Hart InterCivic Verity 1.0

The Hart InterCivic Verity voting system was examined at the Office of the Secretary of State in Austin on September 23-24, 2015. This is the identical system reviewed for the U.S. Elections Assistance Commission (EAC). Its EAC certification # is HRT-Verity-1.0.

The following tables lists the applications/firmware and major hardware components used during the examination.

Product	Application/Firmware	Release #
Verity Build	Election ballot definition validation and election media creation	1.0.3
Verity User Management	Election system user management	1.0.3
Verity Election Management	Election database management system	1.0.3
Verity Desktop	Software used to access the Windows OS - manage computer settings and export software hashes	1.0.3
Verity Central	High speed digital scanner	1.0.3
Verity Count	Central count accumulation and tallying	1.0.3
Verity Scan	Precinct or early-voting ballot scanner (firmware)	1.0.3
Verity Touch Writer w/ Access	Ballot marking device (BMD) w/ accessibility attachment (firmware)	1.0.3

Component/Description	Manufacturer	Model/Part #
Verity Touch Writer/Ballot/Report Printer	OKI	B431d
	OKI	C831dn
	OKI	C911dn
Verity Central Scanner	Canon	DR G1100
	Canon	DR G1130
	Kodak	i5600
Verity Application Workstation	HP	Z230
Ethernet Switch	HP	1405-8G
Verity Tablet	ADLink	2005301
Verity vDrive	Apacer	AH322
Verity Device AC-DC Power Supply	AP Power	VEH60WS24
Verity Device Battery	TOTEX	1005015 U80327
UPS for Touch Writer Printer	EATON	5P1500

For a detailed explanation of the components and applications of the system please refer to the EAC certification test report # HRT-3026-CTR-01 here.

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Findings

- The responses provided for Form-101 are acceptable.

- The system software components listed in Table 1 were built successfully and the file hashes were verified to be correct.

- The prepared test ballots and the manually voted test ballots were recorded and tallied correctly.

- The accessibility devices worked as expected.

- The real-time audit log did not have newline characters which makes it difficult to read. This should be corrected in the next release of the Verity system.

- A "zero totals" report was available on the Verity Central system, but it the system did not require it to be run before proceeding to scan ballots. I recommend that in next release that the system force this to be run.

  A "zero totals" report was required before the Verity Scan precinct would scan ballots.

- The Verity Touch writer monitors the attached printer and will not work if the printer is offline. If a printer is offline, a poll-worker is required to resolve the issue.

  During the examination a ballot was pulled out of the printer prematurely and this caused the Verity Touch Writer to print an additional identical ballot. This potentially could be exploited to cast a duplicate ballot. It is unlikely that a voter would know to do this and be able to insert two ballots into the Verity Scan machine undetected.

- There was a serious problem on the central systems. An error occurred while loading the scanned ballots' cast vote records (CVR's) into the Verity Count system from the vDrive created from the Verity Central system. The Verity Count system displayed "*vDrive format is invalid*" on the screen. There was also an entry written to the Verity audit log. The pertinent portion of the log message reads as follows:

  Exception details: System.Data.SqlClient.SqlException (0x80131904) Received an invalid column length from the bcp client for colid 2.

  The problem stemmed from the fact that some of the voted ballots included both a straight party selection and write-in selection. Apparently, the problem occurred due to the combination of a straight-party selection, a write-in candidate name was entered, and the ballots were adjudicated on the Verity Central system. This resulted in the write-in name taking 100 characters of storage in the database. This happened regardless of the length of the write-in name. This was discovered by examining the CVR record on the vDrive.

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Here is a snippet from the XML file on the vDrive which shows the space padded write-in record:

```
<Options>
  <Option>
    <Id>771850ee-0d03-44f0-a2f9-31a112728918</Id>
    <Value>1</Value>
    <WriteInData>
      <Text>Mickey Mouse                              </Text>
      <ImageId>18ba759707a5484f8b6d77f60ebdbf67</ImageId>
      <WriteInDataStatus>Resolved</WriteInDataStatus>
    </WriteInData>
  </Option>
</Options>
```

The text in yellow was padded with spaces to 100 characters which was the defined size of the database column for the write-in data in Verity Central. The Verity Count database has a defined maximum length of 50 for this column. In layman terms, you cannot squeeze 100 characters (including spaces) into a 50 character field.

Hart performed a root cause analysis to determine that the padding of the write-in was the issue due to the database column mismatch. It was also determined that there are other voting scenarios which would cause the same problem. However, the solution for all scenarios is the same: altering the database column on the Verity Central database from a data type of CHAR to VARCHAR. VARCHAR columns use as many characters as the actual size of the write-in name. No spaces are padded to reach the field's defined maximum size. The Verity Central application code limits a write-in name so that when it is inserted into the database, it cannot be greater that 50 characters.

Note: this problem would not occur if the ballots were adjudicated on the Verity Count system which is an option. Without the database column fix, the ballots would have to be rescanned on the Verity Central system, but adjudicated on the Verity Count system. This is unacceptable.

As suggested, Hart submitted a de minimis software Change Order (CO) request to the EAC to allow a change to the system's installation procedure to alter the database column definition. A de minimis CO allows for the system to retain its EAC certification; a new certification campaign is not required. The CO request was reviewed by the testing lab (SLI Global Solutions) and the EAC, and Hart's request was granted. It is worth noting that the request would not likely have been granted if it involved a change to the application code as this would require a new Trusted Build of the software for the system.

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The SQL scripts used to alter (ALTER command) the database and verify (SELECT command) the change to the column definition are now part of the installation process. The SQL commands used are:

USE Verity
ALTER *TABLE CentralVoteOptionChange ALTER COLUMN CandidateName VARCHAR(100)*

USE Verity
SELECT *DATA_TYPE, CHARACTER_MAXIMUM_LENGTH*
FROM INFORMATION_SCHEMA.COLUMNS
WHERE TABLE_NAME = 'CentralVoteOptionChange' and COLUMN_NAME = 'CandidateName'

Conclusion

Hart should demonstrate to the Secretary of State staff that the transfer of CVR's on the vDrive, which were scanned and adjudicated on the Verity Central, can be uploaded into Verity Count without error. I do not believe a full examination is required. The ballots processed should include a straight-party selection with write-in candidate names as was the case for the September examination.

If the database column mismatch fixed by the ALTER command solves the problem with the corrupted vDrive, then I believe the system meets the requirements of the Texas Election Code, and I recommend certification.

Tom Watson
Examiner