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Last summer, a Finnish computer expert found a way to pre-load votes inside Diebold's optical scanning machines, then cover his tracks by hacking Diebold's interpreted code to print out reports showing no votes were in memory when in fact the election already was rigged.

McPherson found that private laboratories charged with testing Diebold's machines for compliance with the federal standards never examined the interpreted code and ordered Diebold back into lab testing. At the same time, he asked a team of scientific advisers from Lawrence Livermore lab, the University of California at Berkeley and UC-Davis to study the interpreted code and report back. The panel included computer scientists who have been skeptical, even critical of electronic voting systems, such as David Jefferson, Matt

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Bishop and David Wagner.

The team wrote two reports, one public and one ``confidential that lays out security flaws in the Diebold system, as well as ways to attack it.

The scientists found the interpreted code was very limited in function and not particularly vulnerable, but the software that translates that code into computer instructions for the voting machine had at least 16 bugs that could be used to hack or frustrate elections, according to the team's public report.

"There are serious vulnerabilities in the AV-OS (AccuVote Optical Scanner) and AV-TSx (AccuVote TSx touchscreen) interpreter that go beyond what was previously known. If a malicious individual gets unsupervised access to a memory card, he or she could potentially exploit these vulnerabilities to modify the electronic tallies at will, change the running code on these systems, and compromise the integrity of the election arbitrarily," the scientists wrote.

``The attack could manipulate the electronic tallies in any way desired. These manipulations could be performed at any point during the day. For instance, the attack code could wait until the end of the day, look at the electronic tallies accumulated so far, and choose to modify them only if they are not consistent with the attacker's desired outcome," the report went on. `` The attack could erase all traces of the attack to prevent anyone from detecting the attack after the fact. It is conceivable that the attack might be able to propagate from machine to machine, like a computer virus."

Yet the scientists concluded that the security holes only were exposed when someone gained unauthorized access to the memory cards or PC cards and their contents. The software on the PC cards is somewhat better protected because it is encrypted, but the scientists discovered that Diebold still is using the same encryption key in all of its software nationwide that scientists at Johns Hopkins and Rice University reported publicly in 2003. Another scientist had noted the key's use as early as 1997 and advised Diebold to change

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The scientists recommended having counties change the encryption keys on all Diebold touchscreens and maintain tighter controls over the memory cards and PC cards, for example by requiring two people be present whenever the cards are moved or their contents changed. Serial numbers for the cards and the tamper-proof seals to lock them into the voting machines will have to be logged by elections officials at each polling place.

McPherson adopted those recommendations in certifying the Diebold machines for the June and November statewide elections. His staff wrote Diebold Friday urging the company to fix the bugs in its software and eventually to get rid of the interpreted code entirely.

``The report was written by some pretty heavy critics of electronic voting systems," said Jennifer Kerns, a McPherson spokeswoman. ``We're confident that we've gone above and beyond the call of duty to test it, and above and beyond what other evaluations would have revealed and can maintain the integrity of the vote."

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