Context Description: Posted Dec. 1, 2006

This draft report was prepared by NIST staff at the request of the Technical Guidelines Development Committee (TGDC) to serve as a point of discussion at the Dec. 4-5 meeting of the TGDC. Prepared in conjunction with members of a TGDC subcommittee, the report is a discussion draft and does not represent a consensus view or recommendation from either NIST or the TGDC. It reflects the conclusions of NIST research staff for purposes of discussion. The TGDC is an advisory group to the Election Assistance Commission, which produces voluntary voting system guidelines and was established by the Help America Vote Act. NIST serves as a technical advisor to the TGDC.

The NIST research and the draft report's conclusions are based on interviews and discussions with election officials, voting system vendors, computer scientists, and other experts in the field, as well as a literature search and the technical expertise of its authors. It is intended to help in developing guidelines for the next generation of electronic voting machine to ensure that these systems are as reliable, accurate, and secure as possible. Issues of certification or decertification of voting systems currently in place are outside the scope of this document and of the TGDC's deliberations.

Chapter 1: Setup Validation

1.1 Introduction/Scope

This section provides requirements supporting the capability to verify that voting equipment is setup and configured properly for use in an election. The requirements support the inspection of the voting equipment to determine that: (a) only authorized EAC and jurisdiction certified software is installed; (b) non-authorized, non-certified software is not installed; (c) registers and variables contain proper values; (d) voting equipment components (such as touch screens, batteries, power supplies, etc.) are within proper tolerances, functioning properly, and ready for use in an election. These requirements support the inspection of the voting equipment after voting system (including election specific) software has been installed, logic and accuracy (L&A) testing has been performed, and before voting equipment is re-configured for another election. However, inspection of the voting equipment at other times during the voting process can be supported by the requirements. The verification of the voting equipment can take place at polling sites and/or central election facilities by authorized personnel. The requirements found in this section are derived from requirements found in commercial and federal standards such as Voluntary Voting System Guidelines 2005 [VVSG 2005] and IEEE P1583 Draft Standard for the Evaluation of Voting Equipment [IEEE P1583].

1.2 Background

This section provides a brief overview of the components of voting system equipment that can be inspected and the limitations of the inspections. In addition, a discussion of the effects timing of the inspections has on the assurance provided to voting system equipment is included.

1.2.1 Inspection of software installed on voting equipment

Voting equipment can be inspected to locate and identify the software installed on the voting equipment. Voting equipment that store software on devices with a file system can use directory paths and filenames to locate and identify software. When voting equipment store software on devices without file systems, a device's storage locations (such as memory addresses) can be used to locate the software. However, other information (such as byte strings) may be needed identify software residing in the storage locations of the device.

The integrity of software installed on voting equipment can be inspected to determine if software has been modified. Software verification techniques use software reference information (such as digital signatures and performance measures) to determine if the software has been modified. Although software validation techniques can detect modifications, they cannot determine the reason a modification to the software occurs – malicious intent or accidental error. Depending on the characteristics of the software to being inspected, the effectiveness of software verification techniques will vary. Static software[1] can be inspected to determine if the software has been modified. The inspection of dynamic software is possible but provides limited information since determining the events that change the state of the software is impractical. Note: the use of the term software throughout the rest of this section is meant to refer to static software.

Software reference information (such as digital signatures and performance measures) from the VSTL, NSRL, EAC, or other notary repositories can be used to determine if EAC or jurisdiction approved software has been modified. However, VSTLs, NSRL, EAC, and other notary repositories can only provide software reference information for the voting system software they receive from vendors, VSTLs, and jurisdictions. Election specific and installation dependant software used by jurisdictions could be provided to the VSTLs, NSRL, EAC, and other notary repositories in order for them to generate the associated software reference information. In addition, jurisdictions can also generate software reference information associated with election specific and installation dependant software

1.2.2 Inspection of voting equipment registers and variables

The registers and variables of voting equipment can be inspected to determine their contents. Registers and variables containing constant values will contain the same value whenever they are inspected. Registers and variables containing dynamic values – values that change over time such as accumulation registers – contain different values depending on the when they are inspected and events that have occurred prior to the inspection. In general, the initial values of dynamic

[1] Static software refers to software that not expected to change over time. Dynamic software refers to software that is expected to change over time but the specific time or value of the change is usually unknown in advance.

registers and variables are known prior to using the voting equipment in specific elections such as accumulation registers with zero values. However, the intermediate and final values of dynamic registers and variables are dependant on the events that occur during the operation of the voting equipment for an election.

The proper initial and constant values of registers and variables can be determined before the voting equipment is used from documentation provided by vendors and jurisdictions. The proper intermediate and final values of dynamic registers and variables cannot be determined before the voting equipment is used. However, secondary information from the voting system such as poll check-in records might be used to derive the proper values of dynamic registers and variables. For example, the value of the register or variable that holds the number of ballots cast on the voting equipment can be compared to the record of the number of voters that used the voting equipment. However, some dynamic registers may require that the registers or variables be summed together in order to determine if they hold proper values. For example, if voters select one from a limited list of choices (such as for, against, or abstain) on an issue that are held in different accumulation registers or variables. A summation of the register or variable values can be compared to the record of the number of voter that used the voting equipment.

1.2.3 Inspection of the voting system's other properties

In addition to the inspection of the software, registers, and variables, other properties can be inspected to determine if the voting equipment is ready for use in an election. The other properties of the voting equipment that can be inspected include: (a) the connections of the cables (network, power, etc.), (b) the calibration and function of input and output interfaces such as touch screens, (c) the current level of consumables (paper, ink, battery, etc.), and (d) the state of physical mechanisms (such as locks, tamper evident tape, enclosure panels, etc.) used to protect input and output interfaces. In addition, the voting equipment can perform tests to exercise the functionality of voting equipment components to determine if the components are malfunctioning or miss configured

1.2.4 Personnel and logistics of voting equipment inspections

The inspection of voting equipment can take place at different locations (polling places and central election offices) and times (before and after ballot casting) in the voting process. In addition, the people (election officials and poll worker) performing the inspections can differ. Inspections of the voting equipment only provide information about the state of the voting equipment at the time of the inspection. As a result, a set of inspections taken during various times in the voting process is better than performing a single inspection at a specific point in the voting process.

The variables of when, where, and who performs the inspections of voting equipment impacts the assurance provide by the inspections. If an inspection takes place at the central election offices before the voting equipment is deployed to polling places, there is a window of opportunity for the state of the voting equipment to be altered before cast ballots are captured. If an inspection takes place at the polling place, the window of opportunity for the state of the voting equipment to be altered before cast ballots are captured decreases. However, the people performing the inspections at the central election offices may have better technical skills to perform the inspections properly versus the people at polling places. These three variables (when, where, and who) need to be considered to gain the maximum benefit provided by performing inspections of voting equipment.

The following example demonstrates how the when, where, and who variables related to voting equipment inspections could be varied to have inspections performed by different people, at different locations, and at different times during the voting process. Voting equipment inspections could be performed: (a) before the voting equipment leaves the central election offices; (b) after voting equipment arrives at polling places but before it is used to capture cast ballots; (c) after the voting equipment has finished capturing cast ballots for the election but before it leaves the polling place; and (d) when voting equipment arrives back at the central election offices before the equipment is reconfigured for the next election. This example incorporates multiple inspections throughout the election process performed by both election administrators and poll workers at both central election offices and polling places.

1.3 Voting equipment setup validation requirements

1.3.1 Voting equipment setup validation process requirement

→ **1.3.1-A** Model setup validation process user documentation requirement.

Vendors **shall** provide a model setup validation process that the voting equipment was designed to support and description of the risks of deviating from the process in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

The model setup validation process ensures that the voting equipment is in a proper initial state before capturing or tallying cast ballots.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.1-B** Model setup validation inspection requirement

A model setup validation process **shall** at a minimum include the inspection of voting equipment software (See requirements in section 1.3.2), registers and variables (See requirements in section 1.3.3), other voting equipment properties (See requirements section 3.4), and execution of logic and accuracy testing (See Section X.X) related to readiness of use in an election.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (a) and (f)*

Impact: *Extends the VVSG 2005 Volume I, Section 7.4.6 (a) and (f) requirements by requiring the execution of logic and accuracy testing and inspection of items other than installed software and register and variable values.*

→ **1.3.1.1-C** Model setup validation record generation requirement

The model setup validation process **shall** describe the records that result from performing the setup validation process.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 5.4.2*

Impact: *Relates to VVSG 2005 Volume I, Section 5.4.2 requirements about records to be generated for system readiness*

1.3.2 Voting equipment software inspection requirements

1.3.2.1 Software identification verification

1.3.1.2-A File system software list procedure user documentation requirement

Vendors **shall** provide the procedures to list all software files installed on the file system of the voting equipment in the user documentation.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

This requirement supports the ability to determine if the proper software is installed and no other software is present on the voting equipment. The software distribution requirement X.X.X requires vendors to provide in the user documentation the list of software files required by the voting equipment.

Source: *VVSG 2005 Volume I, Section 7.4.6 (b)(ii)*

Impact: *This requirements updates VVSG 2005 Volume I, Section 7.4.6 (b)(ii) by specifying that the procedures to list all software files needs to be documented*

1.3.1.2-B File system software list technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the listing of all software files installed on the file system is implemented by the voting equipment in the TDP.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (c)*

Impact: *This is requirement extends VVSG 2005 Volume I, Section 7.4.6 (c) by requiring technical documentation on how the voting equipment software listing capability is implemented*

→ **1.3.1.2-C** Voting equipment file system software list capability requirement

Voting equipment **shall** provide the capability to list all software files that are installed on the file system of the voting equipment.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

The full directory path can be from a base directory where the software is installed. The full directory path is the final destination of the software when installed on the voting equipment.

Source: *VVSG 2005 Volume I, Section 7.4.6 (c)*

Impact: *This requirements updates VVSG 2005 Volume I, Section 7.4.6 (c) with some word changes*

→ **1.3.1.2-D** Non-file system software identification procedure user documentation requirement

Vendors **shall** provide in the procedures to identify all software installed on the storage devices without file systems of the voting equipment in the user documentation.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

This requirement supports the ability to determine if the proper software is installed and no other software is present on the voting equipment. The software distribution requirement X.X.X requires vendors to provide in the user documentation the list of software files required by the voting equipment.

Source: *VVSG 2005 Volume I, Section 7.4.6 (b)(ii)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (b)(ii) by specifying the procedures used to identify all software on non-file system storage devices need to be documented*

1.3.1.2-E Non-file system software identification technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the identification of all software installed on storage devices without files systems is implemented by the voting equipment in the TDP.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

Source: *VVSG 2005 Volume I, Section 7.4.6 (c)*

Impact: *This requirements extends VVSG 2005 Volume I, Section 7.4.6 (c) by requiring technical documentation on how the voting equipment software identification capability is implemented*

1.3.1.2-F Voting equipment non-file system software identification capability requirement

Voting equipment **shall** provide the capability to identify all software that is installed on storage devices without a file system of the voting equipment.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 5.2*

DISCUSSION

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (c)*

Impact: *This requirement extends VVSG 2005 Volume I, Section 7.4.6 (c) by requiring that software installed on non-file system storage devices be capable of being identified*

1.3.1.2-G Record of software identification verification inspection requirement

Software identification verification inspections of the voting equipment **shall** result in a record including: time, date, and location of the inspection, information that uniquely identifies the software (such as software name, version, build number, etc.) and location (such as full path name or memory address), name(s) of the individual(s) that performed the inspection, and information that uniquely identifies the voting equipment that was inspected.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 5.4.2*

Impact: *Relates to VVSG 2005 Volume I, Section 5.4.2 requirements about records to be generated for system readiness*

→ **1.3.1.2-H** Record of software identification verification inspection storage media requirement

The record of the results of the software identification verification inspections **shall** be made on unalterable media.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Unalterable storage media includes technology such as a CD-R, but not CD-RW.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

1.3.2.2 Software integrity verification

→ **1.3.2.2-A** Voting equipment software integrity verification capability requirement

Voting equipment **shall** provide the capability to verify the integrity of software installed on storage devices with and without file systems.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (b)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (b) by creating a stand alone requirement to verify that voting system software installed on voting equipment has not been modified*

→ **1.3.2.2-B** Software integrity verification technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the integrity of software installed on storage devices with and without file systems is verified by the voting equipment in the TDP.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Different techniques can be used to verify the integrity of software installed on voting equipment such as digital signature or performance based techniques (see [Perrig06]).

Source: *VVSG 2005 Volume I, Section 7.4.6 (c)*

Impact: *This requirements extends VVSG 2005 Volume I, Section 7.4.6 (c) by requiring technical documentation on how the voting equipment software integrity capability is implemented*

1.3.2.2-C Software integrity verification technique robustness requirement

Software integrity verification techniques **shall** be as robust as cryptographic based techniques.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Software integrity techniques base on digital signatures and hash values satisfy this requirement. Software integrity techniques based on performance measures must be shown to be as secure as techniques based on digital signatures and hash values in order to satisfy this requirement. Software integrity techniques that rely on non-cryptographic checksums such as cyclic redundancy codes (CRCs) do not satisfy this requirement.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.2.2-D** Software integrity verification technique non-chain of custody dependency requirement

Software integrity verification techniques **shall** be resistant to breaks in the chain of custody processes for the voting equipment.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Software integrity verification techniques that rely on the chain of custody of the voting equipment after software installation for integrity of the software do not satisfy this requirement.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.2.2-E** Software integrity verification technique software and hardware source requirement

Software integrity verification techniques **shall** be able to be performed using software and hardware from sources other than the voting system vendor.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (d)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (d) with some word changes and the elimination of the term "COTS"*

→ **1.3.2.2-F** Software integrity verification technique independence from installed software requirement

Software integrity verification techniques **shall not** depend on the correct behavior of software installed on the voting equipment.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Although performance based software verification techniques run software installed on voting equipment, the techniques do not depend on the correct behavior of the software installed on the voting equipment based on their fundamental design (see [Perrig06]). Digital signature based software verification techniques do not depend on the correct behavior of the software installed on voting equipment when access to the installed software is provided via an external interface (see requirement **1.3.2.2-M**).

Source: *VVSG 2005 Volume I, Section 7.4.6 (b)(i)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (b)(i) with some word changes*

→ **1.3.2.2-G** Software integrity verification technique software non-modification requirement

Software integrity verification techniques **shall not** modify the software on the voting system.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (b)(iii)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (b)(iii) with some word changes*

→ **1.3.2.2-H** Non-digital signature software reference information generation requirement

Vendors **shall** provide a technical specification of how to generate software reference information for non-digital signature based software integrity techniques in the TDP.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

Software reference information (such as digital signatures and performance information) is used to determine if software has been modified. The requirements related to the generation of digital signature software reference information by VSTLs, NSRL, and EAC are found in Chapter X: Software Distribution and Installation.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.2.2-I** Software integrity verification procedure user documentation requirement

Vendors **shall** provide in the user documentation the procedures to verify the integrity of software installed on voting equipment in storage devices with and without file systems using software reference information.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (b)(ii)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (b)(ii) by specifying that procedures used to verify the integrity of software installed on voting equipment is documented*

→ **1.3.2.2-J** Software reference information generation requirement

VSTLs, EAC, and notary repositories **shall** generate software reference information for voting system software.

Applies to: *Programmed Device*

Test Reference: *N/A*

DISCUSSION

See Chapter X: Software Distribution and Installation for the requirements related to the generation of digital signature software reference information. Non-digital signature based software reference information will be generated by based on the specifications provided by requirement **1.3.2.2-H**.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.2.2-K** Software reference information distribution requirement

Software reference information **shall** be distributed in a fashion traceable back to the source that created the reference information.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Software reference information can be distributed on uniquely identifiable unalterable media or via electronic means with a digital signature generated by the source of the software reference information.

Source: *VVSG 2005 Volume I, Section 7.4.6 (d)(ii)*

Impact: *This requirement is a generalization of VVSG 2005 Volume I, Section 7.4.6 (d)(ii)*

→ **1.3.2.2-L** Voting equipment digital signature based software integrity verification capability requirement

Voting equipment using digital signatures to verify software integrity **shall** provide the capability to verify the EAC, NSRL, and State designated notary repositories digital signatures associated with software installed on the voting equipment.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.2.2-M** Voting equipment software access external interface requirement

Voting equipment using software verification techniques requiring external access to software **shall** provide an external interface with the capability to read the software from storage devices on the voting equipment; and prevent the writing of information to storage devices located on the voting equipment.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 5.2*

DISCUSSION

In general, digital signature based software integrity verifications techniques use external interfaces to access software installed on voting equipment.

Source: *VVSG 2005 Volume I, Section 7.4.6 (e)*

Impact: *This requirement is an update to VVSG 2005 Volume I, Section 7.4.6 (e) by acknowledging that some software verification techniques do not require an external interface to export the software being verified and removes the other sub-requirements that are covered by requirement found in subsection **1.3.3***

→ **1.3.2.2-N** Software integrity verification record generation requirement

Software integrity verification inspections **shall** result in a record including: time, date, and location of the verification, information that uniquely identifies the software (such as software name, version, build number, etc.), the software integrity verification technique used, results of the software verification, name(s) of the individual(s) that performed the verification, and information that uniquely identifies the voting equipment that contained the software that was verified.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 5.4.2*

Impact: *Relates to VVSG 2005 Volume I, Section 5.4.2 requirements about records to be generated for system readiness*

→ **1.3.2.2-O** Software integrity verification record storage media requirement

The record of the results of the software integrity verification inspection **shall** be made on unalterable media.

Applies to: *Programmed Device*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Unalterable storage media includes technology such as a CD-R, but not CD-RW

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

1.3.3 Voting equipment register and variable inspection requirements

The requirements found in this subsection apply to registers and variables implemented in both hardware and software. See section 1.2.2 for a discussion of register and variable characteristics and limitations of register and variable inspection.

→ **1.3.3-A** Static register and variable value user documentation requirement

Vendors **shall** provide the values of all static registers and variables, except for the values set to conduct a specific election in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (f)(ii)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (f)(ii) with some word changes*

→ **1.3.3-B** Dynamic register and variable value user documentation requirement

Vendors **shall** provide the initial starting values of all dynamic registers and variables for the voting system, except for the values set to conduct a specific election in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (f)(ii)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (f)(ii) with some word changes*

→ **1.3.3-C** Maximum and minimum register and variable values user documentation requirement

Vendors **shall** provide the maximum and minimum values that static and dynamic registers and variables can store in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (f)(ii)*

Impact: *This requirement extends VVSG 2005 Volume I, Section 7.4.6 (f)(ii) by requiring the documentation of register and variable maximum and minimum values in addition to their initial values*

→ **1.3.3-D** Register and variable value inspection procedure user documentation requirement

Vendors **shall** provide the procedures to inspect the values of all registers and variables of the voting equipment in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (f)(i)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (f)(i) by requiring the procedures used to inspect register and variable values to be documented some*

1.3.3-E Register and variable value inspection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the inspection of all the voting equipment registers and variables is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (f)(i)*

Impact: *This requirement updates VVSG 2005 Volume I, Section 7.4.6 (f)(i) by requiring technical documentation on how inspection of registers and variables values is implemented*

1.3.3-F Register and variable value inspection capability requirement

Voting equipment **shall** provide the capability to inspect all the values of the voting equipment registers and variables.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (f); VVSG 2005 Volume I, Section 2.2.5 (e); VVSG 2005 Volume I, Section 2.2.6 (b)*

Impact: *This requirement extends VVSG 2005 Volume I, Section 7.4.6 (f) by requiring the register and variable values to be inspected beyond just their static and initial values; The requirement extends VVSG 2005 Volume I, Section 2.2.5 (e) and 2.2.6 (b) by including all registers and variables and not just "candidate" and "active measure" registers*

1.3.3-G Register and variable value inspection record generation requirement

Register and variable inspections of voting equipment **shall** result in a record including: time, date, and location of the inspection, information that uniquely identifies the register or variable, the value of each register and

variable, name(s) of the individual(s) that performed the inspection, and information that uniquely identifies the voting equipment that was inspected.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 5.4.2; VVSG 2005 Volume I, Section 2.2.5; VVSG 2005 Volume I, Section 2.2.6*

Impact: *Relates to VVSG 2005 Volume I, Section 5.4.2 requirements about records to be generated for system readiness; this requirement updates VVSG 2005 Volume I, Section 2.2.5 statement "…shall provide a formal record…" and VVSG 2005 Volume I, Section 2.2.6 statement "…shall provide a printed record…" by specifying information to be included in the record*

→ **1.3.3-H** Register and variable value inspection record storage media requirement

The record of the results of the register and variable inspections **shall** be made on unalterable media.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Unalterable storage media includes technology such as a CD-R, but not CD-RW.

Source: *VVSG 2005 Volume I, Section 2.2.5; VVSG 2005 Volume I, Section 2.2.6*

Impact: *This requirement restricts VVSG 2005 Volume I, Section 2.2.5 statement "…a formal record of the following, in any media…" by limiting the record to unalterable storage media; This requirement updates VVSG 2005 Volume I, Section 2.2.6 statement "…shall provide on printed record…" by removing the restriction that the record be limited to printed media*

1.3.4 Voting equipment properties inspection requirements

→ **1.3.4-A** Backup power operational range user documentation requirement

Vendors **shall** provide the nominal operational range for the backup power sources of the voting equipment in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-B** Backup power inspection capability requirement

Voting equipment **shall** provide the capability to inspect the remaining charge of backup power sources without the use of software in quarterly increments (i.e. full, three-quarters full, half full, quarter full, empty) at a minimum.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

DISCUSSION

Backup power sources for voting equipment include but are not limited to batteries.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-C** Backup power inspection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the inspection of the remaining charge of the backup power sources is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-D** Backup power inspection procedure user documentation requirement

Vendors **shall** provide the procedures to inspect the remaining charge of the backup power sources of the voting equipment in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-E** Cabling connectivity inspection capability requirement

Voting equipment **shall** provide the capability to inspect the connectivity of cabling attached to the voting equipment without the use of software.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

For example, LEDs can be used to indicate when power cables are connected and conducting electricity. LEDs can also be used to indicate when network cables are connected and can transmit information.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

1.3.4-F Cabling connectivity inspection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the inspection of the connectivity of cabling attached to voting equipment is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

1.3.4-G Cabling connectivity inspection procedure user documentation requirement

Vendors **shall** provide the procedures to inspect the connectivity of the cabling attached to the voting equipment in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

1.3.4-H Communications operational status inspection capability requirement

Voting equipment **shall** provide the capability to determine the operational status of the communications capability of the voting equipment.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-I** Communication operational status inspection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the inspection of the operational status of the communications capability is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-J** Communications operational status inspection procedure user documentation requirement

Vendors **shall** provide the procedures to inspect the operational status of the communications capabilities of the voting equipment in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-K** Communications on/off inspection capability requirement

Voting equipment **shall** provide the capability to determine when the communications capability of the voting equipment is on or off without the use of software.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

For example, LEDs can also be used to indicate when a given device is on or off. Physical switches can be used to physical turn on or off devices.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-L** Communication on/off inspection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the inspection of the on/off status of the communications capability is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-M** Communications on/off status inspection procedure user documentation requirement

Vendors **shall** provide the procedures to inspect the on/off status of the communications capabilities of the voting equipment in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-N** Consumables inspection capability requirement

Voting equipment **shall** provide the capability to inspect the remaining amount of voting equipment consumables (i.e. ink, paper, etc.) in quarterly increments (i.e. full, three-quarters full, half full, quarter full, empty) at a minimum.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-O** Consumables quantity of voting equipment user documentation requirement

Vendors **shall** provide a list of consumables associated with the voting equipment including estimated number of usages per consumable quantity in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-P** Consumable inspection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the inspection of the remaining amount of each consumable is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Requirement **1.3.4-O** documents the list of consumables used by the voting equipment.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-Q** Consumable inspection procedure user documentation requirement

Vendors **shall** provide the procedures to inspect the remaining amount of each consumable of the voting equipment in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

Requirement **1.3.4-O** documents the list of consumables used by the voting equipment.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-R** Calibration of voting equipment components inspection capability requirement

Voting equipment **shall** provide the capability to inspect the calibration of voting equipment components that require calibration.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

DISCUSSION

Examples of voting equipment components that may require calibration are touch screens and optical scan sensors.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

1.3.4-S Calibration of voting equipment components nominal range user documentation requirement

Vendors **shall** provide a list of components associated with the voting equipment that require calibration and the nominal operating ranges for each component in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-T** Calibration of voting equipment components inspection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the inspection of the calibration for each component is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Requirement **1.3.4-S** documents the list of voting equipment components that require calibration.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-U** Calibration of voting equipment components inspection procedure user documentation requirement

Vendors **shall** provide the procedures to inspect the calibration of each component in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Requirement **1.3.4-S** documents the list of voting equipment components that require calibration.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-V** Calibration of voting equipment components adjustment technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how the adjustment to the calibration of each component is implemented by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

D I S C U S S I O N

Requirement **1.3.4-S** documents the list of voting equipment components that require calibration.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-W** Calibration of voting equipment components adjustment procedure user documentation requirement

Vendors **shall** provide the procedures to adjust the calibration of each component in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Requirement **1.3.4-S** documents the list of voting equipment components that require calibration.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-X** External interface secure protection capability requirement

Voting equipment **shall** provide the capability to secure external interfaces not being used by the voting equipment.

Applies to: *Voting System*

Test Reference: *Volume V, Section 5.2*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 7.4.6 (e)(i)*

Impact: *This requirement is a generalization and extension of VVSG 2005 Volume I, Section 7.4.6 (e)(i) to all external interfaces of the voting equipment not just external interfaces used in software verification*

→ **1.3.4-Y** External interface secure protection procedure user documentation requirement

Vendors **shall** provide the procedures to secure external interfaces not being used by the voting equipment.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

D I S C U S S I O N

Click here and type the discussion about this requirement

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-Z** External interface secure protection technical specification TDP documentation requirement

Vendors **shall** provide a technical specification of how external interfaces are secured when not being used by the voting equipment in the TDP.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Techniques and mechanisms used to secure external interfaces can be found in Chapter X: Physical Security

Source: *VVSG 2005 Volume I, Section 7.4.6 (e)(i), (ii), and (iii)*

Impact: *This requirement is a generalization VVSG 2005 Volume I, Section 7.4.6 (e)(i), (ii), and (iii) by applying the requirement to all external interfaces and removing the restriction on the physical security techniques used to secure external interfaces*

→ **1.3.4-AA** Model checklist of properties to be inspected user documentation requirement

Vendors **shall** provide a model checklist of other properties of the voting equipment to be inspected including a description of the risks on not performing a given inspection in the user documentation.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

Voting equipment may have other properties that need to be inspected that are not covered in Section 1.3.4. This requirement provides a mechanism for the properties not covered in Section 1.3.4 to be captured.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-BB** Minimal voting equipment properties covered by model checklist requirement

The model checklist of other properties of the voting system to be inspected **shall** at a minimum include the inspection of backup power sources, cabling, communications capabilities, consumables, calibration of voting equipment components, general physical features of the voting equipment, and securing external interfaces of the voting equipment not being used.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.1*

DISCUSSION

Voting equipment may have other properties that need to be inspected that are not covered in Section 1.3.4. This requirement provides a mechanism for the properties not covered in Section 1.3.4 to be captured.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

→ **1.3.4-CC** Vote equipment property inspection record generation requirement

Inspections of voting equipment properties **shall** result in a record including: time, date, and location of the inspection, a description of the inspections performed, results of each inspection, name(s) of the individual(s) that performed the inspection, and information that uniquely identifies the voting equipment that was inspected.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Click here and type the discussion about this requirement

Source: *VVSG 2005 Volume I, Section 5.4.2*

Impact: *Relates to VVSG 2005 Volume I, Section 5.4.2 requirements about records to be generated for system readiness*

→ **1.3.4-DD** Vote equipment property inspection record storage media requirement

The record of the results of the voting equipment property inspections **shall** be made on unalterable media.

Applies to: *Voting System*

Test Reference: *Volume V, Section 4.4*

DISCUSSION

Unalterable storage media includes technology such as a CD-R, but not CD-RW.

Source: *Click here to add the Source*

Impact: *Click here to add the Impact*

1.3.5 References

[VVSG 2005] 2005 Voluntary Voting System Guidelines, Election Assistance Commission

[IEEE P1583] IEEE P1583™/D5.3.2 Draft Standard for the Evaluation of Voting Equipment, December 6, 2004.

[TGDC 16-05] Technical Guideline Development Committee Resolution #16-05: Setup Validation, January 2005.

[Perrig06] Adrian Perrig, Arvind Seshadri Mark Luk, Leendert van Doorn, and Pradeep Khosla, Externally Verifiable Code Execution, Communications of the ACM, September 2006, pp. 45-49.

[Jones06] Douglas Jones and Tom C. Bowersox, Secure Data Export and Auditing Using Data Diodes, Electronic Voting Technology Workshop, August 2006, available at http://www.usenix.org/events/evt06/tech/full_papers/jones/jones.pdf