Voting System Examination of Election Systems & Software EVS 6.3.0.0

Brian Mechler, Technical Examiner
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1 Background

An examination of the Election Systems & Software (ES&S) EVS 6.3.0.0 voting system was conducted at the Texas Secretary of State Elections Division offices on January 24-25 and March 31, 2023. EVS 6.3.0.0 is a comprehensive voting system which can consist of a subset of the following components [1-3]:

ExpressTouch - a direct recording electronic (DRE) voting device which supports electronic vote capture (for use in Texas only as a curbside voting device)

DS200 (HW 1.2, 1.3, 1.3.13) - a digital scanner and tabulator for use in the polling place

DS300 - a digital scanner and tabulator for use in the polling place

DS450, DS850, DS950 - central scanners and tabulators

ExpressVote (HW 1.0 & 2.1) - a ballot marking device (BMD) that provides a touch screen interface and printer

Electionware - a suite of end-to-end election management software applications

ExpressLink - a standalone application that interfaces with voter registration (e.g. electronic pollbook) systems and the ExpressVote Activation Card Printer

Event Log Service – a service which monitors and logs users' interactions with the Election Management System (EMS)

ExpressVote Activation Card Printer - a small thermal printer used to print the ballot activation code on the vote summary card

PaperBallot – a ballot layout editor

Removable Media Service - a utility that runs in the background of the Windows operating system used for media validation purposes

Toolbox – a software suite run on non-EMS workstations

Regional Results – a standalone application used to transmit preliminary unofficial results from regional sending sites to jurisdiction headquarters over the jurisdiction's dedicated network

Configuration options are presented in detail in [3]. The Election Assistance Commission (EAC) certification includes tables that describe the voting system software components, voting system platforms, hardware components, and system limits [2].

The Secretary of State obtained the software and firmware images used in the EAC certification directly from the EAC Voting System Test Laboratory (VSTL). ES&S personnel used those same files to perform installation under the supervision of the examiners. In [4]-[19], ES&S provides instructions for the identification and verification of the components included in EVS 6.3.0.0.

The examination also consisted of a vendor presentation, accessibility tests, a mock election, and a free-form session where examiners could ask follow-up questions and perform ad-hoc testing of the voting system. I did not witness the accessibility tests; those results will be presented in other examiners' reports.

This report will focus on the changes between EVS 6.2.0.0 and EVS 6.3.0.0. Examiners' reports on EVS 6.2.0.0 can be found in [20] and previous certification exam reports of ES&S systems can be found in [21].

2   Election Management System

The election management system (EMS) is a set of servers, workstations, and software which provides an end-to-end system for jurisdictions to define, manage, configure, export, tabulate, and report elections.

When EMS hardware is networked together is must be done in a closed network environment. In [22], ES&S defines a closed network environment as consisting of "a stand-alone server used for the specific purpose of using the Election Management System (EMS), with restricted access to specific workstations and no connection to any other network. Only EMS components are allowed on this network, and any voting system component at a precinct voting site is forbidden from being connected." Best practices for physically securing the EMS workstation and server hosts are found in [23].

Changes between EVS 6.2.0.0 and 6.3.0.0 include [24]:

• Dell PowerEdge T440 and R540 were added to the list of approved servers

• Dell Latitude 5520 and OptiPlex XE3 were added to the list of approved workstations

• "Renamed 'DS200' labels to 'Poll Place Count'"

• "Increased Precinct ID limit from 9900 to 9999"

• "Enabled adjudication of write-ins on the vote summary card in Ballot Review in the Electionware Reporting module"

2.1 Observations

During the examination, the EMS was run in a standalone workstation configuration. No major issues were observed.

3 Voting Devices

Voters interact with EVS 6.3.0.0 voting devices via touchscreens and/or accessibility peripherals. Devices in scope of this exam include the ExpressVote (HW 1.0 and 2.1) BMDs and the ExpressTouch DRE. The ExpressTouch is only used for curbside voting in Texas. The ExpressVote XL was not included in the scope of certification in Texas with EVS 6.3.0.0. Best practices for physically securing these devices can be found in [23].

There was only one major change to voting devices between EVS 6.2.0.0 and 6.3.0.0 [24]: "Added configurable options for printing the contest and candidate names in English and the voter's selected language on vote summary cards."

3.1 Observations

Examiners observed the installation of firmware, Election Qualification Codes (EQCs), and election definitions on the ExpressTouch, ExpressVote HW 1.0, and ExpressVote HW 2.1.

During the mock election on Jan-25 there was an issue with the thermal coating on some of the card stock used for the vote summary cards. As a result the ExpressVote could not perform its check of voter selections against the information encoded in the barcodes.

Subsequent to the January exam, ES&S reviewed the bad batch of ballot cards and reported that they had not been stored or transported properly prior to the exam. Unfortunately this issue was seen again during the follow-up exam on Mar-31; however, on that day only the first few cards out of the pack suffered from printing issues.

Proper storage and handling of ballot stock for EVS 6.3.0.0 can be found in [25]. Jurisdictions should take great care to make sure card stock is stored and handled according to best practices. They should also take note of the 3-year shelf life.

Figure 1 shows the screen presented to the voter when the barcode(s) could not be read by the ExpressVote. This messaging is sub-optimal, the machine should not direct anyone to spoil a ballot. That decision should be left to the discretion of the voter, poll worker, or election judge. Fortunately, the messaging on this error screen is configurable. Those performing the coding of elections, including ES&S, should carefully review and craft instructional messaging to avoid confusion.
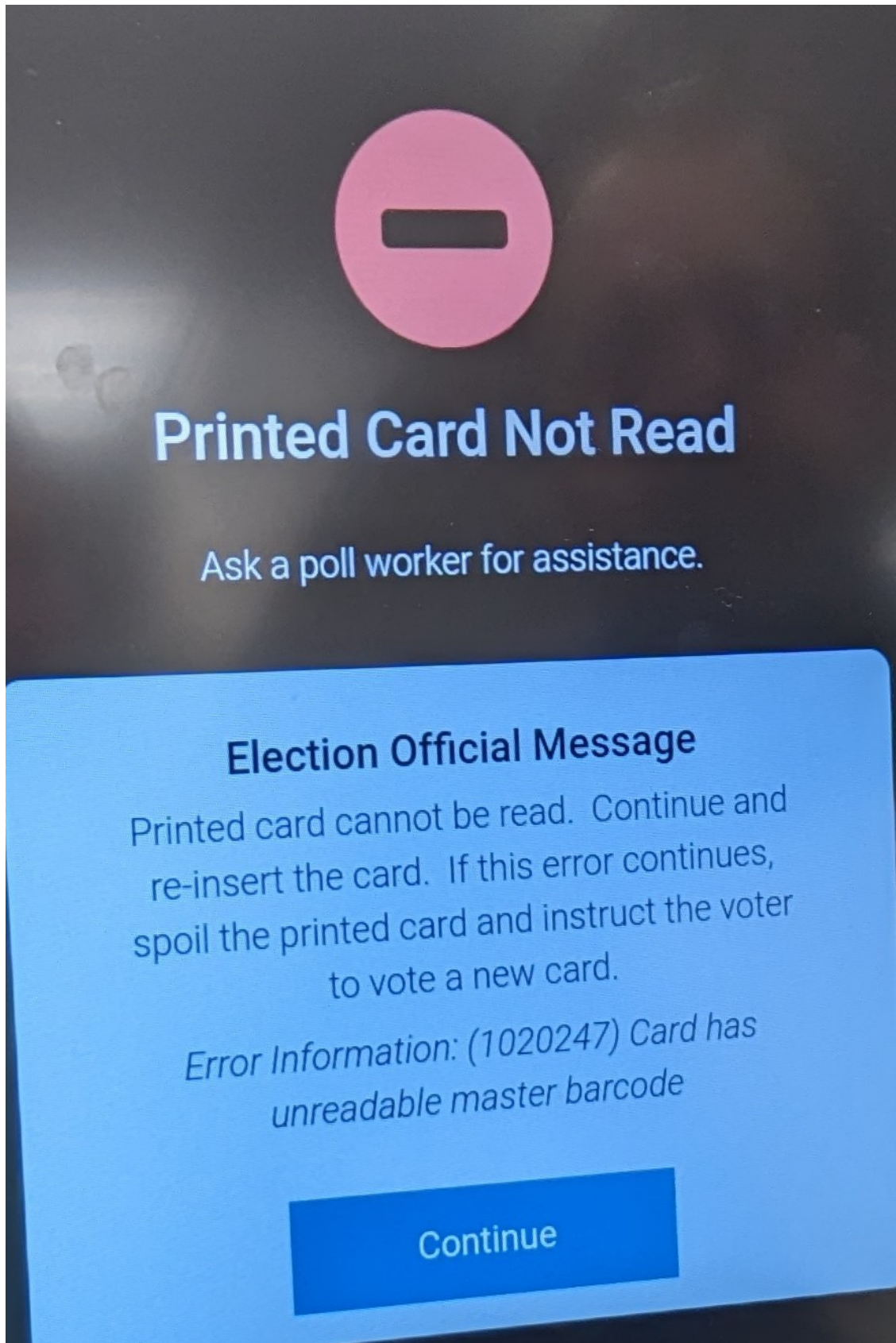
Figure 1: Unreadable Barcode Error Screen

4   Scanners

The scope of EVS 6.3.0.0 includes two precinct scanner options (DS200 and DS300), and three options for central scanners: DS450, DS850, and DS950. All scanners are capable of scanning both hand-marked paper ballots and the vote summary cards produced by the BMDs. The DS950 is the intended replacement for the DS850, and the DS300 is the intended replacement for the DS200. Best practices for physically securing these devices are found in [23].

Changes to scanners between EVS 6.2.0.0 and 6.3.0.0 include [24]:

- Updated monitor with new video control board on DS450 and DS950

- Added reverse belt assembly to DS450

- Added output tray stops for 19" ballots on DS450

- Added risk-limiting audit number printer to DS950

- Added cutout for future imprinter location on DS950

- Added configuration option to use Brother printer for report printing on DS450 and DS950

- Added configuration option to use CyberPower uninterruptible power supply with DS450 and DS950

- Internal ethernet cable is now an optional configuration for DS450 and DS950

- Updated the DS200 operating system to Yocto Linux

4.1 Observations

Examiners observed the installation of firmware and election definitions on the scanning devices. The scanners were used to scan and tabulate ballots during the mock election and ad-hoc testing. There were no issues with accuracy. Ballot boxes for the precinct scanners met the State of Texas requirements on locking mechanisms.

An issue was found with the DS300. Placing a second ballot on the scanner feed tray while another ballot was being processed caused a paper jam with a misleading error message stating, "Your ballot has been counted but it didn't drop into the ballot box." In this case the first ballot was counted and *did* drop into the ballot box, and the second ballot which was still stuck had not been counted. If a poll worker followed the instructions on the screen, they would improperly deposit the second, stuck ballot in the box causing discrepancies during the reconciliation process.

ES&S determined that the DS300 imprinter was the root cause of this issue, and that removing the imprinter would fix the issue (removing the imprinter cartridge changes the behavior of the paper feed rollers in the scanner). During the Mar-31 follow-up, examiners confirmed that removing the imprinter prevented the second ballot from being fed into the scanner. The purpose of the imprinter is to place an audit number on the ballot as it is being scanned. However, risk-limiting audits can be performed without this feature, and printing to a ballot between voter review and placement in the ballot box could create a negative public perception of the voting process. I recommend that any certification orders

place a condition on the DS300 that it may not be used with the imprinter cartridge installed. Since the imprinter cartridge is a consumable sold by ES&S, it should not be delivered nor included in any sales contracts with jurisdictions.

5 ExpressLink and ExpressVote Activation Card Printer

The ExpressLink is a standalone software application that interfaces with electronic pollbooks and the ExpressVote Activation Card Printer. The ExpressVote Activation Card Printer prints a bar code at the top of a vote summary card that encodes the ballot style that the voter should receive. The voter subsequently uses the pre-printed vote summary card to activate their own voting session on the ExpressVote BMD.

The ExpressVote Activation Card Printer also provides a mechanism for marking a ballot as provisional and preventing it from being accepted as a regular ballot by the precinct scanner.

5.1 Observations

Use of the ExpressLink and ExpressVote ActivationCard printer was not observed during this exam. Based on the functionality described in the ES&S technical data package (TDP), large polling places which serve voters from more than one precinct may benefit from these devices since they will reduce the workload on poll workers and increase voter throughput.

6 Toolbox

Toolbox includes a set of software utilities that can be used alongside the Electionware EMS. It includes modules to create test decks, convert text to speech, prepare USB media, and convert election data formats.

6.1 Observations

Use of the Toolbox modules was not demonstrated. Toolbox should never be installed on the same host as the Electionware EMS. Since USB media may be introduced into this outside system, I recommend precincts physically secure the host running Toolbox according to the same best practices outlined by ES&S for Electionware workstations. Furthermore, the hosts running Toolbox should be run in a standalone fashion not connected to any networks.

7 Regional Results

Regional Results is a system and standalone application for transmitting preliminary unofficial results over the jurisdiction's dedicated wide-area network (WAN) from a regional sending site to jurisdiction headquarters on election night. A regional sending site is any location that has connectivity to the jurisdiction's dedicated WAN, e.g. fire station, police station, county offices, etc. Only results data are transmitted (i.e. no ballot images or cast vote records), and the messages are signed, encrypted, and sent over a VPN without connectivity to the internet via SFTP. Results data cannot be transmitted until after polls are closed.

7.1 Observations

Examiners witnessed the installation and verification of Regional Results hosts as well as the transmission and receipt of unofficial results data. No issues were observed with this process.

The purpose of a system like Regional Results is not without merit. In Texas, we have some very large counties, both in terms of geography and population. In these large counties Regional Results could mitigate the challenge of providing timely reporting of unofficial results on election night. Since ballot images are not transmitted, some activities such as ballot adjudication would still have to occur at the jurisdiction's central processing site.

During the EVS 6.2.0.0 exam, examiners noted the lack of best practices documentation for handling of media and separation of networks [20]. For EVS 6.3.0.0, ES&S provided a document titled "Parallel Network EMS" which describes these procedures and a network model diagram appropriate for use in Texas (see Figure 2) [26].

The Secretary of State should use their authority to define a set of policies and procedures for the use of Regional Results that jurisdictions must follow. Furthermore, I recommend that the Secretary of State only approve vendor contracts that include Regional Results in the narrowest of circumstances where the timely delivery of unofficial results on election night is a substantial challenge for the jurisdiction.
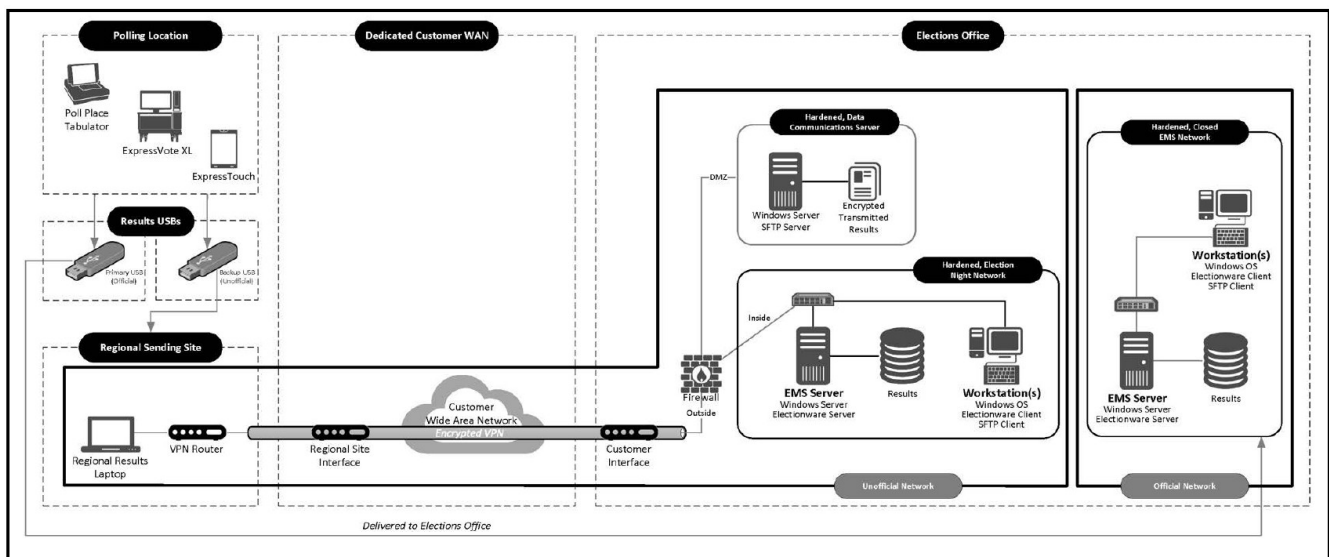

Figure 2: Parallel Network EMS

8   Conclusions

Overall the EVS 6.3.0.0 system performed well during the exam. The system tabulated and reported results accurately during the mock election portion of the exam. Voter facing features are easy to use. When configured properly and handled with good procedures EVS 6.3.0.0 is a system that is both secure and accurate.

I recommend EVS 6.3.0.0 be certified for use in Texas only under the following conditions:

- Sale of Regional Results is restricted to counties that suffer significant impediments to timely reporting of unofficial results

- The Texas Secretary of State defines a set of policies and procedures which counties must follow to ensure the secure use of Regional Results

- The DS300 scanner may not be used or sold with the imprinter cartridge installed

9   References

[1]   Amended Application for Texas Certification of Voting System – Form 100, Election Systems & Software, ES&S EVS 6.3.0.0, Dec-06 2022

[2]   United States Election Assistance Commission Certificate of Conformance, ES&S EVS 6.3.0.0, EAC Certification Number: ESSEVS6300, Nov-17 2022
URL: https://www.eac.gov/voting-equipment/evs-6300

[3]   System Overview, ES&S Voting System 6.3.0.0, Document Revision 1.3, Document ID: ESSSYS_6'3'0'0_D_SYSOVR

[4]   Verification Procedure: Overview. Document Revision 1.2, Document ID: ESSSYS_6'3'0'0_D_VERPROC_OVERVIEW

[5]   Verification Procedure: Regional Results, Document Revision 1.0, Document ID: ESSSYS_1'5'0'0_D_VERPROC_REGIONALRESULTS

[6]   Verification Procedure: Regional Results – Administrator's Guide, Document Revision 1.0, Document ID: ESSSYS_1'5'0'0_D_VERPROC_REGIONALRESULTS_ADMIN

[7]   Verification Procedure: DS200 Hardware 1.2, Document Revision 1.0, Document ID: ESSSYS_3'0'0'0_D_VERPROC_DS200_HW1'2

[8]   Verification Procedure: DS200 Hardware 1.3, Document Revision 1.0, Document ID: ESSSYS_3'0'0'0_D_VERPROC_DS200_HW1'3

[9]   Verification Procedure: DS200 Hardware 1.3.13, Document Revision 1.0, Document ID: ESSSYS_3'0'0'0_D_VERPROC_DS200_HW1'3'13

[10]   Verification Procedure: DS300, Document Revision 1.0, Document ID: ESSSYS_3'0'0'0_D_VERPROC_DS300

[11]   Verification Procedure: DS450, Document Revision 1.0, Document ID: ESSSYS_4'2'0'0_D_VERPROC_DS450

[12]   Verification Procedure: DS850, Document Revision 1.0, Document ID: ESSSYS_4'2'0'0_D_VERPROC_DS850

[13]   Verification Procedure: DS950, Document Revision 1.0, Document ID: ESSSYS_4'2'0'0_D_VERPROC_DS950

[14]   Verification Procedure: ExpressTouch, Document Revision 1.0, Document ID: ESSSYS_4'2'1'0_D_VERPROC_ETOUCH

[15]   Verification Procedure: ExpressVote Hardware 1.0, Document Revision 1.0, Document ID: ESSSYS_4'2'1'0_D_VERPROC_EVOTE_HW1'0

[16]   Verification Procedure: ExpressVote Hardware 2.1, Document Revision 1.0, Document ID: ESSSYS_4'2'1'0_D_VERPROC_EVOTE_HW2'1

[17]   Verification Procedure: Data Communication Server Document Revision 1.0,
         Document ID: ESSSYS_6'3'0'0_D_VERPROC_DATACOMM

[18]   Verification Procedure: Data Communication Server Administrator's Guide, Document Revision 1.0,
         Document ID: ESSSYS_6'3'0'0_D_VERPROC_DATACOMM_ADMIN

[19]   Verification Procedure: Election Management System, Document Revision 1.0,
         Document ID: ESSSYS_6'3'0'0_D_VERPROC_EMS

[20]   URL: https://www.sos.state.tx.us/elections/laws/june-2022-evs-6200.shtml

[21]   URL: https://www.sos.state.tx.us/elections/laws/ess_system.shtml

[22]   Electionware Vol. I: Administrator Guide, Software Version 6.3.0.0, Revision 1.1, July 2022

[23]   Best Practices for Physically Securing ES&S Equipment, ES&S Voting System 6.3.0.0, Document
         Revision 1.3

[24]   System Change Notes, ES&S Voting System 6.3.0.0, Document Revision 1.3,
         Document ID: ESSSYS_6'3'0'0_D_CHANGENOTES

[25]   Ballot Production Guide for EVS6300, Manual Version 1.1,
         Document ID: ESSSYS_6'3'0'0_SOP_BPG

[26]   Parallel Network EMS, February 2023

[27]   ESS EVS 6300 Exam Responses, Feb-08 2023

[28]   C. Johnston, FIPS 140-2 Certified Modules for Ubuntu 16.04 LTS, Dec-13 2017,
         URL: https://canonical.com/blog/fips-140-2-certified-modules-for-ubuntu-16-04-lts

[29]   Enabling FIPS with the ua tool,
         URL: https://ubuntu.com/security/certifications/docs/16-18/fips-enablement

[30]   United States Election Assistance Commission Voluntary Voting System Guidelines, Volume I, Version
         1.0, 2005,
         URL: https://www.eac.gov/sites/default/files/document_library/files/VVSG.1.0_Volume_1.PDF