



**Report Prepared for the
Texas Secretary of State
Elections Division**



**Voting System Certification
Evaluation Report**

**Dominion Voting Systems
ASSURE 1.3**

Introduction

The Dominion Voting Systems Assure 1.3 Voting System was evaluated for certification by the State of Texas on August 22, 2012.

Recommendation

The Dominion Voting Systems Assure 1.3 Voting System is not recommended for certification, for the reasons presented in this report.

This recommendation is being made with the observation that prior versions of the system are being successfully used to run elections, including in Texas. A variety of features introduced in this version bring improvements to the version of the system currently in use and so would be a step forward for those counties that use the Assure system.

Further, version 1.3 of the system has been deployed and is being used in some states. Therefore it appears reasonable to assume that remedies can be found and the system has the potential to be certified in the state of Texas once those remedies are brought forth. In an annex to this report a presentation of Ohio's work to remedy one of the issues, the deficiency of the system verification tools, is presented as a possible model for resolving that issue.

The areas of non-compliance identified were:

1. Insufficient evidence was provided to find the accuracy of the system's ballot scanners in compliance with HAVA (Help America Vote Act) or Texas requirements. Further, even in the very limited time available in during the exam evidence was found that mark recognition accuracy may be an issue for this system.
 - a. In one of several problematic tests, of the 16 ballots counted as part of the exam, some marks made by examiners were inconsistently read and read differently on the different scanners. Some marks were read sometimes but not others when the same ballot was feed to the same



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scanner. The accuracy of the system was of particular concern because no details were provided as to how testing was performed to verify that the system meet the HAVA accuracy requirements.

- b. Test methods and test cases were not made available for this examination despite these having been specifically requested well in advance of the exam. The test report that was presented is summative in nature, leaving many aspects of compliance testing undocumented. In the area of system accuracy this is particularly troubling because the test traditionally run by SLI International (formerly SysTest Laboratories) is know to allow a variety of flaws to pass through undetected and seldom fails any system.
2. There were disability access issues with the system.
 - a. When voting with the audio ballot with the screen blank, as a blind voter would vote, and different from voting visually, at the end of voting the voter cannot review their selections. They are instructed to cast their vote and then receive a summary of their votes.
 - b. The audio quality on the TX R6 unit was very poor quality with a great deal of noise that made the audio ballot hard to hear.
 3. PCS Central Count had a high rate of paper jams and misfeeds during the demonstration. From the performance observed in the exam the unit could not be in compliance with the paper handling requirements of the VVSG.
 4. The system audit log and supporting error detection processes were found to be deficient.
 - a. The PCS Central Count scanner did not have a printed real time audit log attached, as required by Texas code.
 - b. A method was discovered to subvert the printed audit log on the GEMS system, initially preventing audit events from being printed and then erasing all record of them.
 - c. The log files were only obtainable in printed form, on narrow and hard to read paper strips, making review of the logs when any significant number of scanners and DRE's are used is a prohibitively labor intensive, manual process and therefore impractical to perform routinely. The lack of access to the logs in an electronic form that can be automatically scanned for irregularities in a timely manner makes the logging system functionally unusable. The VVSG requires that the system report system errors so that election officials can know if system components failed to operate correctly during an election. This system keeps those component failure messages buried in individual unit logs and does not bring them forward so that an election official



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can be aware of any individual unit problems. The only way to know if all units operated correctly is to review the individual logs, but those are only available in a form that would require an inordinate amount of time and effort to perform this necessary review.

- d. The meaning of log file messages was not found in the documentation provided. During the exam additional documentation was provided but time did not permit it to be reviewed during the exam. However, subsequent review failed to find specific documentation on the meaning of status and error messages recorded in the audit logs or what actions should be taken for any errors found. The failure to document the meaning of log messages would leave election officials guessing as to the meaning and significance of the messages.
5. The version of the system currently deployed in Texas has security certificates that expire in June 2013 and January 2014, making those systems non-functional after those dates. The remedy proposed is to ignore dates on certificates, which violates good security practice. Security certificates should expire, but as a date of the State's choosing. Updating security certificates should not require purchase of new software from the company.

A related issue is that the security authority, which is a different issue from the security certificates, also has a time limit and will expire on a different date but in a similar timeframe to the security certificates. This will also render current systems inoperable. The fact of this second date expiration was not stated and the date of that the security authority will expire, for the systems being used in Texas, was given.

6. An issue with the company's customer support processes is revealed by the fact that the State of Texas only became aware of the expiring certificate issue during this exam. States as well as local jurisdictions should be routinely notified whenever a company becomes aware of an issue with its system. In the case of the expiring certificates this would allow both state and local officials the maximum planning horizon to develop mitigation plans.
7. The ability to verify that the system is unmodified and continues to be in its certified state was found to be deficient.
 - a. The system verification tools were incomplete and not usable without considerable additional work from people with advanced technical skills. To further support this finding see the presentation from the State of Ohio in Appendix A.
 - b. The verification of the precinct scanners requires removing chips and reading them in a chip reader. This method is well beyond the



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technical capabilities of most jurisdictions and not practical or desirable as part of any routine verification of the system.

8. It was revealed in the same that some system components had not been produced in the last 6 years and some in the last 10 years. The viability of the system to be purchased as a new system was questioned. It was also questioned how long the company would be able to service and support systems already in use. A related question is what the impact of 6-10 years of storage of the units might be on its reliability.
9. Issues with configuration management, particularly as it relates to Commercial-off-the-Shelf (COTS) used in the system were identified.
 - a. In the EAC certificate of certification for the system examined one option for GEMS is listed as running on a Dell PowerEdge 2900 service using the Windows XP operating system. This combination is not supported by Dell and when contacted, Dell customer service expressed concern about the stability of the combination. In particular concern was expressed about the interface to the disk in the system.
 - b. The Dell PowerEdge 2900, and perhaps other models of COTS listed with the certified system, is no longer available for purchase. This means that new purchases would have to use replacement models which have not been tested at this point by either the EAC or the State of Texas.

Remedial Actions

The following remedial actions are recommended for addressing some of the issues cited:

1. It has been said that the best evidence that a voting system is ready for certification is its ability to run a good election. Because this system is in use it would be highly informative to obtain the logs from some systems being used in other states. These logs would then be used to determine the experienced performance of the system in real elections.
2. Accuracy testing that evaluates the system's ability to recognize marks of differing color, size and position in the target area are needed in order to know the true system accuracy. This is because the real mark recognition accuracy of the system depends on how sensitive it is to variables of color, mark size and location.
3. The audit trail is obtainable and usable without an inordinate effort or highly specialized technical abilities. It should be easy to get the logs and clear as to what their messages mean. This can be accomplished but does



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not currently exist. The logs do exist as electronic files and all that is needed is a utility that would decrypt them and put them into a format that is readable by spreadsheet or similar commonly used software.

4. The system validation tools can be completed so that election officials can routinely verify that the system they are using in an election is unmodified from its certified condition.
5. The security certificate and certification authority should be set to dates the states is aware of and finds acceptable, with an update process that is also acceptable to the State of Texas.

Sincerely,

H. Stephen Berger



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Candidate System

This section describes the candidate system, the Dominion Assure 1.3 Voting System.

System Components

The system is comprised of the following components, based on companies “Application for Texas Certification of Voting System” (Form 100).

System Components			
#	Unit/Application	Version	Function
1	GEMS	1.21.6	Election Management System
2	AccuVote-OS (Precinct Count) with new Memory Card	1.96.14	Precinct Count Ballot Scanner
3	AccuVote-OS (Central Count)	2.0.15	Central Count Ballot Scanner
4a	AccuVote-TSX BallotStation	4.7.10	Direct Recording Electronic (DRE) Voting Device
4b	AccuVote-TS BallotStation	4.7.10	Direct Recording Electronic (DRE) Voting Device
5	TSX WinCE	410.3.10	Operating System
6	TS WinCE	300.3.5	Operating System
7	TSX/TS Bootloader	1.3.11	Bootloader for TSX and TS
8	Key Card Tool	4.7.8	Security Key Card Tool
9	ABasic	2.2.5	Report Scripting
10	Voter Card Encoder	1.3.3	Voter Access Card Encoder
11	VC Programmer	4.7.8	Voter Access Card Programmer
12	Cardwriter	1.1.6	Voter Access Card Encoder
13	PCS Central Count	2.2.5	Central Count Ballot Scanner
14	Assure Security Manager	1.2.5	System Security Management



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System Configuration

Figure 1 and Figure 2 illustrate typical system configurations.

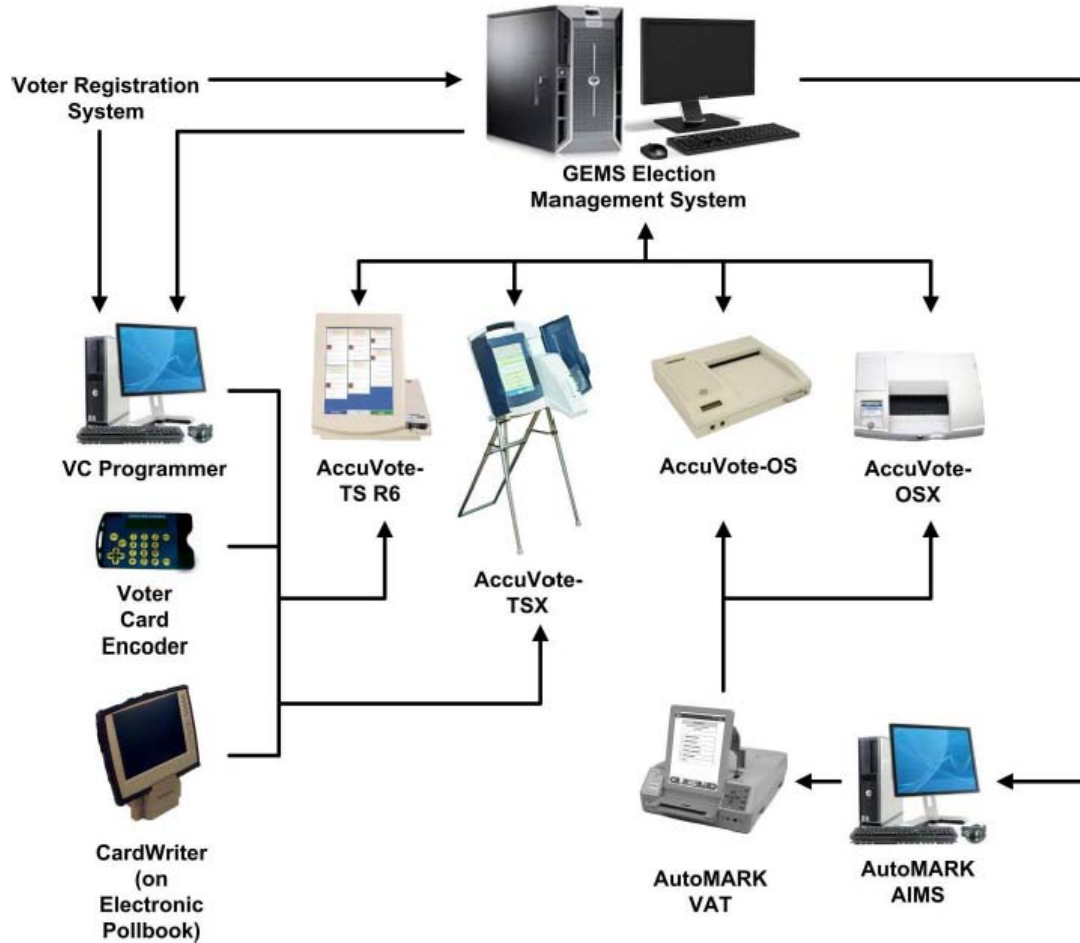


Figure 1 - Assure 1.3 Polling Place and Early Voting Configuration



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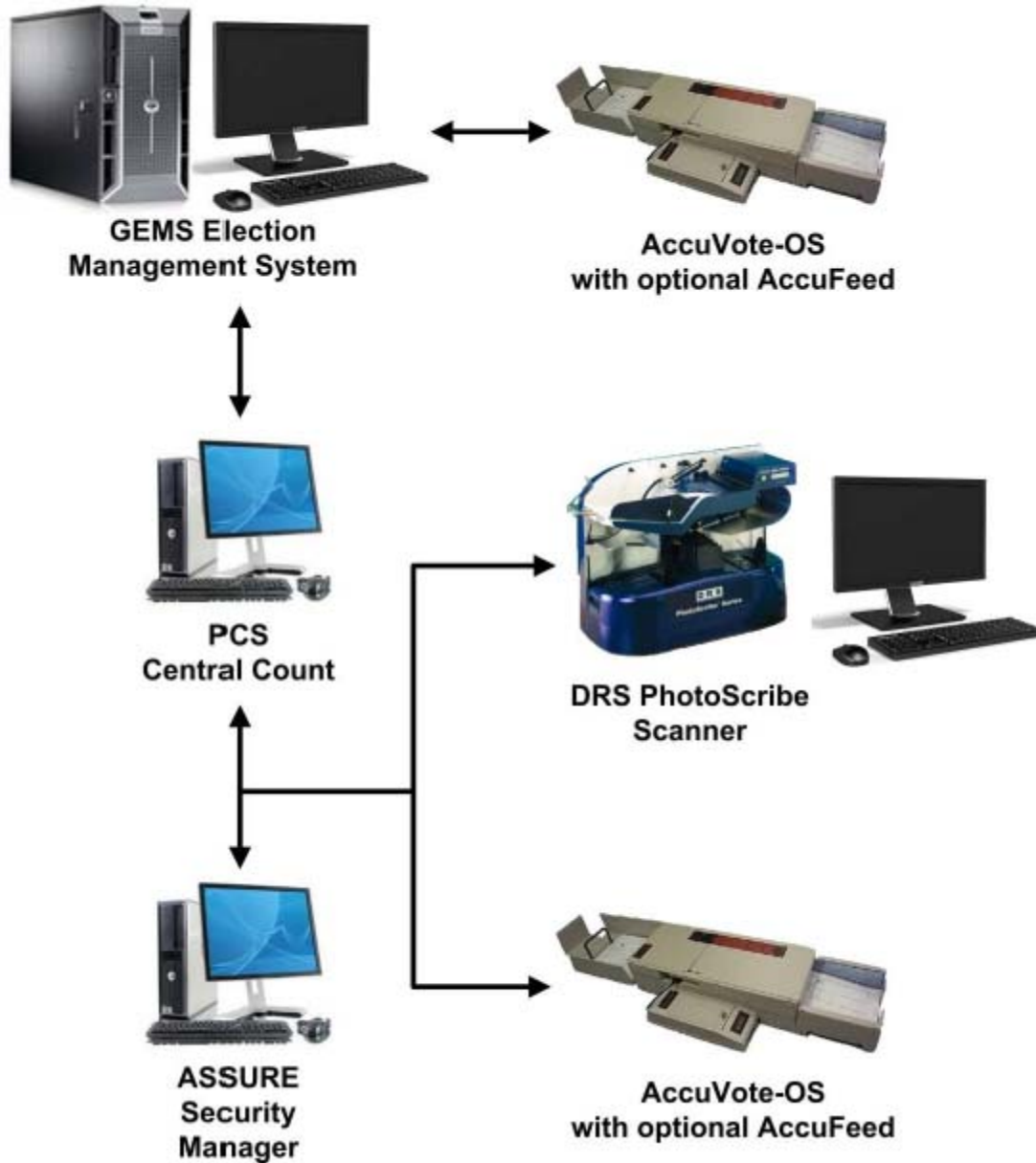


Figure 2 – Assure 1.3 Central Count and Absentee/Mail-in Voting Configuration



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Examination Report

The examination started with a description of the Assure 1.3, including its configuration and the function and role of the various components in the voting system.

Compliance Checklist

The following checklist includes all Texas voting system requirements. The complete checklist is provided as detailed support for the conclusion and recommendation of this report.

Vendor: Dominion Voting Systems	Voting System: Assure 1.3	
Pre-Test Requirements		
<ul style="list-style-type: none"> • Is Form 100 complete and satisfactory? If not satisfactory, please list questions to ask vendor. 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Review Form 100 - Schedule A - Have recommendations/issues made from previous exams been corrected or addressed? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Review Form 101 - Are responses satisfactory? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Review change logs and provide information for testing or questioning vendor 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Training manuals appear complete? 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<ul style="list-style-type: none"> • Training manuals appear to be easy to use? 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<ul style="list-style-type: none"> • Check with other jurisdictions where system is in use and ask questions regarding system, support and training. 	Yes <input type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Did the system receive favorable reviews? If not, please explain. 	Yes <input type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Do all configurations listed in application seem feasible? Keep this in mind during the examination to make sure components necessary to ensure the security are included in all configurations and that the configurations will meet the counties needs (scanner used as central and/or precinct, etc..) 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Vendors' proposals shall state a clear, unequivocal commitment that the election management and voter tabulation software user's application password is separate from and in addition to any other operating system password. 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Vendor's system shall support automated application password expiration at intervals specified by a central system administrator. 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • Vendor shall discuss the steps required by the system administrator to implement and maintain automated password expiration. This discussion will include narrative concerning the degree to which the application password expiration capabilities are based on (a) the server or client's operating system, (b) the software application, or (c) both 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<ul style="list-style-type: none"> • The vendor's proposal shall state the name of any automated incident, issue, or problem tracking system used by the firm in providing support to its election system clients. 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>



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<i>(Note: Technical Bulletins for the previous year were provided and approved.)</i>		
Verify Installation		
• Verify/List all hardware	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
• Verify/List all COTS hardware/software versions	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
• Is the COTS hardware being demonstrated the same version as what was tested at the VSTL?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
• Is the COTS software being demonstrated the same version as what was tested at the VSTL?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
• Witness or actual install the software and firmware with the SOS CDs received from VSTL.	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>



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Vendor: Dominion Voting Systems		Voting System: Assure 1.3	
Texas Law	Federal Law		
System Review			
TEC 122.001		<ul style="list-style-type: none"> Preserves the secrecy of the ballot 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Is suitable for the purpose for which it is intended 	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Operates safely, efficiently, and accurately and complies with the error rate standards of the voting system standards adopted by the FEC (EAC) 	Yes <input type="checkbox"/> No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Is safe from fraudulent or unauthorized manipulation (physical exam and review of manuals) 	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Permits voting on all offices and measures to be voted on at the election 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 122.001	HAVA	<ul style="list-style-type: none"> Warns of Overvote - Prevents counting votes on offices and measures on which the voter is not entitled to vote 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
	HAVA	<ul style="list-style-type: none"> Warns of Undervote 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Prevents counting votes by the same voter for more than one candidate for the same office or, in elections in which a voter is entitled to vote for more than one candidate for the same office, prevents counting votes for more than the number of candidates for which the voter is entitled to vote 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Prevents counting a vote on the same office or measure more than once 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Permits write-in voting 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Is capable of permitting straight-party voting 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 65.007		<ul style="list-style-type: none"> Is capable of cross-over votes 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
TEC 122.001	HAVA	<ul style="list-style-type: none"> Is capable of providing records from which the operation of the voting system may be audited 	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
		<ul style="list-style-type: none"> Is it easy to choose the appropriate ballot style? 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
		<ul style="list-style-type: none"> Is the number of ballot styles available on a unit limited? 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
		<ul style="list-style-type: none"> Can you cancel the marking of a ballot after starting? Explain how. 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
		<ul style="list-style-type: none"> Is there a way to properly secure all ports on the system? 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
		<ul style="list-style-type: none"> Are instructions provided in the documentation for securing the system? 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
		<ul style="list-style-type: none"> Usable for curbside voting? 	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
		<ul style="list-style-type: none"> How to setup or modify audio files 	Yes <input type="checkbox"/> No <input type="checkbox"/>



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			<input checked="" type="checkbox"/>	<input type="checkbox"/>
		• How to adjust volume	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		• Does the system have any RF (Radio Frequency) communications?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		• Have representatives of the visually impaired community evaluated the accessibility of the system?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
		• Test both early voting and election day - all functions opening/closing	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		• Does system include sip 'n puff for accessibility	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		• Does system include paddles for accessibility	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
DRE Review				
TEC 122.001		• Preserves the secrecy of the ballot	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Is suitable for the purpose for which it is intended	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Operates safely, efficiently, and accurately and complies with the error rate standards of the voting system standards adopted by the FEC (EAC)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Is safe from fraudulent or unauthorized manipulation (physical exam and review of manuals)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Permits voting on all offices and measures to be voted on at the election	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001	HAVA	• Warns of Overvote - Prevents counting votes on offices and measures on which the voter is not entitled to vote	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	HAVA	• Warns of Undervote	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Prevents counting votes by the same voter for more than one candidate for the same office or, in elections in which a voter is entitled to vote for more than one candidate for the same office, prevents counting votes for more than the number of candidates for which the voter is entitled to vote	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Prevents counting a vote on the same office or measure more than once	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Permits write-in voting	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		• Is capable of permitting straight-party voting	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 65.007		• Is capable of cross-over votes	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001	HAVA	• Is capable of providing records from which the operation of the voting system may be audited	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
		• Reports available by precinct?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		• In order to perform a manual recount, can you print cast vote records for a precinct (including early voting, ED and absentee?) from an individual DRE?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TAC		• A DRE must have the capability to segregate provisional votes from	Yes	No



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81.176	regularly-cast votes on the precinct returns	<input checked="" type="checkbox"/>	<input type="checkbox"/>
TAC 81.176	<ul style="list-style-type: none"> The precinct returns must indicate the number of provisional ballots cast but not include actual provisional votes in the unofficial totals from the precinct 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TAC 81.176	<ul style="list-style-type: none"> Must provide a method for the cast provisional ballots to be accepted & added to the election results 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Must be designed to not accept provisional write-in votes until the provisional vote has been accepted/approved. 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.033	<ul style="list-style-type: none"> Equipped with a security system capable of preventing operation of the machine 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.033	<ul style="list-style-type: none"> Equipped with registering counters that can be secured against access 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.033	<ul style="list-style-type: none"> Equipped with a public counter 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.033	<ul style="list-style-type: none"> Equipped with a private counter 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 127.154	<ul style="list-style-type: none"> Does each unit have a permanent identification number? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Capability to have more than one ballot style available on a machine (used for consolidated precincts and early voting) 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Can you easily choose the ballot style used on a DRE? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
HAVA	<ul style="list-style-type: none"> Provide voters with disabilities the same opportunity for access & participation (including privacy & independence) 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
	<ul style="list-style-type: none"> Usability of taking system to curbside voter 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
HAVA	<ul style="list-style-type: none"> Allow voter to review selections before casting ballot 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
HAVA	<ul style="list-style-type: none"> Allow voter to change selections before casting a final vote 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
	<ul style="list-style-type: none"> Do multiple choice selections appear on summary screen? EX: vote for 2 or more 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Does the system have any RF (Radio Frequency) communications? 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
	<ul style="list-style-type: none"> Is there a way to properly secure all ports on the system? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Are instructions provided in the documentation for securing the system? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Have representatives of the visually impaired community evaluated the accessibility of the system? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Test both early voting and election day - all functions opening/closing 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> Does system include sip 'n puff for low mobility 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Texas Real-time Audit Log Review			
TEC 81.62	<ul style="list-style-type: none"> A central tabulating device must include a continuous feed printer dedicated to a real-time audit log, which prints out all significant election events and their date and time stamps. 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>



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	<p>See VVSG 2005:</p> <p>2.2.5.2.1.d: "The audit record shall be active whenever the system is in an operating mode. This record shall be available at all times, though it need not be continually visible."</p> <p>2.2.5.2.1.g: "The system shall be capable of printing a copy of the audit record."</p>		
TEC 81.62	<ul style="list-style-type: none"> • Log error messages and operator response to those messages <p style="margin-left: 20px;">See VVSG 2005 Section 2.2.5.2.2.a & 4.4.3.d</p>	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
TEC 81.62	<ul style="list-style-type: none"> • Log the number of ballots read for a given precinct <p style="margin-left: 20px;">See VVSG 2005 Section 4.4.4.a & c & e</p>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
TEC 81.62	<ul style="list-style-type: none"> • Log completion of reading ballots for a given precinct <p style="margin-left: 20px;">See VVSG 2005 Section 4.4.3.b.3</p>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
TEC 81.62	<ul style="list-style-type: none"> • Log the identity of the input ports used for modem transfers from precincts <p style="margin-left: 20px;">See VVSG 2005 Section 4.4.2.g.1-4</p>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
TEC 81.62	<ul style="list-style-type: none"> • Log users logging in and out from election system <p style="margin-left: 20px;">See VVSG 2005 4.4.3.a.4, 4.4.3.d, 6.5.5.a & c</p>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
TEC 81.62	<ul style="list-style-type: none"> • Log precincts being zeroed <p style="margin-left: 20px;">See VVSG 2005 4.4.3.b.2</p>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
TEC 81.62	<ul style="list-style-type: none"> • Log reports being generated <p style="margin-left: 20px;">See VVSG 2005 4.4.3.d</p>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
TEC 81.62	<ul style="list-style-type: none"> • Log diagnostics of any type being run <p style="margin-left: 20px;">See VVSG 2005 4.4.2.a & d</p>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> • Print any attempt to tally or load votes that have already been tallied or counted, identifying the precinct or source of the votes and flagging it as a duplicate 	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> • Print starting the tally software (e.g. from the operating system) or exiting the tally software, or any access to the operating system. 	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	<ul style="list-style-type: none"> • Record if a printer is paused, turned off, turned on, disconnected, and when reconnected. 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Optical Scan System Review			
TEC 122.001	<ul style="list-style-type: none"> • Preserves the secrecy of the ballot 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001	<ul style="list-style-type: none"> • Is suitable for the purpose for which it is intended 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
TEC 122.001	<ul style="list-style-type: none"> • Operates safely, efficiently, and accurately and complies with the error rate standards of the voting system standards adopted by the EAC 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>



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TEC 122.001		<ul style="list-style-type: none"> Is safe from fraudulent or unauthorized manipulation (physical exam and review of manuals) 	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Permits voting on all offices and measures to be voted on at the election 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001	HAVA	<ul style="list-style-type: none"> Warns of Overvote - Prevents counting votes on offices and measures on which the voter is not entitled to vote 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	HAVA	<ul style="list-style-type: none"> Warns of Undervote 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Prevents counting votes by the same voter for more than one candidate for the same office or, in elections in which a voter is entitled to vote for more than one candidate for the same office, prevents counting votes for more than the number of candidates for which the voter is entitled to vote 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Prevents counting a vote on the same office or measure more than once 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Permits write-in voting 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001		<ul style="list-style-type: none"> Is capable of permitting straight-party voting 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 65.007		<ul style="list-style-type: none"> Is capable of cross-over votes 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 122.001	HAVA	<ul style="list-style-type: none"> Is capable of providing records from which the operation of the voting system may be audited 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		<ul style="list-style-type: none"> Reports available by precinct? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		<ul style="list-style-type: none"> In order to perform a manual recount, can you print cast vote records for a precinct (including early voting, ED and absentee?) from an individual DRE? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
TEC 127.154		<ul style="list-style-type: none"> Does each unit have a permanent identification number? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		<ul style="list-style-type: none"> Is there a way to properly secure all ports on the system? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		<ul style="list-style-type: none"> Are instructions provided in the documentation for securing the system? 	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>



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Supplemental Discussion

Complex History

The testing of this system suffered an unusually complex and difficult history. The system started its certification testing as the Assure version 1.2 voting system at SysTest Labs (now operating as SLI International) in mid-2007. It progressed through the certification testing process until the summer of 2008. On October 29, 2009 Premier Voting Systems, the company that originally developed the Assure system, requested EAC permission to move the project to iBeta Laboratory. They cited as their reason the imminent deaccreditation of SysTest Laboratories (now operating as SLI International). The testing was completed by iBeta Laboratories and the Assure 1.2 system was granted certification on August 6, 2009 by the EAC. However, shortly thereafter some problems were discovered with the system, which the company then addressed. They returned the modified version of the system, now the Assure 1.3 system to SLI Laboratories (Formerly SysTest labs, but operating under new management and with extensive changes in technical personnel.) The Assure 1.3 system was certified by the EAC on June 29, 2012. Essentially the certification testing was divided between 3 laboratories and performed over a 5 year period.

Many of the early tests were not required to be rerun, but were accepted for reuse in the certification process. However, some of these tests were performed at SysTest shortly before its accreditation was revoked due to significant quality problems. The newest testing on the Assure 1.3 system focused on the modifications and much of the testing on the Assure 1.2 system was accepted for reuse. However, during this time deficiencies were identified in some test methods, notably the accuracy testing and the EAC worked with the labs to improve their test methods in various areas. However, SLI International was disengaged from the process during much of this time.

Further complicating the process Premier Voting Systems was acquired by ES&S. ES&S was then required by the US Department of Justice to divest itself of certain parts of the company. Portions of Premier were then sold by ES&S to Dominion Voting Systems. It is Dominion Voting Systems which is applying for Texas certification of the system.

Insufficient Description of Testing

This unusually complex history makes review of the testing even more critical than it normally would be. Testing of any voting system is complex and a state review of testing is always advisable even though the EAC is both careful in its work and technologically skilled. With a history as complex as that of the Assure 1.3 system, careful review is particularly in order. However, SLI International has taken the position that the specific test cases are proprietary and will not be disclosed to the State of Texas. Without that level of detail it is not possible to perform an



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independent review of the testing performed. All that can be said is that SLI asserts the system meets all requirements of the VVSG. However, it is relying largely on testing by SysTest, which was deaccredited, and iBeta, which has now withdrawn from the business. This position that test methods are proprietary is highly unusual in testing of this type. Normally the methods and specific detail of testing performed for certification or regulatory purposes are fully disclosed, allowing independent review of them. Laboratory tests are expected to be documented with sufficient detail so that either another laboratory can repeat a test to verify the reported result or that other engineers can form an independent assessment of the testing performed. With the high level test report provided by SLI Laboratories no independent assessment can be made of the quality or appropriateness of the testing. As a result it must be concluded that there is not sufficient evidence provided in this exam to support a finding of compliance with many requirements, most specifically with the system accuracy requirements.

System Accuracy

System accuracy is a central requirement for any voting system. HAVA includes the following requirements regarding system accuracy:

- (5) Error rates.--The error rate of the voting system in counting ballots (determined by taking into account only those errors which are attributable to the voting system and not attributable to an act of the voter) shall comply with the error rate standards established under section 3.2.1 of the voting systems standards issued by the Federal Election Commission which are in effect on the date of the enactment of this Act.
- (6) Uniform definition of what constitutes a vote.--Each State shall adopt uniform and nondiscriminatory standards that define what constitutes a vote and what will be counted as a vote for each category of voting system used in the State.

The accuracy required in the VVSG is:

A target error rate of no more than one in 10,000,000 ballot positions, with a maximum acceptable error rate in the test process of one in 500,000 ballot positions.

All paper ballot scanners will have problems with some marks. Color, size and position of marks are important variables when evaluating mark recognition accuracy. It is important for states to know the real accuracy of voting systems, evaluated against the range of marks made by voters, in order to craft election procedures that match the capabilities of the specific system being used. It is extremely important



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that election officials know the kinds of marks that a system will find problematic so that they can effectively deal with close elections.

The accuracy tests used historically have been shown to be flawed, allowing deficient systems to pass the test. The EAC has worked with the labs to improve testing in this area and work in this area is ongoing. Given the long history of this particular system and the fact that test methods have improved in this area, it is very important that the test methods used to evaluate the accuracy of the system be known and in all likelihood new accuracy testing will be required if the State of Texas is to know the true accuracy of the system, measured against the range of marks typically made by voters, particularly on absentee, mail-in ballots.

Configuration Management

In the EAC certificate of certification for the system examined one option for GEMS is listed as running on a Dell PowerEdge 2900 service using the Windows XP operating system, Figure 3. However, the PowerEdge 2900, being a server was not designed for or intended to be used with consumer type operating systems such as Windows XP.

System Component	Software or Firmware Version	Hardware Version	Operating System or COTS	Comments
Ballot Preparation and Central Count				
GEMS	1.21.6		Dimension 3100 Windows XP SP3 PowerEdge 2900 Windows XP SP3 PowerEdge 1800 Windows Server 2003 SP2	

Figure 3 – On the EAC Certificate of Conformance a non-supported and deprecated configuration of the Dell PowerEdge 2900 is listed¹

Dell only lists the following operating systems for use with the PowerEdge 2900:²

- Microsoft® Windows® Server 2003 R2, Standard, Enterprise Edition, x64, Standard and
- Enterprise Edition; Microsoft® Windows® Server 2003 Small Business Standard, Premium
- Edition; Microsoft® Windows® Storage Server 2003 R2, Standard, Enterprise Edition;
- Red Hat® Linux® Enterprise v4, ES EM64T;

¹ EAC Certificate of Conformance for the DVS Assure 1.3 Voting System, dated June 29, 2012.

² http://www.dell.com/downloads/emea/products/pegedge/en/PE2900_Spec_Sheet_Quad.pdf



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- SUSE Linux Enterprise Server 9 EM64T

When contacted, Dell customer support stated that they would have concern about the stability of Windows XP operating on a PowerEdge 2900 because neither they nor Microsoft make a driver for the disk interface. The use of an unknown driver raises questions about the stability and integrity of the data being written to the disk.

The presence of this example of COTS being modified, particularly in such a critical area, but still being reported as unmodified and commercially available raises questions about the company's quality and configuration management systems.

The problem is further complicated by the fact that the Dell PowerEdge 2900 is no longer available, Figure 4. When the issue of model obsolescence was discussed with Dell product management they expressed interest in working with voting system manufacturers to identify models which would have significant market life, help them identify appropriate replacement models and even work with them to perform some testing. However, it appears that Dominion is not working with its COTS providers at this level. This brings into question their supply chain management and increases the likelihood of election officials suffering the consequences as products are withdrawn, if replacement products do not function in the same way. The concerns created by the mismatched operating system and computer become even greater since the computer that will be used with the system is unknown.

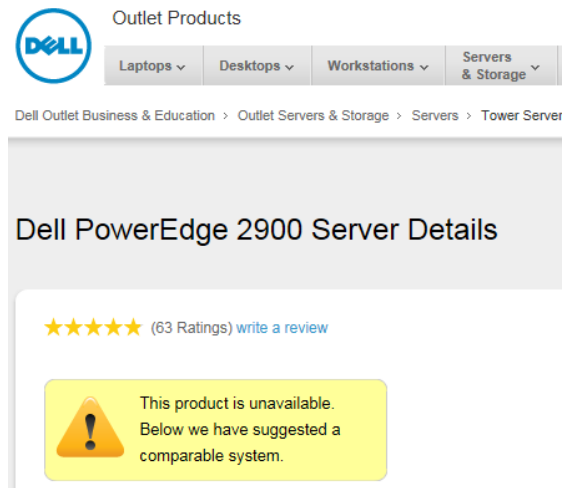


Figure 4 – Dell PowerEdge 2900 is no longer available less than 6 weeks after the system's EAC certification³

³ <http://www.dell.com/us/dfb/p/poweredge-2900/pd#TechSpec>



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Annex A – OHIO Verification Experience

In June of 2012 the following report was presented of Ohio's experience with verifying the Assure 1.2 system. It is included here both to support the findings of this exam but also because it points toward solutions that Ohio developed with the system.



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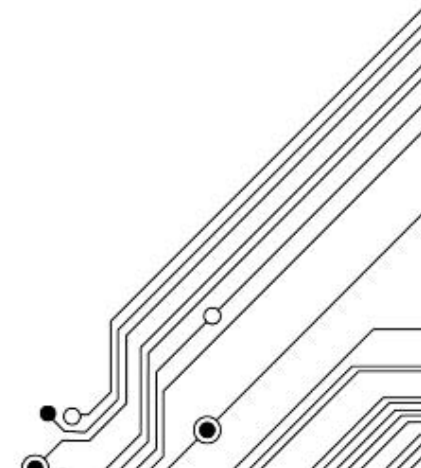


Checking the List Twice

State Certification Testing of Voting Systems
National Conference

Indianapolis, Indiana
June 14-15, 2012

Joshua Franklin
Matthew Masterson
Danielle Sellars





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Overview

Introduction

Purpose

What, When, and How to Verify?

Team Effort

Relevant Facts

The Plan

The Process

The Results

Examples

Conclusions

Next Steps



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Purpose

- To explain our experiences in verifying the physical, software, and set up configuration for the voting systems in Ohio's 88 counties.



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Team Effort

- Accomplishing this is a bumpy road
- Required federal, state, and local efforts
- Danielle Sellars provided the footwork and onsite technical know-how



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Why Verify?

- Keep the system safe, secure, and certified.
- Software is the same during distribution, installation, setup. [1]
- Supports a chain of custody
- “Software integrity: ensuring that the software programs have not been altered, whether by an error, a malicious user, or a virus.” – Bruce Schneier

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When to Verify?

- There is no single answer:
- At time of installation?
- L&A
- Before the election?
- At the polling place?
- After an election?
- After canvass?
- Part of post-election audit?



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What and How to Verify?

- Check the:
 - Installation media
 - Software already on the machine
 - Documentation
- System Identification Tools from manufacturer
 - Validate the hashes of the static software files
 - Provides high level of assurance that the software is unchanged



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UPDATED NOVEMBER 11, 2011



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Relevant Facts

- Purchased in 2002
 - Systems have never validated
 - Numerous upgrades to fielded system since then
- OH requires newly purchased systems to be EAC certified



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The Plan

- Start with Premier Assure 1.2 counties
 - All Assure counties were mandated to upgrade to Assure 1.2
 - EAC certified system
- Don't swallow the entire elephant
 - GEMS servers only
- Work with the EAC and vendor to understand what certified configuration is



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The Process

- Parse the vendor provided verification tools (uneditable pdf) to a useable format (raw text)
- Run SHA1 hash check on GEMS program directory using portable COTS software
- Confirm hash values match EAC certification through the use of hash comparison software
- Identify Windows 2003 Server security configuration (user accounts, rights,¹¹ running services)



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County Data

```

Adams GEMS 1.21.hash - Notepad
File Edit Format View Help
# made with checksum.. point-and-click hashing for windows.
# from corz.org.. http://corz.org/windows/software/checksum/
#
5d6d0305c1f816428393bfa345ef2293ff423e75 *ABasic.ini
250d8c57d6c528a0e096d4f441257322bc4a6adb *ceriched.dll
fff5d7b30694b39d257a7dfabb291cf5fba802c8 *ceutil.dll
e6c3317e6219478a0c627a9886d47a1b7e7a2d05 *crpe32.dll
fd7a15ab082aabfd5d2e936041ee16cb4dbc0574 *dbghelp.dll
b17a0d19faa0c7084b628f6c1c29bff852d63f01 *Gems.exe
72200e96eac0d41a047c02d4d8114d79dd5e6620 *gems.pem
34c2305579b4ddb82d649df5c5273e5ec78401f7 *Locale.ini
d5502a1d00787d68f548ddeebbd1eca5e2b38ca *msvcr71.dll
f599461621f6a9405ccee1e42faad88303a4df9 *office.dll
e512948c519e1562b42579dbfa369c0d0e340778 *pwdcnv.dll
f443eb9babcc1f3aeb433d2b6978bc3caf144561 *Reports.ini
f386213f15e08dd1a1ef295b4476f80219c0fd48 *User's Guide.pdf
e43583df1576adb086a46c3fcf8cc4b7d63defd9 *ABasic/195can.abo
951c294f6f99bdb897871d0bd62ea5684e650f90 *ABasic/195fr.abo
1a6d43c9c58778b9287da8b95f4c2de63d9eaae9 *ABasic/195us.abo
5754566d8c116bc9e788db9ce8e698434df53df5 *ABasic/195us02.abo
8196184c77021ae48c74f5f9bfd67b37d3
40f9fab171cf1fd3e6d3f299096d591c39
4ffa71b1c52a971cc991bc0827684d0f8

```

```

KG GEMS.txt - Notepad
File Edit Format View Help
250d8c57d6c528a0e096d4f441257322bc4a6adb *ceriched.dll
fff5d7b30694b39d257a7dfabb291cf5fba802c8 *ceutil.dll
e6c3317e6219478a0c627a9886d47a1b7e7a2d05 *crpe32.dll
fd7a15ab082aabfd5d2e936041ee16cb4dbc0574 *dbghelp.dll
b17a0d19faa0c7084b628f6c1c29bff852d63f01 *Gems.exe
72200e96eac0d41a047c02d4d8114d79dd5e6620 *gems.pem
34c2305579b4ddb82d649df5c5273e5ec78401f7 *Locale.ini
d5502a1d00787d68f548ddeebbd1eca5e2b38ca *msvcr71.dll
f599461621f6a9405ccee1e42faad88303a4df9 *office.dll
e512948c519e1562b42579dbfa369c0d0e340778 *pwdcnv.dll
f386213f15e08dd1a1ef295b4476f80219c0fd48 *User's Guide.pdf
651e14283e099b3a04a3dae0f606a35f60777b76 *hlp/GEMS.chm
f5fd107c580bc145e697659854571ef4f0f307 *Images/Filledoval.wmf
e40262e42666341d31a4da274fbb50111156ffdf *Images/Finger.bmp

```

- Certified Values
- (manually extracted
- from PDF)



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The Results

- Hash checks of GEMS servers show no differences across counties
- Physical checks of the systems show no differences across counties
- The system setup and rights vary greatly from one county to the next
 - Possibly uncertified configuration
 - Possibly significantly less secure



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	GemsAdmin	ILS anon	Gems User	IUSR	IWAM	LocalAdmin	LocalGuest	Support	Asonet	Accutouch TS	IUSR county	IWAM county	localadmin	localguest	nonadmin	support
Adams											L	Y		Y		
Ashland																
Belmont																
Butler																
Carroll																
Coshocton																
Crawford																
Darke																
Defiance	Y				L	Y	Y									
Fairfield								Y	Y	L	L	Y	L	Y		
Fulton								Y	Y	L	L	Y	L	Y		
Gallia								Y	Y	L	L	Y	L	Y		
Greene								Y	Y	L	L	Y	L	Y		
Guernsey								Y	Y	L	L	Y	L	Y		
Hancock																
Hardin																
Harrison																
Henry																
Highland									Y	L	L	Y	L	L		
Hocking								Y	Y	L	L	Y	L	Y		
Holmes																
Huron																
Jackson											L	Y		Y		



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Board of Elections / Secretary of State
Information Technology Security Review
Directives 2008-56, 73

Storage Requirements of Election Equipment (2008-56)	
Climate controlled location	
Security Requirements (2008-56)	
Access to secure rooms kept to minimal number of privileged BOE personnel	
Minimum Access Control Requirements (2008-56)	
Entry/Exit log	
Security Requirements Tabulation Server Room (2008-56)	
Access to secure rooms kept to minimal number of privileged BOE personnel	
Room secured by a double lock system	
Minimum Access Control Requirements (2008-56)	
Entry/Exit log	
Password Management on Tabulation Server	
BIOS Password in place, Split R/D	
Windows Account Password, Split R/D	
Password Complexity (2008-73)	



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State Goals

- Establish the baseline configuration for each voting system, regardless of vendor
- Baseline includes tabulation software and system configuration
- Confirm deployed systems match that configuration
- Work with vendors and jurisdiction to bring systems into proper configuration



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State Conclusions

- Provided validation tools did not include mechanism for comparison, nor a simple way to compare only static files.
- Produces additional overhead in confirmation process.
- Hash codes must be manually transcribed for visual and/or text comparison
- An automatic utility would be preferable: faster and more accurate



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EAC Conclusions

- The tools were not a form that could readily be used. (e.g., received in pdf file format)
- The state would need to procure a COTS hashing tool to compare against the PDF.
 - No automatic comparison. A person would have verify each hash by sight or manually transcribe the values.
- Poor quality hardware pictures requiring special tools and knowledge.

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EAC Conclusions

- The EAC's program did not require the tools to be checked for functionality or usability by any parties.
- Vendors basically submitted whatever they wanted under the heading of "System ID Tools".



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EAC & State Next Steps

- Validate the voting systems (not just servers)
- EAC work with state and jurisdictions to understand their needs
- Talk with other states to learn their process
 - are there other reasonable paths?
- Work with vendor to understand differences and certified configuration



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References

- [1] Report to U.S. Election Assistance Commission, NSRL, 2004.
<http://www.nsrl.nist.gov/Documents/vote/July132004-EAC.pdf>
- [2] Ohio SOS, System Verification Documentation