

Allegheny County Board of Elections
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**VoteAllegheny Report
on the
Election Night Tabulation of Returns
on 11/07/2006**

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Abstract

On November 7 and 8, 2006, members of VoteAllegheny representing the Green Party and the Constitution Party observed the tabulation of votes from the November 7th general election at the County Office Building on Ross Street in Pittsburgh.

In this report we document our observations. While we note the relative efficiency of the process and acknowledge that no election will be trouble-free, we highlight a number of problematic events that must be addressed. We shall detail several problems, including the use of unsecured USB flash keys to transmit data, the installation of software during processing and the discrepancy between tested scanners and those employed by the County on election night.

We begin with some background and an overview of the process, present a list of noted problems, and then conclude with suggestions for the County and questions that remain unanswered.

Background

On Tuesday the 7th of November, 2006, Allegheny County held a general election. The ballot included races for governor, U.S. Senate, U.S. House of Representatives, Pennsylvania general assembly, and other local races as well as one statewide ballot initiative. As part of the standard election-day procedures, absentee and emergency ballots and electronic media from touch-screen voting machines are collected at regional reporting centers and then brought downtown to the County Office Building for a tallying of election-night results. While this is not the final canvassing of votes it is treated as such by many voters and candidates, who often declare victory or concede defeat based upon these preliminary numbers.

On election night, Mr. Lynch and Mr. Dougherty were present at the tabulation center from roughly 8:00 p.m. on election night to roughly 5:30 a.m. on the morning of November 8th, representing the duration of the tabulation process. Mr. Lynch was there under the auspices of the Allegheny County Constitution Party and Mr. Dougherty represented the Allegheny County Green Party. VoteAllegheny is entirely non-partisan in nature. These two parties granted us access not only to observe and safeguard the tallying of votes on behalf of their parties, but also to affirm their commitment to free and fair elections for all voters. So far as we know, we were the only such witnesses in residence. Some information below may be incomplete because we were forbidden to ask questions of the staff as a condition of our entrance to observe.

Note also that the terminology below may differ from the terminology used on other occasions. On election night some staff workers referred to the yellow-banded PEBs as “Supervisor PEBs” while others referred to them as “Master PEBs”. For the purposes of this discussion we will use the terms used in the “County’s Poll Worker Instructions for the iVotronic Voting System.” In this document the yellow-banded PEBs used to start-up and shut down the polls are known as “Master PEBs,” while the red-banded PEBs are designated “Supervisor PEBs.”

Process

On election night vote tabulation occurred at two locations: the first and sixth floors of the County office Building. Malfunctioning machines were taken to the County's warehouse on the North Side.

The first floor of the office building was being used as a central regional collection point for Elections Region 7. The individual Judges of Elections (JOEs) from each polling site within Region 7 arrived there to turn in their return sheets, PEBs and supply kits. The Elections Division was also using this site to test district-level vote tabulation. County staffers had a laptop PC running an instance of the Unity software suite located on the first floor. This laptop was equipped with an external PEB reader. As the individual JOEs arrived, their Master PEBs were inserted into the reader and their votes were added to a running total on the laptop. Periodically throughout the night the running total accumulated on this laptop was copied to a USB flash drive and carried up to the main tabulation room.

On the sixth floor of the County Office Building paper records from the individual districts were being sorted. Some printed records were filed on a series of shelves on the sixth floor according to region and ward. Absentee, emergency, and provisional ballots were being taken to the open office space across from the elevators for processing while PEBs were being taken to the Voter Registration office for filing and eventually to the central tabulation stations in the media room.

County staff began by opening and sorting the paper ballots and separating absentee ballots from emergency and provisional ballots. They then scanned the absentee ballots by district and passed the totals to the central tabulation room via a zip disk. This was followed by scanning the emergency ballots. Provisional ballots were set aside pending adjudication.

The scanning process was being conducted by county staff persons and ES&S representatives using two ES&S M650 central-count optical scanners. One of the scanners (labeled Scanner #2) was run by Todd Mullen, Regional Sales Director for ES&S, while the other was run by a different individual whose status was unclear. Both scanners were equipped with printers that kept a running log of ballots scanned. Said printers ran for most of the night but jammed repeatedly and were often left as is in such

occurred. During the scanning process Mr. Lynch counted 25 districts that returned manila envelopes designated to contain emergency ballot envelopes. Of those envelopes, five were empty.

As PEBs were brought in from the other six election districts, they were taken to the Voter Registration office and sorted. Supervisor PEBs were separated from Master PEBs and filed by ward and district. Working Master PEBs were taken into the tabulation room for processing. PEBs with errors – including Supervisor PEBs that had been used to close out the polls – arrived with brief notes denoting their problems. As the Supervisor PEBs were being checked in, county staff persons logged the problems on forms entitled “Tabulation Check-In Supervisor PEBs.”

Tabulation

The county's main tabulation room contained three tower PCs and four laptop PCs, one network switch, and two iVotronic terminals – one supervisor model (red-handled) and one standard model (blue-handled). The laptops were running instances of Unity and were equipped with external PEB readers. These were used for reading Master PEBs into the system. Two of the tower machines were also running instances of Unity. One was equipped with an external PEB reader and an external zip drive. This PC was used to read in remote totals from the first floor, scanned ballots via zip disk, flash drives, and problem PEBs. This PC was also equipped with a USB extender cable. The other Unity tower was used as an “administrator” machine to track incoming results and to process errors. (We discuss these errors further in the sections below.) The remaining tower PC appeared to be running Windows Server 2003 and was acting as a network server.

An additional laptop was located in the room. This laptop was the personal property of one of the ES&S staff persons in residence. Throughout the evening that staff person used this laptop to develop software while occasionally assisting in the processing of returns.

When we arrived everything was still quiet. The tabulation room was occupied by roughly ten county staff persons and two ES&S staff persons including Gary Webb. Mr. Webb was wearing a county staff badge. Both ES&S staff persons were also carrying key cards that granted them access to the tabulation room. Additional staff from both entities came and went all night long. Initially it appeared that the plan was for county staff persons to run the tabulation process. The first few rounds were in fact run by county staff persons. However, once the process got busy the two ES&S staff persons took over the tabulation process and ran the administration process for the remainder of the night. Tabulation was finally completed when the last emergency ballots were processed.

Notable Events

In this section we list several notable or troubling events that occurred during the course of the tabulation. Questions and comments related to these will be discussed in the next section.

Scanner Testing:

State law (25 P.S. § 3011, 25 P.S. § 3031.10, and 25 P.S. § 3031.14) requires that all electronic voting systems including central tabulating equipment such as optical scanners be subjected to a public logic and accuracy test prior to any election.

On October 31, 2006, our colleagues David Eckhardt and Martin B. O'Malley observed the logic and accuracy testing of an M650 central count optical scanner. Their observations are detailed in the document entitled "VoteAllegheny Report on ES&S M650 Logic & Accuracy Testing, October 31st, 2006."

Dr. Eckhardt and Mr. O'Malley observed the testing of only one M650 Optical Scanner. However, on election night two such scanners were in operation. No explanation was given as to how or whether the second scanner underwent testing.

During the Board of Elections meeting on November 13, 2006, Mark Wolosik, Director of the Division of Elections, confirmed that one and only one logic and accuracy test was done on the scanners. This means that the second scanner was not tested prior to the election as required by law. This calls into question the legitimacy of the elections results as reported by the County and may constitute a violation of state election law.

USB Flash Drives:

As we noted above, county staffers made heavy use of USB flash drives during the tabulation of votes. They were used both to ferry Region 7 results up from the first floor to the sixth and to ferry partial results from the Unity tabulation network to the web server for display. For these purposes the County appeared to use two silver-colored flash drives that appeared to be hand carried by county staff persons. On at least three other occasions, however, county staff persons or ES&S employees inserted their own personal USB flash drives or flash drives belonging to some other party into the Unity systems.

At this time it is unclear whether the flash drives are permitted for use with the systems under HAVA certification and Pennsylvania State law. State examiners typically specify not only what technology may be used but how it may be employed. It is not clear whether this method of transporting data is what the examiners foresaw and whether it is consistent with their specifications.

In the first instance, when a county staff person came downstairs to obtain a partial Region 7 results, the individual running the laptop (who was wearing a county badge) inserted his own flash disk into the computer. As he described it, it was a "secure" flash disk that would encrypt the data when stored and then decrypt it on delivery. As he described it to the county runner and the ES&S staff person in attendance (Gary Webb), this had no password protection, simply the disk encryption. After downloading the data to this disk he reattached it to his belt.

While encryption on disk would be a nice feature, the absence of any validation (*e.g.*, a password) makes such encryption a moot point. If any individual in possession of the disk may access it without such validation, then it provides no security against attacks for substitution or copying of data.

In a second instance, an ES&S staff person inserted his own flash disk into one of the central tabulating computers on the sixth floor. This flash disk, a SanDisk U3, was slightly different hardware from the others used during the night. The U3 feature involves part of the drive acting as a fixed-content CD-ROM device which includes device drivers and other software supplied by SanDisk. Because AutoRun was enabled on the management machine, when this disk was inserted the system automatically began installing SanDisk drivers and a helper application known as "U3 LaunchPad." Both ES&S representatives at the console seemed very surprised by this behavior. Although we have no reason to believe that the device installed any malicious software on the machine, the fact that this situation was allowed to occur demonstrates that basic Windows security precautions were not in place. Unless the SanDisk U3 software was certified by the Secretary of the Commonwealth, its introduction onto the Unity system presumably voided the certification of the installation.

Once the installation began, the ES&S representatives quickly attempted to close it on the advice of ES&S staff person Gary Webb. Once that was complete the first staff person sat down at the computer and opened up a command prompt window. Using that window he copied some of the election data to his flash disk. Having done that, he removed the flash disk from the central tabulating computer and reinserted it into his own personal laptop where he copied the files onto his machine. Once he had finished copying the file data he also opened up a command window in Unity entitled "Clear Voting Terminal Audit Data," at which point the system displayed "Remote Results Read."

At this time the second ES&S staff person (Gary Webb?) explained to me that what he was doing was copying data files to his computer to facilitate the development of additional reports. The original staff person then spent much of the night working on the report in question.

At the end of the night after the final batch of emergency ballots had been scanned, Gary Webb sat down at one of the other tabulating computers in the main room and inserted his own USB flash drive into the machine. It is unclear what he intended to accomplish by this as he had not completed anything by the time the observing Mr. Lynch left. He did make several attempts to kill a process using the Windows process control menu. He did not need to enter a password to get to this menu. It is unclear what process he was trying to kill or why. It was clear, however, by the time that Mr. Lynch was escorted out, that he was unable to complete his intended process. At the time that he did this Unity was still running on the laptop in question. Mr. Lynch was escorted out by Tim Johnson Director of the County's Office of Administrative Services.

These events raise serious questions about the extent to which the Unity tabulation machines are protected. It also raises serious questions about the role of out-of-state contractors in running our local elections. The integrity of our elections systems rests in part on the fact that the citizens of Allegheny County are running the elections. If the processing is controlled even in part by private contractors then we have ceded our ability to run our own elections.

Upper St. Clair 4-3:

According to elections staff and ES&S staff members, there were serious operational and security issues associated with iVotronic terminals deployed to the third district of the fourth ward of Upper St. Clair ("Upper St. Clair 4-3"). According to information received by VoteAllegheny, poll workers were unable to close the voting terminals, consolidate the votes, and print final vote counts. When the voting machine mechanic dispatched by the County was unable to resolve these problems on site, the mechanic removed *all* election equipment and vote data from the polling place. This means that the sole record of all votes cast in this district was taken out of sight of the poll workers, party-appointed Observers, and members of the public. Result tapes were not produced or posted as required by law, and the Minority Inspector did not receive a copy of the polling place vote data for safeguarding.

At the County Office Building, three terminals from the district were brought to the tabulation room by County staff persons. ES&S technician Gary Webb opted to dump the audit data to flash cards rather than attempt a manual close out after it was confirmed that no tapes had been produced. This process was accomplished using a special Master PEB that had been pre-programmed by Mr. Webb. When inserted, this PEB would boot the iVotronic and force a dump without further human intervention.

On the first two iVotronics (S.N. 09442 and 09440, both non-ADA) this process appeared to operate as expected. When the terminals booted up they displayed dialogs stating that they were dumping the data to the flash cards and those cards were then read into the Unity terminals. On the last of the

systems, however (S.N. 092053, an ADA model), the process did not go so smoothly. When booted up the system gave a prompt stating: "To Dump results via modem select here" and offered the user the chance to select "ok" or "cancel. Mr. Webb pointed out that this was an ADA –Model, and then shut down the machine and reinserted the PEB, at which point things appeared to operate as expected.

On election day the security of the election at each polling place rests on the oversight provided by the poll workers, the party-appointed observers, and interested members of the general public.. In this event the sole record of the votes was removed from this oversight until the machines were delivered to the Elections Division offices. In this event the physical security of the machines broke down.

Empty Result Tape:

In Pittsburgh 5-4 the JOE encountered a PEB error when she attempted to close the polls. A technician was called out but was unable to fix it. The technician was able to print a result tape, but that tape contained all zeros indicating that no votes were cast or recorded. No word was given on how the votes were obtained for this district, if they were obtained at all.

PEBs Missing:

In Mount-Lebanon 2-4 all three PEBs – one Master and two Supervisors – were misplaced. According to county staff persons, the Judge misplaced them when closing down for the night and they remained unaccounted for at the end of the night.

While it is possible that they were subsequently located, this event points out the ease with which PEBs can get “into the wild” and the potentiality that they may be available to would-be attackers.

Additional Errors:

Additional unexplained errors occurred in at least 23 districts causing one or more machines to be closed improperly or left out of the election-night totals. Each of these errors deserves sufficient documentation to show that proper procedures were followed and no votes were lost. In the event that machines gave errors it is incumbent upon the County to prove that they functioned properly. We are particularly interested in the following districts, listed according to Unity Number: 1207, 0506, 0517, 0487, 0464, 0056, 1226, 0407, 0327, 0003, 0593, 0793, 1296, 1049, 0206, 0389, 0536, 0013, 0109,

0515. In each of these districts one or more of the iVotronics was not closed on election night and uploads were made from the remaining systems.

In four districts (Unity numbers 0278, 0064, 0241, and 0428) none of the PEBs were readable and the results were manually entered in from the result tapes.

In one additional district (Unity number 0559) the system reported an error on upload stating: "0559 - Page has more candidates than results database." We still await an explanation from the county on what this error means and why it occurred.

Emergency Ballots:

Emergency ballots were apparently used in 20 districts. Twenty-five manila envelopes were returned, and of those five were empty. We are not alleging that ballots were missing from those five districts, only that no ballots were returned in those envelopes. During the BOE meeting on November 13th the County agreed that they had in fact accepted ballots from 25 districts.

Discussion

In this report we detailed our observations on election night. While no elections system is absolutely trouble-free we observed a number of worrisome or problematic occurrences that demand the immediate attention of both count officials and the general public. We will first summarize these issues before presenting some of our initial recommendations and conclusions.

The use of flash drives is worrisome for several reasons. First, as amply demonstrated by the U3 install, flash drives may be used to install software on computers with little or no human intervention. As such they are a clear attack vector for the introduction of illicit software and/or viruses. They can also be used to introduce false election results into the reporting stream thus altering the outcome of the election. While such a challenge may seem solvable within the confines of a single building, it will grow more complicated if the County follows its plan of implementing regional tabulation at each collection center. It is also not clear to us whether the introduction of the U3 software, unintentional though it may be, was entirely compatible with Pennsylvania elections law.

We are also worried by the number and frequency of machine breakdowns. While machine errors are inevitable with any widespread deployment of technology, they are worrisome given the high cost of

elections failure. The incident in Upper St. Clair 4-3 is notable because it calls into question claims that the iVotronic DRE system architecture is reliable due to redundant data storage. If all copies of vote data are equally inaccessible, even to a trained Elections Division machine mechanic, and all copies of vote data are removed from proper oversight, election integrity is gravely threatened.

In the wake of the May Primary, county officials made assurances that future elections would be run by county staff persons alone. Nevertheless much of the core tabulation process in November was run by or largely involved ES&S staff persons. While some ongoing relationship with the vendor is inevitable in these cases, it is necessary that elections be run as much by the County as possible, and that a clear distinction be drawn between county staff persons and third-party contractors. Self-sufficiency is vital to election integrity.

Ultimately, however, total independence will likely not be achieved. Based upon the experience of other counties employing iVotronics, it appears that some measure of loss or breakage is normal for any given election and that core components such as batteries have a relatively limited lifespan. No amount of training or preparation can compensate for the fact that electronic equipment does break down and trained ES&S technicians will be necessary to repair, replace, or update the equipment on election day in order to recover lost or locked votes.

iVotronics are single-vendor integrated systems composed exclusively of proprietary software and hardware technology. Like any other such system all replacement parts or systems must come from only one source and the manufacture of third party components is limited by licenses, copyrights, and patents. Unlike the lever machines or more robust vendor-neutral systems such as optical scanners or those based upon off-the-shelf components, no third party or in-house repair is practicable. The County will remain dependent upon ES&S for as long as it uses these machines.

Recommendations

1. As a first step towards securing the elections the County must upgrade its IT practices. The use of removable flash media presents fundamental insecurities as demonstrated by the accidental install. The Division of Elections should begin using write-only media such as blank CR-Rs to transmit vote totals out of the tabulation room in order to ensure that no illicit software or data is smuggled in. All such media must be inventoried and inspected before use. Moreover stricter controls must be put in place to ensure that no staffers or contractors are able to insert or remove media from the systems. The same stringent controls employed for the incoming PEBs must also be employed for the incoming zip disks.
2. If the County continues to move forward with its plans for regional tabulation centers then the above recommendations must be carried over. The tabulating equipment taken over must be subjected to a clear analysis in advance and all communications between those remote locations and the central tabulation office use media such as CD-Rs.
3. Explicit custody procedures must be developed for all for polling place equipment before complete and accurate vote totals are in the hands of the Minority Inspector and posted publicly. This includes equipment that malfunctions or is otherwise taken offline. Unless the equipment is sealed in a designated secure facility it must be under the control of the poll-workers. Moreover, at no time should all the records for a given election be removed from the control of the poll-workers. In such instances the fundamental security of the election system is not maintained.
4. The County must provide a public report on or immediately after Election Night detailing the number and location of polling places and that were subject to repair procedures and oversight irregularities and an approximate estimate of the number of votes in those locations.
5. The County must make a public commitment to a firm date after which all aspects of the Election Night tallying are carried out by County employees.

Conclusions

Although the tabulation process we observed appeared to be relatively orderly, we still harbor deep concerns about the ability of systems using secret proprietary software to accurately count our votes in the presence of either malice or accident. We note that a recent draft white-paper from the National Institute of Standards and Technology recommends that systems such as ours no longer be used in elections.¹ Ultimately, a voter-verified paper ballot of the type produced with a precinct-count optical scan system or products such as the AccuPoll remains the best choice. Such systems are legally available in Pennsylvania and still remain viable purchase choices.

It is our belief that the tabulation process, while it can be improved, cannot be made fully secure under the present conditions. Ultimately the security of our elections system rests upon the iVotronics, and the tabulating computers. The actual functioning of these machines is hidden from the county and, in their present form, no reliable means to audit them is available. When combined with the ongoing financial dependence of the county on ES&S this means that we are no longer in a position to fully secure or manage our own elections. We do not consider this situation to be acceptable in the long run and believe that steps must be taken to ensure the long-term security, transparency, and auditability of our elections process.

1 <http://vote.nist.gov/DraftWhitePaperOnSIinVVSG2007-20061120.pdf>