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To the concerned citizens and elected officials of the State of Ohio:

Elections are the defining institution in a democracy, and the integrity of the system of elections is essential to the integrity of any democratic nation. The integrity of the technology used for elections in the United States was brought into question by the events of Election 2000 [1,2], when widespread attention was focused on the failings of punched-card voting systems. The reforms instituted after that election, most notably the Help America Vote Act of 2002 (HAVA) [3], led to the rapid and Federally subsidized replacement of punched-card voting systems with new equipment, both mark-sense ballot scanners and direct-recording electronic voting systems.

While each of the 50 states are free to select their own voting systems under broad technical outlines set by civil rights law and by HAVA, most states have opted to require conformance to a set of voluntary standards promulgated by the Federal Election Commission and the National Association of State Election Directors in 1990 and revised in 2002 (the FEC/NASED standards) [4,5]. These standards remain voluntary only in the sense that the Federal government does not require that vendors seek certification or that states demand conformance to these standards. Technically, HAVA has removed the authority for voting system standards from the FEC, moving them to the Federal Election Assistance Commission, however, the standards activities of this new commission have not yet been funded.

The adequacy of the FEC/NASED standards had already been called into question by one of us (Jones) in 2001 [2], and in 2003, these warnings were confirmed when one voting system vendor, Diebold Election Systems, accidentally disclosed the source code for the software used in their AccuVote TS voting system to the public [6]. This story exploded into the press with the public release by several of us (Rubin, Wallach) of a report documenting serious security flaws in this system (the Hopkins report) [7]. While the vendor has strenuously denied the significance of these flaws [8], subsequent reports commissioned by the state of Maryland from Science Applications International Corporation (SAIC) [9] and RABA Technologies [10] and by the state of Ohio from InfoSentry [11] and Compuware [12] substantially confirm all of the major security flaws identified in the Hopkins report and identified several additional flaws. It is noteworthy that none of these studies are complete; each has missed some of the security flaws identified in the others.

All voting systems certified under the FEC/NASED standards are subject to testing by Federally certified independent testing authorities, and these tests include a source code audit, the detailed results of which are confidential. The original source code audit for the system that would later become the Diebold AccuVote TS system was

available to one of us (Jones) [13]; this report indicated that the software of this voting system was the best the examiners had ever seen and that they were particularly impressed by its security. In the light of the security flaws that were evident in that report [2, Jones testimony], and in light of the even more severe flaws revealed since then [7,9,10,11,12], such an evaluation calls into question both the examination process and the security of all other voting systems in the marketplace!

It is worth asking, why would a Federally certified testing laboratory declare a voting system to be secure while 5 other reviews of that same system found major flaws? The answer lies, in part, in the question being answered. The Federally certified lab asked if the system met the FEC/NASED standards, while the other reviewers simply asked if the system was secure and applied their own reasonable definitions of what it means to be secure. This calls into question the FEC/NASED standards themselves as much as it calls into question the competence of the Federally certified examiners.

While the reports done for Maryland only cover the security of the Diebold AccuVote TS, the reports for Ohio [11,12] cover systems made by Diebold, Election Systems and Software, Hart InterCivic, and Sequoia. These 4 vendors, between them, dominate the marketplace for voting technology in the United States, and the Ohio reports make it clear that, indeed, the FEC/NASED standards process has not ensured that voting systems meet any useful security standards.

The four state-sponsored reports identify serious security problems in the administrative rules and procedures governing the use of voting systems the sponsoring states, Ohio and Maryland. In an additional audit of voting equipment used in 17 California counties, unauthorized voting software was in use in every one of these counties [14]. Taken together, these findings bring into question the assertion that "checks and balances in elections equipment and procedures"[8] are sufficient to defend the security of our current voting technology.

What Must Be Done

The RABA report [10] recognized that it is unrealistic to expect states that have invested millions in new voting technology to abandon it in the upcoming round of elections, so it suggested that states pursue short-term strategies to address security problems in elections held this spring, medium-term strategies for the general election in the fall, and long-term strategies for the future.

While we differ with some of the details suggested in the RABA report, we endorse this general strategy. There is time, before the fall general election, to undertake serious reviews of state administrative rules, instituting reforms that markedly increase our confidence in the security of our election systems. Canvassing procedures, auditing procedures, and physical security measures can and must be improved for the voting systems already in use, and not only for direct-recording electronic voting systems, but also optical mark-sense systems; all four state sponsored reports include numerous appropriate recommendations along these lines, and we can suggest several more.

In the long run, we must insist on voting systems that meet a standard of auditability comparable to the standards we apply to the financial world, where we insist that no individual or small group of people be put in a position where they can safely falsify

records, and where sufficient information is saved that errors and deliberate falsification can be detected and corrected by auditors. Furthermore, we know that auditing in the financial world must be performed routinely, not just in response to allegations of fraud, and we must apply this lesson to elections as well.

We must insist on the same level of oversight for counting votes as we have routinely insisted on for counting dollars. Today's direct-recording electronic voting systems simply do not allow this level of oversight, even if we apply every recommendation the SAIC and Compuware reports contained for the voting system vendors [9,12]. With the technology available today, we see no way that such oversight can be provided without maintaining a voter-verified paper record of each vote cast.

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