Adventures in Electronic Voting Research

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The FBI says it has found breaches in voter registration systems in Illinois and Arizona, and it’s urging states to increase their computer security ahead of the November presidential election. (Reuters)

By Ellen Nakashima August 29

Hackers targeted voter registration systems in Illinois and Arizona, and the FBI alerted Arizona officials in June that Russians were behind the assault on the election system in that state.

The bureau described the threat as “credible” and significant, “an eight on a scale of one to 10,” Matt Roberts, a spokesman for Arizona Secretary of State Michele Reagan (R), said Monday. As a result, Reagan shut down the state’s voter registration system for nearly a week.
13 Sept 2016: House Space, Science, & Technology Committee

https://www.youtube.com/watch?v=iRU9ZuFF9a0
WASHINGTON — The Obama administration on Friday formally accused the Russian government of stealing and disclosing emails from the Democratic National Committee and a range of other institutions and prominent individuals, immediately raising the issue of whether President Obama would seek sanctions or other retaliation.
“33 states and 11 counties or local election officials” have requested help. (October 2016)

39 states compromised (June 2017)
Russian Cyber Hacks on U.S. Electoral System Far Wider Than Previously Known

by Michael Riley and Jordan Robertson
June 13, 2017, 4:00 AM CDT

→ Attackers said to take measure of voting systems, databases
→ A ‘red phone’ warning to the Kremlin from Obama White House

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The scope and sophistication so concerned Obama administration officials that they took an unprecedented step -- complaining directly to Moscow over a modern-day “red phone.” In October, two of the people said, the White House contacted the Kremlin on the back channel to offer detailed documents of what it said was Russia’s role in election meddling and to warn that the attacks risked setting off a broader conflict.
Denial of service attacks
Flood the Internet with garbage

Election-specific attacks
Ukrainian and Bulgarian election commission servers

Voter registration databases are online!
Opportunity: selectively delete data, induce long lines, disenfranchise voters.
Stuxnet attacked Iranian nuclear centrifuges (offline!)  

What about offline voting machines?  

Insider threats?
Then the election happened.
The winner is happy with the outcome.

But the loser requires evidence.
Jill Stein requested recounts

Wisconsin recount: minor changes in election totals

Michigan recount: stopped by court order

Pennsylvania recount: never even got started
What would a really good voting machine look like?
A rare opportunity

Dana DeBeauvoir (Travis County Clerk),
Keynote speech, EVT/WOTE 2011

We’re going to design a new voting system from scratch and we need your help.
STAR-Vote: Registration
STAR-Vote: Registration
STAR-Vote: Registration

Registration

Precinct 101A
STAR-Vote: Authorization

Registration

Controller

Voting terminals

Precinct 101A
STAR-Vote: Authorization

Registration

Controller

Voter

Voting terminals

Precinct 101A
STAR-Vote: Authorization

Registration

Controller

Voting terminals

Auth: 52794

Similar to Hart InterCivic eSlate
STAR-Vote: Ciphertext copies distributed

Registration

Controller

Voting terminals

Voter
STAR-Vote: Ciphertext copies distributed

Registration

Controller

Voting terminals

Voter
STAR-Vote: Casting

Registration

Controller

Voting terminals

Ballot box

Official Ballot: November 6, 2012

Travis County, Texas, Precinct 101A

Ballot box

Voter

11042012   Pct 101A   BID11042012   BCID3457894   Pg 1 of 2
STAR-Vote: “Version 2” prototype

**HP printer guts**
Reliable paper handling!

**Raspberry Pi**
Off-the-shelf accessories
Cheap USB barcode scanner
Printed plastic scanner bracket
Custom driver board for motors

**Steel ballot box**
Local Houston fabrication
Open challenges

Online voter registration databases are a vulnerability
Necessary for “vote center” / “early voting” models

Research challenge 1: replicated, history-preserving, sometimes-offline voter databases

Voter credentials currently not associated with votes (privacy!)
But provisional voting retains a connection (voter is adjudicated, ballot is still private)

Research challenge 2: scalable, usable, secure provisional voting

Cyber attacks are hard to attribute to their source
Russia still denies these attacks, IC cannot share “sources and methods”

Research challenge 3: attribution and provenance on the Internet