

# Certification Test Plan – Modification

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Prepared for:

<b>Vendor Name</b>	Hart InterCivic (Hart)
<b>Vendor System</b>	Verity Voting 2.5
<b>EAC Application No.</b>	HRT-Verity-2.5
<b>Vendor Address</b>	15500 Wells Port Drive Austin, TX 78728

Prepared by:



4720 Independence St.  
Wheat Ridge, CO 80033  
303-422-1566  
[www.SLICompliance.com](http://www.SLICompliance.com)



***Accredited by the Election  
Assistance Commission (EAC)  
for Selected Voting System Test  
Methods or Services***



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## Revision History

Date	Version	Author	Revision Summary
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## 1 INTRODUCTION

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This Modification Certification Test Plan outlines the test approach SLI Compliance will follow when performing Certification Testing on the **Hart Verity Voting 2.5** voting system against the Voluntary Voting System Guidelines 1.0 (VVSG 1.0). **Verity Voting 2.5** is a modification of **Verity Voting 2.4**, certified by the EAC on February 21<sup>st</sup>, 2020, with limited changes. The system will be tested based on the “modified system” requirements, as set forth in section 4.6.2.3 of the “EAC Voting System Testing and Certification Program Manual, version 2.0”. The purpose of this document is to provide a clear understanding of the work SLI will conduct and a detailed plan outlining the test effort.

When the testing is complete, SLI will submit a Certification Test Report that details all test results and findings from the Certification Test effort, as well as a recommendation to the EAC regarding certification.

### 1.1 Description and Overview of the Certified System

This test plan contains a description of the previously certified system, the specific modifications to the current system version, and the impact of those modifications on the system and certification testing.

#### 1.1.1 Definition of the Baseline Certified System

This modification project builds upon the foundation established in **Verity Voting 2.4**, which contains the applications **Verity Data**, **Verity Build**, **Verity Central**, **Verity Count**, and **Verity Relay**, as well as the polling place devices **Verity Controller**, **Verity Scan**, **Verity Print**, **Verity Touch**, **Verity Touch Writer**, and **Verity Touch Writer Duo**

#### 1.1.2 Modifications

**Verity Voting 2.5** is a modification of the EAC certified **Verity Voting 2.4** system.

The modifications to **Verity Voting 2.5** address multiple aspects of the system, including features for all devices and workstations, state specific features, updates to the operating system (OS), security enhancements, inclusion of the Touch Writer Duo Standalone, addition of the Verity Duo Go accessory, as well as associated documentation updates.



The following modifications are implemented in this release:

### **Features for all devices and workstations**

- Windows Embedded Standard 7 OS is being replaced with Windows 10 Enterprise 2019 LTSC.
- Support has been added for the Haitian Creole language.
- The vDrive file and the folder names and paths have been added to the signed and validated content.

### **Wisconsin-specific features**

- Support has been added for the Open Primary logic for the state of Wisconsin. This logic is a combination of Hart's current open primary logic with the addition of a party selector contest.

### **Additional Features for Verity Devices**

#### **All Verity Devices**

- A user may now create a recovery vDrive and export temporary logs to a USB stick during a system alert. These are logs for when a vDrive for the currently loaded election is not present.
- Backup data may now be deleted.
- SQL Server 2012 is replaced with SQLite 3.29.

#### **Features for devices with the thermal report printers**

- Device Tests menu function to send a test page to the thermal roll printer has been renamed "Test report printer."

#### **Features for devices that allow poll workers to activate a ballot**

- If only one precinct-split will appear on the Select Precinct screen, the system shall automatically select it and not present the Select Precinct screen.
- If only one party will appear on the Select Party screen, the system shall automatically select it and not present the Select Party screen.

#### **Features for devices with ballot entry and review**

- An option has been added to require voters to view all contests on the ballot before finishing their voting session. This option is set in Verity Build.

#### **Features for Touch Writer Duo**

- Introduction of Standalone configuration that does not require the use of a Verity Controller. The Touch Writer Duo Standalone configuration is akin to the Touch Writer device and includes a thermal report printer and support for the optional AutoBallot barcode scanner.
- Introduction of the optional Verity Duo Go, a carrier for use with Verity Touch Writer Duo to enable "curbside" voting.
- Device Tests menu function to send a test page to the full sheet thermal



printer is renamed “Test vote record printer.”

### **Features for Verity Scan**

- Scan devices that support PVR scanning now also support standard paper ballot scanning in the same session.
- An option has been added for an automatic duplicate of the vDrive when two vDrives are inserted. This option is set in Verity Build.
- 3G modem support for use with the Relay kit has been removed.
- The single sheet ballot limit per vDrive has been increased to 25,000 to support long early voting events. The Ballot Box limit is unchanged and must be emptied every 4000 sheets.

### **Additional Features for Verity Workstation Software**

#### **Features for All Workstation Software**

- SQL Server 2012 has been replaced with SQL Server 2017.
- TPM 2.0 support has been implemented on Z240 and Z4 G4 workstations.

#### **Features for Workstation Software with Ballot Proofing**

- A new report titled “Translation Proofing Report” has been added to Verity Data and Verity Build.

#### **Features for Verity Data**

- A Party Selector Contest may now be added in an Open Primary election.
- Keyboard shortcut keys have been added for usability and convenience:
  - Select Election screen
    - Alt+O for “Open”
  - Contest Titles screen
    - Alt+O for “Add Office”
    - Alt+P for “Add Proposition”
    - Alt+R for “Add Party Selector”
  - Choices screen
    - Alt+A for “Add Choice”
    - Alt+D for “Delete Choice”
  - Rotation
    - Alt+G for “Generate Indices”
  - Audio screen
    - Alt+I for “Import”
    - Alt+E for “Export”
    - Alt+N for “Normalize”
    - Alt+A for “Normalize All”
    - Alt+C for “Clear Entry”
  - Import screen
    - Alt+I for “Import”
  - Export screen
    - Alt+E for “Export”



## Features for Verity Build

- The following feature enhancements to devices discussed above are settable in Verity Build:
  - A new option to require voters to view all contests on the ballot before finishing their voting session.
  - A new option for automatic duplicate vDrive creation in Verity Scan.
- The Print Queue import now allows write-in text to be defined for each write-in available on the ballot.

## Features for Verity Central

- Support has been added for the scanning of Printed Vote Records. The default Voting Method is set in the election's task.
- Keyboard shortcut keys have been added for usability and convenience:
  - Select Election tab
    - Alt+S for "Save" in the preferences menu
  - Scan tab
    - Enter for "Scan" in the Scan menu
    - Alt+R for "Batch Report" in the Manage Batches menu
    - Alt+T for "Change Type" in the Manage Batches menu
    - Alt+N for "Edit Notes" in the Manage Batches menu
    - Alt+D for "Delete Batch" in the Manage Batches menu
    - Enter for "Search" in the Search Ballots menu
    - Alt+S for "Save" in the Settings menu
    - Alt+T for "Test Scan" in the Settings menu
  - Review Tab
    - Alt+A for "Add Choice" in the Review images menu
    - Alt+C for "Clear Filters" in the Review images menu
    - Alt+R for "Refresh List" in the Review images menu
    - Alt+P for "Print List" in the Review images menu
    - Alt+A for "Accept" in the Review Images menu (Ballot Review)
    - Alt+R for "Revert" in the Review Images menu (Ballot Review)
    - Alt+P for "Previous" in the Review Images menu (Ballot Review)
    - Alt+N for "Next" in the Review Images menu (Ballot Review)
    - Alt+Left Arrow for "Previous Unresolved" in the Review Images menu (Ballot Review)
    - Alt+Right Arrow for "Next Unresolved" in the Review Images menu (Ballot Review)
    - ESC for "Return to Page View" in the Review Images menu (Ballot Review)

## Corrected Defects

The following defects found in Verity 2.4 have been corrected in the Verity Voting 2.5 modification:



Product	Description of Verity Voting 2.3 Defect	Resolution/Results In Verity Voting 2.4
Verity Count	The application does not save an update to a write-in name on the Write-in Candidate screen UI if the change made is only to the case of the alphabet (i.e. uppercase, lowercase).	The name change is now properly saved, even when the change is only to case of the alphabet.

### 1.1.3 Initial Assessment of Impact of the Modifications

Review of the modifications listed in section 1.1.2 indicates the need for hardware testing, as well as limited Physical and Functional Configuration Audits, in order to verify that the system continues to meet VVSG 1.0 requirements.

A full suite of EMC/EMI hardware tests shall be performed on the **Verity Touch Writer Duo Standalone**. As the **Verity Touch Writer Duo Standalone** hardware configuration is nearly identical to the certified **Verity Touch Writer Duo**, operational and non-operational environmental hardware testing will not be performed on the **Verity Touch Writer Duo Standalone**.

All software and firmware modifications will be verified by execution of elections that incorporate steps to verify the modifications, or via test suites designed to specifically focus on the functional changes made to the applicable devices and applications.

### 1.1.4 Regression Testing

The limited FCA will consider functions that have not changed but may be impacted by the modifications. Each modified component of the system will require a new build. This will be subjected to FCA review at an appropriate level of scrutiny.

All modified components of **Verity Voting 2.5** will be regression tested in order to verify continued compliance to VVSG 1.0. Additionally, end-to-end system level general and open primary elections will be performed to verify proper system operation.

## 1.2 References

The following key documents were used in preparing this Modification Test Plan:

1. Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG), Version 1.0 Volumes I and II.
2. NIST Handbook 150: 2016.
3. NIST Handbook 150-22: 2017.
4. EAC Voting System Testing and Certification Program Manual, United States Election Assistance Commission, v 2.0, May 2015.



5. SLI VSTL Quality System Manual, Rev. 3.2, prepared by SLI, dated June 8<sup>th</sup>, 2020.

### 1.3 Attachments

The following attachments apply to this Modification Test Plan:

1. Attachment A - Hart Verity 2.5 EAC Electrical Hardware Test Plan v1.0

### 1.4 Terms and Abbreviations

The following terms and abbreviations will be used throughout this document:

**Table 1 – Terms and Abbreviations**

Term	Abbreviation	Description
American Association for Laboratory Accreditation	A2LA	A nonprofit, non-governmental, public service, membership society whose mission is to provide comprehensive services in laboratory accreditation and laboratory-related training.
Ballot Marking Device	BMD	An accessible computer-based voting system that produces a marked ballot (usually paper) that is the result of voter interaction with visual or audio prompts.
Compact Flash card	CF	This is a type of flash memory card in a standardized enclosure often used in voting systems to store ballot and/or vote results data.
Compact Flash AST	CFAST	A compact flash media based on the Serial ATA bus rather than the Parallel ATA bus, used by the original CompactFlash.
Commercial Off the Shelf	COTS	Term used to designate computer software, hardware or accessories that are ready-made and available for sale, lease, or license to the general public.
Direct Recording Electronic	DRE	Voting systems that, using Touch Screen or other user interfaces, directly record the voter's selections in each race or contest on the ballot in electronic form.
Election Assistance Commission	EAC	An independent, bipartisan commission created by the Help America Vote Act (HAVA) of 2002 that operates the federal government's voting system certification program.
Election Management System	EMS	Typically, a database management system used to enter jurisdiction information (district, precincts, languages, etc.) as well as election specific information (races, candidates, voter groups (parties), etc.). In addition, the EMS is also used to layout the ballots, download the election data to the voting devices, upload the results and produce the final results reports.



Term	Abbreviation	Description
Electromagnetic Compatibility / Electromagnetic Interference	EMC/EMI	The goal of EMC/EMI is to validate the correct functioning of different equipment in the same environment and the avoidance of any interference effects between them.
Functional Configuration Audit	FCA	The testing activities associated with the functional testing of the system.
National Institute of Standards and Technology	NIST	A non-regulatory federal agency within the U.S. Dept. of Commerce. Its mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.
National Voluntary Laboratory Accreditation Program	NVLAP	A division of NIST that provides third-party accreditation to testing and calibration laboratories.
Physical Configuration Audit	PCA	The testing activities associated with the physical aspects of the system (hardware, documentation, builds, source code, etc.).
Precinct Count Scanner	PCS	A digital scanner is a mark sense-based ballot and vote counting device located at a polling place and is typically operated by scanning one ballot at a time.
Request For Interpretation	RFI	A means used by testing laboratories and manufacturers to request that the EAC provide an interpretation of a technical issue related to testing of voting systems.
Requirements Matrix	N/A	A matrix that traces the VVSG requirements to the various test modules and test methods.
Technical Data Package	TDP	The data package supplied by the vendor, which includes Functional Requirements, Specifications, End-user documentation, Procedures, System Overview, Configuration Management Plan, Quality Assurance Program, and manuals for each of the required hardware, software, firmware components of a voting system.
Test Method	TM	SLI proprietary documents which are designed to group sets of EAC VVSG requirements in a logical manner that can be utilized to more efficiently validate where and how requirements, or portions of a requirement, are met.
Validation	No Abbreviation	Confirmation by examination and through provision of objective evidence that the requirements for a specific intended use or application have been fulfilled (ISO 9000).



Term	Abbreviation	Description
Verification	No Abbreviation	Confirmation by examination and through provision of objective evidence that specified requirements have been fulfilled (ISO 9000).
Verity vDrive	vDrive	Media used for transportation of voting system data.
Voluntary Voting System Guidelines	VVSG	A set of specifications and requirements against which voting systems can be tested to determine if the systems provide all of the basic functionality, accessibility and security capabilities required for EAC certification.
Voter Verifiable Paper Audit Trail	VVPAT	An independent verification system for voting machines designed to allow voters to verify that their vote was cast correctly, to detect possible election fraud or malfunction, and to provide a means to audit the stored electronic results.
Voting System Test Lab	VSTL	An independent testing organization accredited by NVLAP and the EAC to conduct voting system testing for EAC certification.

## 1.5 Testing Responsibilities

The subsections below describe the project responsibilities.

### 1.5.1 Owner Assignments

- System analysis and review will be conducted by Source Code Review, Security and Voting Test Engineers, with oversight by the Test Manager.
- Source code review will be conducted by Voting Test Engineers (Source Code Review Specialists), with oversight by the Test Manager.
- Documentation review will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.
- Test module development will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.
- Test suite development will be conducted by Security and Voting Test Engineers, utilizing SLI's formal Test Methods, with oversight by the Test Manager.
- Formal test execution will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.
- Third party testing will be conducted by the subcontracting third party hardware laboratories, with oversight by the Hardware Test Engineer.



## 1.5.2 Project Schedule

The following schedule outlines the expected timeline for this project:

ID	Notes	Task Name	Start	Finish
1		<b>Hart Verity Voting 2.5 EAC Certification Project Plan</b>	<b>Wed 4/15/20</b>	<b>Wed 10/14/20</b>
2		<b>Phase 1 Initiation</b>	<b>Wed 4/15/20</b>	<b>Mon 8/17/20</b>
3		<b>Project Initiation</b>	<b>Mon 5/11/20</b>	<b>Mon 5/11/20</b>
5		<b>TDP Delivery/Receive Vendor Package</b>	<b>Wed 4/15/20</b>	<b>Mon 6/15/20</b>
21		<b>TDP Review</b>	<b>Thu 4/16/20</b>	<b>Fri 7/17/20</b>
70		<b>FCA Assessment</b>	<b>Tue 7/7/20</b>	<b>Fri 7/10/20</b>
75		<b>Hardware</b>	<b>Fri 6/12/20</b>	<b>Wed 6/17/20</b>
83		<b>Test Plan Development</b>	<b>Mon 6/22/20</b>	<b>Mon 8/17/20</b>
90		<b>Phase 2 Trusted Build</b>	<b>Mon 5/18/20</b>	<b>Wed 6/17/20</b>
91		<b>Trusted Build</b>	<b>Tue 5/26/20</b>	<b>Wed 6/3/20</b>
98		<b>Test Readiness Review (TRR)</b>	<b>Mon 5/18/20</b>	<b>Wed 6/17/20</b>
109		<b>Phase 3 Hardware Testing</b>	<b>Thu 7/2/20</b>	<b>Thu 7/30/20</b>
110		<b>Hardware Test Execution</b>	<b>Thu 7/2/20</b>	<b>Thu 7/30/20</b>
115		<b>Phase 4 Create/Validate</b>	<b>Wed 6/17/20</b>	<b>Mon 7/13/20</b>
116		<b>Test Suite Development</b>	<b>Wed 6/17/20</b>	<b>Fri 6/19/20</b>
118		<b>Vendor Specific Module and Suite Creation/Validation</b>	<b>Fri 6/19/20</b>	<b>Mon 7/13/20</b>
176		<b>Phase 5 Official Execution</b>	<b>Mon 7/13/20</b>	<b>Fri 8/7/20</b>
177		<b>Official Test Execution of Test Suites</b>	<b>Mon 7/13/20</b>	<b>Fri 8/7/20</b>
234		<b>Phase 6 Reporting to EAC</b>	<b>Fri 8/7/20</b>	<b>Wed 9/30/20</b>
235		<b>Certification Test Report and Final Test Plan</b>	<b>Fri 8/7/20</b>	<b>Mon 9/28/20</b>
243		<b>Delivery of Artifacts to EAC Repository</b>	<b>Mon 9/28/20</b>	<b>Wed 9/30/20</b>
245		<b>Phase 7 Completion</b>	<b>Mon 9/28/20</b>	<b>Wed 10/14/20</b>
246		<b>Return Equipment to Vendor</b>	<b>Mon 10/12/20</b>	<b>Wed 10/14/20</b>
249		<b>Archive Test Materials</b>	<b>Mon 9/28/20</b>	<b>Tue 9/29/20</b>
251		<b>Project Management</b>	<b>Wed 4/15/20</b>	<b>Wed 10/14/20</b>
252		<b>Project Management Hours</b>	<b>Wed 4/15/20</b>	<b>Wed 10/14/20</b>

## 1.5.3 Test Module Development and Validation

Test Modules will be developed and/or modified to provide repeatable detailed test steps. The Modules are defined at a basic level in SLI's formal Test Methods and are designed for use in any suite that employs their functionality. This reusability reduces the development time associated with creating Modules. The Modules will be validated prior to formal test execution to ensure accurate testing of the voting system. Additionally, the Test Modules will provide traceability to SLI's formal Test Methods, as well as the VVSG 1.0 requirements.

## 1.5.4 Test Suite Development

Test Suites will be developed to group and focus testing around key areas of the voting system. Each Test Suite will contain multiple test modules providing clear and traceable test scripts and information. Potentially, variations of the same suite may be run multiple times to verify different configurations.



### 1.5.5 Trusted Build

Prior to formal test execution, a Trusted Build will be performed, producing software and firmware components for **Verity Data, Verity Build, Verity Central, Verity Count, Verity Print, Verity Controller, Verity Touch, Verity Touch Writer, Verity Touch Writer Duo, Verity Touch Writer Duo Standalone, Verity Scan, and Verity Relay** in order to include modifications made to those applications.

### 1.5.6 Formal Test Execution

Formal test execution of the validated Test Suites and modules will be conducted against the declared voting system, to verify the system’s compliance with the VVSG 1.0 requirements.

### 1.5.7 Third Party Hardware Testing

Hardware testing will be conducted by 3rd Party accredited hardware test laboratories to verify the voting system devices are compliant with the VVSG 1.0 hardware requirements.

#### Other Labs Performing Non-Core Hardware Testing

SLI Compliance is responsible for all core voting system tests as identified in the NIST NVLAP Handbook 150-22 (2017). The labs listed below will perform non-core hardware testing for this certification test campaign.

**Table 3 – Lab(s) Performing Hardware Testing**

Laboratory	Address	Test(s)	Date(s)
NTS EMC / EMI	1736 Vista View Dr. Longmont, CO 80504	<b><u>EMC / EMI Tests:</u></b> Radiated Emissions, Conducted Emissions, ESD, Electromagnetic Susceptibility, Electrical Fast Transient, Lightning Surge, Conducted RF Immunity, Magnetic Fields Immunity, Electrical Power Disturbance	TBD

Please see “Attachment A - Hart Verity 2.5 EAC Electrical Hardware Test Plan v1.for more information regarding hardware testing that will be performed.

### 1.5.8 EAC & Manufacturer Dependencies

The Test Plan will require **EAC** approval prior to finalization.

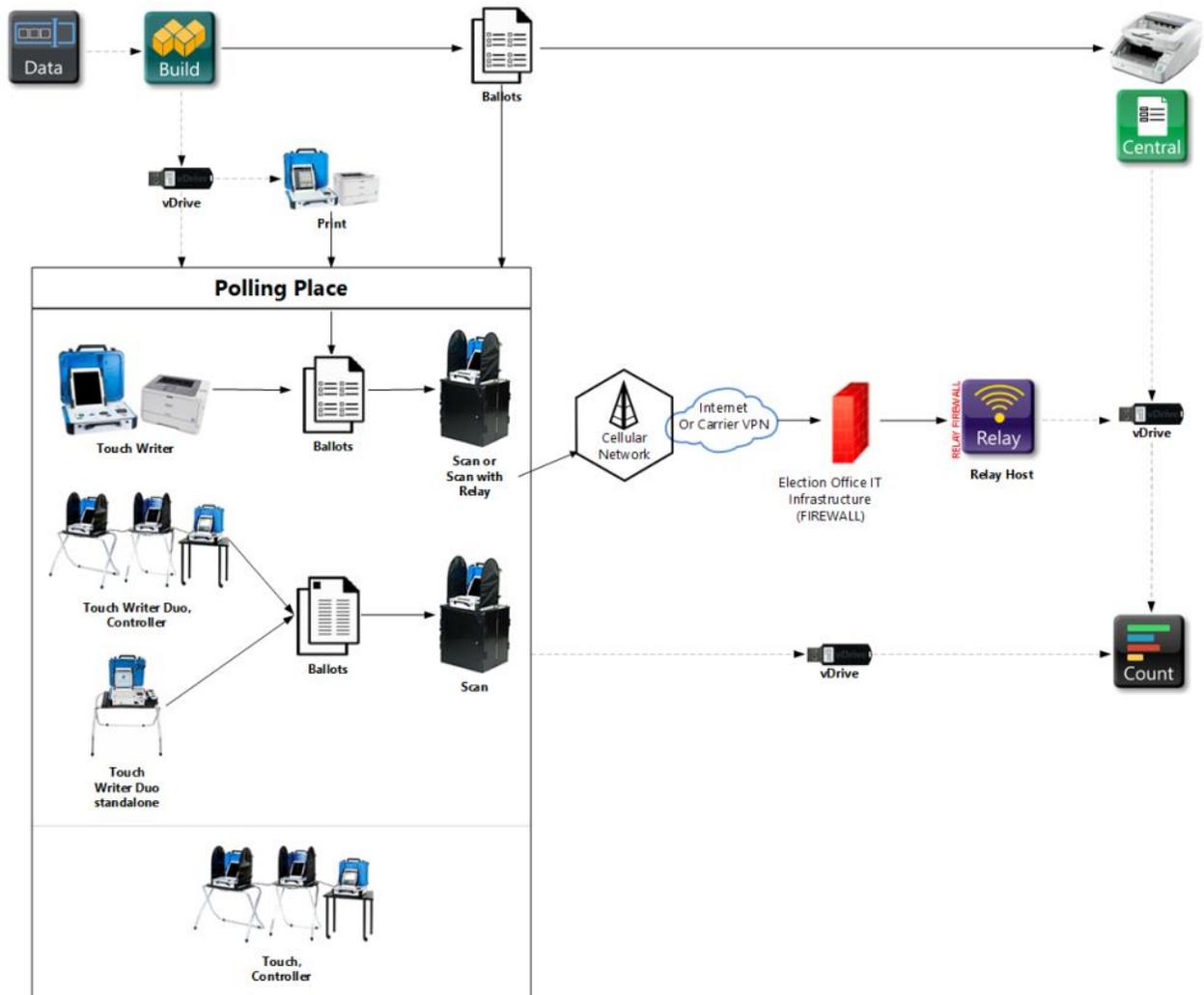
**Hart** will be required to provide all source code, documentation, equipment and supporting materials identified as part of the voting system.

The source code must have all discrepancies resolved, be able to be built successfully, and installed.

In addition, **Hart** is required to provide training on the voting system and support throughout the life of the project.

## 1.6 Scope of Testing

### 1.6.1 Block Diagram



Overview of the diagram:

- The components are displayed as touch points of data access, transfers, and verification.
- Dotted lines show the flow of data and air gaps using vDrives and are also used to separate the deployment models shown within the polling place.
- Verity Print is a ballot production device that provides unmarked printed



- ballots.
- Verity Touch Writer and Scan may be installed in polling places to support paper-based voting.
  - Verity Controller, Touch Writer Duo, Touch Writer Duo Standalone, and Scan may be installed in polling places to support paper-based voting.
  - Verity Controller and Touch may be installed in polling places to support DRE voting.
  - Verity Relay is a remote transmission software application that receives election data transmissions sent by Verity Scan devices equipped with an optional Relay modem accessory.
  - Verity Key (not shown) is required for user access into components to load elections, to use critical features, and to generate reports. Feature access depends on the roles applied to user accounts.

### 1.6.2 EAC Request For Interpretation

This Certification Test Plan and the execution of tests for the voting system identified in this plan does not include any new EAC Request for Interpretation.

### 1.6.3 EAC Notices of Clarification

This Certification Test Plan and the execution of tests for the voting system identified in this plan does not include any new EAC Notices of Clarification.

## 2 PRE-CERTIFICATION TESTING AND ISSUES

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### 2.1 Evaluation of prior VSTL testing

Prior VSTL testing has been performed on predecessor versions of the **Hart Verity Voting 2.5** voting system. A full test campaign was done by SLI during the **Verity Voting 2.0** EAC certification project. The **Verity Voting 2.4** release, which was VSTL tested and EAC certified, constitutes the main code base used for the **Verity Voting 2.5** release.

### 2.2 Evaluation of prior non-VSTL testing

No prior state or non-VSTL lab testing has been performed on the **Hart Verity Voting 2.5** voting system. Review of Hart's internal testing will be performed during the FCA review.

### 2.3 Known Field Issues

Review of the "Known Vulnerabilities" database, maintained by SLI, has provided no known vulnerabilities that relate to the modifications implemented in **Verity Voting 2.5**.



## 3 MATERIALS REQUIRED FOR TESTING

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Any materials that are used in an election cycle must be provided to SLI to facilitate testing of the voting system. This section outlines these required materials.

### 3.1 Software/Firmware

All software and firmware that is to be used by the declared voting system, whether directly or indirectly, in a production environment, must be validated during the certification process.

The following software/firmware is required. This includes all supporting software such as operating systems, compilers, assemblers, application software and firmware, any applications used for burning of media, transmission of data or creation/management of databases.

#### 3.1.1 Hart Verity Voting 2.5 Software/Firmware

Hart Verity Voting 2.5 voting system consists of the following software and firmware components:

- **Verity Data** EMS software
- **Verity Build** EMS software
- **Verity Central** high-speed optical scanner software
- **Verity Count** central count location tabulation and reporting software
- **Verity Relay** data transmission software
- **Verity Scan** optical scanner firmware
- **Verity Touch Writer** BMD firmware
- **Verity Touch Writer Duo** BMD firmware
- **Verity Touch Writer Duo Standalone** BMD firmware
- **Verity Controller** firmware
- **Verity Touch** DRE firmware
- **Verity Print** printer firmware
- **Verity** device microcontroller firmware for **Verity** devices

Note: Versions for each will be available after execution of the Trusted Build and will be listed in the Test Report.

#### 3.1.2 COTS Software/Firmware

This section details the Commercial Off The Shelf software and firmware utilized within the **Verity Voting 2.5** system.



**Table 2 – COTS Software/Firmware**

Manufacturer	Application	Version	Verity Voting 2.5 Component
Microsoft	Windows 10 Enterprise 2019 LTSC	10.0.17763	Data/Build, Central, Count, Relay, Print, Scan, Touch Writer, Touch Writer Duo, Touch Writer Duo Standalone, Controller, Touch, Touch with Access
Microsoft	Microsoft SQL Server Standard 2017	14.0.1000.169	Data/Build, Central, Count, Relay
Microsoft	SQLite	3.28.0	Print, Scan, Touch Writer, Touch Writer Duo, Touch Writer Duo Standalone, Controller, Touch, Touch with Access
McAfee	McAfee Application Control for Devices (“Solidifier”)	8.2.1-143	Data/Build, Central, Count, Relay, Print, Touch Writer, Touch Writer Duo, Touch Writer Duo Standalone, Controller, Touch, Touch with Access
Nuance Communications	Nuance Western OCR, Desktop, OEM	V20	Verity Scan

### 3.1.3 Additional Supporting Test Software

This section outlines all test specific software that will be used in the certification campaign.

**Table 3 – Additional Supporting Test Software**

Manufacturer	Application
<u>LocMetrics</u>	<u>LocMetrics Line Counter</u> , a commercial application used to determine the counts of executable and comment lines.
SLI	<u>Module Finder</u> , a SLI proprietary application used to parse module names from C/C++, Java and VB code and populate the identified module names into the review documents.
SciTools	<u>Understand</u> : a customizable integrated development environment used for static code analysis.

## 3.2 Equipment

The following equipment is required for the execution of the hardware, software, and security tests. This includes system hardware, general purpose data processing and communications equipment, and any test instrumentation required.

### 3.2.1 Hart Verity Voting 2.5 Equipment

The following **Hart Verity Voting 2.5** equipment will be used in testing:



**Table 4 – Hart Verity Voting 2.5 Equipment**

Hardware
Verity Controller
Verity Print
Verity Scan (digital scanner)
Verity Touch (DRE)
Verity Touch Writer (BMD)
Verity Touch Writer Duo (BMD)
Verity Touch Writer Duo Standalone (BMD)

### 3.2.2 COTS Equipment

The following Commercial Off-the-Shelf equipment will be used in testing:

**Table 5 – COTS Equipment**

Manufacturer	Hardware	Model
OKIDATA (for <b>Verity Data, Verity Build, Verity Central, Verity Count, Verity Relay, Verity Print, and Verity Touch Writer</b> )	Ballot and Report Printer	B432dn
OKIDATA (for <b>Verity Data, Verity Build, and Verity Print</b> )	Ballot Printer	C844dn
OKIDATA (for <b>Verity Data and Verity Build</b> )	Ballot Printer	C931e
Various (for <b>Verity Data, Verity Build, Verity Central, Verity Count, Verity Relay</b> )	Intel-Windows Workstation ( <b>Minimum Requirements</b> ) Processor – x86-compatible, 3.0GHz, Quad Core Memory – 32GB Hard Drive – 2 x 1 TB RAID-Level 1, Removable w/ key lock Ethernet Port – 100Mb/1Gb USB Ports – 4 ports Video Card - Integrated Graphics Keyboard - USB Keyboard Mouse - USB Mouse	
Various (for <b>Verity Data, Verity Build, Verity Central, Verity Count, Verity Relay</b> )	<b>Verity Display (Minimum Requirements)</b> Panel Size - 50.8 cm Aspect Ratio - Widescreen (16:9) Optimal Resolution - 1600 x 900 at 60Hz Contrast Ratio - 1000: 1 Brightness - 250 cd/m2 (typical)	
Canon (for <b>Verity Central</b> )	Ballot Scanner	DR-G1100 DR-G1130



Manufacturer	Hardware	Model
		DR-G2110 DR-G2140

### 3.3 Test Materials

The following test materials are required for the performance of testing including, as applicable, test ballot layout and generation materials, test ballot sheets, test ballot cards and control cards, standard and optional output data report formats, and any other materials used in testing.

- Ballots & blank ballot grade paper
- Thumb drives
- USB dongle
- Ballot marking pens
- Printer paper rolls

### 3.4 Deliverable Documents

The following are documents to be delivered as a part of the **Hart Verity Voting 2.5** system:

- 6641-037 A00\_Verity\_2.5\_Administrators Guide\_Data.pdf
- 6641-038 A00\_Verity\_2.5\_Administrators Guide\_Build.pdf
- 6641-039 A00\_Verity\_2.5\_Administrators Guide\_Central.pdf
- 6641-040 A00\_Verity\_2.5\_Administrators Guide\_Count.pdf
- 6641-041 A00\_Verity\_2.5\_Administrators Guide\_Relay.pdf
- 6641-042 A00\_Verity\_2.5\_System Administrators Guide.pdf
- 6643-008 A00\_Verity\_2.5\_Support Procedures Guide.pdf
- 6651-030 A00\_Verity\_2.5\_Polling Place Field Guide - CDS.pdf
- 6651-031 A00\_Verity\_2.5\_Polling Place Field Guide - SW.pdf
- 6651-032 A00\_Verity\_2.5\_Polling Place Field Guide - CT.pdf
- 6651-033 A00\_Verity\_2.5\_Polling Place Field Guide - SRW.pdf
- 6651-035 A00\_Verity\_2.5\_Verity Print Field Guide.pdf
- 6651-037 A00\_Verity\_2.5\_Polling Place Field Guide - DS.pdf
- 6653-008 A00\_Verity\_2.5\_Device Troubleshooting Field Guide.pdf
- 6673-010 E\_Verity\_Relay Implementation Process.pdf
- All-In-One Code Framework Coding Standards.pdf
- Configuration Management Process 1001074 D01.pdf
- Continual Improvement Process 1000550 E02.pdf
- Control of Nonconforming Product Procedure 1000657 B02.pdf
- Device Configuration Process Document 4005523 B00.pdf
- Device OS Creation and Configuration Process Document Verity 2.5 4005675 A00.pdf



- Device Win10 Creation Process Document Verity 4005676 A00.pdf
- Document Control Procedure 1000538 E06.pdf
- Factory TUV SUD inspection 2019 June report signed.pdf
- Hardware 2005713-CFAST Door Security Kit Design.pdf
- Hardware 3005018-ATI Kit Design.pdf
- Hardware 3005174-AutoBallot Kit Design.pdf
- Hardware 3005350-Scan Design.pdf
- Hardware 3005351-Controller Design.pdf
- Hardware 3005352-Touch Writer Design.pdf
- Hardware 3005353-Touch with Access Design.pdf
- Hardware 3005355-Touch Design.pdf
- Hardware 3005356-Print Design.pdf
- Hardware 3005356-Print Design.pdf
- Hardware 3005358-Standard Booth Design.pdf
- Hardware 3005359-Accessible Booth Design.pdf
- Hardware 3005700-Touch Writer Duo Design.pdf
- Hardware 3005730-Touch Writer Duo Standalone Design.pdf
- Hardware 3005800-Scan Design.pdf
- Hardware 3005801-Accessible Booth With ATI Tray Design.pdf
- Hardware 3005825-Controller Design.pdf
- Hardware 3005852-Touch Writer Design.pdf
- Hardware 3005853-Touch with Access Design.pdf
- Hardware 3005854-Touch Design.pdf
- Hardware 3005856-Print Design.pdf
- Hardware 3005905-Duo Go Design.pdf
- Hardware Design Development Procedure 1000513 D01.pdf
- Hardware PCB Photos.pdf
- Hardware Verification and Validation Process 1000514 D01.pdf
- Hart Safety Certificate U8 17 10 90917 004.pdf
- Hart Safety Certificate U8 090917 0006.pdf
- Hart Secure Ballot Stock Specification 4005526 A01.pdf
- HP Z4 G4 Verity Win10 Workstation Manufacturing 4005670 A00.pdf
- HP Z230 Verity Win10 Workstation Manufacturing 4005674 A00.pdf
- HP Z240 Verity Win10 Workstation Manufacturing 4005673 A00.pdf
- HPQC Test Cases.pdf
- Quality Manual 1000490 D04.pdf
- Record Retention Matrix 1000510 E02.pdf
- Software Design Development Procedure 1000566 D02.pdf
- Software Production 1000551 E01.pdf
- Software Test Design Development 1000508 D02.pdf
- Software Verification and Validation Process 1000560 D02.pdf
- Software Versioning Procedure 1001070 C05.pdf



- SQA Requirements Management Process 1000540 A02.pdf
- Supplier Qualification and Management 1000563 C02.pdf
- The Creation and Configuration of the Access Build Environment 4005517 A01.pdf
- The Creation and Configuration of the MCU Build Environment 4005519 A02.pdf
- The Creation and Configuration of the Trusted Build Environment 4005518 A04.pdf
- Verity 2.5 Implementation Statement 4005668 A00.pdf
- Verity 2.5 Notice of Protected Information 1000781 A00.pdf
- Verity 2.5 TDP Abstract 1000780 A00.pdf
- Verity 2.5 VVSG 1.0 TDP Trace.pdf
- Verity 2.5.X COTS List.pdf
- Verity Airgap Interface Technical Reference 4005512 A02.pdf
- Verity Application Framework TRD 4005634 A00.pdf
- Verity Application Installer Build Process Document Verity 2.5.0 4005672 A00.pdf
- Verity Application Programming Interface Specification 4005604 A04.pdf
- Verity Ballot Creation TRD 4005636 A00.pdf
- Verity Base Station Microcontroller Specification 4005462 A01.pdf
- Verity Build TRD 4005628 A00.pdf
- Verity Central TRD 4005632 A00.pdf
- Verity Coding Standard 4005498 A14.pdf
- Verity Controller TRD 4005624 A01.pdf
- Verity Count TRD 4005629 A01.pdf
- Verity Data TRD 4005627 A00.pdf
- Verity Database Attributes 4005543 C04.pdf
- Verity Device Suite TRD 4005621 A00.pdf
- Verity Election Definition Data TRD 4005639 A01.pdf
- Verity Election Management TRD 4005631 A00.pdf
- Verity Electronics Specification 4005461 A21.pdf
- Verity Entity Relationship Diagram Database - Devices.pdf
- Verity Entity Relationship Diagram Database - Servers (Count Only).pdf
- Verity Entity Relationship Diagram Database - Servers (No Count).pdf
- Verity Key Design 4005514 A02.pdf
- Verity Logging TRD 4005635 A00.pdf
- Verity Omni Modification TRD 4005655 A01.pdf
- Verity Operational Environment 4005515 C14.pdf
- Verity PC Application Framework User Interface Design Document.pdf
- Verity Performance Characteristics 4005497 C03.pdf
- Verity Print TRD 4005626 A00.pdf
- Verity Redstone Modification TRD 4005671 A00.pdf



- Verity Relay Theory of Operations 4005571 A04.pdf
- Verity Risk and Threat Assessment 4005513 C04.pdf
- Verity Scan TRD 4005623 A00.pdf
- Verity Security Requirements 4005464 A07.pdf
- Verity Shared Device User Interface Design Document.pdf
- Verity Software Architecture-Design 4005463 B01.pdf
- Verity Summative Usability Report 4005496 A00.pdf
- Verity Summative Usability Test Plan 4005495 A01.pdf
- Verity Supply Chain PRD 4005302 C01.pdf
- Verity Touch TRD 4005633 A00.pdf
- Verity Touch Writer Duo Base Station Microcontroller Specification 4005638 A00.pdf
- Verity Touch Writer Duo TRD 4005625 A00.pdf
- Verity Touch Writer TRD 4005622 A00.pdf
- Verity User Management TRD 4005630 A00.pdf
- Verity Vote Counting and Cast Vote Records TRD 4005640 A00.pdf
- Verity Voting 2.5 Change Notes 4005669 A01.pdf
- Verity Voting 2.5 Usability Impact Statement.pdf
- Verity Voting National Certification Test Specification 4005527 B03.pdf
- VirTex Q01 Quality Manual Rev R.pdf
- Voting System Implementation and Maintenance 1000745 C02.pdf
- VSTL Product Submission Procedure 1000565 D02.pdf
- Workstation Configuration Process Document Verity 2.5 4005678 A00.pdf
- Workstation Win10 Creation Process Document Verity 2.5 4005677 A00.pdf

## 4 TEST SPECIFICATIONS

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The following are the specifications for testing to be conducted on the **Hart Verity Voting 2.5** system. The specifications contain details on the focus of testing, configuration(s), and the functions to be tested.

### 4.1 VVSG Requirements

#### 4.1.1 Functional Requirements

The **Verity Voting 2.5** modification will be tested to the VVSG 1.0 requirements listed below:

##### Volume I:

- 2.1.1 Security
- 2.1.2 Accuracy
- 2.1.7.1 Functions



- 2.1.7.2 Voting Variations
- 2.1.8 Ballot Counter
- 2.1.9 Telecommunications
- 2.2.2.d Election Programming
- 2.2.3 Ballot and Program Installation and Control
- 2.2.4.a-e Readiness Testing
- 2.2.5 Verification at Polling Place
- 2.3 Voting Capabilities
- 2.3.1.1 Opening the Polling Place (Precinct Count Systems)
- 2.3.3.1.c,d Common Requirements
- 2.3.3.2.b,e-h Paper based System Requirements
- 2.3.3.3.c-e,f,h,j DRE System Requirements
- 2.4.1 Closing the Polling Place (Precinct Count)
- 2.4.2 Consolidating Vote Data
- 3.1.2 Functional Capabilities
- 3.1.3 Alternative Languages
- 3.1.7 Privacy
- 3.2 Accessibility Requirements
- 4.1.1 Accuracy Requirements
- 4.1.5.2 Ballot Reading Accuracy
- 6 Telecommunications Requirements
- 7 Security Requirements

## 4.1.2 Hardware Requirements

### Volume I:

- 4.1 Performance Requirements
- 4.1.2.4 – 4.1.2.12 EMC/EMI Requirements

## 4.1.3 State Specific Modifications

The modification listed under “Wisconsin-specific features” in section 1.1.2 represents a feature Hart designed to satisfy a jurisdictional request made for the State of Wisconsin.

## 4.2 Hardware Configuration and Design

The **Hart Verity Voting 2.5** system, as declared in the application for certification submitted to the EAC, consists of:

- A **Verity Data/Build** workstation to create all election information and election media.
- **Verity Print** is a pre-voting ballot production device that is paired with a COTS printer to produce unmarked paper ballots.



- At the precinct level, **Verity Scan** optical scanners, **Verity Touch DRE** and **Verity Touch Writer BMD**, and **Verity Touch Writer Duo BMD** and **Verity Touch Writer Duo Standalone BMD** configurations are employed.
- The central count location employs a high-speed COTS scanner, in combination with a workstation that utilizes the **Verity Central** software, for tabulation of paper ballots.
- The consolidation, tally and reporting location employs a workstation with **Verity Count** software as well as a printer.
- **Verity Relay** is a remote transmission software application that receives election data transmissions sent by Verity Scan devices equipped with an optional Relay modem accessory.

## 4.3 Test Suite Design

### 4.3.1 Software Functional Test Design and Data

SLI will prepare functional test modules using the operator/user procedures specified in the TDP. Functionality provided by the **Verity Voting 2.5** voting system is exercised in order to verify that each functional component performs as expected. Accept/reject criteria are based on requirements of the VVSG and the system specification documents provided within the TDP. As many of the individual functional components rely on preceding functionality within the system, SLI incorporates system level suites that employ modules that exercise the individual functional components of the system.

Following analysis of the changes incorporated into the **Verity Voting 2.5** voting system, the following test suites will be implemented:

2 Hour Backup – The **Verity Touch Writer Duo Standalone** battery backup will be exercised in order to verify that the hardware is capable of performing for extended periods of time without a connection to auxiliary power in accordance with the VVSG 1.0 requirements.

Accuracy – The **Verity Touch Writer Duo Standalone** will be tested for accuracy in accordance with ballot selections, to meet the minimum number of marks required to determine accuracy as defined in the VVSG 1.0.

Closed Primary Election - The full **Verity Voting 2.5** voting system will be reviewed in order to verify proper integration of the voting system and that all components continue to work as expected with the introduction of the Windows 10 Operating System.

Error Messaging and Recovery – This test suite will focus on the ability of the **Verity Touch Writer Duo Standalone** to generate appropriate error messaging and recovery from error conditions in order to proceed with election functions.

General Election 1 - The full **Verity Voting 2.5** voting system will be reviewed in order to verify proper integration of the voting system and that all components



continue to work as expected with the introduction of the Windows 10 Operating System.

General Election 2 – The full **Verity Voting 2.5** voting system will be reviewed in order to verify proper integration of the voting system and that all components continue to work as expected with the introduction of the Windows 10 Operating System.

Modifications – The modifications to each component and software application will be given focused testing in order to verify that the modifications implemented, and the subsequent Trusted Build of the software, do not adversely affect operations.

Open Primary Election (Wisconsin) – The full **Verity Voting 2.5** voting system will be reviewed in order to verify proper integration of the voting system and that all components continue to work as expected with the introduction of the Windows 10 Operating System. This election definition will also be designed to test the Wisconsin party selector contest method to ensure all Wisconsin specific modifications and functionality are working correctly as documented.

**Verity Central** - The modifications to the **Verity Central** application will be given focused testing in order to verify that the modification implemented with the introduction of the Windows 10 OS does not produce any adverse effects.

**Verity Count** - The modifications to the **Verity Count** application will be given focused testing in order to verify that the modification implemented with the introduction of the Windows 10 OS does not produce any adverse effects.

**Verity Data/Build** - The modifications to the **Verity Data/Build** application will be given focused testing in order to verify that the modification implemented with the introduction of the Windows 10 OS does not produce any adverse effects.

**Verity Relay** - The modifications to the **Verity Relay** application will be given focused testing in order to verify that the introduction of the Windows 10 OS does not produce any adverse effects.

**Verity Touch Writer Duo Standalone** – All software functions and features of the new **Verity Touch Writer Duo Standalone** device will be thoroughly tested.

### 4.3.2 Security Test Suite

The Security Test Suites are SLI's tests for verifying that a voting system will correspond to requirements in VVSG Volume 1, Section 7. These suites incorporate system security provisions, unauthorized access, deletion or modification of data, audit trail data, and modification or elimination of security mechanisms. Security testing will be conducted on all the devices and workstations, with a focus on the modifications from section 1.1.2 that relate to physical security measures, telecommunications, access control, and software/firmware security.

In its security testing SLI identifies the specific threats that are tested for and the associated risk if a flaw or exception is identified in a voting system. The tests used



by SLI are designed to ensure that the voting system meets or exceeds the requirements in the VVSG. In any instance where an anomaly or possible security flaw is identified, the potential risk is reported and evaluated.

## 4.4 TDP Evaluation

SLI is completing an assessment of the deliveries of the Technical Data Package for **Verity Voting 2.5** against the **Verity Voting 2.4** TDP. Any modification to previously reviewed documentation will be evaluated.

SLI will conduct a PCA review of all vendor traced documents submitted for review in the delivery of the **Verity Voting 2.5** TDP. Documents are verified for compliance to the VVSG 1.0, Volume 2, Sections 2.2 through 2.13 and Volume 2, Section 6.6.

## 4.5 Source Code Review

The certification campaign for the **Hart Verity Voting 2.5** voting system includes proprietary software and firmware that have been created/modified by **Hart**. SLI has conducted a source code review of all modified proprietary source code submitted in the delivery of the voting system for compliance to the VVSG 1.0, Volume 2, Section 6.6.

The coding languages involved in the vendor's applications include:

- C
- C++
- C#

Source code review Tools utilized by SLI include:

- LocMetrics Line Counter: a commercial application used to determine the counts of executable and comment lines.
- Module Finder: an SLI proprietary application used to parse module names from C/C++ and VB code and populate the identified module names into the review documents
- Understand: a customizable integrated development environment used for static code analysis.

Any subsequent re-reviews of source code will be the result of fixes to discrepancies identified in the FCA activities.

COTS operating systems and software used in the voting system have been verified as authentic and unmodified in the **Verity Voting 2.5** test campaign.

## 4.6 Trusted Build

The Trusted Build process for Hart Verity 2.5 was devised to allow for the build to be performed remotely under the supervision of a SLI Voting System Test Engineer, to preserve the security of the Hart Trusted Build process, and to maintain SLI's chain



of custody. This process received a single case approval from the EAC. The steps for this process included the following:

- Preparation for the Trusted Build – Reviewed Hart’s procedure for constructing the build platform, verifying the target build platform, and verifying the proper contents of the source code package were extracted to the target build platform via hash codes.
- Execution of the Trusted Build – A Voting System Test Engineer observed Hart perform the Trusted Build, using the step-by-step build procedure to create a pristine build environment. SLI observed the following items throughout the build process:
  - Build environment images at various key points
  - Build environment and file hashes at various key points
  - Build environment hardware characteristics
  - Build results from code compilation and file hashes
  - Final software install files and file hashes
  - Build virtual machine files
- Deliverables to Testing – Upon completion of the Trusted Build, the product installs were created and installed on equipment at Hart’s facility. Each device had a unique serialized security seal applied that was verified by SLI upon receipt. In addition, certain items were sent to the SLI test group:
  - Final software install files
  - Workstation base OS images
  - Workstation product images
  - Build output hash values to validate install files
  - Workstation and device hash files
  - Tamper seal application evidence
  - Build server artifacts
- Final Record Keeping and Archiving Procedures – At the conclusion of the Trusted Build process, SLI completed all final record keeping and archiving procedures at SLI’s facility. This record keeping includes any unique identifiers, results of the build with version numbers and dates, and descriptions of all hashes and images in the repository. Hash files of the build outputs were verified against the hash files obtained from the devices to ensure the contents of the installed images. Tamper seals codes were verified and confirmed to be intact.

## **4.7 Standard VSTL Test Methods and Uncertainty of Test Data Measurement**

This test campaign utilizes Standard VSTL test methods and election specific type test data only.



## 5 TEST DATA

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Test data for the **Hart Verity Voting 2.5** voting system will be compiled such that all functionality declared will be tested to determine conformance to the standards.

### 5.1 Data Recording

SLI will evaluate the system functionality, as described by **Hart** technical documentation, as well as requirements as listed in the EAC VVSG 1.0, and make determinations as to expected results of all data inputs into the **Hart Verity Voting 2.5** voting system. These include:

- Election type
- Precincts of all types
- Districts
- Offices
- Contests
- Candidates
- Parties
- Devices used
- Voting variations employed
- Issues/Referendums
- Votes cast for each candidate/issue/referendum
- Vote consolidation data from one device/level to the next

Testing information will be recorded in the test suites, as well as in test notebooks, which are utilized according to SLI's corresponding standard lab procedure.

### 5.2 Test Data Criteria

SLI will evaluate the system functionality as described by Hart technical documentation, as well as requirements as listed in the EAC VVSG 1.0, and make determinations as to expected output of all data inputs into the **Hart Verity Voting 2.5** voting system. The system's execution shall be measured against the expected results.

## 6 TEST PROCEDURE AND CONDITIONS

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This section describes the test conditions and procedures for execution of test suites. Additionally, this section is used to describe procedures for setting up equipment that will be utilized in the execution of the test suites.



## 6.1 Facility Requirements

Testing will be performed on-site at SLI in Wheat Ridge, Colorado.

Secure labs are available with appropriate power supply and space to accommodate the various configurations defined within this test plan. Temperature/humidity gauges will be employed to determine whether the appropriate conditions exist during testing.

Unless otherwise specified herein, all remaining tests, including system level functional testing, shall be performed at standard ambient conditions:

- Temperature: 64°F - 79°F (17.7°C - 26.1°C)
- Relative Humidity: 20 to 90%
- Atmospheric Pressure: Local Site Pressure

All TDP and test documentation are stored on site at SLI's facility in a secure project directory on SLI's secure "Voting" and "TDP" servers.

Electrical hardware testing for hardware components of the **Hart Verity Voting 2.5** voting system will be performed at either NVLAP or A2LA accredited testing laboratories or at laboratories audited by SLI to NVLAP Handbook 150-22 requirements.

## 6.2 Test Setup

Configurations of **Verity Voting 2.5** will be deployed that conform to each specific test suite's needs. In all instances **Verity Voting 2.5** documentation will be followed in the setup of the configurations.

## 6.3 Test Sequence

While there are no required sequences for performing voting system certification testing and audits, there are prerequisite tasks for some testing. Any needed prerequisites are contained within the suite for that test.

## 6.4 Test Operations Procedures

An inventory has been performed to verify the voting equipment received contains hardware and software elements as defined in the TDP prior to commencement of testing.

Throughout the testing effort, test suites and modules will be marked as follows:

- **Accept** – Test is accepted as successful.
- **Reject** – Test is rejected as unsuccessful.
- **NT** – Not Testable is used for test modules that cannot be completed. For example, if failure of one test modules failure precludes attempting subsequent test modules, the latter will be marked as NT.



Test results **Reject** and **NT** will include comments by the VTS explaining the reason for the result.

Issues encountered during review and testing will be documented on the Discrepancy Report. Test findings showing that an aspect of the voting system does not conform to the requirements of the identified test standard will be marked as Documentation Discrepancies, Source Code Review Discrepancies, Hardware Discrepancies, or Functional Discrepancies.

Issues that are encountered during testing or documentation review but are not addressed by the applicable standard will be added to the Discrepancy report and noted as Informational. The vendor has the option whether to address Informational issues. All responses provided by the vendor are noted in the Discrepancy Report attachment to the Certification Test Report.

## 7 Approval Signatures

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SLI:

A handwritten signature in blue ink, appearing to read 'Traci Mapps'.

Traci Mapps  
Director, SLI Compliance  
July 1<sup>st</sup>, 2020

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End of Verity Voting 2.5 Modification Test Plan

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