U. S. ELECTION ASSISTANCE COMMISSION
VOTING SYSTEM TESTING AND CERTIFICATION PROGRAM
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Notice of Clarification

NOC 08-003: Clarification of EAC Conformance Testing Requirements for Voting System Test Laboratories (VSTLs)

Issued by Program Director, July 30, 2008:

This notice is intended to clarify that the VSTLs should be moving from simple design verification testing, sometimes mistakenly termed "conformity testing', towards a testing approach that is more consistent with the guidance of the 2002 VSS and 2005 VVSG concept.

The NOC clarifies the intentions of the EAC, and redefines the voting system conformance testing.

Terminology

At the heart of this issue are basic misconceptions regarding "conformance testing" as described in the 2002 VSS, 2005 VVSG and required by the EAC's Certification Program. Conformance testing means more than testing designed to produce correct results if correct data and correct procedures are followed. The EAC assumes conformance testing done pursuant to the certification of a voting system will include the deliberate practice of showing the robustness of the system against operator error and the specific requirements to recognize, report, and respond to error conditions. Both the 2002 VSS and 2005 VVSG require such testing. Among the sections that require conformance testing that is robust, exploring the system for potential failure points are:

> ***VSS V2:6.1 & VVSG V2: 6.1***
>
> *The system level certification tests shall include the tests (functionality, volume, stress, usability, security, performance, and recovery) indicated in the National Certification Test Plan, described in Appendix A. These tests assess the system's response to a range of both normal and abnormal conditions initiated in an attempt to compromise the system. These tests may be part of the audit of the system's functional attributes, or may be conducted separately.*
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> ***VSS V2:A.4.4.5 & VVSG V2:A.4.3.5 - System-level Test Case Design***
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> *The test lab shall provide a description of system tests of both the software and hardware. For software, these tests shall be designed according to the stated design objective without consideration of its functional specification. The test lab*

shall independently prepare the system test cases to assess the response of the hardware and software to a range of conditions, such as:

a. Volume tests: These tests investigate the system's response to processing more than the expected number of ballots/voters per precinct, to processing more than the expected number of precincts, or to any other similar conditions that tend to overload the system's capacity to process, store, and report data.
b. Stress tests: These tests investigate the system's response to transient overload conditions. Polling place devices shall be subjected to ballot processing at the high volume rates at which the equipment can be operated to evaluate software response to hardware-generated interrupts and wait states. Central counting systems shall be subjected to similar overloads, including, for systems that support more than one card reader, continuous processing through all readers simultaneously.
…..
f. Performance tests: These tests verify accuracy, processing rate, ballot format handling capability, and other performance attributes claimed by the vendor.
g. Recovery tests: These tests verify the ability of the system to recover from hardware and data errors.

The EAC therefore requires "conformance testing" test systems in a way that will reflect the system response not only under optimum laboratory conditions, but also under stresses similar to those fielded systems will face in a real-world election environment.

Goals

Conformance testing must begin with confirmation that a system functions as documented. However, testing must also show that the system will recognize and respond appropriately to incorrect as well as correct data and procedures as currently specified in the 2002 VSS and 2005 VVSG. In addition, testing should ensure that the system is robust and resistant against common user and technical sources of error. All reports available should accurately report the results of all valid votes. Audit records will include information showing the appearance of invalid or questionable data that were rejected so that potential recount related issues may be resolved. Testing should also be responsive to requirements that may not be adequately defined in the current published standards, especially those that show up under State testing and/or during actual elections. The goal is to catch as many errors as possible in testing **before** they show up in an election environment.

It is not possible to mechanically test all possible inputs, system variations and possible abnormal conditions. There is no standard defined for how to select which combinations to test. However the requirements quoted above and others point the way to move testing beyond testing against a best case set of procedures and data.

- The VSTL is to examine and sample the manufacturer's test plans and test results but the lab is required to develop their own tests independent of the manufacturers test. These tests should include considering alternative choices and test cases from the prior manufacturers suggested test cases.

- VSS/VVSG Vol II, 6.2.1 also included the following:
  "Where practical, the ITA will perform coverage reporting of the software branches executed in the functional testing. The selection of the baseline test cases will follow an operational profile of the common procedures, sequencing, and options among the shared state requirements and those that are specifically recognized and supported by the vendor. The ITA will use the coverage report to identify any portions of the source code that were not covered and determine:
    a. The additional functional tests that are needed;
    b. Where more detailed source code review is needed; or
    c. Both of the above."

  Structuring testing on an "operational profile" this way is a best practice from software reliability testing engineering studies and has been used to increase the confidence and thoroughness in testing while reducing the expense of blind testing across multiple options. This requirement is also one that identifies that source code review is to do more than pass/fail checks against the coding conventions but is to be actively used to help develop better test cases.

- The Volume and Stress tests referenced from the System Level Test Case Design section require the testing to test at the limits in the system specification and beyond. This practice includes boundary testing and but also can encompass data flow analysis and other techniques to determine where critical values are set, changed, and stressed. Boundary testing should also include information from the source code analysis to recognize where boundary values exist and conditions that may apply to achieving them.

Other testing techniques and engineering analysis tools such as failure analysis to identify the most likely areas needing testing may also be used and should be seriously considered. The Conformance testing must include the deliberate and planned introduction of errors and out of bound conditions to validate the voting systems response and reporting. Source code review should not only look for simple passive conformance to the standards, but should also include the active analysis and identification of conditions that need to be addressed in testing.

Effective Date:

Immediate for all systems not having an approved test plan prior to the date of publication.