



Is Technology the Answer? Software Quality Issues in Electronic Voting Systems

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History

2000 presidential election chaos in Florida

Help American Vote Act

A rush to use Direct Recording Electronic (DRE) voting computers

Federal funds for purchase

South Carolina bought ES&S iVotronics 2004-2006:
46 counties, 2300 precincts, 3.5M voters, 12,000 iVos



The South Carolina System

The vendor is ES&S (Election Systems & Software)

iVotronic – The actual voting computer, about 13,000 statewide

PEB – The handheld device that activates the iVotronics

Unity – The software run at county HQ on a Windows desktop





Issues

Proprietary HW and SW

EVEREST report 2007 (for Ohio)

“lack[s] the fundamental technical controls necessary to guarantee a trustworthy election under operational conditions”

“several, pervasive, critical failures”

Florida State report following 2006 election in Sarasota

Data obtained 2010 (very messy) and programs written

Data obtained 2012, 2014, 2016, 2018—by now the data is actually very clean



Observed Problems

Procedural errors (as if everything works perfectly?)

Hardware failures (can't deal with broken computers?)

Event codes with no explanation

Genuine bugs in the software that have led to votes not being counted properly

Entirely electronic, no paper trail, no way to verify the votes, no way to audit the results



EL155 Cast Vote Record

5134625	3	59 Lindsay Agostini	SCH0002 School Board District 2
5134625	2 *	15 Peter Skewes	PRESIDENT AND VICE PRESIDENT
5134625	2	23 Rebel Michael Scarborough	U.S. SENATE
5134625	2	30 Eddie McCain	CON0002 U.S. House of Rep Dist 2
5134625	2	33 Mia McLeod	SEN0022 State Senate District 22
5134625	2	37 Joe McEachern	HOU077 State House of Rep Dist 77
5134625	2	41 W/I DUNCAN BUELL	Sheriff
5134625	2	43 Jeanette W McBride	County Clerk of Court
5134625	2	46 Gary Watts	Coroner
5134625	2	49 Gwen Kennedy	CCL0007 County Council District 7
5134625	2	56 Jeff Laney	Soil and Water
5134625	2	63 Kay Harvey	SCH0002 School Board District 2
5134625	2	65 Bill McCracken	SCH0002 School Board District 2
5134625	2	69 Shelley Williams	SCH0002 School Board District 2
5134625	3 *	6 Republican	STRAIGHT PARTY
5134625	3	14 Donald J Trump	PRESIDENT AND VICE PRESIDENT



The Data

EL155—The cast vote record—the actual vote, the iVo serial number, the ballot style, and the precinct

EL152—The iVotronic log of events—iVo serial number, PEB number for events, timestamps, existence of votes cast

EL68A—The Unity system log at county HQ—memory card upload, vote totals upload, PEB serial numbers

EL30A—The “results” printout, by precinct, of votes for candidates and by which method the votes were accumulated



South Carolina is Unique

No other state publishes ALL the vote data the way SC does

North Carolina forbids showing the 155 to the voters

In most states only the election officials are allowed to see the data

Since we have one system statewide, and since we publish the data, I can analyze all the data with only one set of programs.



What Can We Learn?

Sometimes not all the votes get counted.

Richland, Horry, etc., 2010

Richland, 2012, due to a bug in the software

Sometimes the votes get counted twice --Wallace
Precinct, Marlboro County

Sometimes the votes get counted in the wrong place –
Beaufort County 2010



Did New Software Help?

iVotronic firmware updated spring 2018

Still some curious things

UNKNOWN

Sick computers whose votes were counted
(Georgetown EL152)



Chester County, 12 June 2018

5132179	130966	SUP	2018-05-23 13:57:41	0001607	Clear-n-test terminal flash successful
		SUP	2018-05-23 13:58:20	0000116	Select: Configure Terminal
		SUP	2018-05-23 13:58:26	0001650	Terminal - exited service menus
123887		SUP	2018-05-23 14:02:14	0001001	Confirm PEB ballot failed by user
147244		SUP	2018-06-12 06:55:17	0001303	Transfer PEB vote data to terminal
143916		SUP	2018-06-11 19:32:43	0001319	Update PEB's terminal record
		SUP	2018-06-12 06:55:23	0000019	UNKNOWN
143400		SUP	2018-06-10 09:25:04	0001024	UNKNOWN
146732		SUP	2018-06-10 18:31:29	0000066	UNKNOWN
146728		SUP	2018-06-10 09:25:24	0001882	UNKNOWN
146732		SUP	2018-06-10 18:31:58	0000019	UNKNOWN
146728		SUP	2018-06-10 09:19:32	0001920	UNKNOWN
147244		SUP	2018-06-12 06:58:49	0002006	Print task was cancelled
		SUP	2018-06-12 06:58:53	0001672	Terminal Opened
123887		SUP	2018-06-12 07:05:22	0000621	Warning: Terminal reset from voting
		SUP	2018-06-12 07:07:12	0002900	Vote cast by voter - Visual



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