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OSCON
Open Source Convention

Open Source Voting

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Outline

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Concept

- Secret Ballots Tallied in Public
- *incompatible with*
- Voting Machines and Tabulators
- whose inner workings are Trade Secrets

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Concept

- Wholesale Fraud versus Retail Fraud
  - *Long and ignoble history of ballot tampering*
  - *A ballot box contains hundreds of potentially vulnerable votes*
  - *A DRE voting system affects millions of potentially vulnerable votes*

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Concept

- Computer + Human = Better than Just Human
  - *Computer voting systems do not substitute for human procedures, but enhance the capability of people to conduct fair elections*
  - *Under the right arrangements, corrupt officials are unable to corrupt elections*
  - *The nature(s) of trust*

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Fully Disclosed Voting Systems

- Part of making the entire voting process *open to full inspection by the public*
  - ✓ *Inventory of components*
  - ✓ *Full source code (except true COTS)*
  - ✓ *Object code images*
  - ✓ *Checksums of object code images*
  - ✓ *Hardware, Software, System Specifications*
  - ✓ *Documentation*
  - ✓ *Internal and external document formats and samples*
  - ✓ *Hardware dependencies, specifications, and requirements*
  - ✓ *For COTS: specifications, requirements, uses, version numbers, dates of manufacture*
  - ✓ *Feature checklists*
  - ✓ *License(s)*
  - ✓ *Reports on non-internal tests*
  - ✓ *Procurement contracts*

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Open Source Voting Systems

- Increases security and reliability
  - ✓ *Often secrecy of existing systems is to avoid embarrassment*
  - ✓ *Open source systems are designed to be secure without secrecy*
  - ✓ *"Security by obscurity" is not true security*
  - ✓ *Many eyes can find bugs, errors, or fraud*
  - ✓ *Open source systems (e.g., Linux, Apache) often more secure than comparable secret source systems (e.g., Windows, IIS)*
- Differences (compared with other Open Source applications)
  - *Special purpose application*
  - *Difficulty in recruiting volunteers*
  - *Security needed in changing source code*
  - *Hard to finance*
  - *Freedom to test, experiment, and analyze*

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Existing Open Source Voting Systems

- OVC Prototype System
  - ✓ *Described last year*
  - ✓ *Demonstrated in 2004*
  - ✓ *Advanced the debate about voting systems*
  - ✓ *Not a production quality system*
- Berkeley research project (Yee, Wagner, et. al)
  - ✓ *Demonstrated in 2006*
  - ✓ *Similar in both features and limitations to OVC Prototype*
- Open Voting Solutions
  - ✓ *A full, production-quality open source voting system*
  - ✓ *Awaiting certification (an expensive process)*
  - ✓ *Derived from OASIS EML open source voting tools and components*
- Non-US Systems
  - ✓ *Australian Capital Territory system*

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New Open Source Voting Systems

VoComp 2007–Univ. Voting Systems Competition

- Punchscan
  - *End-to-end verified system with encryption*
  - *Two-part ballot with receipt*
  - *Cannot manually recount*
  - *First place at VoComp 2007*
- Prêt à Voter
  - *End-to-end verified system with encryption*
  - *Two-part ballot with receipt*
  - *Cannot manually recount*
  - *Supports Ranked Preference Voting (such as IRV and STV)*
  - *Second place at VoComp 2007*
- Prime III
  - *DRE with video backup*
- Voting Ducks
  - *Coercion-free Verifiable Internet Voting*
  - *Uses credentials mailed and submitted by cell phone*

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Open Source Is Not Enough

- Other parts of voting process must also be disclosed
  - ✓ *Adequate audits*
  - ✓ *Paper ballots (whether hand marked or machine marked or printed)*
  - ✓ *Public right of access and public right to observe entire process*
  - ✓ *Timely disclosure to enable recounts and contesting results*
  - ✓ *Electronic disclosure in any medium in which the records are readily available*
  - ✓ *Electronic disclosure in any format to which data is readily convertible with the data custodian's existing software*
  - ✓ *Usable format (e.g., not fragmented)*
  - ✓ *Disclosure costs only actual cost of materials (not labor)*

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Barriers to Open Source Voting

- High cost of system certification
- Entrenched relationships with existing vendors
- Experience of existing vendors
  - *Trust by election officials*
- Limited market
- Risk of insertion of fraudulent code
  - *Problem with pure volunteer development*
- Trust by elections officials at odds with trust by the voting public
  - *Elections officials motivations are different*
  - *Most elections departments are small and understaffed*

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What's Wrong with DRE Voter-Verified Audit Trail

- Helps ensure electronic ballot image is correct.
- Useful for recounts.
- Useful for audits (*if* and *when* they are done!)
- Limited accessibility.
- If not machine readable and tallyable, will be effectively used *only* when legally required.
- Reel-to-reel approach compromises voting privacy by maintaining order of ballots.
- ATM-style roll hard to count by machine.
- Use of airline-style cards could solve these problems by using known reliable printers.
- Better: Voter Verified Paper Ballots directly counted for each election.

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New System Ideas

- Hand-marked optical scan paper ballots
- Electronic Ballot Printer for accessibility
  - *Audio or Video interface*
  - *Prints an entire optical scan paper ballot compatible with hand-marked ones*
- Precinct-count optical scanner and voter ballot verifier
  - *Scans ballot (and saves image)*
  - *Examines image to determine location of marks*
  - *Interprets mark locations to create an Electronic Ballot Record*
  - *Displays (or speaks) ballot choices to voter*
  - *Voter verifies choices or ejects paper ballot for correction*
  - *If voter verifies ballot is read correctly, non-sequential serial number printed on ballot and written on images*
- Scanner totals posted at precinct and available from web
- Ballot images available from precinct on CD-R
  - *In random order by serial number*
- Enables ballot-by-ballot auditing
- Let's change the debate, again

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New System Ideas (continued)

- Publish images of all ballots on CD-R or DVD-R
  - ✓ *By batch (e.g., by precinct (or scanner) for "regular" ballots)*
  - ✓ *Each ballot image accompanied by corresponding Electronic*
  - ü *Ballot Record*
  - ✓ *With vote tallies for each batch*
  - ✓ *Enables ballot-by-ballot auditing*
  - ✓ *Can be matched with overall vote totals (and batch totals)*
  - ✓ *Can be matched with precinct tallies posted at close of voting*
  - ✓ *Allows complete hand-counting by the public*
  - ✓ *Privacy issues with stray marks, problem reduced by electronic*
  - • *ballot printers*
  - ✓ *Allows third-party vote auditing and tallying software*
  - ✓ *Good opportunity for open source, volunteer contributed code*

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Conclusion

- Give election officials more choices.
- Enable best-of-breed voting systems.
- Enable competition in services and follow-on support.
- Build open source voting systems vendors can adopt.
- Cheaper, more reliable and secure, auditable, and more trustworthy.
- Privacy should be added to evaluation standards along with reliability, security, and trustworthiness.

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What You Can Do

- Current legislative status: HR-811; California FOSS Voting Resolution
- For more information, see papers and talks at http://infolab.stanford.edu/pub/keller and click on “Electronic Voting.”
- Contact your *election* officials (county, Secretary of State).
- Contact your *elected* officials (federal, state, and county).
- Help with new prototype system (new ideas section).