

Testimony of  
Mark Skall  
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“The Need for Uniform and Publicly Available Test Suites”

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## **Introduction**

Chair Davidson, Commissioners Hillman, Bresso, and assembled members of the public, thank you for the opportunity to testify today.

Today I will discuss the need for voting system test suites and why they need to be both uniform among Testing Laboratories and publicly available.

## **Background**

As a former employee of the National Institute of Standards and Technology, I say unequivocally that standards, by themselves, are not very useful. Standards are pieces of paper that delineate specific requirements that an implementation (in this case a voting system) must adhere to. If standards are promulgated without test suites, there is no way to determine whether or not implementers have faithfully fulfilled each and every requirement in the standard. Perhaps more importantly, the implementers themselves, in this case the voting system manufacturers, cannot determine whether or not they have implemented the standard correctly. Without test suites, any standard remains just a piece of paper, suitable for including in a standards museum, but useful for little more.

In the voting community, the test suites (or test cases as they are sometimes called) do currently exist. They are developed by a particular Voting System Testing Laboratory (VSTL) for a specific test campaign. As I will discuss later, this scenario is not the most effective way to test voting systems.

## **Benefits of Test Suites for the Voting Community**

To whom are test suites useful? First, the implementers need them. They establish, for implementers of the standard, exactly what it means to adhere to a given specification. With test suites, implementers can determine if they conform to the standard in question. The implementers of voting system standards are voting system manufacturers. Voting system manufacturers can use these test suites to help ensure that their product correctly implements the requirements in the VVSG. This helps them develop higher quality voting systems and thus better products. Although test suites cannot be a substitute for their own testing and quality assurance, the tests provide an additional mechanism for implementers to test their own system and discover, and remedy, needed bugs. By utilizing test suites, voting system manufacturers perform more efficient quality assurance since the test suites will supplement their own internal tests and thus decrease

the number of tests that need to be developed by them. This, in turn, saves the manufacturers both time and money.

Secondly, the testers and the certification agency need test suites to determine whether or not the implementer has correctly implemented each requirement in the standard. In voting, the testers are the VSTLs and the certifier is the Election Assistance Commission (EAC). The test suites serve as the primary input for the VSTLs to produce Test Plans and Test Reports. The EAC then uses the Test Plans and the Test Reports, in conjunction with the test suites, to make a determination on whether or not all requirements in the VVSG have been correctly implemented and whether or not to certify the voting system. The test suites serve as the key ingredient in making the decision to certify voting systems since the VSTL recommendation in the Test Report, to certify or deny certification, is based solely on the pass/fail results obtained by the test suites.

In the marketplace, testing provides a vehicle for exchanging information between a buyer and a seller. It increases a buyer's confidence in a product, or implementation, and its ability to meet his or her needs. Buyers become users of the implementation. For sellers, testing can help to substantiate claims that a product meets a given specification. Thus, the third benefactor, from the availability of test suites, is the voting public, who are the users of voting systems. In voting, the public includes voters, election officials and states and other jurisdictions. In general, advertising that an implementation conforms to a standard is an extremely valuable marketing tool. Without test suites, this claim of conformance cannot be verified. With test suites, buyers of an implementation can ask for "proof" of conformance. Of course, for the voting public, that proof is in the form of a certificate from the EAC showing the voting system has been certified, based on the results of the test suites. Within the voting program, test suites are used to provide confidence both to election officials and to the entire community that they serve, that voting products meet the applicable standards. States benefit because many states require conformance to Federal voting standards and they could not make the determination of conformance without test suites. Additionally, the test suites increase the quality of voting systems for the states and save states money. States will be able to determine what vendor requirements have been tested and will not have to duplicate this testing at the state level.

An added benefit of test suites is that, when a requirement is unclear or ambiguous, test suites serve to clarify the requirement. Although standards-writers try to make each requirement as precise as possible, all standards need to be interpreted. It is not always clear what is meant by the wording of specific requirements. The test suites can actually serve to define what is meant by a potentially ambiguous requirement. Since the test suites are used to determine conformance, they, in essence, become the "official" interpretation of the standard.

### **Uniform and Publicly Available Test Suites**

Having a set of *uniform* test suites is extremely important. Up until now, test suites (usually known by the VSTLs as test cases) were developed by the VSTL who was

conducting the test campaign. The test cases were never shared with other VSTLs since they were considered to be intellectual property of the Laboratory that developed them. The problem with this approach is that, since the test cases were unique to a specific VSTL, and thus to a specific test campaign, there was no consistency among VSTLs and among test campaigns. Thus, the same voting system could pass tests, for the same set of specific requirements, from one Laboratory and fail those tests from another Laboratory. Clearly, this lack of consistency could lead to forum-shopping among manufacturers, where the selection criterion for choosing a Laboratory could be the Laboratory whose test suites give the manufacturer the greatest chance of passing the tests and thus becoming certified. However, having one *uniform* set of tests will help ensure that the same pass/fail verdict will ensue regardless of which Laboratory is chosen to conduct the test campaign for a given voting system manufacturer.

Test suites need not only be uniform, but they will also need to be *public*. Up until now, test cases and test suites developed by the VSTLs have been proprietary. VSTLs do not want to share test cases with each other because they feel this will result in losing a competitive advantage by allowing valuable intellectual property to be implemented by their competitors. Thus, even though the test cases/test suites developed by the VSTLs may be of high quality, there is no way for the voting public to verify their quality. They cannot be scrutinized, except by entities like the EAC, who are bound by Federal statute not to disclose the proprietary information. However, using a set of public test suites will allow anyone in the public to scrutinize these tests, enabling more bugs in the tests to be caught, as well as allowing more scrutiny with respect to the coverage obtained by the tests. Public availability of test suites will also allow others to suggest new and unique ways to perform voting system testing, thus serving to accelerate innovation in test suite development, which may lead to significantly faster and less costly testing.

### **NIST Test Suites**

NIST has developed a test suite for the VVSG 2.0, often referred to as the “Next Iteration” VVSG. However, this test suite will be of no use until the VVSG 2.0 is promulgated as a standard by the EAC. NIST subsequently used parts of the VVSG 2.0 test suite to produce a conformance test suite for the new requirements in the update to the 2005 VVSG ( now known as the VVSG 1.1) that were not in the original 2005 VVSG. The test suite for the new requirements in VVSG 1.1 determines conformance to requirements in human factors, security and the core requirements sections of the VVSG. The intent is for the NIST test suites to be used by all accredited laboratories. This will enable, at least for the requirements in question, all Laboratories to be able to use one set of *uniform* test suites.

The NIST test suites are not owned by any VSTLs and are in the public domain. They can be obtained, and scrutinized, by anyone who downloads them from the NIST or EAC web site. Thus, they fulfill the second important requirement of being *public*. Besides having been available, and subject to scrutiny, on the NIST web site for over a year, they have been made available for initial review to subject matter experts inside and outside of NIST, including Voting System Testing Laboratories and the Technical Guidelines

Development Committee (TGDC). Use of these uniform and public test suites will produce consistent results and promote transparency of the testing process.

## **Next Steps**

There are still a few obstacles to be overcome in getting a complete set of uniform and public test suites in use by the VSTLs. First, we would like to see the NIST test suites properly vetted. Although the test suites are available for review on the NIST web site, and NIST sent the test suites out for review to the VSTLs, the TGDC, and selected others, there were very few comments received. My understanding is that EAC staff is planning on meeting with the accredited VSTLs to obtain specific feedback on these test suites. Additionally, discussion is necessary with the VSTLs to determine how best to integrate these test suites with the existing proprietary test cases currently in use by the VSTLs. The VSTLs will undoubtedly be concerned with preserving the intellectual property rights of their existing test cases, even after they are integrated with the NIST tests. Lastly, and perhaps most importantly, we need to develop a strategy to ensure the availability of uniform and public test suites for *all of the VVSG 1.1*, not just for the requirements that changed from the 2005 VVSG. One possible approach to accomplish this objective is to convene a meeting of all the VSTLs and encourage them to contribute test cases for the requirements not tested in the NIST test suites, with the end result of a complete, comprehensive, uniform, and public tests suite for all of VVSG 1.1 that can be shared by all the Laboratories. However, there are many roadblocks standing in the way of this objective, both technical and legal.

## **Conclusion**

Standards are a necessary, but not sufficient, condition to help ensure that voting systems are accurate, reliable, secure, accessible and usable. In addition to standards, a comprehensive, uniform, and public test suite is needed to help ensure that the voting systems correctly implement the standard. The goal is for all Testing Laboratories to use the same test suite, thus promoting transparency of the testing process and consistency among VSTLs. We've taken a first step toward this objective by providing NIST Test Suites that test for a subset of requirements for the VVSG 1.1. However, many obstacles still remain in achieving a full and comprehensive, uniform and public test suite. We will be striving to overcome these obstacles in the coming months. Only by having a comprehensive, uniform and public test suite for *all* requirements in the VVSG 1.1 can we help assure the trust and confidence that voting systems are not only being tested correctly, but are being produced with the quality and rigor expected by the voting public.

Thank you for the opportunity to testify. I will be happy to answer any questions you may have.