

## DECLARATION OF DAN S. WALLACH

1. I, Dan S. Wallach, declare under penalty of perjury that the foregoing is true and correct.
2. I am an associate professor in the Department of Computer Science at Rice University. I am also the associate director of ACCURATE (A Center for Correct, Usable, Reliable, Auditable, and Transparent Elections), which is a research center funded by a \$7.5 million grant from the National Science Foundation and which studies technological and policy issues with electronic voting systems.
3. I am an expert in computer security, particularly with respect to the Internet. I became interested in voting security issues in 2001. Since then, I have published three research papers on electronic voting security issues. One of those papers described serious security vulnerabilities in the Diebold AccuVote-TS (paperless touch-screen) voting system, including how ordinary voters could cast multiple votes.<sup>1</sup> I have testified about voting issues to government agencies across the U.S., as well as internationally; I have assisted National Institute of Standards and Technology (NIST) and the U.S. Election Assistance Commission (EAC) in the drafting of the 2005 federal Voluntary Voting System Guidelines; and I have assisted the Carter-Baker Commission on Federal Election Reform and the Brennan Center's Voting System Security Task Force. I have also served as a technical expert in a

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<sup>1</sup> Tadayoshi Kohno, Adam Stubblefield, Aviel D. Rubin, Dan S. Wallach, *Analysis of an Electronic Voting System*, 2004 *IEEE Symposium on Security and Privacy* (Oakland, California), May 2004. <http://avirubin.com/vote/analysis/>

variety of lawsuits where electronic voting systems were a concern. My full curriculum vita is attached as Appendix A.

4. I have been asked to provide my opinion concerning information and equipment that might be necessary to conduct a forensic investigation on the recent election in Sarasota County, whose purpose would be to determine the cause or causes of the unusually high undervote rate in the race for the 13<sup>th</sup> Congressional District. This declaration will continue with three main sections: hypotheses which might explain the undervote rate in Sarasota County's recent election, common terminology used when discussing elections, and hardware, software, and information that would be necessary to conduct a thorough forensic investigation of the undervote rate recent election in Sarasota County.

#### **SARASOTA UNDERVOTE HYPOTHESES**

5. In the recent election for Florida's 13<sup>th</sup> Congressional District, an issue of note is the "undervote" rates, particularly within Sarasota County. The election results from Sarasota County, as published on November 7, are:

	Total Votes	%	Election Day	Early Voting	Absentee
Vern Buchanan	58,534	47.24	36,619	10,890	11,025
Christine Jennings	65,367	52.76	39,930	14,509	10,928
Over Votes	1		0	0	1
Under Votes	18,382		12,378	5,433	571

6. These totals indicate that 12.9% of the votes cast in Sarasota County for the 13<sup>th</sup> Congressional District were "undervoted", i.e., the electronic records indicate that no selection was made by the voter. This contrasts with other

- racers that have much lower undervote rates (e.g., 1.14% in the Senate race, 1.28% in the Governor race, 4.36% in the Attorney General race, and 4.43% for the Chief Financial Officer race).
7. If the Direct Recording Electronic (DRE) votes in Sarasota County are considered alone, the Congressional undervote rate was 14.9%. This contrasts with a Sarasota County Congressional undervote rate of 2.5% on absentee ballots. Without any doubt, the DRE votes in the Congressional race exhibit an unusually high undervote rate.
  8. There are a number of different hypotheses that can explain the peculiar undervote rate for the Congressional race. I explain each possible hypothesis and what techniques may be able to validate or exclude these hypotheses from further consideration.
  9. The **voter abstention hypothesis** simply posits that Sarasota County's voters deliberately chose to abstain from voting in the Congressional race. Unfortunately, telephone-based voter polls would not be a reliable way of validating this hypothesis as survey participants might lie to best support their candidate of preference. Instead, the best way to test this hypothesis is by considering the statistics for voters in Sarasota County, who voted on an ES&S iVotronic, with the voters in surrounding counties, in the same Congressional district, who voted using other technologies. This sort of statistical testing is generally done by carefully comparing specific precincts that are known to have similar demographics.
  10. The **human error hypothesis** posits that the ballot style, the angle of view to the screen, the presence of two or more races on the same "page," or other

factors in how the Congressional race was presented to voters caused some voters to “miss” the race. While the summary screen, presented immediately prior to when the voter casts a ballot, gives an opportunity for voters to recognize and correct such mistakes, some voters may not read this carefully and could likewise miss the opportunity to correct their undervote. There are several possible ways to validate this hypothesis. First, other races in Florida, using the same ES&S iVotronic equipment, may have had a similar visual presentation to the page seen by voters in Sarasota County. Statistical comparisons of those counties’ results to Sarasota County may be able to identify whether similar populations facing a similar ballot presentation had similar undervote rates. Second, ES&S iVotronic systems or a reasonable facsimile thereof could be installed in a laboratory setting and human subjects could be asked to cast ballots for fictional candidates. If the human errors occur under laboratory conditions, then they would be likely to have occurred in the recent election as well.

11. The **software bug hypothesis** suggests that the ES&S iVotronic machines may have latent mistakes or errors in their design that escaped the normal testing and certification processes that are applied to all voting systems. There may be something about the ballot styles used in Sarasota County that induced the ES&S iVotronic machines to occasionally transform genuine votes to undervotes. To validate this hypothesis, we might borrow voting machines, cast a large number of ballots (while videotaping everything we do), and compare the machine-reported totals to our original input. If they differed in the Congressional race, this would be a proof that the machines’

software was at fault. (This process will be far more comprehensive than the “logic and accuracy” testing that election officials perform prior to every election.) Unfortunately, such testing can never prove the *absence* of relevant software bugs. The best way to do that would be to inspect the *source code* of the voting system. Source code is the medium in which software engineers conceive and implement a computer program.

12. The **post-election corruption hypothesis** suggests that the voting machines internally recorded votes correctly, but that the vote records were somehow corrupted, perhaps by poll workers or election administrators, before they were tallied and presented as official results. To test this hypothesis, we must require that the original voting machines were properly sequestered and protected (i.e., their chain of custody was properly maintained at all times). Then, we could directly download voting records from each machine and tabulate them ourselves. If we found any discrepancies, that could be indicative of corruption. The recount process, which is now complete, similarly provides a check against this form of corruption.
13. The **malicious software hypothesis** considers that the software or firmware inside the voting machines might have been illegitimately modified in such a way as to introduce bias into the records of votes cast on that particular machine. Testing this hypothesis would require physically disassembling the voting machine to access its internal memory chips and extract their contents for suitable forensic analysis.

## TERMINOLOGY AND INFORMATION ON VOTING SYSTEMS

14. Direct Recording Electronic (DRE) voting machines are designed to record and tabulate votes electronically within their computer memory. All DRE systems record the user's ballot in volatile internal memory, one choice at a time, and only commit the voter's ballot to a non-volatile electronic form when the voter presses the "cast ballot" button, or equivalent. At this point, standards in place since 1990 require that at least two durable copies be created. Typically, these are non-volatile electronic copies that remain inside the machine until the polls close.
15. In contrast, Optical Scan systems take paper ballots as input, scan the ballots for certain written marks, and tabulate the ballot marks, creating an electronic record of the vote. Thus, the Optical Scan equivalent of pressing the "cast ballot" or "vote" button is to deposit a paper ballot in the scanner or ballot box; scanning also creates two copies of the vote, one retained on paper and the other in electronic form within the scanner.
16. Both DRE and Optical Scan systems are able to deliver both printed and electronic results at the close of the polls. The electronic results may be delivered by any of several means to canvassing centers where the results from multiple precincts are combined to create county-wide or district-wide results. The available means typically include transmission by modem and recording of results onto removable memory cartridges that may be hand-delivered to the canvassing center. Cartridge formats include PCMCIA cards (a format set by the Personal Computer Memory Card International Association), CompactFlash cards, and various proprietary devices.

17. The volatile memory used for temporary storage within electronic voting machines is typically solid state Random Access Memory (RAM). If the machine is restarted or the power is removed, the data in the volatile memory is erased. It is also typically erased between voters to reduce the risk of disclosure of one voter's choices to the next voter.
18. The non-volatile memory used to store durable copies of the votes may be battery-backed RAM, an internal hard disk drive, flash memory, or a recordable compact disc. The technology used varies by vendor. Flash memory, whether permanently installed in a voting machine or packaged as a removable PCMCIA or CompactFlash card, is a form of Electrically-Erasable Programmable Read-Only Memory (EEPROM).
19. All Direct Recording Electronic voting systems store a file of "ballot images" in non-volatile memory, containing one electronic copy of each voter's ballot. The term "image" in this context, does not necessarily imply anything visual, but rather the fact that this is not an original ballot, but rather, a copy made at the time that the voter presses the "cast ballot" or "vote" button. Some optical scan voting systems also record ballot images.
20. All electronic voting systems retain "event logs," sometimes called "audit logs," in non-volatile memory. These record the times at which each significant event occurs in the course of an election such as power on, power off, poll opening, poll closing and the casting of each ballot. These records allow determination that the polls were opened and closed legally and they allow a somewhat independent check to be made on the number of ballots cast on the system.

21. At the end of the voting period, precinct election officials formally close the polls by closing each electronic voting system in use. This is intended to prevent the recording of additional votes.
22. As the polls are closed, all electronic voting systems deliver a summary of the votes counted on that system, giving the total number of votes for each candidate. This summary may be computed as running totals throughout the day, or it may be computed from ballot images at the time the polls are closed.
23. In some cases, the closing of the system copies some or all of the data from the internal non-volatile memories to a removable non-volatile memory device. In other cases, the closing of the DRE permits removal of one of the non-volatile memory devices on which data has already been recorded. The removable memory devices may store the summary vote totals for the machine, the complete file of ballot images, or both.
24. Electronic voting machines also generally include a printer that can print the summary voting data and in some cases also the ballot images. In many jurisdictions, one or both of these are printed at the polling place and signed by the polling place election officials as part of the normal procedures for closing the polls. Likewise, "zero tapes" are often printed and signed by election officials at the beginning of the voting day as evidence that there were no votes in the machine prior to the start of the election.
25. Precinct election officials transmit, either physically or electronically, the summary data, event logs, or ballot image files from the electronic voting machines to a central tabulator at the canvassing center where the votes are aggregated. From there, a final total may be derived. Electronic transmission

is usually by telephone line and modem, but in some cases, Internet protocols are used, allowing use of commercial Internet Service Providers to deliver this data, and in other cases, wireless transmission is used.

26. Election officials may remove the removable non-volatile memory devices from the electronic voting systems at the polling place for immediate return to the canvassing center, or these may be left sealed in the machines until the machines are returned to the canvassing center. In either case, the contents of these removable memory devices may be copied into the central tabulator in order to aggregate the votes.
27. Aggregate totals may also be manually computed from the printouts of summary data that were delivered from the precinct.
28. All paths for delivery of data from the precinct to the canvassing center are vulnerable to error or malicious alteration. Data hand delivered from the precinct to the canvassing center is subject to alteration or loss. Data may be accidentally read into the tabulating system more than once, so that votes are counted twice. Data transmitted over public networks such as the telephone system, radio broadcast or the Internet may be subject to interception and alteration. Physical paper ballots or voter-verifiable paper trail (VVPT) records may be lost, altered (whether accidentally or intentionally) or forged.
29. In most jurisdictions, one of the copies is considered the official result, binding unless questions arise. This is usually either the contents of the hand-delivered electronic cartridge or the signed and witnessed printed copy of the summary data from the precinct.

30. In most jurisdictions, in a recount or election contest, one of the other copies takes precedence. The original paper ballots, VVPT records, or the signed paper copy (if neither of the former exist) are usually designated as the official copy in case of conflict.
31. In most jurisdictions, the other surviving records of the election are never examined. The other surviving records that are typically available include copies of the ballot image file and event logs surviving in removable non-volatile memory cartridges and in the non-volatile memory that is a permanent part of the electronic voting system.

#### **HARDWARE, SOFTWARE, AND INFORMATION NEEDED TO TEST THESE HYPOTHESES**

32. Sarasota County used ES&S iVotronic voting systems for its early and election day voting. The election results are accumulated in computers running ES&S's "Unity" software suite. Unity can produce a variety of different reports that describe what occurred in the election. At present, the County has only published two of these reports. One describes "bottom line" tallies of the entire county. The other has individual tallies from each precinct. **Conducting an effective audit would require two additional reports: "event logs" and "ballot image logs."** Appendix B shows samples of these logs, taken from a race in Webb County, Texas. (Webb County uses the same ES&S equipment as is used in Sarasota County.) The County can produce these reports in only a few minutes, using their Unity systems. Unity scrambles the order of the ballot images, so the production of these reports will, in no way, compromise voters' anonymity. **Conducting an effective**

**audit would require the reports in digital form.** The reports will fit comfortably on a recordable compact disc. The reports refer to individual voting machines by their serial numbers. **Conducting an effective audit would require a list of which machines, by serial number, were used in which precincts.**

33. Given the above information, we will be able to begin our study of the election. We can determine if the undervote rate is consistent across machines in a precinct, or if particular machines are more prone to exhibiting a high undervote rate. We can determine if the undervote rate is correlated in any way with how many votes were captured on a given machine. We may be able to detect other anomalous factors as well. For example, when we studied the March 2006 primary in Webb County, Texas, we found 27 “test votes” had been included in the final tally. We also found several machines which had been cleared on election day, possibly causing votes to be lost.<sup>2</sup>

34. When ES&S iVotronic machines are to be loaded with the ballot styles for any particular election, the Unity suite contains a tool that allows these ballot styles to be described. A variety of computer files are written which are then copied to an iVotronic, either using CompactFlash cards or PEBs.

**Conducting an effective audit would require digital copies of the ballot style files for all nine ballot styles used in Sarasota County; we need every file that is loaded onto the iVotronic as part of the “ballot programming” process, both in early voting and on election day (if different).** This data

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<sup>2</sup> Dan S. Wallach, "Security and Reliability of Webb County's ES&S Voting System and the March '06 Primary Election" (Expert Report in *Flores v. Lopez*), May 2006. <http://accurate-voting.org/wp-content/uploads/2006/09/webb-report2.pdf>

will be necessary when examining iVotronic machines and/or their source code (both described in more detail, below).

35. To conduct a forensic examination of the recent election, we will need actual ES&S iVotronic machines, configured identically to those used in Sarasota County. At a minimum, **conducting an effective audit would require eight iVotronic machines from Sarasota County which experienced high undervote rates during the recent election along with their carrying cases, power adapters, and other apparatus to set up voting booths.**<sup>3</sup> We would use two of the machines as part of the software analysis (described below) and the other six for conducting carefully controlled, videotaped tests, such that we might be able to demonstrate a software bug, should it be present. In order to properly perform such a demonstration, we will need other equipment as is used inside every voting precinct in Sarasota County. **Conducting an effective audit would likewise require two supervisor PEBs (personalized electronic ballot), nine regular PEBs (one configured for each ballot style used in Sarasota County in the recent election), a standard ES&S “Communications Pack” (containing a thermal printer and all the necessary cabling), and all of the manuals and training materials used in Sarasota County.** In addition, we need some equipment not commonly found in a precinct. **Conducting an effective audit would require a PEB reader, used to connect PEBs to standard PCs. We would also require permission to physically open and inspect the internal components of one**

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<sup>3</sup> Once we have the requested logs, we will be able to identify the specific machines with the highest undervote rates by their serial numbers. Until then, we ask for one machine from each of the following precincts with high undervote rates: 31, 44, 74, 105, 117, 118 as well as two machines used during early voting.

**of our iVotronic machines, including the necessary tools and documentation to extract and read the “three redundant memories” contained within the iVotronic.** Also, in order to operate these iVotronic machines, **conducting an effective audit would require that we know their passwords.**

36. As described above, one of the hypotheses to test is whether a software bug may have somehow resulted in the observed undervote rate in Sarasota County. The best way to identify whether software bugs may have been responsible is to study the software in its human-readable form: “source code.” Software engineers write source code in programming languages such as C, C++, or Java, and then use other software tools, such as compilers, to translate this source code to a binary format that the computer can directly execute. For voting systems, each vendor’s source code is typically placed in escrow with the state to allow for its inspection, in events such as what has occurred here, as well as to provide the state some recourse if the vendor goes out of business. **Conducting an effective audit would require access to a full copy of all ES&S source code, as escrowed with the State of Florida.**
37. With access to the source code, we would be able to determine if there are flaws as serious as what we and others have discovered in the Diebold AccuVote-TS voting system. We would also be able to determine whether some unforeseen and previously untested interaction between the ballot definition files and the voters might have caused voter intent to be incorrectly captured by the machine.

38. For example, there may be a latent “buffer overflow” bug<sup>4</sup> that is triggered by the specific ballot definitions used in Sarasota County in their recent election. Buffer overflow bugs often induce non-deterministic behavior in software and could be responsible for some votes being corrupted while others are recorded properly. Furthermore, because each county uses different ballot definitions, problems observed in one county would not necessarily be repeated in other counties.
39. Likewise, software errors often manifest themselves when used with unusual inputs that may not have been adequately tested. For example, consider Florida’s races for U.S. Senate and for Governor, each of which had seven options, whereas most other races only have two choices. It’s entirely possible that ES&S’s development and testing process never considered such a possibility and the result could be non-deterministic software behavior as described above.
40. Once such a non-deterministic bug has been triggered, its effects could vary widely. It is entirely possible that the software would continue to function in an apparently correct manner, or it is possible that the bug could cause corruption in an arbitrary part of system. If, for example, corruption were to have occurred in the procedures responsible for committing vote records to the non-volatile storage medium, then it would be possible for subsequent vote records to be corrupted as they are written out.

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<sup>4</sup> A full description of buffer overflow bugs is beyond the scope of this declaration. The Wikipedia has a reasonable technical introduction to the topic ([http://en.wikipedia.org/wiki/Buffer\\_overflow](http://en.wikipedia.org/wiki/Buffer_overflow)).

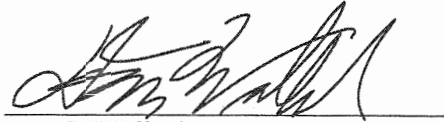
41. As this source code is not normally made available for public analysis, states typically rely on a certification process managed by the National Association of State Election Directors (NASSED) which will soon be managed instead by the federal government's Election Assistance Commission (EAC). Election system vendors submit their source code along with a "technical documents package" to one of several Independent Testing Authorities (ITAs). The ITA reports and the technical document packages are considered to be trade secrets between the vendor and the ITA, although some states require that they receive copies for their own inspection. I had the opportunity to inspect the ES&S-relevant documents as an expert in *Conroy v. Dennis* (District Court, Denver County, Colorado, Case Number 06CV6072). I found evidence of significant weaknesses in ES&S's software engineering procedures and in their software design.<sup>5</sup> These weaknesses apply directly to the ES&S iVotronic systems certified and used in Florida. As such, **we cannot rely on prior certification and testing as a substitute for our own analysis.**

42. I have worked in past legal challenges with software considered to be proprietary and trade secret including, in *Uniloc v. Microsoft* (a patent infringement case), code that Microsoft considers so sensitive that most of its own developers are never allowed to see it. I would be willing to sign an appropriate protective order that stipulates that I will protect the secrecy of the code and that I will not disclose anything not relevant to the undervote issue in Sarasota County's recent election. And furthermore, if I need additional

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<sup>5</sup> Dan S. Wallach, "[Expert Report in \*Conroy v. Dennis\*](http://accurate-voting.org/wp-content/uploads/2006/09/dwallach-redacted-new.pdf)" (portions redacted), September 2006. <http://accurate-voting.org/wp-content/uploads/2006/09/dwallach-redacted-new.pdf>

people to work with me on this analysis, I would require that they accept the same restrictions.

A handwritten signature in black ink, appearing to read 'Dan S. Wallach', written over a horizontal line.

Dan S. Wallach

Appendix A to  
Declaration of  
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**Publications** (see also, [publications by area](#))**Journal Papers**

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*Advised by [Edward W. Felten](#)*

## Workshop Papers

Seth James Nielson, Scott A. Crosby, and Dan S. Wallach, [A Taxonomy of Rational Attacks](#), *Fourth International Workshop on Peer-to-Peer Systems (IPTPS '05)* (Ithaca, New York), February 2005.

Alan Mislove, Gaurav Oberoi, Ansley Post, Charles Reis, Peter Druschel, and Dan S. Wallach, [AP3: Cooperative, Decentralized Anonymous Communication](#), *11th ACM SIGOPS European Workshop* (Leuven, Belgium), September 2004.

Tsuen-Wan "Johnny" Ngan, Animesh Nandi, Atul Singh, Dan S. Wallach, and Peter Druschel, [Designing Incentives-Compatible Peer-to-Peer Systems](#), *2nd Bertinoro Workshop on Future Directions in Distributed Computing (FuDiCo 2004)* (Bertinoro, Italy), June 2004.

Tsuen-Wan "Johnny" Ngan, Dan S. Wallach, and Peter Druschel, [Incentives-Compatible Peer-to-Peer Multicast](#), *2nd Workshop on Economics of Peer-to-Peer Systems* (Cambridge, Massachusetts), June 2004.

Ping Tao, Algis Rudys, Andrew Ladd, and Dan S. Wallach, [Wireless LAN Location Sensing for Security Applications](#), *ACM Workshop on Wireless Security (WiSe 2003)* (San Diego, California), September 2003.

Andrew Fuqua, Tsuen-Wan "Johnny" Ngan, and Dan S. Wallach, [Economic Behavior of Peer-to-Peer Storage Networks](#), *Workshop on Economics of Peer-to-Peer Systems* (Berkeley, California), June 2003.

Alan Mislove, Charles Reis, Ansley Post, Paul Willmann, Peter Druschel, Dan S. Wallach, Xavier Bonnaire, Pierre Sens, Jean-Michel Busca, Luciana Arantes-Bezerra, [POST: A Secure, Resilient, Cooperative Messaging System](#), *9th Workshop on Hot Topics in Operating Systems (HotOS IX)* (Lihue, Hawaii), May 2003.

Nathanael Paul, David Evans, Aviel D. Rubin, and Dan S. Wallach, [Authentication for Remote Voting](#), *Workshop on Human-Computer Interaction and Security Systems* (Fort Lauderdale, Florida), April 2003.

Tsuen-Wan "Johnny" Ngan, Dan S. Wallach, and Peter Druschel, [Enforcing Fair Sharing of Peer-to-Peer Resources](#), *2nd International Workshop on Peer-to-Peer Systems (IPTPS '03)* (Berkeley, California), February 2003.

Algis Rudys and Dan S. Wallach, [Enforcing Java Run-Time Properties Using Bytecode Rewriting](#), *International Symposium on Software Security* (Tokyo, Japan), November 2002.

Dan S. Wallach, [A Survey of Peer-to-Peer Security Issues](#), *International Symposium on Software Security* (Tokyo, Japan), November 2002.

Yuri Dotsenko, Eyal de Lara, Dan S. Wallach, and Willy Zwaenepoel, [Extensible Adaptation via Constraint Solving](#), *4th IEEE Workshop on Mobile Computing Systems & Applications* (Callicoon, New York), June 2002.

Eyal de Lara, Rajnish Kumar, Dan S. Wallach, and Willy Zwaenepoel, [Collaboration and Document Editing on Bandwidth-Limited Devices](#), *Proceedings of the Workshop on*

*Application Models and Programming Tools for Ubiquitous Computing (UbiTools '01)*  
(Atlanta, Georgia), September 2001.

Eyal de Lara, Dan S. Wallach, and Willy Zwaenepoel, Position Summary: Architectures for Adaptation Systems, *Eighth IEEE Workshop on Hot Topics in Operating Systems (HotOS-VIII)* (Schloss Elmau, Germany), May 2001.

Y. Charie Hu, Weimin Yu, Alan L. Cox, Dan S. Wallach, and Willy Zwaenepoel, Runtime Support for Distributed Sharing in Typed Languages, *Proceedings of LCR2000: the Fifth Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers* (Rochester, New York), May 2000.

Dan S. Wallach, Jim A. Roskind, and Edward W. Felten, Flexible, Extensible Java Security Using Digital Signatures, *Network Threats* (New Brunswick, New Jersey), December 1996, R. N. Wright and P. G. Neumann, Eds., vol. 38 of *DIMACS Series in Discrete Mathematics and Theoretical Computer Science*, American Mathematical Society, pp. 59-74.

### **Tech Reports / Miscellaneous**

Dan S. Wallach, "Expert Report in *Conroy v. Dennis*" (portions redacted), September 2006.

Dan S. Wallach, "Security and Reliability of Webb County's ES&S Voting System and the March '06 Primary Election" (Expert Report in *Flores v. Lopez*), May 2006.

Seth Nielson, Seth J. Fogarty, and Dan S. Wallach, Attacks on Local Searching Tools, Technical Report TR-04-445, Department of Computer Science, Rice University, December 2004.

Dan S. Wallach, Testimony for the NIST/EAC Technical Guidelines Development Committee (Gaithersburg, Maryland), September 2004.

Dan S. Wallach, Testimony for the Texas Senate Committee on State Affairs (Austin, Texas), May 2004.

Dan S. Wallach, Testimony for the Texas House Elections Committee (Austin, Texas), March 2004.

Dan S. Wallach, Testimony for the Ohio Joint Committee on Ballot Security (Columbus, Ohio), March 2004.

Jonathan Bannet, David W. Price, Algis Rudys, Justin Singer, Dan S. Wallach, Hack-a-Vote: Demonstrating Security Issues with Electronic Voting Systems. Technical Report TR-03-427, Department of Computer Science, Rice University, November 2003.

Tadayoshi Kohno, Adam Stubblefield, Aviel D. Rubin, Dan S. Wallach, Analysis of an Electronic Voting System, Johns Hopkins Information Security Institute Technical Report TR-2003-19, July 2003.

David L. Dill, Rebecca Mercuri, Peter G. Neumann, and Dan S. Wallach, Frequently Asked Questions about DRE Voting Systems (web page, also submitted to Santa Clara County board of supervisors), February 2003.

David W. Price, Algis Rudys, and Dan S. Wallach, Garbage Collector Memory Accounting in Language-Based Systems, Technical Report TR-02-407, Department of Computer Science, Rice University, December 2002.

Adam B. Stubblefield and Dan S. Wallach, Daxster: Censorship-Resistant Publishing Without Replication, Technical Report TR01-380, Department of Computer Science, Rice University,

July 2001.

Alex Grosul and Dan S. Wallach, A Related-Key Cryptanalysis of RC4, Technical Report TR-00-358, Department of Computer Science, Rice University, June 2000.

Adam B. Stubblefield and Dan S. Wallach, A Security Analysis of My.MP3.com and the Beam-it Protocol, Technical Report TR-00-353, Department of Computer Science, Rice University, February 2000.

Eyal de Lara, Dan S. Wallach, and Willy Zwaenepoel, A Characterization of Compound Documents on the Web, Technical Report TR-99-351, Department of Computer Science, Rice University, November 1999.

### Invited Panels

Steve Ansolabehere, *et al.*, Workshop on Developing a Research Agenda for Electronic Voting Technologies, American Association for the Advancement of Science (AAAS), September 2004.

Darleen Fisher, *et al.*, NSF Workshop on Security and Privacy (Berkeley, California), February 2002. *Publication pending.*

Gary McGraw, *et al.*, Attacking Malicious Code: A Report from the Infosec Research Council (San Antonio, Texas), April, 2000. Report published in *IEEE Software* 17(5), pp. 33-40.

### Teaching

Courses at Rice:

Comp527: Computer Systems Security (Spring 1999, Fall and Spring 2000, Fall 2001-2006)

Comp435: Election Systems, Technology, and Administration (Fall 2006)

Comp314: Applied Algorithms and Data Structures (Fall 1999, Spring 2001, 2002, 2004-2006)

Comp620: Seminar in Secure Systems (Fall 1998)

Short courses and tutorials:

Dan S. Wallach, Language-Based Security (a one-week intensive short course), presented at The Summer School on Foundations of Internet Security (Duszniki Zdrój, Poland), June 2002.

Dan S. Wallach and Drew Dean, Java and Security (a one-week intensive short course), Katholieke Universiteit Leuven (Leuven, Belgium), March 1997.

Teaching assistant positions at Princeton:

Introduction to Computer Systems (Spring 1996)

Computer Graphics (Fall 1993, Fall 1994, and Fall 1995)

Advanced Programming Techniques (Spring 1994)

### Professional Service

*Research management:*

Associate Director, ACCURATE (NSF-funded research center), 2005-2010

*Program committees:*

ACM Conference on Computer and Communications Security (CCS) 2004 and 2005

ACM Conference on Electronic Commerce 2007

ACM Role-Based Access Control Workshop 1999 and 2000  
 Applied Cryptography and Network Security (ACNS) 2005  
 HotOS Workshop 2003  
 HotSec Workshop 2006  
 IEEE International Conference on Distributed Computing Systems (ICDCS) 2007  
 IEEE Security and Privacy 1999, 2004, 2005, and 2007  
 IEEE Workshop on Mobile Computing Systems and Applications (WMCSA) 2002 and 2004  
 International Peer-to-Peer Symposium (IPTPS) 2004 and 2006  
 Network and Distributed Systems Security Symposium (NDSS) 2002-2004 and 2006  
 NSF grant panels 2002, 2004, 2005, 2006  
 South Central Information Security Symposium 2003-2006  
 Usenix Annual Conference 2001  
 Usenix Security Symposium 1999-2003 and 2005  
 Usenix Symposium on Internet Technologies and Systems (USITS) 2003  
 Workshop on Economics in Peer-to-Peer Systems 2004  
 WWW Conference 1999, 2000, 2003, 2004, 2006, and 2007

*Program committee chair:*

Usenix Security Symposium 2001  
Usenix/ACCURATE Electronic Voting Workshop 2006  
WWW Conference, Co-Chair of Security, Privacy, Reliability, and Ethics Track 2007

*Invited talks coordinator:*

Usenix Security Symposium 2002

*Panel moderator/organizer (electronic voting security):*

Usenix Security Symposium 2003  
 IEEE Symposium on Security and Privacy 2004

*Workshop organizer:*

South Central Information Security Symposium 2003-2006

*Editorial and advisory board memberships:*

Election Science Institute (VoteWatch)  
IEEE Internet Computing (2004-2006)  
International Journal of Information Security  
International Journal of Information and Computer Security  
International Journal for Infonomics  
National Committee for Voting Integrity  
Verified Voting Foundation / VerifiedVoting.org

*University committees:*

Advisor for MCS Students (2000-2001)  
 CS Graduate Admissions (1998-2005)  
 CS Curriculum Committee (2005-present)  
 CS Facilities (occasional involvement)  
 KTRU (Rice Radio) Friendly Committee (2005-present)  
 University IT Security Committee (2002-present)

*Other university service:*

Divisional advisor and faculty associate, Martel College (2001-present)  
 Rice Social Dance Society: faculty sponsor, instructor, workshop organizer, etc.  
 (2001-present)

## Grants

Aviel D. Rubin, Dan S. Wallach, Michael Byrne, Douglas W. Jones, David Dill, Dan Boneh, David A. Wagner, Dierdre Mulligan, Drew Dean, and Peter G. Neumann, CT-CS: A Center for Correct, Usable, Reliable, Auditable, and Transparent Elections (ACCURATE), NSF CNS-0524211 (October 2005).

Dan S. Wallach and Peter Druschel, CSR/PDOS: Security and Incentives for Overlay Network Infrastructure, NSF CNS-0509297 (August 2005).

Dan S. Wallach and Mike Dahlin, Resource Management for Safe Deployment of Edge Services, Texas Advanced Technology Program #003604-0053-2001 (October 2001).

Dan S. Wallach, Security and Resource Management in Type-Safe Language Environments, NSF CAREER CCR-9985332 (March 2000).

Behnaam Aazhang, Richard G. Baraniuk, Joseph R. Cavallaro, Edward W. Knightly, and Dan S. Wallach, Seamless Multitier Wireless Networks for Multimedia Applications, NSF Special Projects ANI-9979465 (April 1999).

### *Industrial gifts and support:*

Microsoft gift (November 2002)  
 Schlumberger gift (February 2002)  
 IBM University Partnership Program (June 2000)  
 Microsoft gift (July 2000)

### *Related support:*

Usenix Student Scholarship for Adam Stubblefield (May 2001)

## Invited Talks and Panels

Dan S. Wallach, *Electronic Voting: Risks and Research*, Institute for Security Technology Studies Distinguished Speaker Series, Dartmouth College (Hannover, New Hampshire), October 2006.

Dan S. Wallach, *Electronic Voting: Risks and Research*, Max Planck Institute for Software Systems (Saarbrücken, Germany), October 2006.

Dan S. Wallach, *Electronic Voting: Risks and Research*, , Chaire Internationale en Sécurité Informatique, Institut Eurécom (Sophia Antipolis, France), October 2006.

Dan S. Wallach, *Electronic Voting: Risks and Research*, University of Texas at Austin (Austin, TX), September 2006.

Dan S. Wallach, *The Risks of Electronic Voting*, Election Protection Summit (Washington, D.C.), June 2006.

Dan S. Wallach, *Computer Security Education at Rice*, Workshop on Information Assurance Education (Houston, Texas), May 2006.

Dan S. Wallach, *The Risks of Electronic Voting*, Georgia Institute of Technology (Atlanta, Georgia), March 2006.

Dan S. Wallach, Testimony for the California Senate Elections, Reapportionment & Constitutional Amendments Committee (Menlo Park, California), February 2006.

Elizabeth Hanshaw Winn and Dan S Wallach, *Panel: Electronic Voting Technology*, First Annual

Legislative and Public Policy Conference, TSU Thurgood Marshall School of Law (Houston, Texas), October 2005.

Paul Craft, Douglas Jones, John Kelsey, Ronald Rivest, Michael Shamos, Dan Tokaji, Dan S. Wallach, *Panel: Threat Discussion on Trojan Horses, Backdoors, and Other Voting System Software-Related Problems*, NIST Workshop on Threats to Voting Systems (Gaithersburg, Maryland), October 2005.

Dan S. Wallach, *The Risks of Electronic Voting*, Virginia Joint Committee Studying Voting Equipment (Richmond, Virginia), August 2005.

Dan S. Wallach, *The Risks of Electronic Voting*, Tarrant County Democratic Party Meeting (Hurst, Texas), July 2005.

Dan S. Wallach, *Electronic Voting Machine / Registration Systems*, Testimony for the Carter-Baker Commission on Federal Election Reform (Houston, Texas), June 2005.

Dan S. Wallach, *The Risks of Electronic Voting*, NSF Workshop on Cyberinfrastructure and the Social Sciences (Arlington, Virginia), March 2005.

Dan S. Wallach, *The Risks of Electronic Voting*, CASSIS: Construction and Analysis of Safe, Secure, and Interoperable Smart Devices (Nice, France), March 2005.

Dan S. Wallach, *The Risks of Electronic Voting*, University of Massachusetts, Amherst, Five Colleges Information Assurance Lecture Series (Amherst, Massachusetts), December 2004.

Dan S. Wallach, *The Risks of Electronic Voting*, University of Iowa, Department of Computer Science (Iowa City, Iowa), December 2004.

Dan S. Wallach, *The Risks of Electronic Voting*, CSI's 31st Annual Computer Security Conference (Washington, D.C.), November 2004.

Hans Klein, Eugene Spafford, Donald Moynihan, Dan S. Wallach, and Jim Reis, *Panel: E-Voting Policies and Perils*, Association for Public Policy Analysis and Management (APPAM) (Atlanta, Georgia), October 2004.

Dan S. Wallach, *The Risks of Electronic Voting*, Seventh Workshop on Languages, Compilers, and Run-time Support for Scalable Systems (Houston, Texas), October 2004.

Dan S. Wallach, *The Risks of Electronic Voting*, Symposium on the 2004 Presidential Election, John J. Marshall Law School (Chicago, Illinois), October 2004.

Chris Bell, Dan S. Wallach, and Tony J. Servello III, *Panel: Electronic Voting*, Science Café (Houston, Texas), October 2004.

Dan S. Wallach, *The Risks of Electronic Voting*, The Integrity of the Election Process, U. of Toledo Law School (Toledo, Ohio), October 2004.

Dan S. Wallach, *The Risks of Electronic Voting*, Princeton University, Department of Computer Science (Princeton, New Jersey), October 2004.

Dan S. Wallach, *The Risks of Electronic Voting*, DIMACS Workshop on Cryptography: Theory Meets Practice (Piscataway, New Jersey), October 2004.

Dan S. Wallach, Michael I. Shamos, Eugene Spafford, and Michael E. Lavelle, *Panel: Who Can Plug Into E-Voting Machines?*, E-election 2004: Is E-Voting Ready for Prime Time?, John Marshall Law School (Chicago, Illinois), October 2004.

Dan S. Wallach, Testimony for the NIST/EAC Technical Guidelines Development Committee

(Gaithersburg, Maryland), September 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, DiverseWorks: The Voting Machine (Houston, Texas), September 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Baker Institute Forum on Electronic Voting (Houston, Texas), September 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, League of Women Voters General Meeting (Houston, Texas), September 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Simposio acerca de Urnas Electrónicas para la Emisión del Voto Ciudadano (Mexico City, Mexico), September 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Fermi National Accelerator Lab (Batavia, Illinois), August 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, TrueMajority "National Day of Action" (Austin, Texas), July 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, 10th Annual County and District Clerks' Association of Texas Conference (Lake Conroe, Texas), June 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Texas State Democratic Party Convention, Progressive Populist Caucus (Houston, Texas), June 2004.

Dan S. Wallace, *Hack-a-Vote: Demonstrating Security Issues with Electronic Voting Machines*, DIMACS Workshop on Electronic Voting - Theory and Practice (Piscataway, New Jersey), May 2004.

Dan S. Wallace, Testimony for the Texas Senate Committee on State Affairs (Austin, Texas), May 2004.

Josh Benaloh, Dana DeBeauvoir, and Dan S. Wallace. *Panel: Electronic Voting Security*, IEEE Symposium on Security and Privacy (Oakland, California), May 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Harris County Democrats (Houston, Texas), April 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, North Brazoria County Democrats (Pearland, Texas), April 2004.

Dana DeBeauvoir, Ann McGeehan, Dan S. Wallace, *Panel on the Security of Electronic Voting*, League of Women Voters (Austin, Texas), April 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Guest lecture in "Texas Political Parties and Elections" (Government 335N, University of Texas, Austin), March 2004.

Dan S. Wallace, Testimony for the Texas House Elections Committee (Austin, Texas), March 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Bell County Republican Convention (Belton, Texas), March 2004.

Dan S. Wallace, Testimony for the Ohio Joint Committee on Ballot Security (Columbus, Ohio), March 2004.

Dan S. Wallace, *The Risks of Electronic Voting*, Houston Peace Forum (First Unitarian Universalist Church, Houston, Texas), March 2004.

- Ben Cohen and Dan S. Wallach, *TrueMajority Press Event* (Washington, D.C.) February, 2004.
- Dan S. Wallach, *The Risks of Electronic Voting*, European Commission eDemocracy Seminar (Brussels, Belgium), February, 2004.
- Dana DeBeauvoir, Dan S. Wallach, Ann McGeehan, Bill Stotesbery, Adina Levin, *Electronic Voting: Benefits & Risks*, First Unitarian Universalist Church of Austin (panel co-sponsored by Travis County Green Party and Austin Democracy Coalition) (Austin, Texas), January 2004.
- Dan S. Wallach, *The Risks of Electronic Voting*, Texas IMPACT / United Methodist Women (Austin, Texas), January 2004.
- Dan S. Wallach, *The Risks of Electronic Voting*, River Oaks Democratic Women (Houston, Texas), January 2004.
- Dan S. Wallach, *The Risks of Electronic Voting*, University of Michigan, Department of Computer Science (Ann Arbor, Michigan), January 2004.
- Dan S. Wallach, *The Risks of Electronic Voting*, EFF-Austin Policy Roundtable (Austin, Texas), December 2003.
- Dan S. Wallach, *O.S. Security Semantics for Language-based Systems*, Katholieke Universiteit Leuven (Leuven, Belgium), December 2003.
- Dan S. Wallach, *O.S. Security Semantics for Language-based Systems*, Belgium Java User's Group: JavaPolis (Antwerp, Belgium), December 2003.
- Dan S. Wallach, *The Risks of Electronic Voting*, Austin Pastoral Center (Austin, Texas), November 2003.
- Dan S. Wallach, *Peer-to-Peer Security*, Cornell University, Department of Computer Science (Ithaca, New York), November 2003.
- Dan S. Wallach, *The Risks of Electronic Voting*, Duke University, Department of Computer Science (Durham, North Carolina), October 2003.
- Dan S. Wallach, *The Risks of Electronic Voting*, University of Arizona, Department of Computer Science (Tucson, Arizona), September 2003.
- Dan S. Wallach, *Peer-to-Peer Security*, UW/MSR/CMU Software Security Summer Institute (Stevenson, Washington), June 2003.
- Dan S. Wallach, *Peer-to-Peer Security*, Stanford University, Department of Computer Science (Stanford, California), May 2003.
- Dan S. Wallach, *Adventures in Copy Protection Research*, The Hockaday School (Dallas, Texas), April 2003.
- Dan S. Wallach, *Adventures in Copy Protection Research*, Formal Techniques for Networked and Distributed Systems (Houston, Texas), November 2002.
- Dan S. Wallach, *Peer-to-Peer Security*, Oregon Graduate Institute (Portland, Oregon), March 2002.
- Dan S. Wallach, *Mobile Code Security Through Program Transformations*, Mathematical Foundations of Programming Semantics (New Orleans, Louisiana), March 2002.
- Dan S. Wallach, *The Risks of E-Voting Machines*, Bay Area New Democrats (Houston, Texas), November 2001.

Dan S. Wallach, Testimony before the Houston City Council on the risks of electronic voting systems, July 2001.

Dan S. Wallach, *Adventures in Copy Protection Research*, Open Group Meeting (Austin, Texas), July 2001.

Dan S. Wallach, *Adventures in Copy Protection Research*, Houston Copyright Town Hall Meeting (Houston, Texas), April, 2001.

Dan S. Wallach, *Mobile Code Security Through Program Transformations*, U.C. Berkeley (Berkeley, California), March 2001.

Dan S. Wallach, *Mobile Code Security Through Program Transformations*, University of Texas (Austin, Texas), November 2000.

Dan S. Wallach, *Mobile Code Security Through Program Transformations*, International Workshop on Mobile Objects/Code and Security (Tokyo, Japan), October 2000.

Dan S. Wallach and John DeRose, *The Security of My.MP3.com and Other "Beaming" Technologies*, MP3 Summit (San Diego, California), June 2000.

Dan S. Wallach, *An Overview of Computer Security*, Law Practice Management Section of the Houston Bar Association (Houston, Texas), May 2000.

- Wallach has also spoken to visiting groups of high school students via a Rice outreach program organized by Jen Overton.

## Advisees

### *Completed PhDs:*

Eyal de Lara (PhD completed January '03, now a professor at the University of Toronto)

### *Recent graduate researcher collaborators (\* = Wallach is current, primary advisor):*

Konstantinos Bekris

Cristian Coarfa

Scott Crosby\*

Anwis Das (current at Google)

Yuri Dotsenko

Tadayoshi Kohno (professor at University of Washington)

Rajnish Kumar

Andrew Ladd

Alan Mislove

Animesh Nandi

Seth Nielson\*

Tsuen Wan "Johnny" Ngan (currently at Symantec Research)

Ainsley Post

Algis Rudys (currently at Google)

Atul Singh

Adam Stubblefield (Johns Hopkins)

Ping Tao

### *Recent undergraduate researchers:*

Jonathan Bannet

Kyle Derr

Eliot Flannery

Andrew Fuqua

David Wray Price (JD from Stanford, now clerking for the Federal Circuit, Patent Appeals Court)

Adam Stubblefield (2002 CRA Outstanding Male Undergraduate Award)

Andy Thomas

Ted Torous

## Consulting *Private Consulting:*

AT&T Research (fall 2001, collaborating with Avi Rubin on security research)

GalleryFurniture (August 2001, post-attack web site audit and reinstall)

Curl (December 2000, security architecture review)

Quaadros Technologies (October 2000, design review)

Cloakware (September 2000 and August 2001, design review)

Coral Technologies (December 1999, security audit)

MetaCreations (March 2000, security audit)

CenterPoint Ventures (ongoing, technical evaluations of startups)

Rho Ventures (ongoing, technical evaluations of startups)

## *Legal Consulting (Election-related):*

Conroy et al. v. Dennis (Colorado Sec. of State) (September 2006, expert for plaintiffs)

Santana et al. v. Williams (Texas Sec. of State) and DeBeauvoir (Travis County Clerk) (July 2006, expert for plaintiffs)

Taylor et al. v. Cortés (Pennsylvania Sec. of Commonwealth) (April 2006, expert for plaintiffs)

Bruni v. Valdes and Benavides (April 2006, expert for Bruni)

Flores v. Lopez (April 2006, expert for Flores)

ACLU v. Connor (Texas Sec. of State) (February 2005, expert for the ACLU)

## *Legal Consulting (Other):*

Autobytel v. Dealix (May 2005, expert for Dealix)

Soverain v. Amazon.com (April 2005, expert for Amazon.com)

Uniloc v. Microsoft (November 2004, expert witness for Microsoft)

Nash v. Microsoft (May 2004, expert witness for Microsoft)

Recruitsoft v. Hire.com (August 2003, expert witness for Hire.com)

DirecTV v. NDS (April 2003, expert witness for DirecTV)

RIAA v. MP3.com (February 2000, wrote declaration for MP3.com)

**Employment** Rice University, Associate professor, Department of Computer Science, beginning October 1998.

**History** (Promoted from assistant professor in May 2005.)

9/93 - 10/98 Princeton University, Graduate student, Department of Computer Science. Supported by grants from NSF, Sun Microsystems, Intel, Microsoft, and others.

6/97 - 8/97 Netscape Communications Corporation, Mountain View, California.

Integrated Java with SSL. Audited the CORBA and RMI implementations for security bugs. Wrote a CORBA demonstration (a chat server).

6/96 - 8/96 Netscape Communications Corporation, Mountain View, California.

Designed and implemented a privilege-based security mechanism and user interface to enable digitally-signed Java applets. Participated in design reviews of several Netscape and JavaSoft technologies.

6/95 - 8/95 Microsoft Corporation, Redmond, Washington.

Wrote a converter from Softimage to a RenderMorphics-based system (V-Chat). Designed and implemented a polygonal model compression system for virtual reality applications.

6/94 - 8/94 David Sarnoff Research Center, Princeton, New Jersey.

Wrote a microcode-level simulator for parallel video processing engine. Wrote design documents for the client side of a future video-on-demand system.

6/93 - 8/93 Berkeley Systems, Berkeley, California.

Ported a screen-reading system (allowing blind people to use graphical user interfaces) from Microsoft Windows to X.

9/92 - 6/93 U.C. Berkeley, Research Assistant for Dr. Larry Rowe.

Implemented parts of a MPEG-1 video encoder. Wrote the audio support for a real-time distributed media-on-demand system.

Appendix B to  
Declaration of  
Dan S. Wallach

## APPENDIX B TO WALLACH DECLARATION

An example of an event log:

```

                                WEBB COUNTY, TEXAS
                                PRIMARY ELECTION
                                MARCH 7, 2006 RE-COUNT LOG
RUN DATE:03/24/06 02:14 PM                                     ELECTION ID: 6PTXWEBB

Votronic  PEB#  Type  Date      Time      Event
5117865  161061  SUP  03/06/2006 16:31:12  01 Terminal clear and test
161126  SUP  03/07/2006 07:09:37  09 Terminal open
03/07/2006 07:13:50  13 Print zero tape
03/07/2006 07:15:39  13 Print zero tape
160973  SUP  03/07/2006 12:32:24  20 Normal ballot cast
03/07/2006 16:59:19  20 Normal ballot cast
03/07/2006 18:06:23  20 Normal ballot cast
03/07/2006 18:25:56  20 Normal ballot cast
03/07/2006 18:32:18  20 Normal ballot cast
03/07/2006 18:48:54  20 Normal ballot cast
03/07/2006 18:56:03  20 Normal ballot cast
03/07/2006 19:01:52  20 Normal ballot cast
161126  SUP  03/07/2006 19:39:41  10 Terminal close

5140052  161061  SUP  03/07/2006 15:29:03  01 Terminal clear and test
160980  SUP  03/07/2006 15:31:15  09 Terminal open
03/07/2006 15:34:47  13 Print zero tape
03/07/2006 15:36:36  13 Print zero tape
160999  SUP  03/07/2006 15:56:50  20 Normal ballot cast
03/07/2006 16:47:12  20 Normal ballot cast
03/07/2006 18:07:29  20 Normal ballot cast
03/07/2006 18:17:03  20 Normal ballot cast
02/07/2006 18:37:24  22 Super ballot cancel
03/07/2006 18:41:18  20 Normal ballot cast
03/07/2006 18:46:23  20 Normal ballot cast
160980  SUP  03/07/2006 19:07:14  10 Terminal close

5140148  160997  SUP  03/01/2006 08:27:11  01 Terminal clear and test
160990  SUP  03/07/2006 08:56:17  09 Terminal open
159979  SUP  03/07/2006 12:55:43  20 Normal ballot cast
03/07/2006 13:14:30  20 Normal ballot cast
02/07/2006 18:21:03  22 Super ballot cancel
03/07/2006 18:23:53  20 Normal ballot cast
160990  SUP  03/07/2006 19:08:32  10 Terminal close

5141714  161061  SUP  03/03/2006 19:31:38  01 Terminal clear and test
174809  SUP  03/07/2006 06:28:56  09 Terminal open
174804  SUP  03/07/2006 08:12:48  20 Normal ballot cast
03/07/2006 11:44:18  20 Normal ballot cast
03/07/2006 12:01:25  20 Normal ballot cast
03/07/2006 12:06:44  20 Normal ballot cast
03/07/2006 12:32:55  20 Normal ballot cast
03/07/2006 13:09:48  20 Normal ballot cast
03/07/2006 13:27:33  20 Normal ballot cast
02/07/2006 14:28:04  20 Normal ballot cast
02/07/2006 14:44:26  20 Normal ballot cast
03/07/2006 14:57:31  20 Normal ballot cast
03/07/2006 17:19:51  20 Normal ballot cast
03/07/2006 17:38:37  20 Normal ballot cast
02/07/2006 17:45:27  20 Normal ballot cast
03/07/2006 17:51:42  20 Normal ballot cast
03/07/2006 18:04:22  20 Normal ballot cast
03/07/2006 18:14:04  20 Normal ballot cast
03/07/2006 18:40:21  20 Normal ballot cast
03/07/2006 18:53:11  20 Normal ballot cast
03/07/2006 18:56:28  20 Normal ballot cast
03/07/2006 19:03:57  20 Normal ballot cast
03/07/2006 19:07:33  20 Normal ballot cast
03/07/2006 19:29:50  20 Normal ballot cast
                                WEBB COUNTY, TEXAS
                                PRIMARY ELECTION
                                MARCH 7, 2006 RE-COUNT LOG
RUN DATE:03/24/06 02:14 PM                                     ELECTION ID: 6PTXWEBB

Votronic  PEB#  Type  Date      Time      Event
5141714  174809  SUP  03/07/2006 19:42:45  10 Terminal close

5141719  161061  SUP  02/26/2006 12:26:10  01 Terminal clear and test
161118  SUP  03/07/2006 07:18:05  09 Terminal open
160992  SUP  03/07/2006 08:44:39  20 Normal ballot cast
03/07/2006 09:29:58  20 Normal ballot cast
03/07/2006 10:26:00  20 Normal ballot cast
03/07/2006 12:17:25  20 Normal ballot cast
03/07/2006 12:39:49  20 Normal ballot cast
03/07/2006 13:00:29  20 Normal ballot cast
03/07/2006 14:16:55  20 Normal ballot cast
03/07/2006 14:32:43  20 Normal ballot cast
03/07/2006 16:03:04  20 Normal ballot cast
03/07/2006 17:01:53  20 Normal ballot cast
03/07/2006 17:07:45  20 Normal ballot cast
03/07/2006 17:15:47  20 Normal ballot cast
03/07/2006 17:24:21  20 Normal ballot cast
03/07/2006 17:40:58  20 Normal ballot cast
03/07/2006 18:10:29  20 Normal ballot cast
03/07/2006 18:23:06  20 Normal ballot cast
161118  SUP  03/07/2006 19:14:35  10 Terminal close

5141721  160997  SUP  03/01/2006 08:42:44  01 Terminal clear and test
161131  SUP  03/07/2006 12:20:13  09 Terminal open
161124  SUP  03/07/2006 12:37:29  22 Super ballot cancel
03/07/2006 12:39:41  20 Normal ballot cast
02/07/2006 12:49:48  20 Normal ballot cast
03/07/2006 13:01:22  20 Normal ballot cast
03/07/2006 13:05:40  20 Normal ballot cast
03/07/2006 13:11:14  20 Normal ballot cast
02/07/2006 13:16:10  20 Normal ballot cast

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03/07/2006 13:51:58 20 Normal ballot cast
03/07/2006 14:02:06 20 Normal ballot cast
03/07/2006 14:07:28 20 Normal ballot cast
03/07/2006 14:16:49 20 Normal ballot cast
03/07/2006 14:30:46 20 Normal ballot cast
03/07/2006 15:24:52 20 Normal ballot cast
03/07/2006 16:26:03 20 Normal ballot cast
03/07/2006 16:29:44 20 Normal ballot cast
03/07/2006 16:33:13 20 Normal ballot cast
03/07/2006 16:42:36 20 Normal ballot cast
03/07/2006 17:15:38 20 Normal ballot cast
03/07/2006 17:18:14 20 Normal ballot cast
03/07/2006 17:33:15 20 Normal ballot cast
03/07/2006 17:48:54 20 Normal ballot cast
03/07/2006 18:01:07 20 Normal ballot cast
03/07/2006 18:29:14 20 Normal ballot cast
03/07/2006 18:31:48 20 Normal ballot cast
03/07/2006 18:39:35 20 Normal ballot cast
03/07/2006 18:46:18 20 Normal ballot cast
03/07/2006 18:50:42 20 Normal ballot cast
03/07/2006 18:56:40 20 Normal ballot cast
03/07/2006 19:05:39 20 Normal ballot cast
03/07/2006 19:12:14 20 Normal ballot cast
161131 SUP 03/07/2006 19:19:50 10 Terminal close
5141829 161061 SUP 02/27/2006 19:40:15 01 Terminal clear and test
160962 SUP 03/07/2006 06:53:31 09 Terminal open
160963 SUP 03/07/2006 07:45:23 20 Normal ballot cast
03/07/2006 08:42:41 20 Normal ballot cast

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An example of a ballot image log:

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                                WEBB COUNTY, TEXAS
                                PRIMARY ELECTION
                                MARCH 7, 2006 RE-COUNT LOG
                                PRECINCT 1 - PRECINCT 401
                                ELECTION ID: 6PTXWEBB

RUN DATE:03/24/06 02:16 PM

VOTR.  B/S  CANDIDATES RECEIVING A VOTE
5141719 2 * 2 Darrel Reece Hunter DEM - United States Senator
5141719 2 4 Rick Bolanos DEM - United States Representative, Dist 23 USREP23
5141719 2 5 Chris Bell DEM - Governor
5141719 2 9 Adrian De Leon DEM - Lieutenant Governor
5141719 2 11 David Van Os DEM - Attorney General
5141719 2 12 Fred Head DEM - Comptroller of Public Accounts
5141719 2 13 Valinda Hathcox DEM - Commissioner of the General Land Office
5141719 2 14 Hank Gilbert DEM - Commissioner of Agriculture
5141719 2 16 Dale Henry DEM - Railroad Commissioner
5141719 2 17 William E. "Bill" Moody DEM - Justice, Supreme Court, Place 2
5141719 2 18 J. R. Molina DEM - Presiding Judge, Court of Criminal Appea
5141719 2 19 Rene Ruffez DEM - Member, State Board of Education, Distri
5141719 2 21 Mercurio Martinez Jr. DEM - State Representative, District 42 REP0042
5141719 2 24 Catherine Stone DEM - Appeals Court Justice Dist 4 P2
5141719 2 25 Richard Garcia Jr. DEM - Appeals Court Justice Dist 4 P3
5141719 2 26 Dan Forza DEM - Appeals Court Justice Dist 4 P4
5141719 2 27 Lauro A. Bustamante DEM - Appeals Court Justice Dist 4 P5
5141719 2 28 Eddie De La Garza DEM - Appeals Court Justice Dist 4 P7
5141719 2 30 Manuel B. Flores DEM - District Judge, Judicial District
5141719 2 31 Raul Vasquez DEM - District Judge, 11th Judicial District
5141719 2 34 Danny Valdez DEM - County Judge
5141719 2 36 Alvinio "Ben" Morales DEM - Judge, County Court at Law
5141719 2 38 Jesus "Chuy" Garza DEM - Judge, County Court at Law 2
5141719 2 40 Manuel "Meme" Gutierrez DEM - District Clerk
5141719 2 43 Esther Degollado DEM - County Clerk
5141719 2 45 Javier Martinez DEM - County Treasurer
5141719 2 51 Sergio "Keko" Martinez DEM - County Commissioner, Precinct No. 4 COM0004
5141719 2 59 Oscar Rene Liendo DEM - Justice of the Peace, Pct 1 P2 JOF0102
5141719 2 61 Javier Montemayor, Jr. DEM - County Chairman
5141719 2 95 For DEM - Referendum 1
5141719 2 97 For DEM - Referendum 2
5141719 2 20 Richard Raymond DEM - State Representative, District 42 REP0042
5141719 2 35 Louis H. Bruni DEM - County Judge
5141719 2 39 Diana Navarro DEM - Judge, County Court at Law 2
5141719 2 43 Esther Degollado DEM - County Clerk
5141719 2 45 Javier Martinez DEM - County Treasurer
5141719 2 51 Sergio "Keko" Martinez DEM - County Commissioner, Precinct No. 4 COM0004
5141719 2 2 Darrel Reece Hunter DEM - United States Senator
5141719 2 4 Rick Bolanos DEM - United States Representative, Dist 23 USREP23
5141719 2 5 Chris Bell DEM - Governor
5141719 2 9 Adrian De Leon DEM - Lieutenant Governor
5141719 2 11 David Van Os DEM - Attorney General
5141719 2 12 Fred Head DEM - Comptroller of Public Accounts
5141719 2 13 Valinda Hathcox DEM - Commissioner of the General Land Office
5141719 2 14 Hank Gilbert DEM - Commissioner of Agriculture
5141719 2 16 Dale Henry DEM - Railroad Commissioner
5141719 2 17 William E. "Bill" Moody DEM - Justice, Supreme Court, Place 2
5141719 2 18 J. R. Molina DEM - Presiding Judge, Court of Criminal Appea
5141719 2 21 Mercurio Martinez Jr. DEM - State Representative, District 42 REP0042
5141719 2 24 Catherine Stone DEM - Appeals Court Justice Dist 4 P2
5141719 2 25 Richard Garcia Jr. DEM - Appeals Court Justice Dist 4 P3
5141719 2 26 Dan Forza DEM - Appeals Court Justice Dist 4 P4
5141719 2 27 Lauro A. Bustamante DEM - Appeals Court Justice Dist 4 P5
5141719 2 28 Eddie De La Garza DEM - Appeals Court Justice Dist 4 P7
5141719 2 29 Joe Loper DEM - District Judge, Judicial District
5141719 2 31 Raul Vasquez DEM - District Judge, 11th Judicial District
5141719 2 34 Danny Valdez DEM - County Judge
5141719 2 36 Alvinio "Ben" Morales DEM - Judge, County Court at Law
5141719 2 38 Jesus "Chuy" Garza DEM - Judge, County Court at Law 2

                                WEBB COUNTY, TEXAS
                                PRIMARY ELECTION
                                MARCH 7, 2006 RE-COUNT LOG
                                PRECINCT 1 - PRECINCT 401
                                ELECTION ID: 6PTXWEBB

RUN DATE:03/24/06 02:16 PM

VOTR.  B/S  CANDIDATES RECEIVING A VOTE
5141719 2 40 Manuel "Meme" Gutierrez DEM - District Clerk
5141719 2 42 Margie Ramirez Ibarra DEM - County Clerk
5141719 2 44 Adolfo "Popo" Gonzalez DEM - County Treasurer
5141719 2 49 Rodolfo "Rudy" Lerma Jr. DEM - County Commissioner, Precinct No. 4 COM0004
5141719 2 55 Juan Ramirez DEM - Justice of the Peace, Pct 1 P2 JOF0102

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5141719	2	61 Javier Montemayor, Jr.	DEM - County Chairman
5141719	2	95 For	DEM - Referendum 1
5141719	2	97 For	DEM - Referendum 2
5141719	2	1 Barbara Ann Radnofsky	DEM - United States Senator
5141719	2	5 Chris Bell	DEM - Governor
5141719	2	10 Maria Luisa Alvarado	DEM - Lieutenant Governor
5141719	2	14 Hank Gilbert	DEM - Commissioner of Agriculture
5141719	2	20 Richard Raymond	DEM - State Representative, District 42 REP0042
5141719	2	30 Manuel R. Flores	DEM - District Judge, Judicial District
5141719	2	32 Carlos "C. Y." Benavides, III	DEM - County Judge
5141719	2	36 Alvin "Ben" Morales	DEM - Judge, County Court at Law
5141719	2	39 Diana Navarro	DEM - Judge, County Court at Law 2
5141719	2	42 Margie Ramirez Ibarra	DEM - County Clerk
5141719	2	46 Delia Perales	DEM - County Treasurer
5141719	2	47 Consuelo "Chelo" Montalvo	DEM - County Commissioner, Precinct No. 4 COM0004
5141719	2	55 Juan Ramirez	DEM - Justice of the Peace, Pct 1 P2 JOP0102
5141719	2	85 For	DEM - Referendum 1
5141719	2	97 For	DEM - Referendum 2
5141719	2	3 Gene Kelly	DEM - United States Senator
5141719	2	4 Rick Bolanos	DEM - United States Representative, Dist 23 USREP23
5141719	2	5 Chris Bell	DEM - Governor
5141719	2	9 Adrian De Leon	DEM - Lieutenant Governor
5141719	2	11 David Van Os	DEM - Attorney General
5141719	2	12 Fred Head	DEM - Comptroller of Public Accounts
5141719	2	13 Valinda Hathcox	DEM - Commissioner of the General Land Office
5141719	2	15 Keesadee Melton, Jr.	DEM - Commissioner of Agriculture
5141719	2	16 Dale Henry	DEM - Railroad Commissioner
5141719	2	17 William E. "Bill" Moody	DEM - Justice, Supreme Court, Place 2
5141719	2	18 J. R. Molina	DEM - Presiding Judge, Court of Criminal Appea
5141719	2	19 Rene Nuñez	DEM - Member, State Board of Education, Distri
5141719	2	21 Mercurio Martinez Jr.	DEM - State Representative, District 42 REP0042
5141719	2	25 Richard Garcia Jr.	DEM - Appeals Court Justice Dist 4 P3
5141719	2	26 Dan Pozza	DEM - Appeals Court Justice Dist 4 P4
5141719	2	27 Lauro A. Bustamante	DEM - Appeals Court Justice Dist 4 P5
5141719	2	28 Eddie De La Garza	DEM - Appeals Court Justice Dist 4 P7
5141719	2	29 Joe Lopez	DEM - District Judge, Judicial District
5141719	2	31 Raul Vasquez	DEM - District Judge, 11th Judicial District
5141719	2	33 Judith S. (Judy) Gutierrez	DEM - County Judge
5141719	2	37 Hugo D. Martinez	DEM - Judge, County Court at Law
5141719	2	39 Diana Navarro	DEM - Judge, County Court at Law 2
5141719	2	40 Manuel "Memo" Gutierrez	DEM - District Clerk
5141719	2	42 Margie Ramirez Ibarra	DEM - County Clerk
5141719	2	46 Delia Perales	DEM - County Treasurer
5141719	2	48 Jaime Canales	DEM - County Commissioner, Precinct No. 4 COM0004
5141719	2	59 Oscar Rene Liendo	DEM - Justice of the Peace, Pct 1 P2 JOP0102
5141719	2	61 Javier Montemayor, Jr.	DEM - County Chairman
5141719	2	95 For	DEM - Referendum 1
5141719	2	97 For	DEM - Referendum 2
5141719	2	21 Mercurio Martinez Jr.	DEM - State Representative, District 42 REP0042
5141719	2	29 Joe Lopez	DEM - District Judge, Judicial District
5141719	2	32 Carlos "C. Y." Benavides, III	DEM - County Judge
5141719	2	37 Hugo D. Martinez	DEM - Judge, County Court at Law
5141719	2	38 Jesus "Chuy" Garza	DEM - Judge, County Court at Law 2
5141719	2	42 Margie Ramirez Ibarra	DEM - County Clerk
5141719	2	45 Javier Martinez	DEM - County Treasurer