Pre-Election and Parallel Testing

Introduction

Pre-election testing, also called Logic and Accuracy testing (L&A testing), is the act of testing *every* ballot style and *every* component of the voting system prior to the election. If you represent a large jurisdiction with thousands of voting stations and dozens of ballot styles, this will appear to be a daunting task. It is. However, documenting pre-election testing is a critical component of the election's audit trail, which ensures the election was administered in a fair, accurate, and transparent manner.

Parallel testing is the act of duplicating, as nearly as possible, a portion of the election under conditions that are identical to the conditions that occur in a polling place. Parallel testing came about in response to the contention that it is impossible to detect with 100 % certainty the presence of so called Trojan Horses that may be present in the voting system.

The contention is that these Trojan Horses would contain malicious code that would only become active after the polls are opened and would disappear immediately after the polls are closed. This being the case, their malicious activity would be impossible to detect. Thus, the idea behind parallel testing is that we can fool these Trojan Horses into thinking that the polls are open and then detect their malicious activity with a carefully controlled test.

Pre-Election/Logic and Accuracy Tests

Pre-test Planning: Pre-election testing involves setting up the voting system for *each* of your precincts and early voting locations, loading the election definition, opening the election, casting a known pattern of votes on each ballot style, closing the election, printing the vote totals for the precinct, and then comparing the printed vote totals with the known pattern of votes. In short, you are going to set up and test your entire election.

Planning for the pre-election testing should begin several weeks before the actual tests begin. This planning should include identifying the space required to house the tests, the staff required to conduct the tests, and the time required for the tests. If you represent a large jurisdiction, time requirements may dictate that tests for several voting locations must be conducted simultaneously.

Staff restrictions may require that you use contractors to assist you with the pre-election testing. If at all possible, a member of the election staff should be in charge of each contractor test team. One staff person can supervise two or three test teams provided the tests are conducted in the same location. Under no circumstances should a test team be composed entirely of contractor personnel. Each team should consist of at least two individuals. The EAC recommends that representatives from voting system manufacturers *do not* assist jurisdictions with pre-election testing.

As part of your pre-test planning prepare the test scripts that are to be voted on each ballot style. Be sure that each test script includes at least one vote for each candidate on the ballot and one 'yes' and one 'no' vote for each issue or question on the ballot. Be sure to include audio ballots in your test scripts.

Any testing that requires printed ballots (i.e. optical scan ballots) cannot actually begin until these ballots are available. This can be as little as 45 days prior to the election. However, if early voting locations and election-day precincts only use electronic voting stations and do not require paper ballots this testing can be scheduled to begin as soon as the election definition is completed.

As part of the pre-planning activities review your jurisdiction's requirements as they relate to open access to the pre-election tests. Many State election codes require that these tests must be open to the public and advertised in your official record (newspaper) a specified number of days before the tests begin.

Recommendation: *If your state or local laws and regulations allow make the pre-election testing a media event.*

About a week before the pre-election tests are to begin invite the media to a briefing. At this briefing provide them with the dates and times of the tests. Show diagrams of the test locations and point out where the media personnel can be during the tests. Provide written copies of any rules and procedures that apply to media personnel attendance and/or participation in the tests.

Recommendation: At the test locations separate the test area from the public and media area with a physical barrier; for example, a low wall or a rope. Ensure this barrier is located so that the public and media can observe the test but cannot touch the testers or any of the test materials.

Pre-election testing: Before beginning a test, be sure that all required supplies are on hand, including the test deck of optical scan ballots. Although your ballot printer can provide you with a 'Logic and Accuracy Test Deck', the *Voluntary Voting System Guidelines* recommend that the optical scan test deck consist of hand-marked ballots. For a very large election hand marking a test deck may not be feasible.

Recommendation: *Include a fully voted ballot (every voting location marked), a blank ballot, and a ballot from a previous election in the test deck.*

Conduct the pre-election test from beginning to end on one precinct/voting location at a time. Set up all of the equipment for the precinct/voting location and load the election setup on each device. Open the election and cast the test scripts for each ballot style.If DRE voting stations are used in the precinct/voting location, manually enter the test script for *every* ballot style on *every* voting station. If it is not feasible to vote every ballot on every voting station, the minimum recommendation is to vote every ballot style on at least one voting station and then visually inspect every ballot style on each of the other voting stations.

If audio ballots are used on either DRE voting stations or ballot marking voting stations such as the AutoMark device, enter the test script for *every* ballot style on every voting station. Again, if it is not feasible to vote every ballot on every voting station, the minimum recommendation is to vote every ballot style on at least one voting station and then visually inspect every ballot style on the screen of each of the other voting stations.

If optical scan ballots are used in the precinct/voting location, run the test deck for every ballot style used in the precinct/voting location.

If central count optical scan is used, run the test deck for every ballot style used in the election through each central scanner that will be used in the election.

When all testing has been completed, zero out all vote totals and close and seal all devices with a tamper proof seal. Record the seal numbers on a transmittal sheet that will be used in the polling place to verify that the devices have not been tampered with during transit.

Repeat the above pre-election test for every precinct/voting location.

Remember: Test the absentee precincts!

Hint: *When time is of the essence, you can begin pre-election tests for voting locations that use only DRE voting stations prior to receiving the optical scan ballots from the printer.*

When the tests in all of the precincts/voting locations have been completed and uploaded to the election management system, close the election and print the overall jurisdiction reports. Compare the vote totals on the jurisdiction reports with the known results from the test scripts.

Parallel Testing

Parallel testing is the act of duplicating, as nearly as possible, a portion of the election under conditions that are identical to the time and conditions that occur in a polling place. The rational for parallel testing is that malicious code may have been introduced into the voting system software at some point, and is lying dormant until the voting station is setup for an election. Parallel testing is an attempt to deceive this code into becoming active by simulating the exact conditions of an election.

Note: *Parallel testing is not recommended for optical scan systems. In this case, the paper ballots can be used to resolve any challenge to the election.*

Successful parallel testing must take place during the hours of the election, using software and hardware that was prepared to be used in the election.

The mechanics of conducting a parallel test are as follows:

- Conduct all of your pre-election testing in the normal manner,

- Determine how many precincts and voting stations you are going to include in the parallel test,
- Randomly select precincts/voting locations to be included in the parallel test,
- Randomly select voting stations that have been prepared and sealed for use in the selected precincts/voting locations,
- During the hours that the precinct/voting location is open, cast a known script on the selected voting stations,
- Compare the resulting vote totals with the vote totals for the known script.

When selecting voting locations to be included in your parallel test, stratify your sample so that the number of large, medium, and small voting locations to be used in your test are in the same proportions as the number of large, medium, and small voting locations in your jurisdiction. Also, prepare voting scripts that reflect the demographics of the voting locations used in the test. This includes the number of ballots usually cast on a single voting station at that location and the distribution of those ballots by political party affiliation and language choice. *Note: Audio is a language choice.*

If possible select voting stations to be used in the parallel test that were prepared and sealed to be used in the voting location. If this will cause a shortage of voting stations in the precinct or voting location, use voting stations from your inventory – preferably voting stations that have been prepared and sealed for the election as 'back up' or 'spare machines.'

Important: On Election Day, conduct the parallel test in 'Official Election Mode' and cast the test voting scripts during the times that the voting location is open for voting.

Observe the "two person rule" when casting votes on a DRE voting station; have one person enter the votes while the other person calls out the votes and verifies the votes on the screen. *Suggestion: Make a video record of all voting. This record can be used in the event of a discrepancy in the results to determine whether or not a data entry error caused the discrepancy.*

If optical scan ballots or VVPATs are used, manually count the optical scan ballots or the VVPATs and compare the results with both the electronic vote totals and the known results of the voting script.

Important: Be aware that the ballots used for the parallel test are identical to the ballots used in the actual election. USE EXTREME CARE TO KEEP THE TEST BALLOTS SEPERATED FROM THE ACTUAL BALLOTS SO THAT THE TEST BALLOTS DO NOT BECOME INCLUDED IN THE OFFICIAL ELECTION RESULTS.

Unless the parallel test is conducted rigorously, the results are not conclusive. That is to say, that without extreme rigor the malicious code may be clever enough to detect that you are running a test and remain dormant.

Post-Election Testing

Post-election testing consists of repeating a portion or all of the Pre-Election (Logic and Accuracy) tests. Many election officials feel that post-election Logic and Accuracy tests can be as effective at detecting an election anomaly as parallel tests, unless the parallel test is rigorous: uses voting stations prepared for the voting location, uses a significant number of voting locations and voting stations, and has a video record for backup. Post-election tests should be routinely conducted a percentage of your precincts and particularly on any precinct that experienced an event that casts suspicion on the results.

Recommendation: Even is you do parallel testing, it is recommended that you conduct post election Logic and Accuracy tests on at least 10 % of your precincts.

Conclusion

Parallel testing and post-election testing will only detect problems in an election *after* they occur. At this point, as the saying goes, "The horse is already out of the barn." Certainly, if a problem occurs during an election you want to detect it so that you can take remedial action.

The best way to detect a potential problem *before* it occurs is with comprehensive, extensive pre-election (Logic and Accuracy) testing.