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EAC Technical Guidelines Development Committee (TGDC)  
Election Assistance Commission (EAC)

Dr. Eustis, esteemed TGDC Members and Commissioners:

This memorandum briefly addresses certain broad, conceptual shortcomings in IEEE 1583. Although I submitted several dozen formal comments on the current draft, and a larger number for draft 5.0, these comments do not represent all of the problems I see in the draft, but rather what I have time to write specific remedies for, knowing that many, probably most, will be rejected for sundry reasons. Moreover, the real shortcomings in IEEE 1583, in my opinion, are organizational, philosophical, and conceptual, and are not well addressed by the methodology of correcting small parts of the document; that methodology is appropriate to a document that already addresses the correct entities, and simply needs editing or alterations in technical specifications, but is quite incapable of effecting a substantial overhaul.

Firstly, please let me explain that my personal involvement in IEEE 1583 began when I answered a call, in IEEE's "Institute", for volunteers to draft a standard for voting equipment; my decision was based on my experience as a firmware engineer who worked on many life-critical projects, my membership in IEEE-SA, and also as a native of Florida, involved in local campaigns and electoral politics. I had no previous knowledge of the voting equipment industry and thought that these standards would benefit from my professional background.

Alas, IEEE 1583 had no interest in in rigorous software engineering process or formal software testing procedures, or the like. At my first meeting in January 2001, any time I mentioned standard practice for developing a critical system or even any simple, common-sense measures of security, I was told that such things were not appropriate to a voting machine. For example, I proposed that software reside on a chip which must be locked inside the device so that multiple physical keys would be required to alter the device so that tampering would be obvious; I was told that this is unnecessary because it shows lack of trust in government officials. Since then, there have been several well-documented cases of uncertified and otherwise altered software used in elections in this country.

The standard has evolved out of existing FEC standards which did little more than formalize de facto practices; any attempt to display innovative thought or consider problems not already dealt with in existing standards was usually met with hostility. The software engineering sections of the FEC standards read as excerpts from introductory programming books and are a far cry from published IEEE software engineering standards or industry standard practices for critical computer systems. IEEE 1583 is a bit better, only because a few more serious requirements have been pasted into that framework.

For nearly the first two years I was on the committee, the notion of the possibility of a voter verified audit trail on DREs was not even subject to discussion. Only when it became apparent that state laws would require this was it decided that it could be addressed as an option in 1583. In the same vein, proposals to generalize systems tend to fail because they lead to consideration of architectures that do not already exist. Attempts to "think outside the box", to pose innovate solutions, to consider problems that are not already addressed by existing standards, are typically dismissed.

Venues for discussing standards for voting equipment are perforce dominated by vendors for the simple reason it is part of their job to attend these

discussions. So, while there are a few academics or engineers in private industry such as myself who spend money out of our own pockets to attend IEEE voting equipment standards meetings, it is a trivial business expense for the manufacturers of these products to send any number of employees to those meetings. While there are, to be certain, benefits from the knowledge that industry insiders bring, there is also a significant problem with inertia to preserve what is familiar.

In reality, many voting systems are little more than modified personal computers. Attempts to mandate more serious engineering practices in IEEE 1583 are typically rejected on the grounds of being too expensive. I have repeatedly heard it argued that, for example, reviewing the source code of the entire system, is simply impossible and no company in any industry could ever do that; however, that is mandated practice in many industries (e.g., medical or avionics) and some voting equipment manufacturers also do that. The sad reality is that many in the voting equipment industry are clueless about computer architecture and would not begin to know how to go about designing a system that could not be a modified personal computer such as, say, a cell phone or a hospital vital signs monitor. But, IEEE 1583, like the FEC standards, accommodates them.

These problems aside, the scope of IEEE 1583 is limited to the voting machines at the polling places. Many election problems stem from procedures, and these are beyond the scope; others problems stem from the interaction of machines in this scope with other machines. A robust standard would need to address these other problems, or at least have sibling standards that address them. A good example of a problem that can not be dealt with by Voting Equipment Standards is that of doing a sample hand count of votes as a sanity check on machines. In two elections in Florida this year, optical scan machines behaved in a manner so bizarre that this was noticed and the count redone. In the presidential preferential election in Bay County, Gephardt, who had withdrawn from the race six weeks previously, had a 2-1 lead over Kerry; if that were not a race where a certain outcome were expected, the error would have never been noticed. In November in Broward County, absentee ballots for certain referenda were observed counting backwards; the outcome of one state-wide referendum was changed by the resulting recount. Again, if someone had not been watching and applying common sense, this would have gone unnoticed. This cries for procedural rules to sample check the counts, since there is no other way to be sure the machines are properly functioning, but that falls out of the scope of 1583.

IEEE 1583 is an improvement over the FEC standards, but it is still the same sort of document; this improvement is like that of a slide rule over an abacus, but what our democracy needs and deserves and could have is a computer. There are many talented computer scientists with much to contribute to forming standards for voting equipment, but no governmental agency appears to be interested in what they could do, so presumably we will only continue to improve our slide rule.

I thank you.

Sincerely,

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