

## Presenting an Enhanced Audit Proposal: Summary

Maryland State Board of Elections Meeting October 28, 2016

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Chairman McManus, Vice-Chair Hogan, State Board of Elections Members, Members of the Public,

We are a group of election integrity experts who have collectively been involved in dozens of election audits in dozens of jurisdictions, and would like to offer a constructive proposal.

It's great that Maryland voters get to vote on paper ballots this year: paper ballots that voters can check are the best evidence of "the will of the people." Maryland's ballots will be scanned and then counted electronically. As required by hard-won state legislation passed in 2007, the paper ballots will be stored securely as durable evidence of what voters wanted. The state appears to have been prescient about the need for election verification, a very important characteristic of a good election.

The next step in ensuring that the electronic counts show who really won is to manually review some of the paper ballots: an audit. But the recently proposed post-election "audit" falls short: it will not look at the marked paper ballots! Instead, the State Board of Elections has contracted to use *another* software-based system that assumes the state's voting system scanned every ballot perfectly. But no system is perfect. Mistakes happen. Equipment malfunctions. And some people may want to make it look like the rightful winner lost.

Other states review the paper ballots to ensure that any tabulation errors didn't change the outcome. Modern audits can be highly efficient: they review only a small random sample of the ballots. There's no good reason not to use the actual ballots in an audit.

It is good that the State Board is planning reviews for all votes, races and counties. The proposed pilot can detect many types of errors in the original count, and adds value by involving human input in vote interpretation. But relying on the scans—which are as vulnerable as any other computer data—limits the kinds of problems the reviews can detect. We are not aware that the Board has any plans to determine whether the scans match the paper ballots. In fact, all public comments, including one in the Post earlier this week, seem to imply that the Board simply assumes they *do* match. But an "audit" misses the point when it doesn't check the ballots.

A hand and eye inspection of actual voter-verified paper ballots is necessary to reliably determine the intent of the voters. Because the Board does not plan to check the scans against the ballots, the reviews can't detect differences between the paper ballots and the scans. The scans aren't like photographs taken on film: they are digital representations and can differ due to machine error, tampering, or human error (for instance leaving out a batch of ballots or

scanning the same batch twice). In fact, the legislature appears to be aware of this, because the budget report requires the Board to explain why hand and eye inspection was not necessary if the audit relied only on images. While some other states wish they had verified paper records this year, the State Board will ignore the paper records voters have good reason to trust, and instead rely on electronic records that there is no reason to trust.

There are many good ways to audit election results. But none starts by trusting that computer results are right. The State Board claims that their proposed method is “independent” of the voting system, but it isn’t. It copies scan data from the voting system, assuming that the data are complete and correct. That can check the internal consistency of the system, but it isn’t an audit of the election results.

A robust statistical audit of the electronic results against the paper ballots can produce strong evidence that election outcomes are correct, or correct incorrect outcomes. In this contentious election, it is extremely important to Maryland and the nation to audit election results against the actual paper ballots. In fact, the legislated text for the budget report requires the State Board to report on the risk level of the procedure, which, in this case, would be 100% because no ballots were examined. It is not too late to plan and conduct a real audit in addition to the proposed post-election process, which adds value but is not an audit. We would be happy to help.

The budget report requires the State Board to describe “the manner in which the public was permitted to comment on the audit procedures before the audit, observe the audit, and comment on the conduct and results of the audit after the audit is complete”. We look forward to the Board providing a robust opportunity for public comment on all methods.

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**2. Joe Kiniry**

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**3. Mark Lindeman**

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**4. Neal McBurnett**

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**5. Ronald L. Rivest**

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**6. John Sebes**

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**7. Pamela Smith**

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**8. Philip B. Stark**

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**9. Paul Stokes**

United Voters of New Mexico

**10. Howard Stanislevic**

Founder, E-Voter Education project, NY, NY

**11. Poorvi L. Vora**

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**12. Luther Weeks**

CT Voters Count

**Harvie Branscomb** is an electrical engineer, election technologist and election quality advocate. He has conducted numerous statutory election audits in Colorado. He has served as a credentialed watcher of elections across the state including several pilots of innovative tabulation and audit techniques. He served on several Colorado Secretary of State appointed advisory committees including one leading to the choice of the Uniform Voting System. Harvie is a regular participant in public testimony on election rules and statutes. He is a board member of Coloradans For Voting Integrity. He is also CEO of StandbySoft LLC.

**Joseph Kiniry**, Ph.D, is the CEO and Chief Scientist of Free & Fair, a public benefit corporation whose goal is to foster trustworthy elections through trustworthy technology worldwide. He is also a Principal Investigator at Galois, where he leads programs in high assurance cryptography, rigorous engineering, and formal methods-based audits. His clients include federal agencies and large public corporations. Previously he was a Full Professor at the Technical University of Denmark (DTU). There, he was the Head of DTU's Software Engineering section. He also held a guest appointment at the IT University of Copenhagen. Over the past decade he has held permanent positions at four universities in Denmark, Ireland, and The Netherlands. Joe has extensive experience in formal methods, high-assurance software engineering, foundations of computer science and mathematics, and information security. Specific areas that he has worked in include software verification foundations and tools, digital election systems and democracies, smart-cards, smart-phones, critical systems for nation states, and CAD systems for asynchronous hardware. He has fifteen years' experience in the design, development, support, and auditing of supervised and internet/remote electronic voting systems while he was a professor at various universities in Europe. He co-led the DemTech research group at the IT

University of Copenhagen and has served as an adviser to the Dutch, Irish, Danish, and U.S. governments in matters relating to electronic voting.

**Mark Lindeman** is a political scientist whose research includes public opinion, political behavior, and election verification issues. His work with post-election vote tabulation audits includes writing several co-authored methods papers; serving as executive editor of the 2012 white paper "Risk-Limiting Audits: Why and How" on behalf of a multidisciplinary working group; and advising officials and advocates in several states about audit implementation. He is co-author of *Public Opinion* (third edition: Perseus Westview, 2015).

**Neal McBurnett** is an independent consultant in election integrity and security. He has computer science degrees from Brown and Berkeley, and worked for Bell Labs, Internet2 and Databricks. He has worked to improve election integrity since 2002 by pioneering post-election audits, working with election administrators, legislators and secretaries of state. He did the first risk-limiting audit in Colorado, and collaborated on Colorado's Risk Limiting Audit project and ballot-level risk-limiting audits that reached new levels of efficiency and scale. He also audited the innovative Scantegrity end-to-end-verifiable election in Takoma Park MD in 2011, and is a member of the STAR-Vote design team.

Neal has also worked on data format standards for elections via the IEEE and the US Election Assistance Commission (EAC), and is active with the Election Verification Network. He can often be found dancing in one of the Avalon ballrooms in Boulder Colorado.

**Ronald L. Rivest** is the Institute Professor of Computer Science in MIT's Dept. of Electrical Engineering and Computer Science. He is a member of MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL), a member of the lab's Theory of Computation Group and is a leader of its Cryptography and Information Security Group. He is a founder of RSA Data Security and an inventor of the RSA public-key cryptosystem, and a co-founder of Verisign and of Peppercoin. Professor Rivest has research interests in cryptography, computer and network security, voting systems, and algorithms. He is a member of the National Academy of Engineering, the National Academy of Sciences, and is a Fellow of the Association for Computing Machinery, the International Association for Cryptographic Research, and the American Academy of Arts and Sciences. He is also on the EPIC Advisory Board.

Together with Adi Shamir and Len Adleman, Dr. Rivest was awarded the 2000 IEEE Koji Kobayashi Computers and Communications Award and the Secure Computing Lifetime Achievement Award. He also received, together with Shamir and Adleman, the 2002 ACM

Turing Award and the 2009 NEC C&C Prize. He received an honorary degree from the University of Rome. He is a Fellow of the World Technology Network and a Finalist for the 2002 World Technology Award for Communications Technology. In 2005, he received the MITX Lifetime Achievement Award; in 2007, he received both the Computers, Freedom and Privacy Conference “Distinguished Innovator” award and the Marconi Prize. In 2008, he received an honorary doctorate from the Louvain School of Engineering at the Universite Catholique de Louvain (UCL). In 2010, he was awarded MIT’s Kilian Faculty Achievement Award. He has extensive experience in cryptographic design and cryptanalysis, and served as a Director of the International Association for Cryptologic Research, the organizing body for the Eurocrypt and Crypto conferences, and as a Director of the Financial Cryptography Association.

**E. John Sebes** is one of the two original co-founders and Chief Technology Officer (“CTO”) for the U.S. based non-profit public benefit corporation, the Open Source Election Technology Institute (“OSET”). He leads all aspects of technology strategy, vision, architecture, engineering and development for the TrustTheVote Project – the flagship effort of the Institute.

OSET is an election technology research and development institute working with elections officials across the country to create publicly available election technology to increase confidence in elections and their outcomes and because we all deserve a better voting experience. The mission is simple: increase integrity; improve turnout; and lower taxpayer cost. The strategy is delivery. To do this, the Institute is tackling the lack of verifiable, accurate, secure and transparent publicly available election technology primarily in the U.S., but with intentions of global availability. The Institute’s flagship effort – known as the TrustTheVote Project – is designing and building a next-generation “democracy operating system” called “ElectOS” to serve as a draft standard for critical democracy infrastructure. All software is freely available to any jurisdiction to adopt, adapt, and deploy—most likely through a commercial systems integrator.

Prior to the TrustTheVote Project, He’s been a software developer, technical consultant, and CTO, working in several areas - network infrastructure, application frameworks, embedded systems, critical infrastructure, datacenter operations - with strong common themes of risk management, security, privacy, and reliability. Innovation and tech transfer have been another consistent theme, in settings as varied as government-funded R&D, venture-backed start-ups, professional services, academia, and non-profits.

For parts of his career, John provided independent consulting services related to information security and IT operations assurance, for a variety of organizations ranging from technology start-ups and venture capital firms to major government agencies and established financial services firms. At other times, John has been a Principal Investigator in R&D projects, ranging

from DARPA projects performed in the pre-web era, to recent work with DHS on open source security technology. He has been working in the non-profit world with a focus on election technology for nearly a decade, partly from a desire to do public service with his professional skills, and partly because it is a surprisingly good fit for several seemingly disparate parts of John's work history and interests.

Previously CTO at Solidcore Systems, Inc.; VP Strategy at Securify; Technology Officer of Network Associates Labs; and variety of consulting, development, and R&D management roles at commercial InfoSec pioneer Trusted Information Systems.

John is a co-author of 12 patents and 20+ publications

**Pamela Smith** is President of Verified Voting. She provides information and public testimony on verified voting issues at federal and state levels throughout the US, including to the US House of Representatives Committee on House Administration. She oversees an extensive information resource on election equipment and the regulations governing its use at the federal level and across the 50 states. Ms. Smith is co-editor of the "Principles and Best Practices in Post Election Audits," co-author of "Counting Votes 2012: a State by State Look at Election Preparedness" and a contributing author for *Confirming Elections: Creating Confidence and Integrity through Election Auditing*. She has been a small business and marketing consultant and nonprofit executive for a Hispanic educational organization working on first language literacy and adult learning. Originally from Chicago, IL, Smith is now a resident of Carlsbad, CA.

**Howard Stanislevic** has been a computer network engineer for over 25 years in NYC working in various industries including telecommunications, airlines and advertising. He has worked on such diverse projects as domestic satellite digital audio transmission systems and the Washington-Moscow "Hotline." In his spare time, he has worked with the Internet Engineering Task Force and has contributed to several Requests for Comments (RFCs -- formalized peer-reviewed memoranda addressing and defining Internet standards). He has been studying the e-vote-counting problem since 2004, and has become a full-time advocate for verified elections (not just "verifiable" ones). Stanislevic believes there are some viable solutions to the election verification problem, but that in general, there is not enough of a commitment to implementing them. He co-authored the first risk-based statistical audit law in the nation, NJ C.19:61-9 (PL 2007 Ch. 349) and papers on election auditing, voting system reliability and standards published by The American Statistical Association, Verified Voting and VoteTrustUSA. He has contributed to NY State's Voting System Standards and two drafts of NY's Election Auditing and Recanvass regulations.

**Philip B. Stark** is the Associate Dean, Division of Mathematical and Physical Science at the University of California, Berkeley. Prof Stark is on the Board of Advisors of the US Election Assistance Commission. He developed the notion of “risk-limiting audits”, which are now required by the state of Colorado (C.R.S. 1-7-515) and this work has led to audit-related legislation in California: California AB2023, SB360, AB44. He served on [California Secretary of State Bowen’s Post Election Audit Standards Working Group](#). Dr. Stark has published more than one hundred articles and books, served on the editorial board of several scientific journals, and lectured at universities and professional societies in seventeen countries. He has consulted for the U.S. Department of Justice, the Federal Trade Commission, the U.S. Department of Agriculture, the U.S. Census Bureau, the U.S. Department of Housing and Urban Development, the U.S. Department of Veterans Affairs, the California Attorney General, the California Highway Patrol, and the Illinois State Attorney. He has testified to the U.S. House of Representatives Subcommittee on the Census; the State of California Senate Committee on Elections, Reapportionment and Constitutional Amendments; the State of California Assembly Committee on Elections and Redistricting; and the State of California Senate Committee on Natural Resources. In 2011, Dr. Stark received the University of California Chancellor’s Award for Public Service for Research in the Public Interest.

**Paul Stokes** spent most of his career at Sandia National Laboratories conducting research, development and analysis of technologies for arms control compliance verification and intelligence, and later at the International Atomic Energy Agency in Vienna, Austria, conducting nuclear inspections in Iraq, and at the Comprehensive Nuclear Test Ban Treaty Organization, also in Vienna, developing on-site inspection techniques.

He has been engaged in election integrity activities since the 2004 election, when he worked with national organizations to pursue a recount, followed by support for legal action to investigate the accuracy of voting machines. Since that time, as coordinator for United Voters of New Mexico, Paul has continued to work with state election officials and the Legislature to bring the uniform use of paper ballots throughout the state, and post-election audits to verify with high confidence the accuracy of voting machines. He continues to work on Election Integrity by advocating methods to improve voter access to the polls.

**Poorvi L. Vora** is Professor of Computer Science at The George Washington University. Her research focus has been on end-to-end independently verifiable (E2E) voting systems which enable voters and observers to audit election outcomes without requiring them to rely on the trustworthiness of election technology or unobserved election processes. Prof. Vora was a member of the team that deployed polling-place, paper-ballot-based, E2E voting system

Scantegrity II in the Takoma Park elections of 2009 and 2011, and of the team that developed remote voting E2E system Remotegrity and accessible voting variant Audiotegrity, used in 2011. She has worked with the National Institute of Standards and Technology (NIST) on definitions of desired properties of E2E systems, and on information-theoretic models and measures of voting system security properties. Her research is funded by the National Science Foundation and the Maryland Procurement Office. She has a Ph.D from North Carolina State University.

**Luther Weeks** is Executive Director of CT Voters Count. He is a retired software engineer, and a computer scientist who has been active for several years in voting integrity issues and citizen-lobbying the Connecticut Legislature and the U.S. Congress.

Mr. Weeks' efforts in Connecticut contributed to the passage of the paper record law in 2005 and the selection of optical-scan over DRE (touch screen) voting equipment in 2006. In 2007, he organized a coalition of citizens to observe Connecticut's post-election audits showing that they are insufficient, unreliable, and ineffective, resulting in public legislative hearings across the state. He is also Executive Director of the [Connecticut Citizen Election Audit](#) and a Director of TrueVoteCT.

He has a B.S. Mathematics, Clarkson University with Distinction; an M.S. Computer Science from Rensselaer Polytechnic Institute and is Master Fellow of the Life (insurance) Management Institute. Spanning thirty-five years, Mr. Weeks led the initial implementations of database, personal computer, and artificial intelligence technologies for The Travelers, where he also led the evaluation and acquisition of commercial software. In the 1990's, for nine years, he was a field engineer and product manager for two data communications software start-ups.