Armodilo SPHERE-B-FPC-L-01-B
Card Reader, Mag Stripe, Black, HiCo	MagTek Dynamag USB
Hub, Multi-port networking	Lavalink STS-2UE+
Hub, Accessible Devices	Tecla Shield DOS
Joystick, 4-way Switch	Tecla
D-Suite 4.19 ICX RVS	
Remote Voting Server Computer	DELL Latitude e7440 Laptop, 8GB RAM, 500GB HDD, MS Windows 8.1 Professional, SQL Server 2012 Express with advanced services
Card Reader, Mag Stripe, Black, HiCo	MSR606

Table 2.1-2: Hardware Versions *(continued)*

State of Colorado Certification of D-Suite 4.19 System	Hardware Version
Ethernet Switch, 16 ports	DELL PowerConnect 2816
EMS Servers and Workstations	
EMS Standard Server	DELL PowerEdge R630 Server, Rack Mount, 32GB RAM, 6x 1TB HDD, HW RAID Controller (H710), 2x1GB NIC, eSATA, MS Windows Server 2012
EMS Client Workstation	DELL Precision T1700 Workstations, 8GB RAM, 500GB HDD, MS Windows 8.1 Professional
Computer Accessories	
UPS, Smart-UPS, 1000VA	APC SMC1000
UPS, Smart-UPS, 1500VA	APC SMC1500
Ethernet Switch, 8 ports	DELL PowerConnect 2808

Table 2.1-2: Hardware Versions *(continued)*

State of Colorado **Certification of D-Suite 4.19 System**	**Hardware** **Version**
Supplies and Accessories	
CF Card Reader/Writer	GGI Gear
iButton Programmer with Adapter	Maxim DS9490R#
iButton Security Key with Key Ring Mount, Black	Maxim DS1963S
Compact Flash Memory Card, 4G	SanDisk cards (SDCFAA-004G)
Cable, Ethernet Cat5e	Various
Paddle Switches	Enabling Devices 971
Sip and Puff Device	Enabling Devices 972
Straws/Filters, Sip and Puff, 10/pkg	Enabling Devices 970K
Headphones	Cyber-Acoustics ACM-70
Stereo Inline Adapter, 1/4” Jack to 1/8” Stereo Plug	Radioshack 274-875
Gold Plated Y-Adapter, 1/8” Stereo Jacks to 1/8” Stereo Plug	Radioshack 274-879

2.2 Testing Configuration

The testing event utilized one setup of the D-Suite 4.19 System and its components. The following is a breakdown of the D-Suite 4.19 System components and configurations for the test setup:

Standard Testing Platform:

Individual ICX systems were set up at various Voter Service Polling Centers (VSPCs) for both early and Election Day voting. Each VSPC was supplied with a laptop computer containing the ICX RV Admin web application and RV App Services component, multiple COTS tablet devices loaded with the ICX client application, printers connected to the RV App Services laptop but physically located next to each tablet, accessibility devices (using a universal hub device), and Ethernet network connection hardware.

The central count location utilized multiple Canon DR-G1130 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 were connected with the EMS server via Ethernet.

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 2.4-1: Technical Data Package

Document Name	Document Number	Revision Number
Democracy Suite System Overview	2.02	4.19::323
System Security Specification	2.06	4.19::432

Table 2.4-1: Technical Data Package *(continued)*

Document Name	Document Number	Revision Number
System Test and Verification	2.07	4.19::110
Personnel Training and Deployment Requirements	2.10	4.19::63
Configuration Management Process	2.11	4.19::226
Quality Assurance Program	2.12	4.19::87
ImageCast Central		
ImageCast Central Functionality Description	2.03	4.19::93
ImageCast Central Software Design And Specification	2.05	4.19::49
ImageCast Central System Operation Procedures	2.08	4.19::131
Adjuducation		
Adjudication Software Design and Specification	2.05	4.19::36
Adjudication Installation and Configuration Procedures	2.08	4.19::63
Adjudication System Maintenance Manual	2.09	4.19::20
ImageCast X		
ImageCast X Functionality Description	2.03	4.19::5

Table 2.4-1: Technical Data Package *(continued)*

Document Name	Document Number	Revision Number
ImageCast X Software Design And Specification	2.05	4.19::16
ImageCast X System Operation Procedures	2.08	4.19::39
ImageCast X System Maintenance Manual	2.09	4.19::5
Election Management System		
EMS Functionality Description	2.03	4.19::274
EMS Software Design And Specification	2.05	4.19::229
EMS System Operation Procedures	2.08	4.19::624
EMS System Maintenance Manual	2.09	4.19::73
User Guides		
ImageCast Central User's guide	---	4.19::45
EMS Election Data Translator User's Guide	---	4.19::63
EMS Audio Studio User's Guide	---	4.19::49
ImageCast Adjudication User's Guide	---	4.19::49

Table 2.4-1: Technical Data Package *(continued)*

Document Name	Document Number	Revision Number
Election Event Designer User's Guide	---	4.19::260
Results Tally and Reporting User's Guide	---	4.19::164
Mobile Ballot Production User's Guide	---	4.19::6
ImageCast X Users Guide	---	4.19::22
RV Admin Users Guide	---	4.19::20
Supplementary Documents		
ImageCast Central Application Installation	---	4.19::34
ImageCast Central Build Environment Setup	---	4.19::26
ImageCast Central DR-G1130 Scanner Driver Installation	---	4.19::30
ImageCast Central Software Build Procedure	---	4.19::32
Canon DR-G1130 User Manual	---	N/A
Election Management System Build and Install	---	2.2.0::3
Adjudication Application Build Procedure	---	0.12

Table 2.4-1: Technical Data Package *(continued)*

Document Name	Document Number	Revision Number
ICX Build Procedure	---	4.19::1
RV Build Procedure	---	4.19::5
ImageCast Device Configuration Files	---	4.18::39
TreeViewEx Build	---	4
Dominion Voting C/C++ Coding Standard	---	1.0.0::8
Dominion Voting C# Automated Code Review Guidelines and Config	---	8
Dominion Voting Java Coding Standard	---	1
ImageCast Election Definition Files	---	4.19::18
ImageCast Printing Specification	---	4.19::27
ImageCast Total Results File	---	4.19::8

3 Test Process and Results

The following sections outline the test process that was followed to evaluate the D-Suite 4.19 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 test campaign was performed at the Pro V&V, Inc. test facility located in Huntsville, AL.

3.2 Test Procedures

Test procedures were developed to evaluate the system being tested against the stated requirements. Prior to execution of the required test procedures, the system under test was subject to testing initialization to establish the baseline for testing and ensure that the test candidate matched the expected test 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 was clean.
- Ensured batteries were 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.

TDP Review – This review was conducted only for stated functionality review and verification. This review did not address consistency or completeness of documents. Results of the review of each document were entered on the TDP Review Checklist and were reported to Dominion for disposition of any discrepancies. This process was ongoing until all discrepancies were resolved. Any documents that were revised during the TDP review process were compared with the previous document revision to determine changes made, and the document was re-reviewed to determine whether the discrepancies had been resolved.

Summary Findings:

During execution of the test procedure, it was verified that the technical documentation provided for the D-Suite 4.19 System with ICX was successfully subjected to the TDP review with all discrepancies that were noted during the review being resolved.

Trusted Build (EAC equivalent Compliance Build) – 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 compliance build, the build documentation was reviewed.

Summary Findings:

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.

A list of the discrepancies identified during test case design is presented below:

ICX Discrepancies

Discrepancy # 1 – When the language menu button is pressed, the Spanish language option is misspelled as “Espano”.

Discrepancy # 2 – When the More button is pressed and the Help button is selected from the dropdown menu, a help window does not display.

Discrepancy # 3 – After logging into the Administrative Menu on the ICX, if the RVAdmin laptop is disconnected from the network switch and the Reload Settings button is pressed an

error window displays which includes a Retry button. If the Retry button is pressed, the ICX does not attempt to retry the connection and instead displays the incorrect screen.

Discrepancy # 4 – When the text size is set to the largest setting, the Election Title text is obscured by the Language button.

Discrepancy # 5 – When starting a voting session with the AV Mode Enabled, if the Spanish Language is selected and the text size is set to the largest setting, at the screen for selecting the desired input method, the A/V Mode button text is cut off and only the icon is visible.

RVAdmin Discrepancies

Discrepancy # 1 – In the Tablet-Printer Settings tab of the Ballot Printing Settings menu in RVAdmin, if the name of a device linked to a printer is edited and a new device name is input, pressing the Save button does not save the changes. If the Cancel button is pressed instead, a prompt displays which states that the "Action was successful." If the Save button was pressed multiple times before the Cancel button was pressed, multiple "Action was successful" status messages are displayed.

Discrepancy # 2 – In the Tablet-Printer Settings tab of the Ballot Printing Settings menu in RVAdmin, if the name of a device linked to a printer is edited and a new device name is input, pressing the Save button does not save the changes. If the contents of the field are removed and the Save button is pressed, a prompt displays which states that the "Action was successful" and the voter is asked "Are you sure you want to clear device name?"

Discrepancy # 3 – In the Account Policy tab of the User Management menu in RVAdmin, the Maximum Password Age, Lockout Threshold, Lockout Duration, and Lockout Timeout Reset fields would add extra zeroes to the value input by the user if the Backspace button was used to clear the contents of the field.

Since a version previous to the D-Suite 4.19 System has been certified to the EAC 2005 VVSG, and D-Suite 4.19 is a modification to that EAC-certified system, the FCA performed during this test campaign focused on the ICX component and its interface with the D-Suite 4.19 system. During the performance of the functional configuration audit each component and subcomponent of the voting system was functionally evaluated as designed and documented in the TDP. The FCA included a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities were categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities applied throughout the election process and included 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 and included 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 included 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 and included 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.

Throughout the performance of the FCA, the assigned test personnel input both positive and negative test data to trigger normal and abnormal conditions. At the conclusion of the FCA, the test personnel analyzed all deficiencies and determined the voting system's ability to perform in accordance with all representations concerning functionality, usability, security, accessibility, and sustainability were compliant with requirements; therefore, it was verified that the D-Suite 4.19 System with ICX successfully completed the FCA with all actual results obtained during test execution matching the expected results.

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 4.19 System with ICX successfully completed the accuracy test with all actual results obtained during test execution matching the expected results.

System Integration – The system level certification tests addressed 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, a General Election was designed in the EED application. The election was then loaded into RVAdmin and the ICX ballot marking device. Ballots were marked using the ICX and were read by the ICC. The results were adjudicated and sent to RTR for results reporting. During execution of the test procedure, it was verified that the D-Suite 4.19 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 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.

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 4.19 System with ICX 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 4.19 System with ICX 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 this test case, 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:

To evaluate the security of the voting system, 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.

Information which was not present in the TDP was presented to Dominion for resolution. Dominion then submitted updated documentation which was reviewed to ensure that the required information was present. During execution of the test procedure, it was verified that the D-Suite 4.19 System with ICX successfully completed the security test with all actual results obtained during test execution matching the expected results.

Usability – The system under evaluation was subjected to usability testing to determine the effectiveness, efficiency, and satisfaction of the system performance when used by the voter. This testing included additional requirements for task performance such as independence and privacy.

Summary Findings:

To perform the usability test, the assigned test personnel followed the manufacturer's documented instructions to setup and configure the voting system as for normal operation at the polling place, with privacy screens and peripheral devices in place. An operational status check was then performed to verify system operation. The assigned test personnel then verified that each function and capability presented to the voter operated as expected and documented. This included verification of the following:

Table 3.3-1: Usability Findings

Function/Capability	Successful Verification
Instructions on system operation are clear and concise	Yes
The ballot is displayed on the system in a manner that is clear and usable	Yes
The voting process is clear	Yes
There is a way to verify and accept or modify ballot selections prior to the casting of a ballot	Yes
The voting system notifies the voter upon successful casting of the ballot	Yes
The voting system shall provide feedback to the voter that identifies specific contests or ballot issues for which he or she has made no selection or fewer than the allowable number of selections (e.g., undervotes)	Yes
The voting system shall notify the voter if he or she has made more than the allowable number of selections for any contest (e.g., overvotes)	N/A The system does not allow overvoting to occur

Table 3.3-1: Usability Findings *(continued)*

Function/Capability	Successful Verification
The voting system shall notify the voter before the ballot is cast and counted of the effect of making more than the allowable number of selections for a contest	N/A The system does not allow overvoting to occur
The voting system shall provide the voter the opportunity to correct the ballot for either an undervote or overvote before the ballot is cast and counted	Yes
The voting system shall allow the voter, at his or her choice, to submit an undervoted ballot without correction	Yes
DRE voting machines shall allow the voter to change a vote within a contest before advancing to the next contest	Yes
DRE voting machines should provide navigation controls that allow the voter to advance to the next contest or go back to the previous contest before completing a vote on the contest currently being presented (whether visually or aurally)	Yes
The ballot marking device shall have multiple language capability	Yes
The voting system provides clear instructions and assistance to allow voters to successfully execute and cast their ballots independently	Yes
The voting system provides the capability to design a ballot for maximum clarity and comprehension	Yes
Warnings and alerts issued by the voting system should clearly state the nature of the problem and the set of responses available to the voter	Yes
When deployed according to the manufacturer instructions, the voting system shall prevent others from observing the contents of a voter's ballot	Yes

During execution of the test procedure, it was verified that the D-Suite 4.19 System with ICX successfully complied with a majority of the Usability requirements from the VSS 2002 and Colorado specific requirements. A total of 5 non-conformances were identified during Usability testing and are presented in Table 3.3-2 below:

Table 3.3-2: Usability Non-Conformances

Standard	Testing Observations
2002 VSS Volume 1: Section 2.2.7.2 b.5) Enables the voter to request repetition of any information provided by the system	ICX does not include an ATI device with a dedicated audio repeat button that will allow the voter to repeat audio information at will.
Colorado Requirements: Section 1-5-704(1)(f) Any voting system that requires any visual perception shall allow the font size as it appears to the voter to be set from a minimum of fourteen points to a maximum of twenty-four points before the voting system is delivered to the polling location.	Using the DTP (Desktop Publishing) Standard size for points, 14pt = 4.9mm and 24pt = 8.4mm. The ICX font measures 4mm and 6.3mm respectively, which does not meet this requirement. However, this requirement is in conflict with the VSS 2002 requirement Sec. 2.2.7.2 e. 3) which says that electronic image displays must permit the voter to adjust the size of the text between the range of 3 to 6.3 millimeters.
Colorado Requirements: Section 1-5-704(1)(o)(II) The elector shall be able to listen to ballot choices in complete privacy and to turn off the visual display.	The ICX does not allow the voter to turn off the display while voting.
Colorado Requirements: Section 1-5-704(1)(o)(VI) The ballot marking device shall have a completely integrated input keypad containing commonly accepted voter accessibility keys with Braille markings.	None of the ICX input devices contain braille markings; however, these devices are tactilely discernible.
Colorado Requirements: Section 1-5-704(1)(o)(VII) The elector shall be able to enter ballot choices using an assistive device, including but not limited to a sip and puff device and a jelly switch.	The ICX supports Paddle buttons and Sip and Puff devices. A jelly switch is not included as part of the voting system, however, it is compatible with the system.

Accessibility – The system under evaluation was subjected to accessibility testing to evaluate the system against the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B) of which the goal is to make the voting system independently accessible to as many voters as possible.

Summary Findings:

To perform the accessibility test, the assigned test personnel followed the manufacturer's documented instructions to setup and configure the voting system as for normal operation at the polling place, with privacy screens and peripheral devices in place. An operational status check was then performed to verify system operation. The assigned test personnel then verified that each function and capability presented to the voter operated as expected and documented. This included verification of the following:

Table 3.3-3: Accessibility Findings

Function/Capability	Successful Verification
Voting systems shall be accessible for individuals with disabilities in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.	Yes

During execution of the test procedure, it was verified that the D-Suite 4.19 System with ICX successfully completed the accessibility tests with all actual results obtained during test execution matching the expected results.

Reliability – The reliability of the system being evaluated was measured during the performance of the system level tests.

Summary Findings: The system reliability was evaluated throughout the test campaign. The data from each system level test was combined to determine acceptable MTBF of the system. In addition, a specific test for reliability was conducted by utilizing a modified functional reliability test that is typically performed during the Temperature and Power Variation Test. This test was conducted at standard ambient conditions with ballots being cast continually until test conclusion.

The parameters of the reliability test were as follows: Two ICX units were used to manually mark a total of 3000 ballots each containing a total of 525 ballot positions. These ballots were then used in the performance of the Accuracy Test. During execution of the test procedure, it was verified that the D-Suite 4.19 System with ICX successfully completed the reliability tests with all actual results obtained during test execution matching the expected results.

3.4 Conditions of Satisfaction

The voting system was 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 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 Gap Analysis Matrix including verification that the conditions of satisfaction were met is included in Attachment A.

4 Conclusions

Based on the results obtained during the test campaign, the D-Suite 4.19 System with ICX, as presented for evaluation, Pro V&V determines that the D-Suite 4.19 System with ICX 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

(Colorado Requirement Matrix provided separately as

Colorado Requirements Matrix-DVS4.19)