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DOMINION VOTING SYSTEMS

DEMOCRACY SUITE 4.14-A.1 WITH

ADJUDICATION 2.4

Software Components

Election Management System: Software version 4.14.2301

ImageCast Evolution: Software version 4.14.10A1

ImageCast Central: Software version 4.14.4

Adjudication: Software version 2.4.1.3201

Staff Report

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I. INTRODUCTION

1. Scope

This report presents the test results for the four phases of the certification test campaign of the Dominion Voting Systems (Dominion) Democracy Suite (DemSuite) 4.14-A.1 with Adjudication 2.4 voting system (system). The purpose of the testing is to test the compliance of the voting system with California and Federal laws. Testing also uncovers other findings, which do not constitute non-compliance, and those findings are reported to the voting system vendor to address the issues procedurally. The procedures for mitigating any additional findings are made to the documentation, specifically the California Use Procedures.

2. Summary of the Application

Dominion Voting System submitted an application for the DemSuite 4.14-A.1 with Adjudication 2.4 voting system, which is comprised of the following major software components:

- Election Management System Software version 4.14.2301;
- ImageCast Evolution Software version 4.14.10.A1;
- ImageCast Central Software version 4.14.4; and
- Adjudication 2.4.1.3201.

In addition to the software, which includes the executable code and the source code, Dominion was required to submit the following: 1) the technical documentation package (TDP); 2) all the hardware components to field two complete working versions of the system, including all peripheral devices, one for the Functional Test Phase and one for the Red Team Penetration Test Phase; 3) fifty (50) ImageCast Evolution voting machines, ten (10) ballot boxes and all the peripherals that would be in the polling place; and 4) the California Use Procedures.

3. Contracting and Outsourcing

Upon receipt of a complete application, the Secretary of State released a Request for Proposal (RFP) for assistance with the Security Review, both Source Code and Red Team Penetration Testing. The statement of work (SOW) also had an option for the Secretary of State to use the awarded contractor for Functional Test, if it deemed necessary.

Through the formal California contracting process, the Secretary of State awarded a contract to Freeman, Craft, McGregor Group, Inc. (FCMG), who would sub-contract portions of the review to atsec information security, Corp. (@sec).

A second round of Security Review testing had to be conducted, so the Secretary of State released a second RFP. The second RFP was awarded to FCMG who sub-contracted the Source Code Review to @sec.

II. SUMMARY OF THE SYSTEM

The Democracy Suite 4.14-A.1 with Adjudication 2.4 voting system consists of four major components.

1. Election Management System (EMS), v. 4.14.2301

EMS is a set of the following applications that are responsible for pre-voting and post-voting activities, including ballot layout, generation of audio files, programming media for voting equipment, importing results data, accumulating and reporting results.

a) EMS-Election Data Translator (EDT), v. 4.14.2301

EDT is an application that imports and exports election data, such as districts, precincts, contests, candidates, translations, etc., to and from the election project (a.k.a. election definition).

b) EMS-Election Event Designer (EED), v. 4.14.2301

EED is an application that handles the majority of the pre-voting activities. EED is the application that receives the imported data from EDT and Audio Studio in order to generate ballot structure, ballot artwork, and tabulator files, including all the audio for an accessible voting session on the precinct tabulators.

c) EMS-Audio Studio, v. 4.14.2301

Audio Studio is an application that assists jurisdictions with the creation of audio files. It can be used to verify, listen and record audio files in EED.

d) EMS-Results Tally Reporting (RTR), v. 4.14.2301

RTR is the main application for post-voting activities. It receives election results from the tabulators, allows for validation of the results, and reports the results. RTR can be used for the addition, and deletion of tabulator files. It also allows for manual resolution of qualified write-ins.

e) EMS-File System Service, v. 4.14.2301

File System Service is a stand-alone service running on client machines enabling access to low level operating system application programming interface (API) for partitioning compact flash (CF) cards.

f) EMS-Data Center Manager, v. 4.14.2301

Data Center Manager is a system-level configuration application used in EMS back-end data center configuration.

g) EMS-Application Server, v. 4.14.2301

Application Server is a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files.

h) EMS-Adjudication Service, v. 4.14.37

EMS-Adjudication Service is a software service that provides EMS data to the Adjudication Services application.

2. ImageCast Evolution (ICE), v. 4.14.10A1

ICE is an all-in-one precinct optical scan tabulator and ballot marking device. The ICE can accept pre-marked ballots, give voters a second-chance notification on ballot errors, and provide a final ballot review based on the machines interpretation of the hand-marked ballot. The software prevents the scanning and tabulating of a vote with a marginal mark based on thresholds set in EED. The ballot marking capabilities allow a voter to place a blank ballot into the machine and vote using the accessible tactile interface (ATI), sip-n-puff, or paddle switches. When the ballot marking capabilities are turned on the voter also has the capability to use the audio features. The version submitted for California has the audio capability to handle any of the ten languages required by the U.S. Department of Justice (English, Spanish, Chinese, Japanese, Tagalog, Korean, Vietnamese, Thai, Hindi, and Khmer).

3. ImageCast Central (ICC), v. 4.14.4

ICC uses a commercial-off-the-shelf (COTS) Canon DR-X10C scanner at the central tabulation location to scan vote by mail ballots and post-voting ballots, such as provisional ballots, vote by mail ballots not delivered until Election Day, ballots that need to be duplicated, and ballots that were scanned into a multi-precinct ICE tabulator. The results from batches scanned through the ICC are dropped into a folder on the server for the Adjudication Client to access.

4. Adjudication Client, v. 2.4.1.3201

Adjudication Client is an application that allows the jurisdiction to resolve a ballot on screen that would normally be outstacked to be remade or hand counted because it had one or more exception conditions, such as write-ins, overvotes, marginal marks, undervotes, or because it is a completely blank ballot. Adjudication Client has two roles, Administration and Ballot Inspection. The functionality of the Administration role is to configure user accounts, exception reasons (e.g. write-ins and overvotes), batch management, and report generation. In the California configuration, the Administration role must be performed directly on the server. Ballot Inspection allows users to review ballots that have at least one exception condition as defined by the Administration role. The user may accept the ballot as is or resolve the ballot pursuant to California law. Each ballot that is adjudicated is stamped with the username of the user who made the change.

a) Adjudication Services, v. 2.4.3201

Adjudication Services is a collection of services that interface with Adjudication Client, EMS data and ICC batches.

III. TESTING INFORMATION AND RESULTS

1. Background

Dominion submitted an application to the Secretary of State for certification of the DemSuite 4.14 with Adjudication 1.0 voting system on September 20, 2013. The Elections Assistance Commission (EAC) certified this version of the system on July 18, 2013, with the EAC Certification Number: DemSuite-4-14. On November 13, 2013, Dominion amended its application to the Secretary of State to include modifications that were certified as part of the EAC certified DemSuite 4.14A voting system. The DemSuite 4.14A voting system received EAC certification on September 20, 2013, with the EAC Certification Number: DemSuite-4-14-A.

California certification testing of the DemSuite-4-14-A voting system began in February 2014. The testing began with the Security Review, which include both the Source Code Review and the Red Team Penetration testing. Results of the testing showed areas of weakness that could be mitigated through the build process and with minor hardware changes. Therefore, Dominion took the system back through the EAC process to make the non-source code modifications on the new configuration, called DemSuite 4.14-A.1. Members of the Secretary of

State's Office of Voting System Technology Assessment went to National Technical Systems, Inc. (NTS), formerly Wyle Laboratories, Inc., to witness the EAC testing. On June 16, 2014, the EAC certified the system with EAC Certification Number: DVS-DemSuite4.14-A.1.

The Secretary of State began the Functional Test phase of testing on DemSuite 4.14-A.1 with Adjudication 1.0 voting system in June 2014 following the EAC certification. Based on testing data and findings from the Functional Test, in July 2014, Dominion decided to withdraw the Adjudication version 1.0 from the test campaign.

In September 2014, Dominion requested Adjudication 2.4 be inserted into the system testing that was currently underway. The Secretary of State permitted the changes to take place with the understanding that the revised system would have to undergo all Functional and Security Testing; the Volume and Accessibility Testing would not be re-conducted because the ImageCast Evolution did not have any modifications made to it.

2. Functional Test Data and Results

The Functional Test of the Dominion Democracy Suite 4.14-A.1 with Adjudication 2.4 voting system was conducted by Office of Voting Systems Technology Assessment staff at the Secretary of State's Office located at 1500 11th Street, Sacramento, California from September 18, 2014, through October 22, 2014.

The Secretary of State ran the Functional Test as if it were a jurisdiction that just purchased the voting system. Testing of the Election Management System began with five pieces of hardware with absolutely no software on them. The five pieces of hardware are the Dell PowerEdge T620 server (EMSServer), Rocstor Guardian 4RM network-attached storage disk array (Rocstor or D:\ drive), Dell Latitude e6530 (EMSWorkstation1), Dell Latitude e6420 (EMSWorkstation2), and Dell Optiplex 9010 All in One (ICCWorkstation). Following the California Installation Procedures the testing began with the installation of the operating system, commercial-off-the-shelf software, voting system trusted build software, and then continued through the security hardening process. Upon completion of the installation of the system, it was run through an acceptance and readiness test to determine that each piece of equipment was functioning properly and that all networking and permissions were configured correctly.

Functional Testing of the system included three main election types, a Top-Two Primary, a Presidential General, and a Special Recall Election. The specific election definition databases used in testing were based on the 2012 Ventura County Presidential Primary, the Santa Clara County

2012 Presidential General, and the 2003 California Statewide Special Recall Election. The Primary and General Elections were configured using data that was exported from each of the respective counties election information management system and/or voting system. Secretary of State Staff configured the data into a workable Excel spreadsheet that EDT could use to import into EED. Neither of the elections was configured completely in the Excel spreadsheet; it was solely used to limit the key data entry. However, the testing of the ability to create an election definition from scratch within EED was conducted during testing of the 2003 California Statewide Special Recall Election.

After configuring the Primary and General election definitions, a logic and accuracy (L&A) test was conducted to verify and validate the content of the ballot and the accuracy of the burning of election media, such as the compact flash card for the ICE and iButtons for both the ICC and ICE voting equipment. Pursuant to the California Use Procedures, all the data from the L&A test was backed up, purged and reset for the live election.

Last, a mock election was conducted using the same order of events as provided for in California Elections Code beginning with voters voting on the ICE for early voting and vote by mail ballots being scanned on the ICC. The memory cards from the ICE early voting machine and the electronic files from the ICC were brought into RTR. However, to make sure that no results were published or reported prior to the close of polls on Election Day, all results remained in the "Initial" state in RTR. At this time, polls opened and voting at the precincts, using the ICE, on Election Day began. When the polls closed the initial results from the ICE early voting machine and the ICC vote by mail (VBM) votes were validated and published in order to release the initial Election Night Report. Subsequently, the memory cards from the precinct ICEs began coming back and the results data uploaded into RTR and reported. Upon completion of the final precinct being tabulated, the Semi-Official Canvass report was ran and a CalVoter import file was created from the Secretary of State's CalVoter Template File; the actual template file that was used during the election that was being tested. During the official canvass period, the remaining VBM ballots and Provisional ballots were scanned, results for any ICE containing a ballot with an unqualified write-in and any ICE loaded with multiple precincts that had a ballot with a write-in vote were deleted and all ballots placed through those ICE machines were rescanned on the ICC. Simultaneously, ballots containing an exception condition were beginning to be resolved using Adjudication. After all ballots were tabulated, the Official Canvass Summary report and Statement of Votes Cast report were generated. Additionally, the Secretary of State Statement of Vote (SOV) and Supplemental Statement of Votes (SSOV) CalVoter Template Files were populated and produced. Note that the above description only relates to the Primary and General

Elections and does not reference the Recall Election. This is because the Recall Election was used to test specific items, such as ballot layout rules and laws, scanner read-head tests to determine the consistency and accuracy of different types of marks using different marking devices simulating actual voters who vote by mail, language tests to determine if the system can populate all fonts used in California correctly and accurately, as well as the capability of the system to export the audio files accurately. Therefore, the process described for the Primary and General Elections was not performed, in its entirety, for the Recall Election.

Test results showed that the voting system performed in a manner consistent with California law and all test cases were executed successfully and accurately. The testing did uncover the following issues in the system, which were each handled procedurally and are documented in the California Installation Procedures or the California Use Procedures, respectively:

Issues with the EMS Applications (EED, EDT, RTR, Audio Studio)

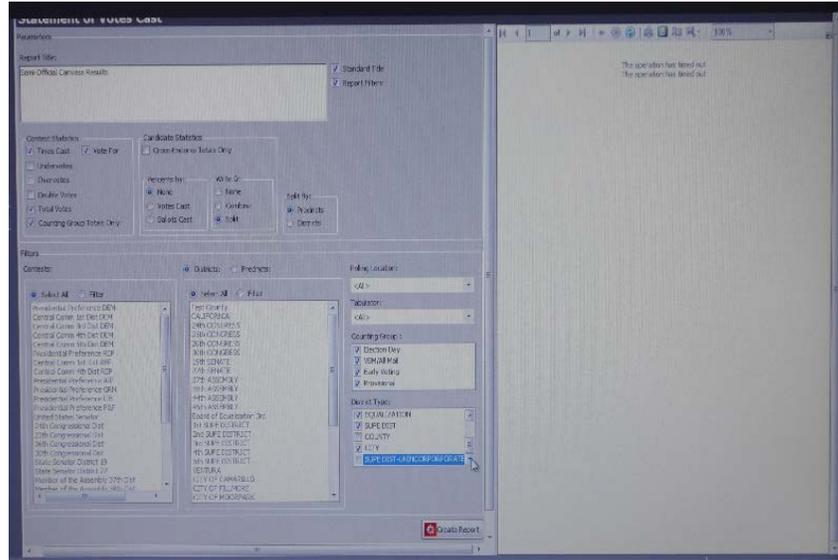
During testing, issues were discovered in the EMS Applications (EED, EDT, RTR, and Audio Studio). Each of the issues discovered was resolved before testing could proceed. Most of the issues discovered were addressed by procedural changes, which are reflected in the California Use Procedures. However, a few of the items had to be resolved through configuration changes within the system. A description of each issue and its resolution is listed below.

- a. RTR cannot accurately resolve ballots containing write-in votes that were cast on the ICE. In order to report Election Night results the ICE results files on the compact flash card must be uploaded into RTR on Election Night and then deleted during the canvass period. Two separate issues arose in testing regarding the handling of ballots containing write-ins. Each issue and its workaround is listed separately below.
 - i. Votes for an unqualified write-in that are tabulated by the ICE cannot be resolved in the Results Tally Reporting application. Every ICE that tabulated a vote for an unqualified write-in must have its results deleted from RTR and all ballots from that tabulator must be rescanned by the ICC, so that the unqualified write-in votes can be resolved through the Adjudication

application and then forwarded onto RTR to be reported accurately and pursuant to California law.

- ii. Votes for a write-in candidate, regardless of whether it is qualified or unqualified, that are tabulated by an ICE that is programmed with multiple precincts (e.g. Early Voting, Vote Center, polling place with multiple precincts, etc.) cannot be resolved in RTR. Every ICE that is programmed with multiple precincts and has tabulated a vote for a write-in must have its results deleted from RTR and all ballots from that tabulator must be rescanned by the ICC, so that the write-in votes can be resolved through the Adjudication application and then forwarded onto RTR to be reported accurately and pursuant to California law.
- b. The import, restore and backup of large data files such as project packages or audio packages across the network will not function properly once the data files hit a specific threshold because of a network timeout issue. When importing the data files, the following error was observed: “Error remote saving file: The underlying connection was closed: An unexpected error occurred on a receive.” The error message is due to a timeout issue because of the size/speed of data that is being transmitted across the network. Dominion set the threshold at 1GB for all data files, requiring any files larger than 1GB be placed directly onto the server and backups created via the server. However, the same issue arose on an audio package smaller than 1GB. Therefore, the California Use Procedures were amended to require that all Project Packages and audio packages be imported and backed up on the server, instead of through EED.
- c. RTR has a hardcoded 10 minute timeout for generating reports. When trying to generate the Statement of Votes Cast (SOVC) report for the Ventura Presidential Primary, RTR would give an error message stating “The operation has timed out” and the report would not generate. Dominion originally believed that the error was in MSSQL Reporting Services, so it changed the California Installation Procedures to configure the timeout on MSSQL Reporting Services to 6000 seconds from the default of 600 seconds. After doing so, the SOVC report again timed out the next time it was generated. Because of this, Dominion instead updated the California Use Procedures to have the report generated iteratively. However, because the timeout is based on generation time, not file size, there is not a definitive breaking point. For instance, the same SOVC report, with the

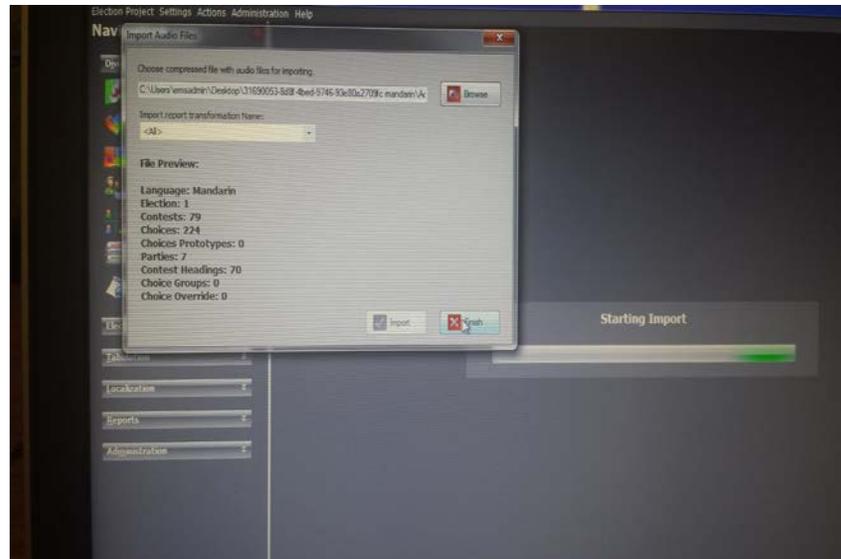
identical reporting parameters, timed out on the first try but generated correctly the second time. Therefore, any jurisdiction that receives the “The operation has timed out” error message should break the report into smaller batches, generating each separate report and then collate them together.



RTR timeout error while generating the SOVC report.

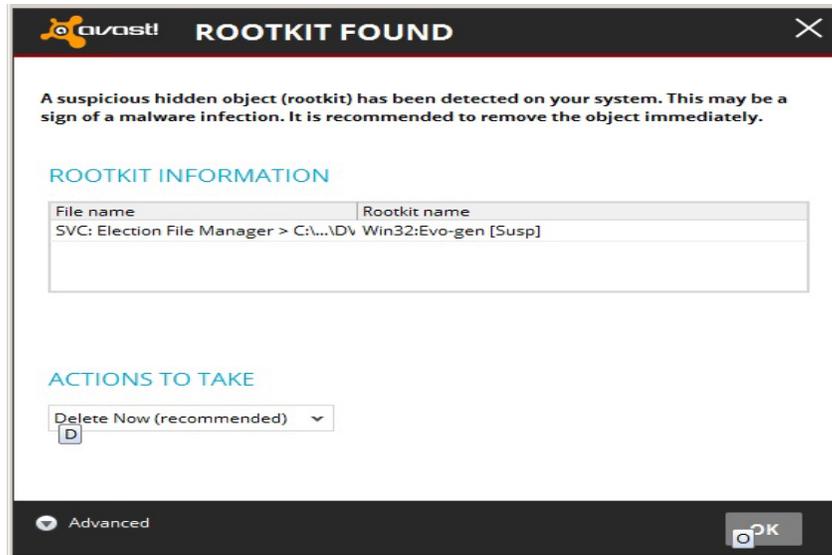
- d. RTR has a functionality called “SOS Mapping”, which was written to export data to the CalVoter Templates for Election Night Reporting, SOV, and SSOV. When populating the data into the CalVoter Template files two issues arose. Each issue and its respective workaround are listed below. Please note that the CalVoter Template files change election to election. Therefore, the two issues noted below may not occur during every election.
 - i. The “SOS Mapping” feature of RTR has two export types, which are automatically populated based on the structure of the imported CalVoter Template file. For the 2012 Presidential Primary SOV (PPSOV) Template, the structure was configured where RTR believed the template file was for an SSOV; the user can not change it to SOV. When the information is populated into the template file, the header lists SSOV, even though it is the PPSOV Template. The workaround is to go into the text file and manually change the header to accurately reflect the report type.

- ii. For files that are determined to be an SSOV reporting type, RTR cannot populate the template file without inserting additional information into the template file before running “SOS Mapping”. In order to get the additional information, the user must copy it from the SOV Template File, run the “SOS Mapping” and then delete the portion that was added. A document entitled “Procedures for using SOS mapping functionality in RTR.docx” was written to give the procedures on how to correctly populate this data.
 - a) Because there were only three template files created for the Ventura County 2012 Presidential Election (Direct Primary (DP) SOV Presidential Primary (PP) SOV, and DPSSOV), there was not the extra data set needed to populate the PPSOV Template. Therefore, the system was never able to generate that file.
- e. EED cannot accurately render text for ballots that use Thai, Khmer and Hindi fonts. When “Generating Ballots” the text that was input into EED renders in a different order, creating an incorrect translation of the text. Dominion stated that the third party text rendering tools it uses in its system cannot correctly format text for those languages. This is both in the ballot artwork and the text on the ICE screen. For jurisdictions that may need to create ballots in those three languages, procedures have been written to use images of the text strings to present the appropriate text on the ballot and ICE screen.
- f. When importing Audio Studio files into EED, a status bar pops up with the text “Starting Import” and two radio buttons present, “Import” and “Cancel”; “Import” is disabled and “Cancel” is enabled. While the process is running the “Cancel” button becomes an enabled “Finish” button with the “Import” button still disabled. The natural instinct is to assume the process is complete once the “Finish” button becomes enabled. However, if the “Finish” button is pressed at this time, the process will continue running and upon completion an error message stating “The underlying connection was closed: An unexpected error occurred on a receive.” Therefore, even though the “Finish” button becomes enabled, it should not be pressed until the status bar informs the user that the process has successfully completed.



"Finish" button enabled while Import is still running.

- g. In EED there are a number of reports that can be run to help with the proofing of the election definition database. One of the reports is the Audio Import report. This report does not accurately reflect the number of audio files that have been generated or imported into the database. This report should not be used. The Dominion recommended procedure is to manually review the files directly in EED, Audio Studio and during the conduction of the L&A testing.
- h. The Avast! anti-virus software does not recognize the Dominion Democracy Suite EMS application files. When launching certain EMS application files get blocked by Avast! and the software recommends the deletion of those files. If the user does not change the settings in the Avast! pop-up window when it appears, the application will be automatically deleted (uninstalled). This occurred with multiple applications. As a workaround, Dominion rewrote the California Installation Procedures to have the DVS folders, where the application install files are located, excluded from the Avast! virus scan.



Avast! virus scan blocking a Dominion application file and recommending its deletion.

- i. There is an issue that will not affect any jurisdiction that creates its own election definition database (Project Package), but it may affect jurisdictions that have the vendor configure the Project Package for them. The issue arises when the Project Package is configured using the Dominion Democracy Suite Express System, which is a configuration not used or certified in the State of California. If the Project Package that is sent to the jurisdiction was created on the Express System, an error may occur when the jurisdiction creates a backup. Dominion informed OVSTA that this was a known issue with the system that is due to the Express System and Standard System having different sector sizes.

Issues with the Adjudication Application

Two issues were identified during the testing of the Adjudication Application. One of the two issues has to do with network communication. The other issue has to do with maneuvering the ballot image within the application. Both issues and their respective workaround are identified below.

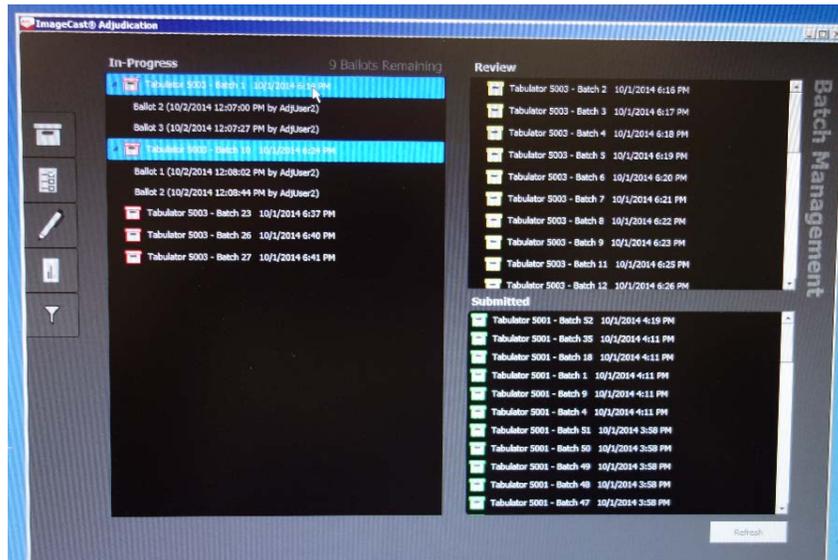
- a. Issues with Adjudication not receiving all the necessary information from the server were observed. Dominion did not confirm what the root cause is, but believes that the issue was due to a Microsoft Message Queuing (MSMQ) network error. The root cause did however create a few separate but related issues with the Adjudication application. Each issue and its workaround are listed separately below.

- i. The first instance where the issue was observed happened while logged on as the Remote Adjudication Administrator. In the Adjudication Administrator application there were not any batches or ballots present. However, ballots had been tabulated. It was verified that the Adjudication folder contained batches that should have been pushed onto the Adjudication Administrator application. Dominion believed that the issue would be resolved by simply clicking the “Refresh” button, but it did not. Further, Dominion informed OVSTA that there should be an “Updates are available” notation on the bottom of the application screen, which was not present. Therefore, the application had to be rebooted. Dominion determined that the issue should be resolved by removing the Remote Adjudication Administrator from the configuration. This forces the Adjudication Administrator to work directly on the server. Although it did resolve the notification issue, it did not resolve the other networking issues described below.

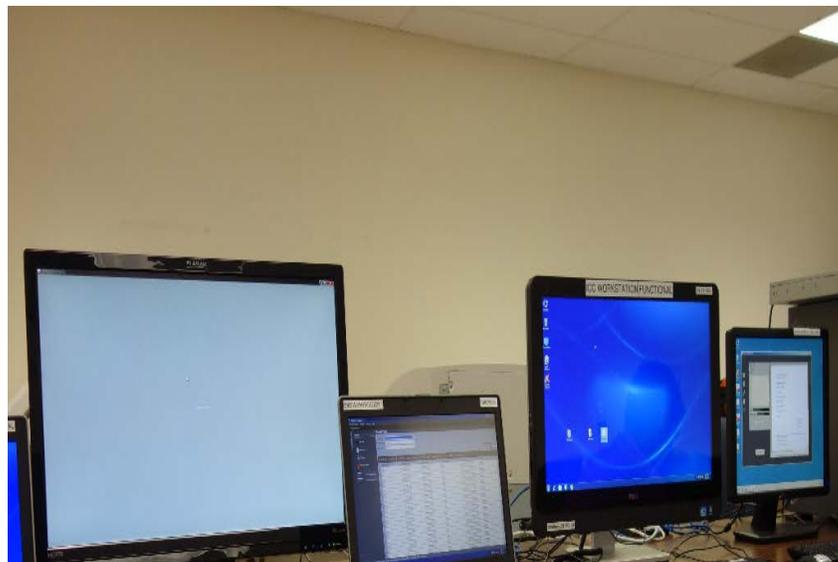
- ii. While resolving ballots through the Adjudication Client, the client erroneously sat in the “Waiting for ballot” state. This normally occurs only when there are no additional ballots that need to be resolved. However, in multiple instances there were ballots waiting in queue that were not making it to the client. A procedural workaround was added to the California Use Procedures that corrects the issue. The workaround is for the Administrator to log onto the Administration Adjudication application and “Refresh” the application.



“Waiting for ballot” screen on Adjudication Client application while ballots still need to be processed.



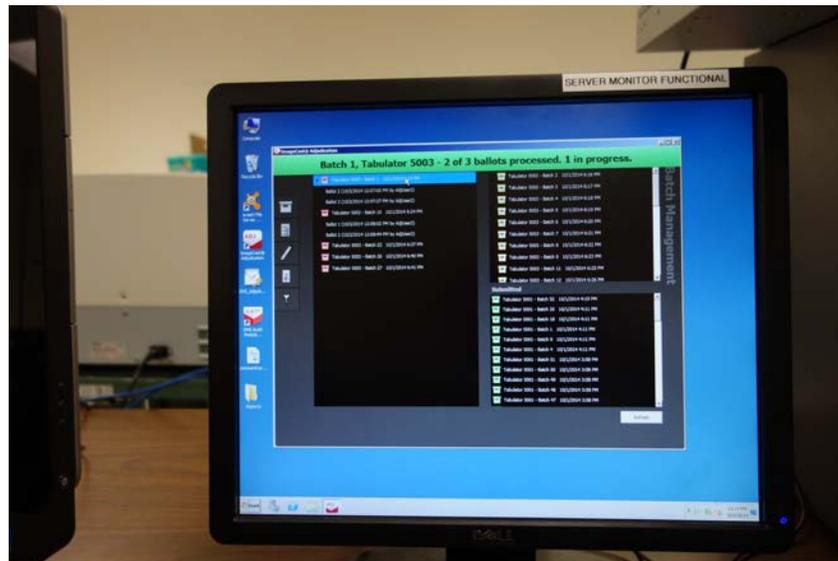
Refresh button on the Adjudication Administrator application (on the server).



Adjudication Client application (far left) Adjudication Administrator application (far right).

- iii. If a ballot has been sent to the Adjudication Client application, but the ballot was never visible to the user, the ballot or the batch may remain “In Progress”. Even though all other ballots from the batch have been resolved and the application has moved onto the next batch, the application shows that there is “[X] of [Y] ballots processed. 1 in progress”. Further, to verify that there was not a ballot in progress, we checked each Adjudication Client to determine, which ballot each had

visible; the ballot in progress was not present. When the issue occurs, the ballot or the batch must be “Reset”.



Expanded view showing 2 of 3 ballot processed in a previous batch while we are adjudicating ballots from the next batch.

- b. Maneuvering a ballot image in the Adjudication application may cause an erroneous vote selection. The only way to scroll the ballot up, down, left, and right to go from contest to contest is by using the grab function (represented by the Hand icon) in Adobe. This causes the user to have to physically move the ballot on screen by grabbing a spot on the ballot. However, if the user grabs the ballot in the area of a vote target, the application selects or deselects the vote position where the ballot was grabbed. In multiple instances a vote was accidentally and erroneously given to a candidate for whom a vote was not intended. The application does give a color-coded notification (Green for vote selection, Red for deselect) across the top of the screen that appears for five (5) seconds, but it is easily overlooked as the user is searching for the exception on the ballot that needs to be resolved. Dominion added a procedure to the California Use Procedures stating that the user should only maneuver the ballot image along the left or right timing marks. Later, it was discovered that this new procedure would not work either because there is an approximately two-inches (2”) of dead space on the left-hand side of the application screen. Therefore, the California Use Procedures were again amended to state that the scrolling of the ballot image should be “in an area **that does not contain voting targets...**” It further explains that the best area to select is the center of the ballot in the second column.

Issues with the ICE

The ICE had three issues arise during testing. The first two issues were election specific problems that will not occur in every election. The last issue would not likely affect most of California jurisdictions because their staff does not perform the maintenance and troubleshooting; it is conducted, through a service agreement, by the vendor. The issues and their respective resolutions are provided in the following sub-sections.

- a. The ICE has a size limitation on how many ballot styles can be loaded onto it. Dominion has approximated this limitation to be 2500 ballot styles. If a jurisdiction is planning to use the ICE for early voting or at a vote center, each ICE unit must contain less than 2500 ballot styles. Based on the fact that this is an issue for jurisdictions with more than 2500 ballot styles, this issue would only affect jurisdictions with a very large number of precincts and are required to provide the ballots in multiple languages.

- b. Because of a Voluntary Voting System Guidelines of 2005 (VVSG 2005) requirement, accessible voting machines are not allowed to have scrolling capabilities; the entire ballot must be able to fit on the screen. This requirement was not correctly implemented into the ICE and therefore, created an issue with the visual presentation when the text of a contest is really long and the ballot layout is set to only span a single column. Although the exact number of characters has not been identified by Dominion, it was observed that a measure used in testing would not display the entire contest (measure text and voting positions) because the length of the single column spanned longer than the length of the ICE screen. In order to circumvent this issue arising in an election, a jurisdiction that creates its own election definition and ballot layout should use a two or three column span for ballot measures, particularly when using a multilingual ballot. For the jurisdictions that have the election definition created for them, a thorough L&A test, including testing the zoom in functionality, should be conducted.

- c. ICE has many features that allow a user to troubleshoot the machine when an issue arises. One feature within the ICE Technician menu is the capability to “Calibrate printer heads”. This feature is intended to recalibrate the printer heads when they become misaligned and print outside the acceptable tolerances. However, the “Calibrate printer heads” feature does

not function properly and can even make the calibration worsen. The printer calibration is originally performed at the time of manufacturing, while the voting system is loaded with a previous version of the software. Because of this issue, if the ICE needs its printer heads recalibrated, it must have the software downgraded, have the necessary factory calibration performed, and then have the California certified software reinstalled from the trusted build.

3. Volume and Accessibility Test

As part of its test protocol, the Secretary of State conducts a Volume Test on all voting machines under test with which the voters will directly interact. Because the Dominion Democracy Suite 4.14-A.1 with Adjudication 2.4 voting system only contains the ImageCast Evolution (ICE) voting machine, which is an all-in-one ballot marking device (BMD) and precinct count optical scan (PCOS), the Secretary of State determined that it would do a combined volume and accessibility test. The volume test of the PCOS functionality (Volume Test) took place between April 29, 2014, and May 1, 2014. The volume and accessibility test on the BMD functionality (Accessibility Test) took place between May 6, 2014, and May 8, 2014. The Secretary of State partnered with the Department of Rehabilitation (DOR) to complete the heuristic evaluation of the accessibility features of the ICE, as well as to provide findings in this report. Both the Volume and Accessibility Tests used the Santa Clara County 2012 Presidential General Election as the basis for the election definition files. A subset of the precincts was used in the tests, with a total of 42 ballot styles being printed and marked for tabulation. Further, each ICE machine was loaded with all 42 ballot styles, similar to a vote center or early voting, as opposed to being loaded with a single precinct, similar to that of a polling place.

a. Volume Test

The Volume Test consisted of a total of fifty (50) ICE voting machines, with ten (10) machines being voted on at any given time. The Secretary of State used a total of forty (40) voters, ranging in age, skill, and voting experience, to vote ballots on the machines. Because California Elections Code requires that jurisdictions be divided into election precincts where the number of voters in the precinct does not exceed 1,000, the Secretary of State decided to have a minimum of 1,000 ballots tabulated by each machine to simulate the most voters a precinct would have on Election Day. The machines were broken up into one of four

categories: machines with 6 card, 8 card, 12 card, and 24 card decks. Machines were numbered 1-50. Machines ending in 1 or 2 (e.g. 1, 11, 2, 22, etc.) voted with the 6 card decks that had a total of 294 ballots. In order to reach the 1000 total ballots, each deck was scanned four times for a total of 1176 total ballots through those machines. The four passes was determined by the Secretary of State, in consultation with Dominion, to be valid because ballots in a real Election can be required to be scanned four times before the close of canvass (precinct, centrally, 1% manual tally, and recount; note that this does not include rescans because of misreads). This allows the Secretary of State to also test the quality of proposed ballot paper and its degradation. Machines ending in 3, 4, or 5 voted with the 8 card decks that had a total of 420 ballots. In order to reach the 1,000 total ballots, each deck was scanned three times for a total of 1,260 total ballots through those machines. Machines ending in 6, 7, or 8 voted with the 12 card decks that had a total of 630 ballots. In order to reach the 1,000 total ballots, each deck was scanned two times for a total of 1,260 total ballots through those machines. Machines ending in 9 or 10 voted with the 24 card decks that had a total of 1,176 ballots, so those decks were only scanned once. In the Volume Test there was a total of 61,320 ballots (1,176 ballots * 20 machines and 1,260 ballots * 30 machines) tabulated through the ICE machines. The test decks consisted of both pre-marked test decks from the ballot printer and hand-marked decks. The ratio was 5:1 or 83.3%:16.6% pre-mark:hand-mark. Additionally, ¼ or 25% of the ballots were pre-folded by the ballot printer to simulate VBM ballots. Folded ballots are used to test the ICE's capability to be used as a central count machine for small jurisdictions who may not want to buy a central count machine.

As the test was being conducted, anytime there was an incident that took "poll worker" assistance, the incident was documented. Out of the 61,320 ballots tabulated, there was a total of thirty-five (35) incidents (excluding incidents caused by human error), equaling a 0.06% incident rate. The thirty-five (35) incidents can be broken down into three categories: 1) ballot misreads; 2) ballot jams; and 3) ballot read to have erroneous "Ambiguous Mark[s]". Ballot misreads consisted of 32/35 incidents or 91% of the incidents reported or 0.05% of the total ballots tabulated. A ballot misread was only reported as an incident if it was scanned in all four orientations and still could not be tabulated. Therefore, the ballot had to be remade before it would be tabulated. Any ballot that was rejected on the first pass and then accepted upon reinsertion was not documented as an incident. The majority of the ballot misreads were determined to

be caused by ballot misprinting or ballot folds on timing marks. There were two (2) instances of ballot jams, which equals 6% of the incidents reported or a total of 0.003% incident rate of total ballots. In both instances, the machine handled the error as expected by requiring poll worker assistance to clear the paper jam, reject the ballot, and allow the voter to rescan the ballot without being remade. The last category, ballot read to have erroneous "Ambiguous Mark[s]," only occurred once, which equals 3% of incidents or 0.002% of total ballots. The ballot in this incident had an undervote, or no votes, for the Presidential contest. However, on the first scan, the ICE gave a warning notification that there were three "Ambiguous Mark[s]" (marginal marks) in the Presidential contest. The ballot was ejected and verified to have no votes or marginal marks in the Presidential contest. Therefore, the voter placed the ballot in the ICE a second time and the machine accepted the ballot without incident.

After the test concluded, the Secretary of State verified the results of vote totals both locally, off of the ICE results tape, and then overall, out of RTR. The verification resulted in a 100% accuracy rate. Based on the fact that the ICE performed with a 100% accuracy rate and the incidents and poll worker intervention rates were well below the 2% ballot rejection rate allowed by the VVSG 2005, the Volume Test for the precinct count optical scan functionality of the ICE was deemed successful.

b. Accessibility Test

The Accessibility Test consisted of ten voting stations, which were placed throughout the Secretary of State's Auditorium giving enough space in between to allow some privacy. Each voting station contained one ImageCast Evolution (ICE) voting unit, one video recording camera with microphone, one table, two chairs and a laptop for note taking by Secretary of State staff. In addition to the ten ICE units used during the test, one additional ICE unit was set aside as a reserve in case anyone not participating in the test wanted to vote using the machine. The eleven machines were labeled in numerical order of #1 through #10 with the spare machine labeled #53 for proper identification.

The ImageCast Evolution has the capability to support voters with the following disabilities:

- i. Cognitive - ballot display via paper and large LCD screen;
- ii. Perceptual and Partial Vision - ability to change screen color scheme, contrast, and font size;
- iii. Low or No Vision - audio, tactile interface;
- iv. Dexterity - integrated ballot marking device that does not require the voter to manipulate the ballot, low force buttons for voter interface;
- v. Mobility –VVSG 2005 required reaches and wheelchair access, ICE product allows voter to avoid manipulating the ballot to go from the ballot marker to the scanner and obtain a scanned vote verification;
- vi. Hearing - audio interface, same as for low/no vision; and
- vii. Speech - no speech is required to operate the voting system.

Voters who were voting an Accessible Voting Session (AVS) had the ability to use any of the following components: the Audio Tactile Interface (ATI), lap pad, adaptive/paddle switches, headphones, and sip and puff device.



Rubber coated lap pad with ATI.



Left and Right Adaptive Switch.



Sip and Puff Device.

The Secretary of State tested the voting system for usability and accessibility with approximately 44 volunteer voters from the general population with the various disabilities mentioned above. Out of the 44 total survey respondents, eight individuals were 30 years old or younger, 27 individuals were between the ages of 31 and 64, two were 65 or older, and seven declined to state their age. Also, 16 individuals identified that they are visually impaired, three identified cognitive impairment, seven identified dexterity problems, four identified that they have multiple disabilities, and five did not identify a disability. These volunteer voters were asked to vote four separate ballots based upon a testing script.

The Secretary of State also had the assistance of 15 staff members who acted as poll workers and documented the test process and experience for each volunteer tester. The Secretary of State staff was provided with a set of instructions to follow along with the ballots. The staff was trained by Dominion personnel on the system and how to use the accessible features. The instructions contained step-by-step directions to assist the Secretary of State staff with maintaining the flow of the process and to remind them of all tasks.

In the first three ballots, the voter was required to voice their intended selection prior to voting it, but on the fourth ballot the voter was asked to vote as instructed by the poll worker. In the first ballot, the voter was allowed to vote as they chose until the completion of the ballot. In the second ballot, the voter was requested to vote for themselves as a write-in candidate in the Presidential race and to vote as they chose for the remainder of the ballot. In the third ballot, the voter was again allowed to vote as they chose until the completion of the ballot, but was required to go back to a specific race and change the selected candidate(s) to a different selection and then cast the ballot.

With the assistance of the California Department of Rehabilitation (DoR), the Secretary of State's usability and accessibility test provided the following heuristic evaluation in accordance with the VVSG 2005, the alternative language requirements and privacy requirements in the Help America Vote Act (HAVA), and the accessibility requirements for Self Contained, Closed Products as established in Section 508 of the U.S. Rehabilitation Act, Subpart B: section 1194.25.

The ICE met all of the requirements of the VVSG 2005 in regard to vision, dexterity, mobility, hearing, speech, English proficiency and cognition. The system also met all requirements, a through j, of Section 508, Subpart B: section 1194.25 of the United States Rehabilitation Act, as well as the alternative language and privacy requirements of HAVA. DoR did however, report a few minor usability issues with the system.

- i. The information display screen for write-in candidates seemed to confuse some people. It seemed that the instructions were not sufficient. The Help screen did not alleviate the confusion.
- ii. While the voting system does meet all reach standards, persons using wheelchairs are required to vote in a side sitting position. Side sitting for an extended period of time

does not seem to be the most eloquent solution. A better option to side sitting would be for the voting machine screen to extend forward, moving closer to the face of wheelchair users. If this option were to be able to be built into the system, wheelchair users would have the option of facing forward while voting.

- iii. Many people who use headsets to vote are accustomed to using screen readers on the computer. A screen reader will announce the number of items in a list upon entering. The fact that the number of candidate options was not given at the beginning of each contest was mentioned by voters as a negative. Knowing how many candidates are in each contest would make the ballot less confusing and reduce some of the frustration that was reported.
- iv. Although the adaptive switches seem to be an appropriate choice for persons who have limited motor dexterity, observations showed that persons who opted to use the adaptive switches made many mistakes while voting. This caused the voter to have to go back and correct their mistakes. This process increased the time needed to successfully complete the voting process. The mistakes seemed to be because the paddles were too close together.
- v. While the ICE can zoom text and adjust font contrast (black/white to white/black), the screen does not scroll. So a person looking at the screen cannot see and read the entire proposition. Section 3.1.6 (a) of the VVSG 2005 states, "voting machines with electronic image display shall not require page scrolling by the voter". However, when the content of a proposition extends beyond the screen, it cannot be seen on the screen, it can only be heard when wearing headset audio devices. If the content would scroll automatically in synchronization with the audio, or a 'next page' button be included as an option so that the individuals can read the long text at the same time they are listening to the audio, that would be beneficial. Several participants mentioned having to listen to the propositions more than once, due in part to not being able to read along.

The Secretary of State provided a two part survey for each voter. Part one of the survey was filled out during the check-in process and asked a series of questions related to the voter themselves and of their experience with the voting process. Part two of the

survey asked twelve questions describing voter's experience with the voting system. To categorize responses, the first ten questions were specific to the voting system. The questions and responses can be viewed in [Appendix B](#).

4. Security Review Summary

The Secretary of State contracted with Freeman Craft McGregor Group, Inc. (FCMG) to conduct the Security Review. FCMG sub-contracted with @sec to conduct the Source Code Review and to assist with the Red Team Review. The Red Team Review took place at the Secretary of State's office between February 10, 2014, and February 14, 2014. The Source Code Review took place between January 8, 2014, and February 21, 2014. Because of changes in the configuration and substitution of the version of Adjudication (2.4 for 1.0), there was a second round of Security Review. The second Red Team Review took place on October 11, 2014, and October 12, 2014. The second Source Code Review took place between September 30, 2014, and October 24, 2014. Below is a summary of each of the two tests, Red Team Review and Source Code Review, but the full reports are located on the Secretary of State's website [here](#).

a. Red Team Review Summary

In regards to the physical security of the voting machines, the Red Team determined that most plastic "lock-type" seals could easily be compromised while the "tie-wrap" and "security stickers" provided adequate integrity validation if properly used. The Red Team was also able to perform a denial of service (DoS) attack on the ICE machine without the other members being aware. The DoS attack was performed by turning on the main power switch to the machine using a paperclip while the door to the switch was closed and sealed. This attack ended up frying the motherboard on the ICE because the power was turned on without a CF0 card inserted. Therefore, that voting machine had to be taken out of service until Dominion technicians could reload the firmware. Additionally, it was determined that the Red Team could bypass the security mechanism placed on the ballot box door, which logs when the door is open and closed. This attack made it so that the system logged that the door was never shut or locked. This was performed in two instances, once accidentally, the other purposefully, by unplugging the switch in the auxiliary bin that creates the logging events.

From a software standpoint, the Red Team reported significant security concerns with the Democracy Suite's Windows-based programs being developed under the .NET framework. The Red Team was able to decompile the executable code into its original source code, including the developers' comments. This allowed the Red Team to view hardcoded passphrases and encryption keys. With the information gained, the Red Team was able to change the outcome of the election.

The outcome of the original Red Team Review in February caused Dominion to make some engineering changes to the hardware to mitigate the risks of the physical security issues that were found in the testing and also to fix one additional issue determined in the hardware of the EMS server, which was found in Dominion's internal testing. Further, it was determined that Dominion could create a new trusted build of the executable code by obfuscating such code during the build process, without modifying any original source code. These changes could solve a majority of the software issues found, or at least minimize the risk of an attack being performed. Dominion made the necessary changes to the system, both hardware and trusted build, and submitted the modifications to the federal Election Assistance Commission (EAC) to review the changes under a modification of engineering change orders (ECOs). OVSTA staff was present and participated in the testing that was performed on the system at the voting system testing laboratory (VSTL) that performed the testing for the federal EAC.

After a new trusted build was created using obfuscation, the Red Team conducted a second review of the system. It was determined that the new build, DemSuite 4.14-A.1, mitigated four of the previously reported vulnerabilities, there were still medium and high level vulnerabilities within the system. Further, during the testing of the new component, Adjudication 2.4, the Red Team was able to recover ballot images and DVD files during the transmission between the ICCWorkstation and the EMSServer.

In conclusion, the implementation of the new hardware ECOs and the obfuscated code has mitigated a majority of the vulnerabilities discovered in the original testing. However, Dominion can make some additional modifications in the future to make it more secure.

b. Source Code Review Summary

The initial review of the Source Code was performed on the overall system, including the EMS, ICE and ICC. Whereas the

second review was only of the three Adjudication software code sets that were added to the system after the initial review was complete. The initial review found one issue with a high severity level, and fourteen items that were categorized as a medium severity level. The Source Code Team defines high severity as implying either the impact of exploitation to the product would result in complete compromise of security, or the difficulty in exploitation would likely require little to no access or knowledge of the system or little to no resources. Medium severity was defined by the Source Code Team as implying either the impact of exploitation to the product would be significant, or the difficulty in exploitation would likely require extended access to the system, informed knowledge of the system, or would require significant resources.

The one high severity risk found in the code was created because the voting system generates weak encryption keys with a low level of entropy. Cryptography is centered on the strength of those keys. An exploit could be performed in a few hours by someone with knowledge of and access to the system or by someone who gained access to election data and had decompiling tools. Note that this vulnerability in the code is what allowed for one of the exploits that the Red Team performed, which was mitigated by the obfuscated build, as described above.

Of the fourteen items discovered with a medium severity level only five were also determined to be a “potential vulnerability” or “vulnerability” versus a “weakness” or “nonconformity”. “Potential vulnerabilities” are likely to be exploitable whereas “vulnerabilities” have been exploited. The iButton, which is used by the poll worker to access features of the ICE and by election officials to access the ICC, uses an unconventional authentication scheme that may not use sound security practices. The iButton also allows access to the configuration files (.config) of the ICC, which gives an attacker the ability to read or alter items that are protected by encryption and integrity keys. An instance of potential privilege escalation was identified. Hard coded encryption keys can be retrieved by an insider with expert knowledge or an attacker with access to election data and who can decompile the executable. Keys are stored unencrypted. These keys are used to protect the election definition. Note that this vulnerability in the code is what allowed for one of the exploits that the Red Team performed, which was mitigated by the obfuscated build, as described above. Further, although some keys are still stored unencrypted, they were no longer present in memory.

The second round of source code review was conducted on the newly introduced component, Adjudication 2.4. The source code review team identified sixteen potential vulnerabilities. All sixteen items were categorized as having a low severity level. Further, of the sixteen items identified, fourteen of those items were items of non-conformance with the VVSG 2005 or standards which the system was written against.

IV. CONCLUSION

The Dominion Democracy Suite 4.14-A.1 with Adjudication 2.4 voting system, in the configuration tested and documented by the Installation and Use Procedures, meets all applicable California laws. [Appendix A](#) contains a detailed chart of the Elections Code sections that the Secretary of State tested the system against. It is the first system to apply for certification in California that is fully certified to the federal Voluntary Voting System Guidelines (VVSG) of 2005, the most up-to-date version adopted by the federal Elections Assistance Commission. Further, many portions of the system have been documented and shown to be compliant with the VVSG version 1.1, which will be required for any new system applying in the future for certification in California. The Dominion Democracy Suite 4.14-A.1 voting system is compliant with all of California laws with the Adjudication 2.4 component. Without Adjudication 2.4, major procedural changes would need to be implemented that would make the system practically unusable. Additionally, due to limitations in the EMS and ICE, the system may not be suitable for jurisdictions that have large database files and that are required to provide ballots in multiple languages.

Appendix A: COMPLIANCE WITH CALIFORNIA ELECTIONS CODE

The following is a chart of the California Elections Code sections that the Secretary of State tested the Dominion Democracy Suite 4.14-A.1 with Adjudication 2.4 voting system against. The chart is broken down by Elections Code Section, language quoted from the section and how the system complies with the section.

Elections Code Section	Elections Code Language	Compliance
10264	<p>As soon as the result of the election is declared, the elections official of the governing body shall enter on its records a statement of the result. The statement shall show:</p> <ul style="list-style-type: none"> (a) The whole number of votes cast in the city. (b) The names of the persons voted for. (c) The measures voted upon. (d) For what office each person was voted for. (e) The number of votes given at each precinct to each person and for and against each measure. (f) The number of votes given in the city to each person and for and against each measure. 	<p>The voting system has the capability to produce the required report(s).</p>
10550	<p>As soon as the result of the canvass by the county elections official is declared, the county elections official shall prepare and mail a statement of the result to the secretary of each district participating in the general district election. The statement shall be signed by the county elections official, authenticated by the seal of the county and shall show:</p> <ul style="list-style-type: none"> (a) The number of ballots cast for elective offices of that district and, when directors of that district are elected by divisions, the number of ballots cast in each division. (b) The name of each candidate for an elective office of that district voted for and the office. (c) The number of votes cast in each precinct for each candidate. (d) When directors are elected by divisions, the number of votes cast in each division for each candidate for the office of director from that division. (e) The number of votes cast in the district for all other elective offices of that district. 	<p>The voting system has the capability to produce the required report(s).</p>

13289	At the presidential primary, if the voting machine will accommodate it, the county central committee election ballot shall be placed upon the voting machine together with the presidential primary ballot.	The voting system has the capability to meet this requirement.
14433	If ballots are counted at precincts pursuant to Article 3 (commencing with Section 15340) or Article 5 (commencing with Section 15360) of Chapter 4 of Division 15, the precinct board immediately shall transmit, unsealed, to the elections official a statement showing the result of the votes cast at the polling place. The statement shall be open to public inspection.	The voting system has the capability to produce the required report(s).
15101(b)	Any jurisdiction having the necessary computer capability may start to process vote by mail ballots on the seventh business day prior to the election. Processing vote by mail ballots includes opening vote by mail ballot return envelopes, removing ballots, duplicating any damaged ballots, and preparing the ballots to be machine read, or machine reading them, but under no circumstances may a vote count be accessed or released until 8 p.m. on the day of the election. All other jurisdictions shall start to process vote by mail ballots at 5 p.m. on the day before the election.	The voting system has the capability to meet this requirement.
15101 (c)	Results of any vote by mail ballot tabulation or count shall not be released prior to the close of the polls on the day of the election.	The voting system has the capability to scan, but not tabulate or report the results prior to the close of polls on Election Day.
15109	Except as otherwise provided in this chapter, the counting and canvassing of vote by mail ballots shall be conducted in the same manner and under the same regulations as used for ballots cast in a precinct polling place.	The voting system has the capability to meet this requirement.
15110	Reports to the Secretary of State of the findings of the canvass of vote by mail ballots shall be made by the elections official pursuant to Chapter 3 (commencing with Section 15150) and Chapter 4 (commencing with Section 15300).	The voting system has the capability to produce the required report(s).
15150	For every election, the elections official shall conduct a semifinal official canvass by tabulating vote by mail and precinct ballots and compiling the results. The semifinal official canvass shall commence immediately upon the close of the polls and shall continue without adjournment until all precincts are accounted for.	The voting system has the capability to meet this requirement.

15151 (a)	<p>The elections official shall transmit the semifinal official results to the Secretary of State in the manner and according to the schedule prescribed by the Secretary of State prior to each election, for the following:</p> <ul style="list-style-type: none"> (1) All candidates voted for statewide office. (2) All candidates voted for the following offices: <ul style="list-style-type: none"> (A) State Assembly. (B) State Senate. (C) Member of the United States House of Representatives. (D) Member of the State Board of Equalization. (E) Justice of the Court of Appeals. (3) All persons voted for at the presidential primary or for electors of President and Vice President of the United States. (4) Statewide ballot measures. 	The voting system has the capability to produce the required report(s).
15152	<p>Neither the elections official, any member of a precinct board, nor any other person shall count any votes, either for a ballot proposition or candidate, until the close of the polls in that county. After that time, the ballots for all candidates and ballot propositions voted upon solely within the county shall be counted and the results of the balloting made public. However, the results for any candidate or ballot proposition also voted upon in another county or counties shall not be made public until after all the polls in that county and the other county or counties have closed. This paragraph applies regardless of whether the counting is done by manual tabulation or by a vote tabulating device.</p>	The voting system has the capability to scan, but not tabulate or report the results prior to the close of polls on Election Day.
15153	<p>During the semifinal official canvass, write-in votes shall be counted in accordance with Article 3 (commencing with Section 15340) of Chapter 4.</p>	With Adjudication 2.4, the voting system has the capability to meet this requirement.
15212	<p>If voting at all precincts within a county is not conducted using the same voting system, the result as to the precincts not subject to this article shall be determined in accordance with other provisions of this code and the result of the vote at precincts subject to this article shall be determined as provided in this article. The statement of the vote in that case shall represent the consolidation of all the results and the results of the canvass of all vote by mail voter ballots.</p>	The voting system has the capability to produce the required report(s).

<p>15302 (e), (f), (g), (h)</p>	<p>The official canvass shall include, but not be limited to, the following tasks: (e) Processing and counting any valid vote by mail and provisional ballots not included in the semifinal official canvass. (f) Counting any valid write-in votes. (g) Reproducing any damaged ballots, if necessary. (h) Reporting final results to the governing board and the Secretary of State, as required.</p>	<p>The voting system has the capability to produce the required report(s).</p>
<p>15342 (a)</p>	<p>Any name written upon a ballot for a qualified write-in candidate, including a reasonable facsimile of the spelling of a name, shall be counted for the office, if it is written in the blank space provided and voted as specified below: (a) For voting systems in which write-in spaces appear directly below the list of candidates for that office and provide a voting space, no write-in vote shall be counted unless the voting space next to the write-in space is marked or slotted as directed in the voting instructions, except as provided in subdivision (f). (d) Neither a vote cast for a candidate whose name appears on the ballot nor a vote cast for a write-in candidate shall be counted if the voter has indicated, by a combination of marking and writing, a choice of more names than there are candidates to be nominated or elected to the office. (e) All valid write-in votes shall be tabulated and certified to the elections official on forms provided for this purpose, and the write-in votes shall be added to the results of the count of the ballots at the counting place and be included in the official returns for the precinct.</p>	<p>The voting system has the capability to meet this requirement.</p>

15372	<p>(a) The elections official shall prepare a certified statement of the results of the election and submit it to the governing body within 28 days of the election or, in the case of school district, community college district, county board of education, or special district elections conducted on the first Tuesday after the first Monday in November of odd-numbered years, no later than the last Monday before the last Friday of that month.</p> <p>(b) The elections official shall post the certified statement of the results of the election on his or her Internet Web site in a downloadable spreadsheet format that may include, but is not limited to, a comma-separated values file or a tab-separated values file and that is compatible with a spreadsheet software application that is widely used at the time of the posting. The certified statement of the election results shall be posted and maintained on the elections official's Internet Web site for a period of at least 10 years following the election. This subdivision shall apply only to an elections official who uses a computer system that has the capability of producing the election results in a downloadable spreadsheet format without requiring modification of the computer system.</p>	The voting system has the capability to produce the required report(s).
15374	<p>(a) The statement of the result shall show all of the following:</p> <ol style="list-style-type: none"> (1) The total number of ballots cast. (2) The number of votes cast at each precinct for each candidate and for and against each measure. (3) The total number of votes cast for each candidate and for and against each measure. <p>(b) The statement of the result shall also show the number of votes cast in each city, Assembly district, congressional district, senatorial district, State Board of Equalization district, and supervisorial district located in whole or in part in the county, for each candidate for the offices of presidential elector and all statewide offices, depending on the offices to be filled, and on each statewide ballot proposition.</p>	The voting system has the capability to produce the required report(s).
19203	The Secretary of State shall not certify or conditionally approve a voting system or a part of a voting system that uses paper ballots unless the paper used for the ballots is of sufficient quality that it maintains its integrity and readability throughout the retention period specified in Chapter 4 (commencing with Section 17300) of Division 17.	According to the documentation submitted with the voting system, the voting system has the capability to meet this requirement.
19204	The Secretary of State shall not certify or conditionally approve any voting system that includes features that permit a voter to produce, and leave the polling place with, a copy or facsimile of the ballot cast by the voter at that polling place.	The voting system has the capability to meet this requirement.

19205	<p>A voting system shall comply with all of the following:</p> <p>(a) No part of the voting system shall be connected to the Internet at any time.</p> <p>(b) No part of the voting system shall electronically receive or transmit election data through an exterior communication network, including the public telephone system, if the communication originates from or terminates at a polling place, satellite location, or counting center.</p> <p>(c) No part of the voting system shall receive or transmit wireless communications or wireless data transfers.</p>	The voting system has the capability to meet this requirement.
19210 (a)	<p>A person, corporation, or public agency owning or having an interest in the sale or acquisition of a voting system or a part of a voting system may apply to the Secretary of State for certification that includes testing and examination of the applicant's system by a state-approved testing agency or expert technicians and a report on the findings, which shall include the accuracy and efficiency of the voting system. As part of its application, the applicant shall notify the Secretary of State in writing of any known defect, fault, or failure of the version of the hardware, software, or firmware of the voting system or a part of the voting system submitted. The Secretary of State shall not begin his or her certification process until he or she receives a completed application. The applicant shall also notify the Secretary of State in writing of any defect, fault, or failure of the version of the hardware, software, or firmware of the voting system or a part of the voting system submitted that is discovered after the application is submitted and before the Secretary of State submits the report required by Section 19213. The Secretary of State shall complete his or her certification process without undue delay.</p>	The corporation met this requirement.
19212 (a) (1)	<p>(1) No later than 10 business days after the Secretary of State certifies or conditionally approves the use of a new or updated voting system, the vendor or county seeking certification or approval of the voting system shall cause an exact copy of the approved source code for each component of the voting system, including complete build and configuration instructions and related documents for compiling the source code into object code, to be transferred directly from either the United States Election Assistance Commission or the voting system testing agency that evaluated the voting system and is approved by the Secretary of State, and deposited into an approved escrow facility.</p>	The vendor has met this requirement.

19240	It is the intent of the Legislature that California voting system standards and elections comply with the provisions of the federal Help America Vote Act of 2002 (42 U.S.C. Sec. 15301 et seq.) that require voting systems be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation, including privacy and independence, as provided to other voters who are not disabled.	The voting system has the capability to meet this requirement.
19242 (b)	At each polling place, at least one voting unit certified or conditionally approved by the Secretary of State shall provide voters with disabilities the access required under the federal Help America Vote Act of 2002 (42 U.S.C. Sec. 15301 et seq.).	The voting system has the capability to meet this requirement.
19300	A voting machine shall, except at a direct primary election or any election at which a candidate for voter-nominated office is to appear on the ballot, permit the voter to vote for all the candidates of one party or in part for the candidates of one party and in part for the candidates of one or more other parties.	The voting system has the capability to meet this requirement.
19301	(a) A voting machine shall provide in the general election for grouping under the name of the office to be voted on, all the candidates for the office with the designation of the parties, if any, by which they were respectively nominated or which they designated pursuant to Section 8002.5. (b) With respect to a party-nominated office, the designation may be by usual or reasonable abbreviation of party names. With respect to a voter-nominated office, the voting machine shall conform to the format specified in subdivision (a) of Section 13105.	The voting system has the capability to meet this requirement.

19303	<p>If the voting machine is so constructed that a voter can cast a vote in part for presidential electors of one party and in part for those of one or more other parties or those not nominated by any party, it may also be provided with: (a) one device for each party for voting for all the presidential electors of that party by one operation, (b) a ballot label therefor (sic) containing only the words “presidential electors” preceded by the name of the party and followed by the names of its candidates for the offices of President and Vice President, and (c) a registering device therefor (sic) which shall register the vote cast for the electors when thus voted collectively.</p> <p>If a voting machine is so constructed that a voter can cast a vote in part for delegates to a national party convention of one party and in part for those of one or more other parties or those not nominated by any party, it may be provided with one device for each party for voting by one operation for each group of candidates to national conventions that may be voted for as a group according to the law governing presidential primaries.</p> <p>No straight party voting device shall be used except for delegates to a national convention or for presidential electors.</p>	The voting system has the capability to meet this requirement.
19322	<p>When a voting machine has been properly prepared for an election, it shall be locked against voting and sealed. After that initial preparation, a member of the precinct board or some duly authorized person, other than the one preparing the machines, shall inspect each machine and submit a written report. The report shall note the following:</p> <p>(1) Whether all of the registering counters are set at zero (000), (2) whether the machine is arranged in all respects in good order for the election, (3) whether the machine is locked, (4) the number on the protective counter, (5) the number on the seal. The keys shall be delivered to the election board together with a copy of the written report, made on the proper blanks, stating that the machine is in every way properly prepared for the election.</p>	The voting system has the capability to meet this requirement, including the generation of an electronic report that meets numbers (1) and (4).

As soon as the polls are closed, the precinct board, in the presence of the watchers and all others lawfully present, shall immediately lock the voting machine against voting and open the counting compartments, giving full view of all counter numbers. A board member shall, in the order of the offices as their titles are arranged on the machine, read and distinctly announce the name or designating number and letter on each counter for each candidate's name and the result as shown by the counter numbers. He or she shall also in the same manner announce the vote on each measure.

If the machine is provided with a recording device, in lieu of opening the counter compartment, the precinct board shall proceed to operate the mechanism to produce the statement of return of votes cast record in a minimum of three copies, remove the irregular ballot, if any, record on the statement of return of votes cast record. The irregular ballot shall be attached to the statement of result record of votes cast for the machine and become a part thereof. One copy of the statement of return of votes cast for each machine shall be posted upon the outside wall of the precinct for all to see. To protect a person's right to cast a secret ballot under Section 7 of Article II of the California Constitution, in cases where fewer than 10 voters cast ballots on any single machine on which the results are tallied at the precinct, the precinct board shall post only the total number of people who voted at that precinct on the machine that keeps vote tallies. The statement of return of votes cast for each machine for the precinct shall constitute the precinct statement of result of votes cast.

The voting system has the capability to meet this requirement.

19370

Appendix B: VOTERS WITH SPECIFIC NEEDS SURVEY RESULTS AND RECOMMENDATIONS

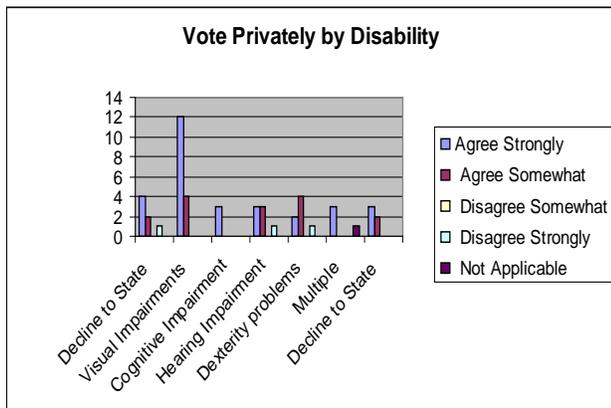
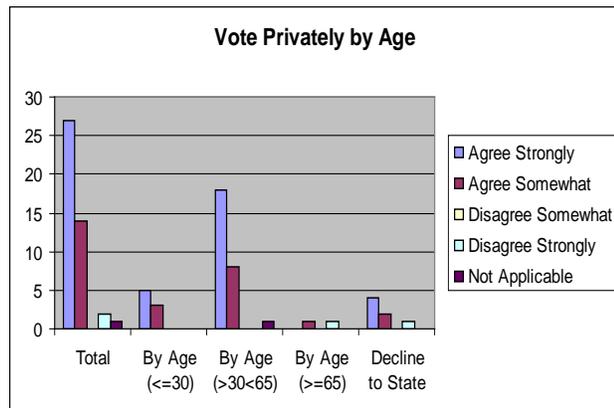
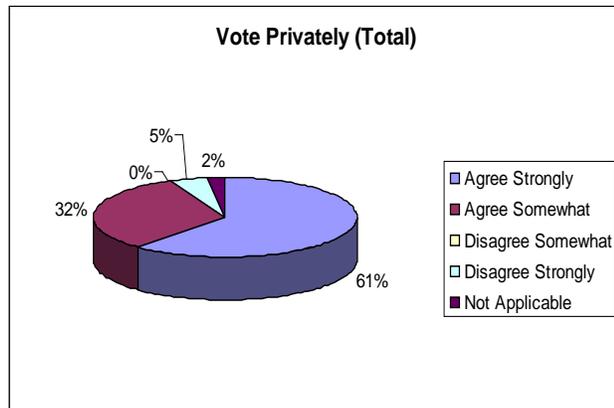
1. Survey Results

The Secretary of State conducted an exit survey on the voters who participated in the Accessibility Test regarding their voting experience utilizing the ImageCast Evolution (ICE). This section contains the results of those surveys. The majority of participants found that the voting system would allow them to vote privately and independently; that the voting instructions were clear and complete; the display was easy to read; the speech output was understandable; the assistive devices were easy to reach and use; the system was not confusing to use; and that the time it took to vote was within their expected timeframe. However, less than a majority of the participants found the voting method to be easy to use.

Question # 1: The voting method was private.

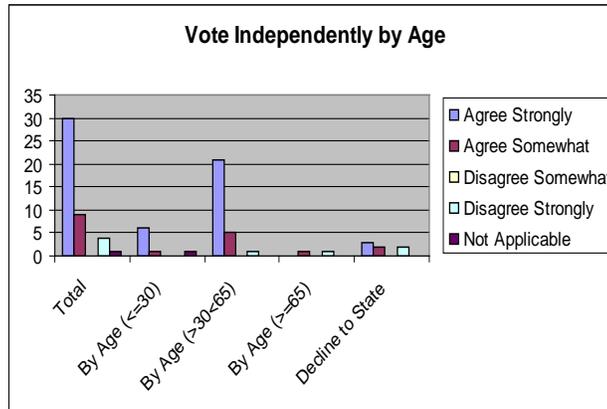
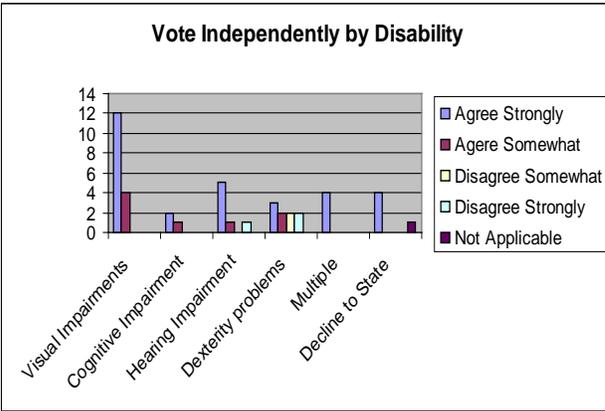
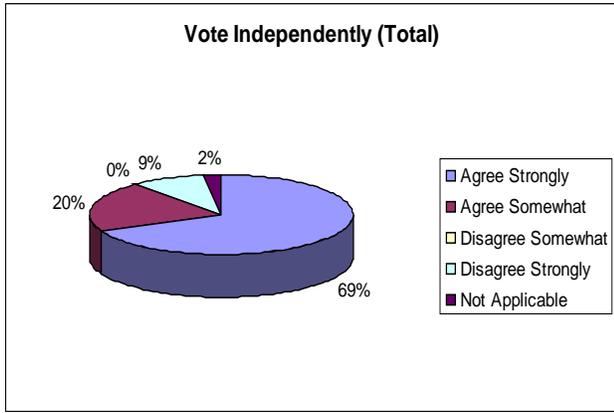
The chart on the right shows that the 61% of survey respondents agreed strongly that the voting method was private, with only 5% disagreeing with the statement.

The two charts below break down the survey responses by age and disability. Those individuals younger than 65 made up most of the survey respondents that agreed the survey was private. The majority of survey respondents with disabilities agreed the voting system was private.



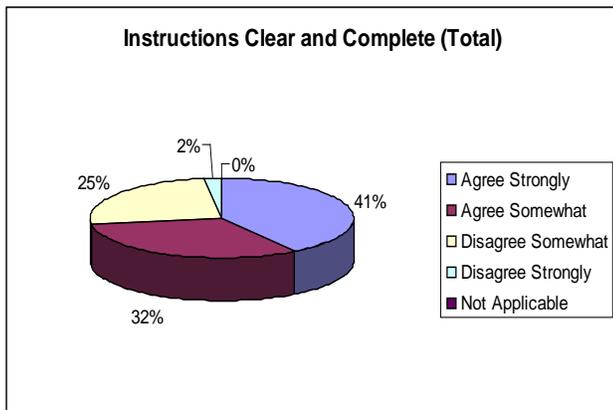
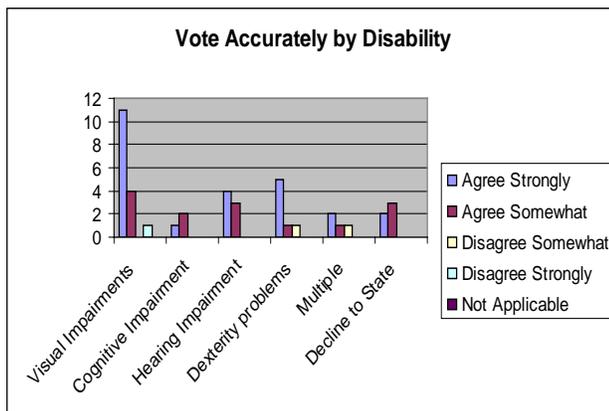
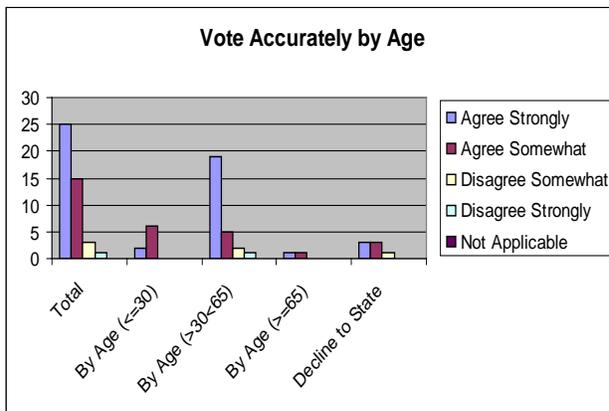
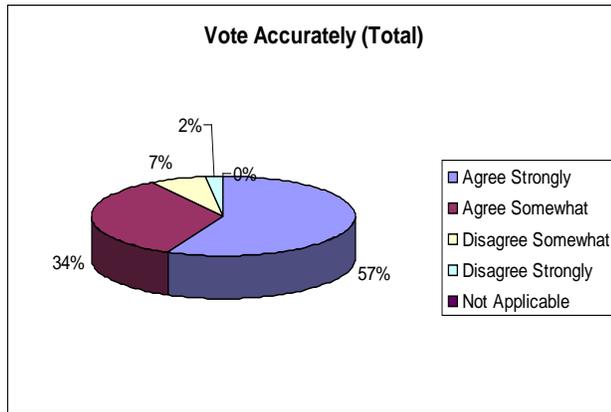
Question # 2: I feel I can use this system to vote independently.

69% of survey respondents agreed strongly that the voting machine allowed them to vote independently, with only 9% disagreeing strongly with the statement. Individuals with all types of disabilities agreed that the system allowed them to vote independently.



Question #3: I am confident that my vote was recorded accurately.

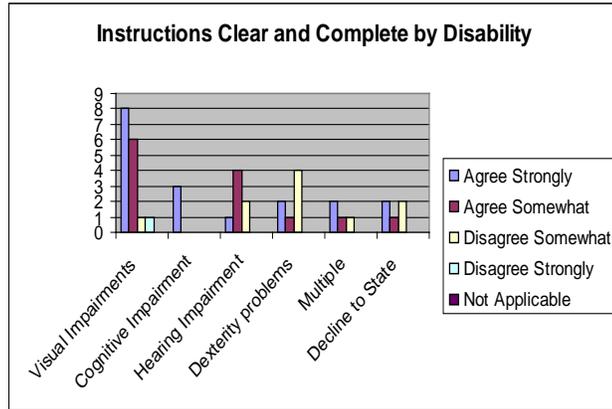
An overwhelmingly majority of testers (91%) agreed that the voting system allowed them to vote accurately, with 7% disagreeing somewhat and 2% disagreeing strongly. Individuals of all ages and disabilities agreed with the statement. Among those individuals that disagreed, one voter had a visual impairment, one had dexterity problems, and the other had multiple disabilities.



Question # 4: The voting instructions were clear and complete.

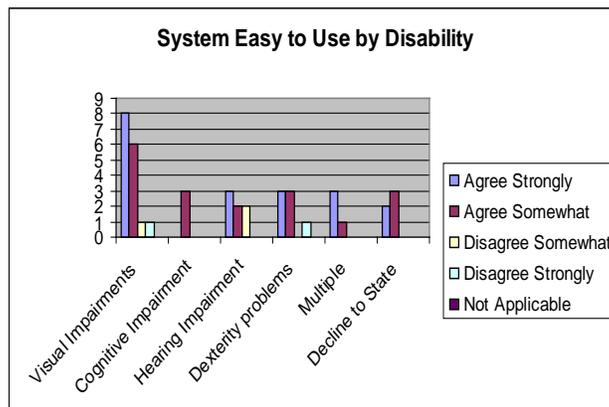
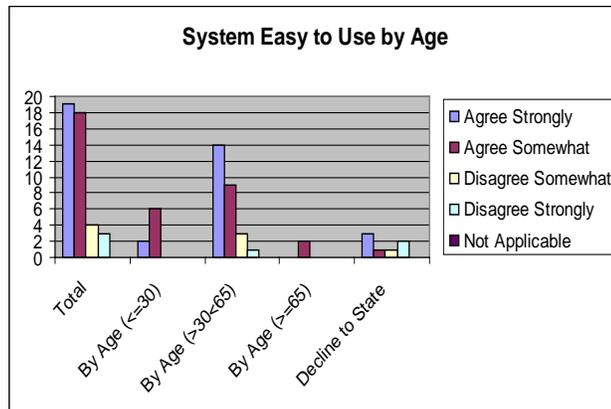
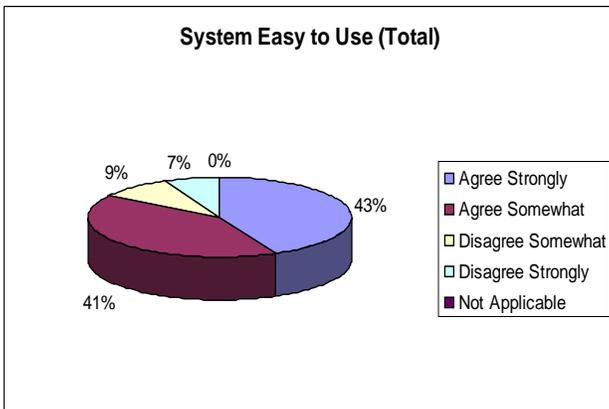
Although 73% of survey respondents either agreed strongly or agreed somewhat that the voting instructions were clear and complete, a quarter (25%) of the survey respondents disagreed somewhat with the statement. This indicates that there was some confusion among the respondents on

how to use the voting equipment. Among those that somewhat disagreed with the statement, voters with dexterity problems and hearing impairments make up the majority. Also, those individuals between the ages of 31 and 64 was the largest demographic who disagreed somewhat with the statement. However, the same group was split between those who agreed and disagreed with the statement.



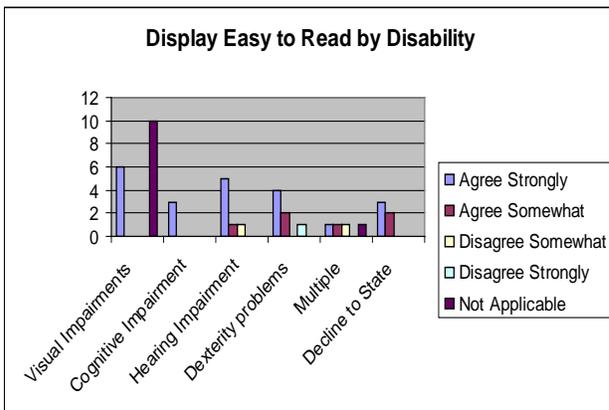
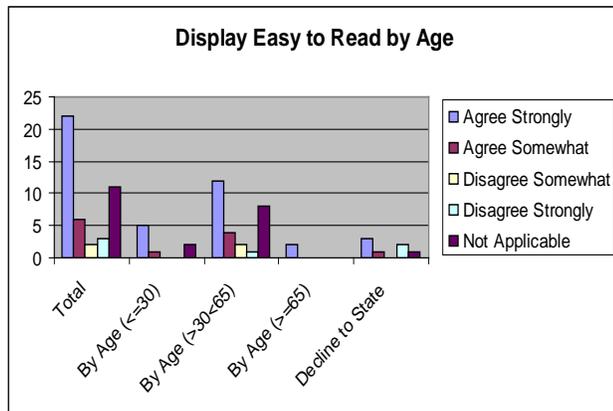
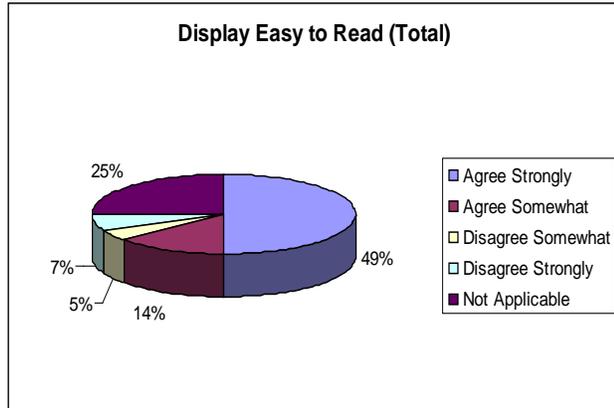
Question # 5: The voting method was easy to use.

43% of survey respondents agreed that the voting method was easy to use, with about 16% disagreeing with the statement. The group that disagreed with the statement was largely comprised of those with individuals with hearing impairments and was between the ages of 31 and 64.



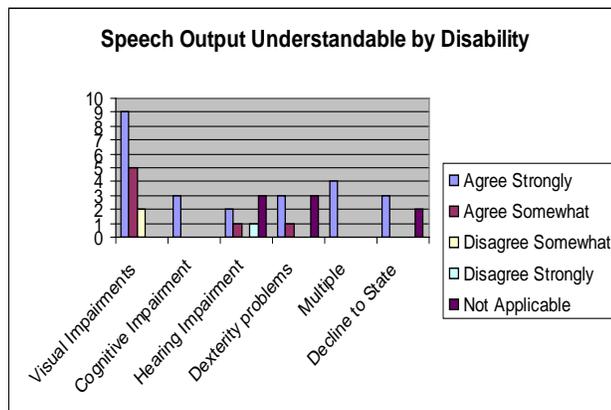
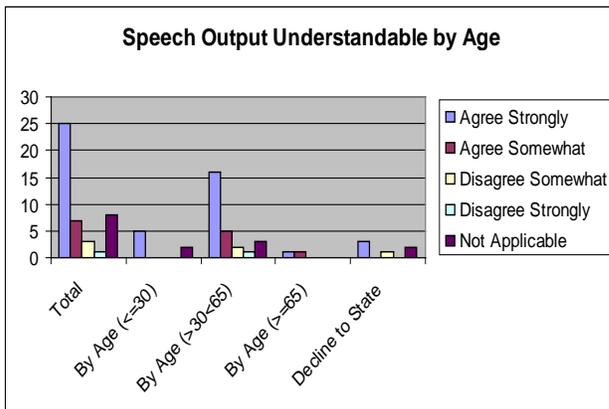
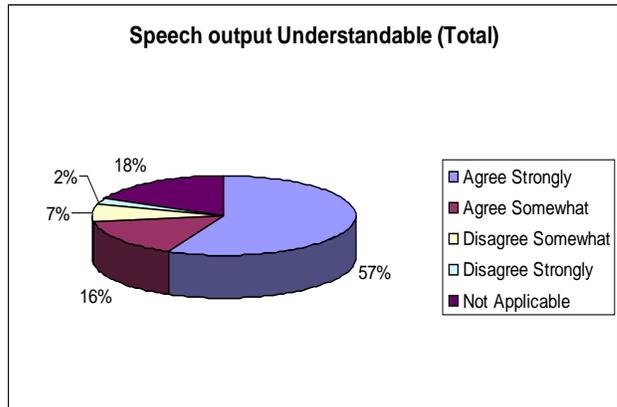
Question # 6: I could read the display easily.

49% of the survey respondents agreed that they could read the display easily, with 12% disagreeing and 25% finding the statement not applicable due to visual impairments. As seen in the charts below, we could not discern significant differences among age groups. However, voters with multiple disabilities, dexterity problems, or hearing impairments disagreed that the voting machine was easy to read. Although it is a small percentage who disagreed, these groups rely on the visual display to vote.



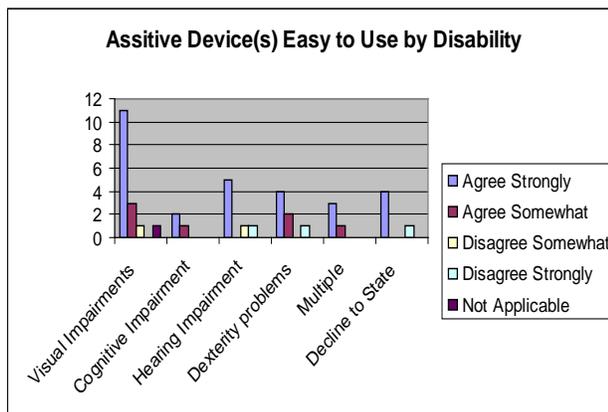
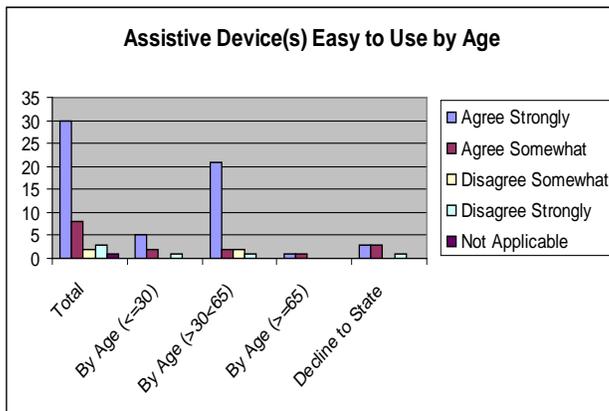
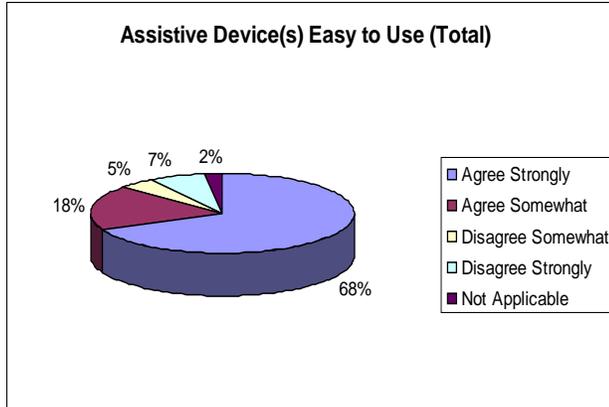
Question # 7: I could understand the speech output.

Again, the majority of survey respondents (57%) agreed that the speech output was understandable, with only 8% disagreeing and 18% finding the statement not applicable due largely to having a hearing impairment. Among those that disagree are those with visual impairments. Since this group relies heavily on speech output to vote, it is important to understand that a number of them had difficulty with understanding the voting system’s speech output (please see next section to read these identified issues).



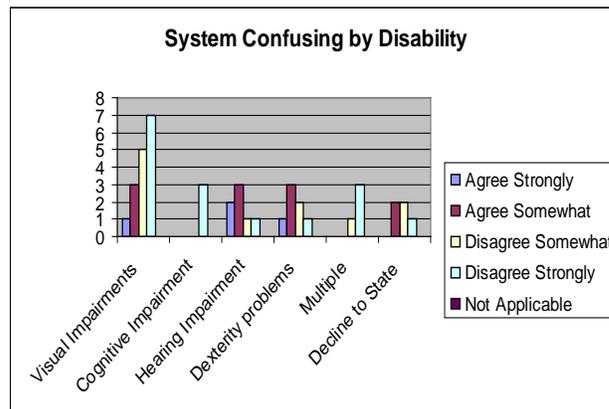
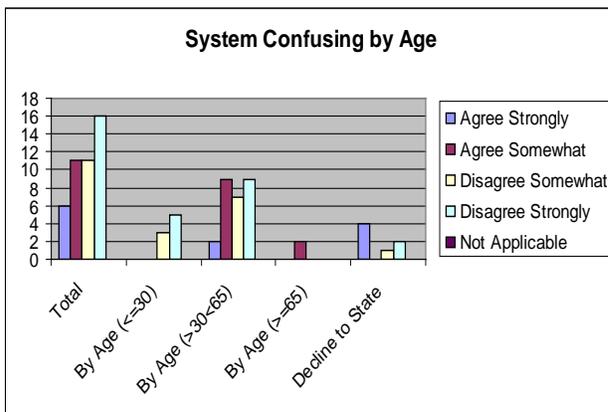
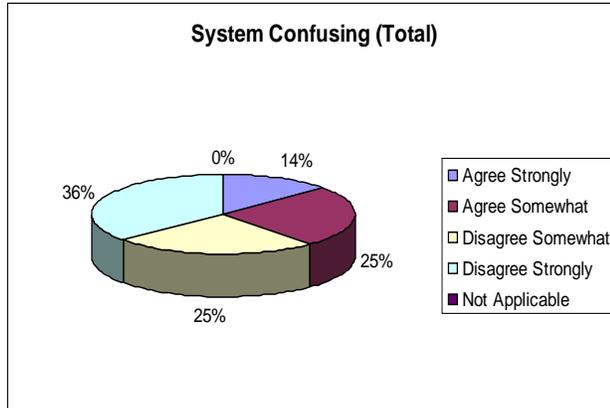
Question # 8: The assistive device(s) were easy to reach and use.

The majority of survey respondents (68%) agreed that the assistive devices such as the ATI and paddles were easy to reach and use. Only 12% disagreed with this statement. There isn't a significant difference among age groups on responses to this statement.



Question # 9: found the system was confusing to use.

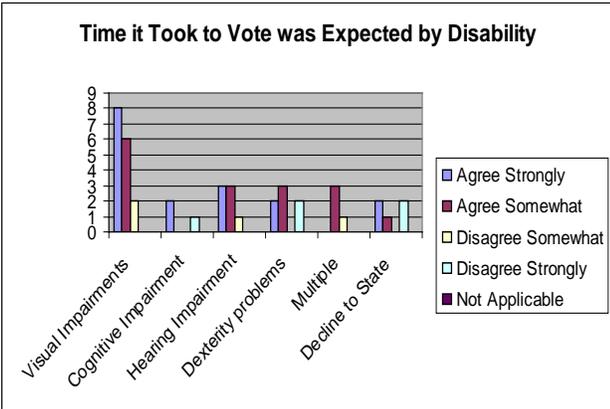
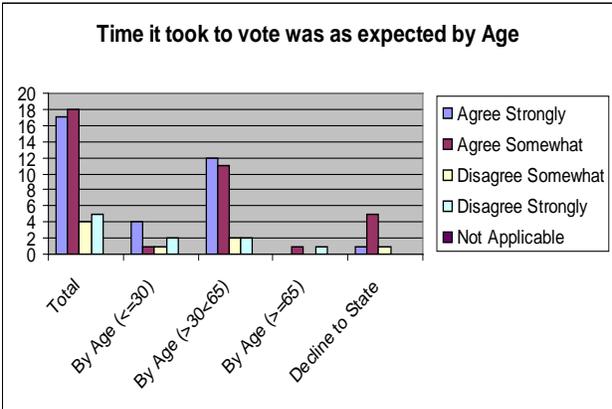
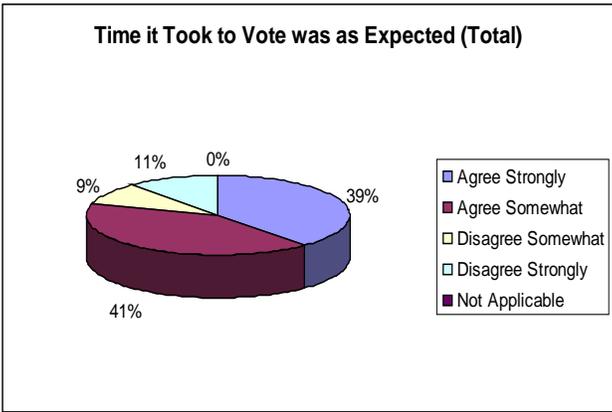
The majority of the participants found the voting system to not be confusing, with 61% disagreeing with the statement and only 39% agreeing with the statement. Of those who disagree, 36% disagreed strongly with the statement, which was representative of all disability types and most of the age groups.



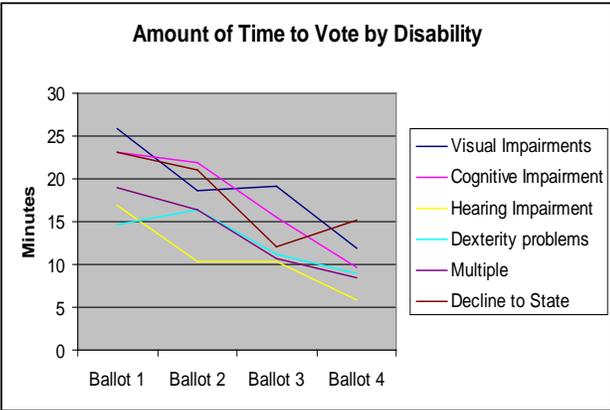
10: The timeframe it took to vote was what I expected.

The majority of participants (80%) agreed that the time it took them to vote was expected, with about only 20% disagreeing with the statement. Of those who disagreed, those individuals with either a cognitive impairment, dexterity problem, or who declined to state their

disability (if any) disagreed strongly. As for age groups, there were no significant differences in the way these groups responded to this question.



In addition to surveying participants on their voting experience, SOS also tracked the amount of time each participant took to vote for each of the four ballots. As displayed in the chart to the right, the voting times for participants no matter what disability went down in minutes as the ballots progressed. This would be expected as the participant became more familiar with the system as they voted.



Furthermore, two survey respondents used a different language. Out of these participants, the Spanish speaking participant disagreed that the system allowed the voter to vote independently and accurately. The Spanish speaker also disagreed that the instructions were clear and complete, that the system was easy to use, and that the display was easy to read. The Mandarin speaker disagreed that the system was easy to use, the display was easy to read, and that the speech output was understandable. Overall, both participants were able to vote successfully on the voting machine despite these issues.

2. Identified Issues/Recommendations from Participants

The Secretary of State also asked voters to speak freely about their voting experience while they were voting about issues or recommendations they may have. Further, after the voting experience, while collecting the post-voting survey, the poll workers asked the voters to provide any additional feedback. A compilation of the issues, recommendations, and additional feedback is listed below.

Physical Access to the Voting Machines

- Recommend detachable paddle with Velcro be included to support head for those with cerebral palsy and similar disabilities.
- Recommend an adjustable tray to hold the ATI or paddles in place.
- Recommend a shelf above knees to place ATI on.

Visual Display Concerns

- Light colors should be used against the black background.
- Voters had trouble editing write-in candidates.
- When using the zoom feature, it is difficult to see where the voter is on the ballot because not all measures and candidates fit on the screen.
- Instructions displayed on screen could be more detailed for voters not using audio.
- With audio off, it would be helpful to have the yellow right arrow button visible on the screen to instruct the voter to hit the button to proceed. All icons on the ATI should also be displayed on the screen so that the voter can look at the screen and know which button to hit to navigate the ballot.
- Recommend a scroll screen so that voters may review what has been voted (Instead of having to go back race by race).
- Missing instructions on how to enter a write-in candidate.
- Screen missing options to go back to the previous screen and change information (e.g., a voter cannot go back to the previous screen to change the language).
- Need better delineation between advancing items and turning the page.
- If ballot is incomplete, voting system should say what was missed.
- It was difficult figuring out how to enter a space on the write-in screen.
- Voters would like all of the contests displayed in the beginning.

- There should be better instructions on how to control the volume and where to scan the ballot in the very beginning.

Audio Concerns

- Audio refers to colors on ATI, not shapes. This is an issue for someone who is blind.
- Audio volume is too low when first screen appears. The instructions don't address volume until later in the voting process. Also, audio missing specific instructions on how to change information once entered.
- Voter did not know which buttons to press to hear audio again for description of a proposition.
- A voter encountered audio "skipping" and going back to the beginning.
- A voter could not zoom in on screen when using audio.
- Voters would like to be able to skip audio as it is slow. One voter recommended making the audio portion shorter in length.
- It would be nice if the ballot scrolled in sync with the audio so that individuals can read along.
- Audio was not staying at a consistent volume throughout entire ballot.
- Headphones didn't alleviate background noise, recommend earbuds.
- Audio should clearly state when "action is in progress".
- Difficult to understand the male synthesized voice.
- The announcement of the next contest is ambiguous and should be more specific (i.e. district/county/state level).

Non-touch Screen Input Controls

- Buttons on the edge of the ATI are not as easy to use for people with visual impairments.
- Instructions in the write-in section include "select the OK button". Not clear where that is on the ATI.
- The ATI should be larger with the use of plain language for those individuals with developmental disabilities (e.g. the red "x" should also say "Vote").
- A voter found it too technical to navigate.
- A voter found it difficult to remember what the buttons do and would prefer a touch screen. Voters found the navigation commands to be confusing. It's not clear on how to move forward after instructions are completed and confusion over the "x" button as didn't understand it was used to select a vote. Also, an "o" would be more intuitive than an "x".
- Paddle does not provide enough opportunities for the voter to provide affirmation before a ballot is cast.
- Braille position not well aligned with buttons for left and right.
- Instructions not clear on the use of the backspace as well as the purpose of the yellow left arrow.
- Slow response time when pressing a button.
- Recommend a repeat button on ATI to repeat ballot measure language.

Dexterity Concerns

- A voter found it hard to push buttons on ATI and recommended a touch screen device.
- ATI is very chunky and “x” button hard to reach with thumbs.
- Buttons on ATI should be spaced further apart.
- Paddles are too sensitive to touch and should be further apart.

Access User Interface Connector Concerns

- No clear instructions on how to leave sip and puff mode, especially when selected by accident.
- A deaf and blind voter decided to not test the system when she realized that she would not be able to vote independently. She did recommend the voting system integrate a refreshable Braille system so that voters who are both deaf and blind can vote independently of their interpreters.

Alternative Language Concerns

- Recommend the voting system include a video that translates ballots into American Sign Language (ASL).

Other Concerns

- The scanner should have white and black arrows where the ballot is fed for the visually impaired.
- There is a concern that the voting system will be used as a scanner and for voters with disabilities, as voters with disabilities may take longer to vote holding up those who want to scan their ballot.