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Open Source Technology & its Impact on Elections

▶ Can Open-Source Safeguard Public Elections?

Elections play a vital role in a free and fair society. They are the cornerstone of global democracies, and increasingly, technology is required to administer elections. As such, election technologies should be transparent. They should be secure. They should be trustworthy. And many people — from individual citizens to government organizations and yes, even some politicians — believe the technology of elections should be “Open.”

In this context “Open” is defined as election technologies based on Open Source Software (OSS). OSS-based voting systems are typically collaborative, readily available to jurisdictions to deploy, and far less expensive than proprietary voting systems currently in place. OSS-based systems are open to anyone — from software and security experts to the public — to verify integrity, reliability and security.

While this conversation about voting systems is not new, it is one that has increasingly been gaining traction worldwide. While the turmoil of the United States election of 2020 is still fresh in our memories, the 2000 Presidential election between Republican George W. Bush and Democrat Al Gore, was hotly disputed, requiring the U.S. Supreme Court to determine the outcome. Votes showed Bush had won Florida by such a close margin that Florida state law required a recount. This alarmed and caused angst among citizens who began questioning the accuracy, integrity and security of America’s voting processes, and in turn, launched efforts to improve election processes and technologies.

▶ Open Source Technology in Elections Administration is Not New

The Internet — and everything that uses Internet connectivity — is built on Open Source technologies, and countries around the world — including Armenia, Australia, Ecuador and New Zealand, among others — are using Internet-based voting systems. Tabulations based on OSS in Europe took place in The Netherlands as early as 2004. The Norwegian Internet Voting System has been used in several national elections. Australia’s Capital Territory relies on Open Source tabulators to calculate election results and the state of Victoria in Australia used an Open Source “vVote” verifiable Internet voting system as early as 2014. Few realize that in the U.S. an Open Source voting system called Scantegrity II was used in a Takoma Park, MD local election in 2011. Scantegrity is an Open Source enhancement tool for optical scan voting systems, providing such systems with end-to-end (E2E) verifiability of election results. It uses confirmation codes allowing voters to prove to themselves their ballot is included and unmodified in the final tally. The codes are privacy-preserving and do not offer any proof of which candidate voters elected. Receipts can be viewed without compromising ballot secrecy by printing confirmation codes in invisible ink to improve usability and dispute resolution. The system relies on certain cryptographic techniques and validates an election outcome, which is both software independent and independent of faults in the physical chain-of-custody for paper ballots.

Since then, New Hampshire used Prime III, another Open Source voting system stemming from the Help America Vote Act (HAVA). It passed in 2002 as a response to some of the issues that arose during the 2000 U.S. Presidential election to ensure individuals with disabilities can vote privately and independently.

After 10 years of research, Prime III was created in 2003 at Auburn University in the Human Centered Computing Lab as a highly accessible voting system built on Open Source. It offers a voting system which provides safeguards for system security, integrity and a user-friendly interface that accommodates all people regardless of ability. The system, created by Dr. Juan E. Gilbert (Miami University & the University of Cincinnati) is named Prime III because it is considered a 3rd-generation voting device. First generation voting uses mechanical equipment and paper including

lever machines, punch cards and other methods, Second-generation voting relies on computers integrating optical scanners and Direct Recording Electronics (DRE) devices. Third generation devices are multimodal machines accommodating multiple types of voters on the same device. Prime III is a 3rd-generation voting device allowing voters to cast ballots using touch, voice, or both.

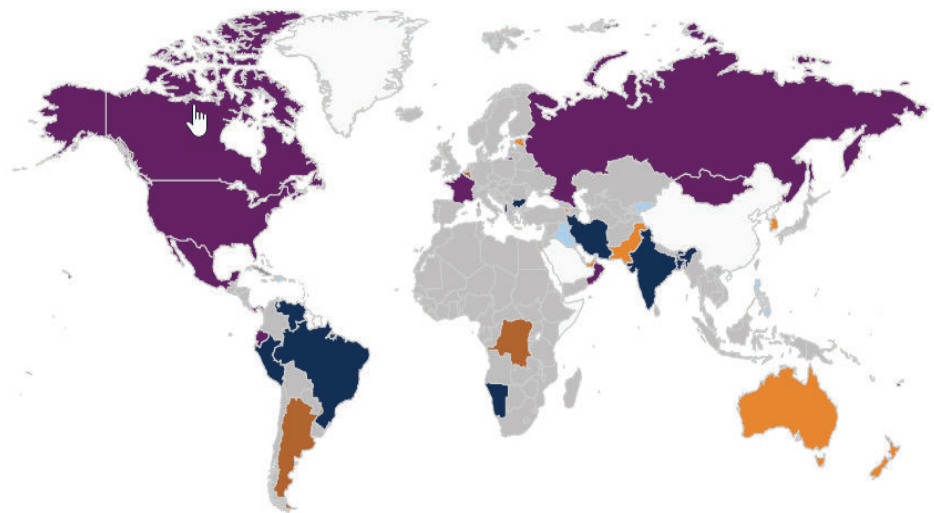
Another effort to innovate election administration with Open Source is Voting.Works, a not-for-profit venture building both advanced tabulation equipment which is being piloted in several jurisdictions, and risk-limiting ballot auditing software now in use by three jurisdictions.

Los Angeles County, CA, developed and deployed a large Open Source project called VSAP, although the source code has not yet been published while San Francisco, CA, has an early-stage Open Source project to produce a new voting system.

Finally, all voting systems today rely on modern applied crypto, and nearly all. depend on OSS cryptographic software libraries such as OIN community member's OpenSSL.

Technology used for eVoting that is Aready in Place Among a Few Countries:

- Direct Recording Electronic (DRE) voting machines with & without Vote-Verified Paper Audit Trail (VVPAT)
- Internet Voting Systems
- Optical Mark Recognition (OMR) - or Optical Character Recognition (OCR)
- Electronic Ballot Printers (EBPs)
- Not Applicable
- No Data
- Multiple Answers



▶ Is it Time for Change?

We live in a digital world and the application of technology, including technology originating as Open Source in elections, continues to rapidly develop because citizens demand more efficient and transparent systems to uphold the fundamental principle elections play a vital role in a free and fair society.

For example, consider West Asia and North Africa. Some countries in these regions are moving towards multi-party elections that are mostly free, fair and peaceful. However, they face considerable challenges, involving weak political institutions, the underrepresentation of women in politics and limited freedom of speech from media outlets. Elections are held s part of these transitions, but when they take place during volatile situations — often in response to critical or urgent political needs — they are typically implemented within a short timeline, with little notice and without adequate preparation time.

America also faces election challenges. While commonalities exist across and within states, each state administers its elections under its own unique legal and procedural framework —as provided for in the U.S. Constitution— using different systems and infrastructure. Not only is this decentralization complicated and costly, it leads — as witnessed in 2000, 2020 and 2022— to uncertainty among voters.

A new report from the Center for Strategic & International Studies think tank reveals governments across the globe have implemented at least 669 Open Source policy initiatives between 1999 and 2022. The majority "convey the government's support" for Open Source Software.

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▶ **Moving Forward: Publicly Owned Election Software Technology**

Lawmakers and policy experts are demonstrating increased interest in Open Source technologies to solve existing challenges, improve security measures and provide transparency to citizens. Here's why.

The application of Open Source principles to a carefully designed and engineered election administration and/or voting system can enhance the verifiability, accuracy, security and transparency of the software because security and correctness can be verified by technology experts and the public. Furthermore, Open Source election software built on Commercial off-the-shelf (COTS) hardware is highly cost effective. Several existing election administration systems are built on top of the Linux Operating System (OS). Several public elections worldwide, as well as pilots in the U.S., have been conducted entirely using Open Source systems.

One such example of using this approach can be found in the R&D work of the Open Source Election Technology (OSET) Institute. The OSET Institute was established in 2007 as a nonpartisan, nonprofit organization to increase confidence in elections and their outcomes. As an advocate of Open Source, OSET is also an Open Invention Network (OIN) member. The institute believes Open Source is imperative to ensure integrity and increase public confidence in elections. It wants to reduce — if not eliminate — common troubles with voting machinery through lower cost, higher quality and verifiable public software to improve elections, as well as minimize disinformation and misinformation. It is an extensive undertaking in high assurance computer engineering to apply security-centric development and user-centered design.

The concept of restoring public trust is paramount for a democracy infrastructure and as such, cannot be a black box, but rather a glass box. OSET's flagship, fiscally-sponsored initiative — TrustTheVote® Project — is a membership-driven effort and unique digital public works project. Its mission is to develop publicly owned election software technology (*the "People's Voting System"*) to address previously mentioned issues. It wants to develop OSS any jurisdiction can adopt, adapt and deploy to improve voting system integrity, security and verifiability; lower costs of election administration; innovate usability, ease, and convenience, and increase confidence in elections and their outcomes. Success of the Institute's work and the TrustTheVote® Project — which is periodically updated — can increase confidence in elections and their outcomes for America and every democracy, worldwide over time.

Conclusion

Awareness must be raised. Conversations must continue. And Open Source projects must be considered for election administration and voting systems.

The Open Source community agrees awareness must be raised among Electoral Management Bodies (EMBs), decision-makers, lawmakers, political parties, civil society and the media about the benefits of Open Source Technologies (OST) for voting in global elections. This, in turn, will drive demand for transparent software source code – something already happening in the recent Brazilian election riot.

Open Source voting systems can potentially make newly developed election technology more readily distributed and accessible. Another expectation from OST is it will help reduce the overall cost of managing elections through increased efficiencies in administration and a reduction in the Total Cost of Ownership (TCO) of voting systems.

"Election technology infrastructure in many democracies has been allowed to languish with inherent security problems; increased costs; usability, accessibility and accuracy issues; and a lack of public trust."

- **Gregory Miller** | Co-Founder & CEO, Open Source Election Technology (OSET) Institute

Integrating Open Source technology in elections is a better way to address these issues by reducing, if not eliminating the opacity in voting systems that gives rise to the disinformation and misinformation roiling elections today. Open Source needs to be a serious consideration in today's digital, global world as a matter of securing democracy.

About Open Invention Network

Established in 2005 and designed as a free membership organization — funded by Google, IBM/Red Hat, NEC, Philips, Sony, SUSE & Toyota — Open Invention Network (OIN) enables freedom of action in Open Source technologies for the world's largest patent non-aggression community with nearly 4,000 worldwide members. It promotes the belief that Open Source collaboration fosters faster innovation, reshapes human experiences, and creates unimagined technologies that improve our lives.

Member companies — of all sizes from more than 150 countries and 20+ industries — gain royalty-free access to the Linux System patents of a community that owns over 2.8 million global patents and applications in aggregate. Among many other benefits, members also receive support to protect their products & services from patent aggressors, reduce their patent risks & mitigate potential litigation.

Sources: Free & Fair, the International Institute for Democracy and Electoral Assistance (IDEA), Open Source Election Technology Institute (OSET), Prime Voting System, User Experience Magazine, Nextgov.com