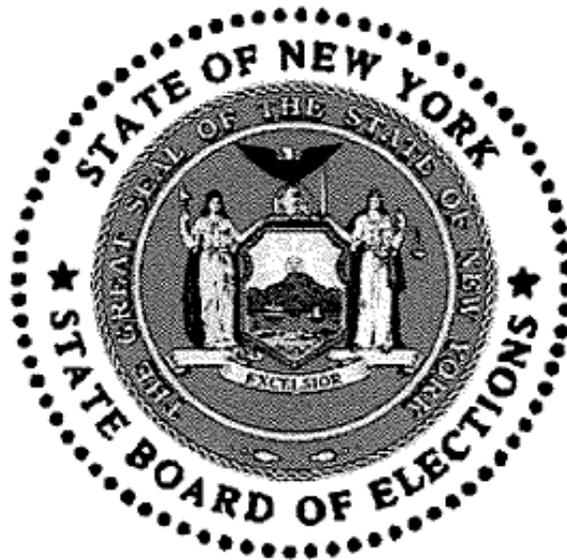


STATE OF NEW YORK
STATE BOARD OF ELECTIONS

NYSBOE Functional Test of Dominion Voting System

ImageCast 4.9 Upgrade



Prepared by the Elections Operations Unit
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New York State Board of Elections

1. INTRODUCTION

1.1 Project Overview

This Document is a report on the Functional Testing conducted on the upgrade of the previously certified software and firmware, as submitted by Dominion Voting Systems, for their ImageCast voting system and ballot marking device. The corresponding trusted build version consists of the EMS Democracy Suite version 4.9.17, ImageCast (ICP) version 4.9.7, and ImageCast BMD version 4.9.6. These new versions, if certified, will replace the current versions of the NYS Certified System (see table below):

Module	New Version	Current Version
EMS Democracy Suite	4.9.17	3.0.3
ImageCast Scanner (ICP)	4.9.10	1.30.6
ImageCast BMD	4.9.6	2.2.2
Democracy Suite DCF	2012	2009

The upgrades submitted are intended to address, inter alia, the Dominion Voting System's change notes, screen changes identified through usability studies, and the necessary conversion to a new operating system compliance with the new version of Windows (Windows 7).

1.2 System Enhancements

This upgrade includes the following updates and enhancements to the ImageCast voting system:

- Improved BMD audio instructions
- Ability to function under the new Windows 7 operating system
- Improved voter screens for overvote warning messages and double vote warning messages.
- Enhanced the EMS system for ease of data entry

1.3 Purpose

The purpose of this functional testing was to verify that the upgrade to the software and firmware still perform the required functions of its certified predecessor and addressed the previously-identified open issues as well as change requests.

This document describes:

- The overall Test Plan and approach implemented, to thoroughly test the upgraded software and firmware
- The overall results and findings from the functional testing performed

2. APPROACH AND PROCEDURES

2.1 Requirements

Testing verifies that the upgrades did not disrupt, disable or otherwise disaffect the required functions of the certified build, therefore multiple variations of elections were generated to test the upgrade. The following ballot variations were used in the functional testing performed by SBOE staff. Both comprehensive and standard test decks were used as part of the logic and accuracy testing required by the test plan:

- **General Elections of 17 inch ballots in length were created from scratch using the DEMOCRACY 4.9.17 EMS suite. These elections were required so that testing would accommodate landscape ballot layouts.**
- **Primary Elections of 17 inch ballots in length were created from scratch using the DEMOCRACY 4.9.17 EMS suite. These elections were required so that testing would accommodate landscape ballot layouts.**
- **General Elections of both 22 inch and 30 inch ballots in length will be imported from a previously -created election using the DEMOCRACY 4.9.17 EMS. These elections were required so that testing would accommodate landscape ballot layouts.**
- **Primary Elections of 22 inch ballots in length will be imported from a previously created election using the DEMOCRACY 4.9.17 EMS. These elections were required so that testing would accommodate landscape ballot layouts.**

These requirements resulted in six separate test cases that would test each variation:

- **Test Case #1 – Created General 17 Inch Landscape**
- **Test Case #2 – Created Primary 17 Inch Landscape**
- **Test Case #3 – Imported General 22 Inch Landscape**
- **Test Case #4 – Imported Primary 22 Inch Landscape**
- **Test Case #5 – Imported General 30 Inch Landscape**
- **Test Case #6 – Imported Multi-Page General 22 inch Landscape**

Test Case 7 was created to verify any functionality or feature that did not appear in the previous six test cases, such as testing each button option.

- **Test Case #7 – Button Test and New Features Not Identified in Previous Test Cases.**

Test Case 8 was created to verify the trusted build of the software. In addition, test decks used in this test case were redesigned to verify the behavior and screen messages for double votes and overvotes.

- **Test Case #8 – Trusted Build Test Case**

These Test Cases were tested on a single hardware configuration:

- **Client/Server Standard Configuration – 2 systems networked (Server which contains the SQL database and a Client which utilizes the SQL database on the Server through a network)**

Each Test Case requires a Test Deck marked in a predetermined fashion. Some Test Cases used multiple ED’s while others used only one. Most test cases utilized smaller 5 to 8 Ballot Test Decks, while others had full Comprehensive Test Decks created based on SBOE Standards. The following table lists the Test Decks built for the functional testing:

Test Case Title	Type of Election	Number of Ballots
Created General 17 Inch Landscape	General	8
Created Primary 17 Inch Landscape	Primary	1 st Style (DEM)=18
		2 nd Style (REP)=15

Imported General 22 Inch Landscape	General	151
Imported Primary 22 Inch Landscape	Primary	1 st Style (DEM)=4
		2 nd Style (REP)=6
Imported General 30 Inch Landscape	General	6
Imported Multi-Page General 22 Inch Landscape	General	2 Pages/Style (5 per page) = 10
Trusted Build - Created General 17 Inch Landscape, Imported Primary 22 Inch Landscape	General	8
	Primary	1 st Style (DEM)=4
		2 nd Style (REP)=6

3. Test Plan

The Test Plan was designed to work in several phases:

Phase 1 – Planning and Test Case Development

- **Verify requirements and draft designs of the Test Cases**
- **Prepare Test Case Procedures**
- **Imported Elections from previously created elections on DEMOCRACY 4.9.17.**
- **Create Elections from scratch using the DEMOCRACY 4.9.17 EMS Suite.**

Phase 2 – Implementation

- **Receive and Install the testing workstations and the upgraded software**
- **Receive training on the upgrades by Dominion representatives**
- **Perform the Dry Run on each of the initial 6 Test cases**
- **Correct and amend Test cases to accommodate the upgrades**
- **Perform the Official Run For Record of the initial 6 Test Cases**
- **Archive the results and data from the Official Run for Record**
- **Perform the Official Run for Record on the Test case 7.**
(Due to the nature of Test Case 7, no dry run was required)

Phase 3 – Finalizing Documentation and Records

- **Perform final formatting adjustments to Test Cases**
- **Collect Test Materials(Marked Ballots, Tape Results) and Records for Final Archive**
- **Prepare finalized reports on project**

Adjustments were made to the test plan to address several scenarios. Some of the adjustments made were as follows:

- Democratic Ballot for the Imported Primary 22 Inch Landscape was printed at 24 Inches. The 24 inch ballots were kept and used as the Republican ballots were the appropriate size and could be reproduced on the BMD.
- A Trusted Build Test Case was added which provided a final verification of the software and verified behavior and messages for double vote and overvote processing.

3.1 Procedure

The procedures performed are detailed in the supplemental Test Case documents. The first two Test Cases required creating an election from scratch. The next five Test Cases required importing the election backup files created earlier. The General Functionality Test Case involved creating election scenarios to verify the general functionality of each software module and the items not addressed by the previous Test Cases. The Final Test Case involved utilizing created, imported, and restored elections to verify the trusted build. This test case provided extensive testing on the behaviors and messages for double vote and overvote functionality to ensure that Dominion had developed the screens and functionality consistent with the court order.

Nine (9) test decks were run in the 7 cases to verify that the upgrades did not affect the logic and accuracy of the voting machines. The Test Decks were marked in a pre-determined pattern to verify the logic and accuracy of the system. The majority of the ballots were marked by hand while at least one ballot in each Test Deck was marked using the BMD. The Test Decks Consisted of the following elections:

Test Case Name	Test Deck	Election Type	# of Ballots	# of Contests	Contests Vote For
Created General 17 Inch Landscape	Test Deck 1	General	8	6	2 vote for 1, 1 vote for 2, 3 Propositions
Created Primary 17 Inch Landscape	Test Deck 2	Primary (DEM)	18	1	1 vote for 2
	Test Deck 3	Primary (REP)	15	1	1 vote for 1
Imported General 22 Inch Landscape	Test Deck 4	General	151	9	5 vote for 1, 1 vote for 4, 3 Propositions
Imported Primary 22 Inch Landscape	Test Deck 5	Primary (DEM)	4	2	1 vote for 1, 1 vote for 2
	Test Deck 6	Primary (REP)	6	3	3 vote for 1
Imported General 30 Inch	Test Deck 7	General	6	9	2 vote for 1, 1 vote for 4, 2 vote for 2, 3

Landscape					Propositions
Imported Multi-Page General 22 Inch Landscape	Test Deck 8	General	10	9	5 vote for 1, 1 vote for 4, 3 Propositions
Trusted Build - Created General 17 Inch Landscape	Test Deck 9	General	8	6	2 vote for 1, 1 vote for 2, 3 Propositions

Once all of the Test Cases were completed and results were verified, backup files were made of the 7 Test Case elections. Along with the reports, these files were saved to a DVD. All of the Test Decks, results tapes, and associated materials were collected and organized for filing and archiving.

4. Results

4.1 Overall

The six base test cases performed as expected. The created elections were able to be created and run without issue as were the imported elections.

The Button Test and New Features Not Identified in Previous Test Cases (Test Case #12) verified the functionality of all the button options presented in each software module along with any feature not previously tested in the DEMOCRACY 4.9.17 Suite. Functions not tested are not functions utilized by the State of New York. These functions were identified in the test case as either "Not Applicable" or "No Longer Supported". However, all the necessary functions were verified that are utilized by the State of New York.

Testing revealed functional issues with the screen presentation which required 2 additional reviews and trusted builds.

Test Case Name	Test Deck	Election Type	# of Ballots	# of Contests	Contests Vote For	
Created General 17 Inch Landscape	Test Deck 1	General	8	6	2 vote for 1, 1 vote for 2, 3 Propositions	PASS
Created Primary 17 Inch Landscape	Test Deck 2	Primary (DEM)	18	1	1 vote for 2	PASS
	Test Deck 3	Primary (REP)	15	1	1 vote for 1	
Imported General 22 Inch Landscape	Test Deck 4	General	151	9	5 vote for 1, 1 vote for 4, 3 Propositions	PASS
Imported Primary 22 Inch Landscape	Test Deck 5	Primary (DEM)	4	2	1 vote for 1, 1 vote for 2	PASS
	Test Deck 6	Primary (REP)	6	3	3 vote for 1	
Imported General 30 Inch Landscape	Test Deck 7	General	6	9	2 vote for 1, 1 vote for 4, 2 vote for 2, 3 Propositions	PASS
Imported Multi-Page General 22 Inch Landscape	Test Deck 8	General	10	9	5 vote for 1, 1 vote for 4, 3 Propositions	PASS
Trusted Build - Created General 17 Inch Landscape Imported Primary 22 Inch Landscape	Test Deck 9	General	8	6	2 vote for 1, 1 vote for 2, 3 Propositions	PASS
	Test Deck 5	Primary (DEM)	4	2	1 vote for 1, 1 vote for 2	
	Test Deck 6	Primary (REP)	6	3	3 vote for 1	

All changes presented in the Dominion System Change Notes were either verified by Test Cases #1-6 or by Test Case #7.

Any changes that were not functionally tested due to the nature of the change were identified and reviewed by SLI (NYSBOE's Independent Testing Lab) during source code review.

4.2 Findings/Workarounds

The following are findings/workarounds that became apparent in the test cases:

- Due to database changes elections created in prior versions cannot be imported into DEMOCRACY 4.9.17.
- There is no warning in ballot styling when the ballot size exceeds 22 inches.

Workaround: In the Adobe Acrobat Reader preferences, turn on the "Always Display Page Size" option.

5. Conclusion

During our functional testing we did not encounter any issues that would be considered show stoppers and otherwise jeopardize the integrity of the election process. The logic and accuracy of the ImageCast scanner functioned as intended and the voting results obtained with all of the Test Decks used matched the pre-determined expected vote results. The upgrade changes made to the EMS enabled the SBOE testing team to create ballots from scratch in landscape orientation. The functional testing team was able to restore the election definitions from backup files generated in DEMOCRACY 4.9.17.

Based on NYSBOE functional testing and all source code reviews of the DEMOCRACY 4.9.17 EMS Suite upgrade, ImageCast firmware upgrade, and ImageCast BMD firmware upgrade, we recommend that the Dominion Voting System upgrades described herein, be certified for use in New York State.