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THE EDITORIAL VIEW

PAPERLESS VOTING LOSES GROUND

By Tom Halfill {10/27/08-01}

The old dream of a paperless office remains alluring, but the U.S. finally appears to be awakening from its nightmare of paperless voting. Gradually, election reformers are convincing public officials that paperless electronic voting machines are too flawed to win public confidence in the most important exercise of a democracy. Although much work remains to be done, we're seeing positive change since first editorializing on this subject in 2006. (See *MPR 12/26/06-01*, "Undo Electronic Voting.")

Politics is beyond the purview of *Microprocessor Report*, but we are alert to flagrant abuses of computer technology. A bread toaster that connects to the Internet and requires periodic firmware updates may offend our engineering sensibilities, but it's also funny, in a perverse way. A black-box voting machine that determines elections by running secret source code on untested hardware behind a poor user interface—and without a paper trail—is simply perverse.

As we stated in 2006: "Electronic voting machines are a classic example of botching a high-tech solution to a low-tech problem, thereby creating a new high-tech problem. It might be amusing if anything less than our democracy were at stake."

The Rush For a Technological Solution

A few years ago, paperless electronic voting seemed like an irresistible force. After the 2000 presidential-election debacle, Congress passed the Help America Vote Act (HAVA) and allocated billions of dollars for electoral upgrades. But many state election officials didn't perform their due diligence before spending the money. Nationwide, they spent more than $1.5 billion on new voting equipment, mostly on touch-screen machines costing $5,000 to $12,000 each. By the midterm elections of November 2006, about 80% of ballots nationwide were counted by proprietary voting machines made by four private companies.

This technology was largely untested by independent experts. Most touch-screen machines were paperless. They kept no hard-copy records with which election officials could audit the electronic tallies. In some states, voting-machine manufacturers stubbornly resisted attempts to mandate a paper trail, protesting that the technology was too difficult. When overruled, they charged big bucks for little add-on printers.

Machine failures have been widespread. They are variously blamed on hardware glitches, software bugs, malware infections, dirty touch screens, human errors, or deliberate tampering. Vendors have refused to show their source code to election officials and independent experts who sought to test the machines and analyze the failures.

In some states, election officials were accused of distributing the limited number of costly voting machines in suspicious patterns that seemed to favor partisan political strategies. For instance, some dense urban precincts received too few machines, causing long lines that deterred voters. A few miles away, less-populated suburban precincts

with different political leanings enjoyed a surplus of voting machines.

Snafus Don't Inspire Confidence

In Ohio and other places, voters repeatedly stabbed their fingers at touch screens grimy from hours of use, watching in frustration as the screens recorded votes for different candidates than the voters selected. In Florida—the Twilight Zone of election snafus—a variant of the SQL Slammer worm disabled a Sarasota County database attached to the Internet. Voting machines were idled for hours because officials couldn't verify voter-registration data.

In that same county, same election, a congressional contest was decided by a mere 369 votes, but 18,000 electronic ballots showed no votes at all in that race. Absentee ballots cast on paper in the same election had a much lower rate of these "undervotes." (*MPR* believes the discrepancy was caused in part by a poorly designed ballot screen; see our previously referenced editorial.) There was no paper trail to verify the electronic ballots, but it didn't matter. At that time, it was unlawful in Florida to recount paper records of electronic ballots.

Last August, Premier Elections Solutions (a Diebold spinoff) notified 1,750 voting jurisdictions in the U.S. that its tabulation software could lose votes for entire precincts when the data was loaded from multiple memory cards. The company said the problem affected all 19 models of its electronic voting machines made in the past ten years or so.

These events, and many others, finally stirred public opinion. We're no longer living in the 1950s, when people entrusted computer technology to scientists in white lab coats. Thanks to the popularity of personal computers, cellphones, DVD players, videogame consoles, and other gadgets, the average person today is no stranger to the frailties of computer technology. If the best engineers in the world can't make a PC that's secure, infallible, and easy to troubleshoot, why should we trust computer voting machines that have received much less real-world testing and are tightly controlled by a handful of secretive companies? Gradually, the tide has begun turning against black-box voting.

Florida Gets Less Touchy-Feely

Even Florida is seeing the light, to some extent. In a stunning reversal, the state largely responsible for this mess is abandoning its new touch-screen voting machines. Florida is switching to optically scanned paper ballots—an alternative that *MPR* recommended two years ago. California and other states are moving in the same direction.

In the upcoming U.S. presidential election, 57 percent of registered voters live in jurisdictions that will use optically scanned paper ballots, according to an Associated Press Election Research survey. Only 36% of registered voters live in counties that use electronic voting machines, down from 44% in 2006. Most of the remaining 7% of voters live in places that use mechanical lever-pull machines, and a few counties in Idaho are reportedly the last holdouts using the much-maligned punch-card ballots.

Optically scanned ballots don't require expensive voting terminals. Voters simply mark the paper ballots with pens. Ballots are printed on thick paper, capable of withstanding multiple machine recounts without the rapid deterioration of paper punch cards. Optical tabulation is virtually as fast as electronic voting and tabulation. (For some handicapped people, electronic ballots are easier to use, so they still have applications.)

One of our strongest objections to today's electronic voting machines is their proprietary design. Manufacturers are notoriously tight-fisted with their source code, hiding it even from outside experts who need to test the machines. This attitude is baffling. Essentially, voting-machine software simply reads user input and increments variables. Then it encrypts and saves the ballot on a memory card or transmits the ballot to a central location. All these functions are elementary. The encryption and transmission algorithms should be accepted standards, such as AES and TCP/IP, not proprietary concoctions that seek security through obscurity. What, exactly, are the voting-machine makers trying to hide?

Last year, California Secretary of State Debra Bowen commissioned a technical review of paperless voting machines from Diebold, Hart InterCivic, and Sequoia—three manufacturers that have sold machines in California. Researchers had no trouble bypassing the security measures in every machine, leading Bowen to decertify those machines in her state.

Open-Source Voting

Bowen and a California-based organization called the Open Voting Consortium support the development of open-source voting software. The consortium demonstrated an early version of its balloting software at the LinuxWorld conference in San Francisco this year. Attendees used the software to choose the best-of-show award and conduct a straw poll for the U.S. presidential race. Anyone can examine the consortium's source code, test it, and suggest improvements. The consortium is also developing low-cost electronic balloting machines that generate paper records. In the future, it's possible that open-source software could run on machines from multiple manufacturers, bringing much-needed standardization to different voting jurisdictions. Any country in the world can adapt the software, too.

In addition to open-source balloting software, *MPR* would like to see open-source software for tabulation and voter registration. The whole top-to-bottom voting process should be standardized and transparent. Perhaps we can call it the new DOS—Democracy Operating System.

Rigorous testing and verification are essential. *MPR* readers understand that the verification stage of a project is often more time-consuming and expensive than the design stage. Yet some public officials buy new voting equipment that's untested by anyone but the manufacturers—and the manufacturers set their own testing standards.

Without adequate testing, any technology is suspect. Lately, Florida has even experienced problems with its new optical-scan equipment, normally a reliable and proven technology. Palm Beach County, the vortex of the 2000 election controversy, recently spent $5.5 million on new high-speed optical-scan tabulation machines from Sequoia. Optical-scan ballots replaced the touch-screen machines that the county bought in 2002, which replaced the antiquated punch-card ballots that caused so much grief in 2000.

After an August 26 primary election, Palm Beach County had to run *three* machine recounts to decide a close judicial race, which at first hinged on a mere 17 votes. Of course, it didn't help that election officials initially lost nearly 3,500 of the 100,000 ballots cast. But even after recovering and tallying the lost ballots, officials found disturbing inconsistencies among the high-speed tabulators. In tests, some machines rejected valid ballots that other machines counted. And some machines accepted invalid ballots that should have been rejected. Note that this reliability testing wasn't conducted until *after* the close judicial race prompted officials to question their new equipment.

In Washington, D.C., after a September 9 primary, Sequoia's machines reportedly counted 4,759 ballots in a precinct where only 326 ballots were actually cast. An investigation discovered that the tally included hundreds of non-existent *write-in* votes. Election officials told the *Washington Post* that the machines produced three different results during three subsequent runs. According to news stories, Sequoia blamed the problems on static-electric discharges or mishandled memory cartridges.

We Need a Slow-Vote Movement

Perhaps you've heard of the slow-food movement. It's a trendy reaction against mass-produced fast food. Slow food emphasizes healthy cooking and eating, ideally using locally produced organic ingredients. What we need more desperately is a slow-*vote* movement. Many of our voting problems could be avoided by taking a more patient approach to this all-important process.

First and foremost, the entire process should favor accuracy over speed. That vital distinction was lost during the 2000 election controversy. Back then, some people argued that punch-card machines with an average error rate of 1% or 2% (and an actual raw error rate of 3.5%) could accurately measure a difference of 0.009%. "Machines can't be biased," they said. But the technical issue was measurement precision, not tabulation bias. Even the co-inventor of the Votomatic machines testified that they were designed for speed, not maximum accuracy. That trade-off is unwise. What's the hurry?

After a lengthy political campaign, there's no compelling reason to demand election results before retiring to bed on election night—unless you're eager to toot horns and wave flags at a candidate's victory party. The celebrations can wait. In some countries, it's routine to wait days or even weeks for election results.

For More Information

The Open Voting Consortium is based near Sacramento, California:

- *www.openvotingconsortium.org*

"Open Source Voting," by Mark Anderson, *IEEE Spectrum*, October 2008, pp. 13–14:

- *http://spectrum.ieee.org/oct08/6788*

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- *www.dispatch.com/live/content/local_news/stories/2008/08/21/voting_machines.html*

"Company Acknowledges Voting Machine Programming Error," the Associated Press, August 22, 2008:

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"Worm Attacked Voter Database In Notorious Florida District," *Computerworld*, May 16, 2007:

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"Panel Calls for Use of Open Source Software on Voting Machines," by Larry Magid, *San Jose Mercury News*, September 29, 2008:

- *www.mercurynews.com/business/ci_10560363*

"Many States Turning to Paper Ballots for Fall," by Brian C. Mooney, *Boston Globe*, June 17, 2008:

- *www.boston.com/news/nation/articles/2008/06/17/many_states_turning_to_paper_ballots_for_fall/*

"Election Officials Return to Paper," by Allison Hoffman, the Associated Press, August 6, 2008:

- *www.usatoday.com/tech/news/techpolicy/evoting/2008-08-06-paperballots_N.htm*

In the U.S., it needn't take weeks, but even a few days would permit significant improvements. Tired poll workers wouldn't be so harried after a long election day. Optical-scan tabulation machines could operate at slower speeds, examining each ballot more carefully. Election officials could eyeball the rejected ballots to rule if they're valid or not. Tabulators could compare vote totals in a city or county with subtotals from all the precincts, to ensure that the numbers add up. Officials could double-check any mismatches between voter identities and registration records.

By taking just a little more time, officials could resolve most discrepancies that bedevil them on election night—*before* announcing results. Heck, the time saved in recounts and court battles alone would justify the extra effort expended on the initial count.

Finally, any new technology introduced to this process should be judged by its contribution to accuracy, not merely by its speed or someone's idea of high-tech fashion. The hardware and software must be a glass box, not a black box. And the entire system must be thoroughly tested and verified by independent experts before use. In other words, we must apply sound engineering principles to the problem. We may discover that the best solution is the simplest.

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