

How do we vote?

Ronald L. Rivest

MIT



EmTech

September 13, 2018

How do we vote?
How should we vote?

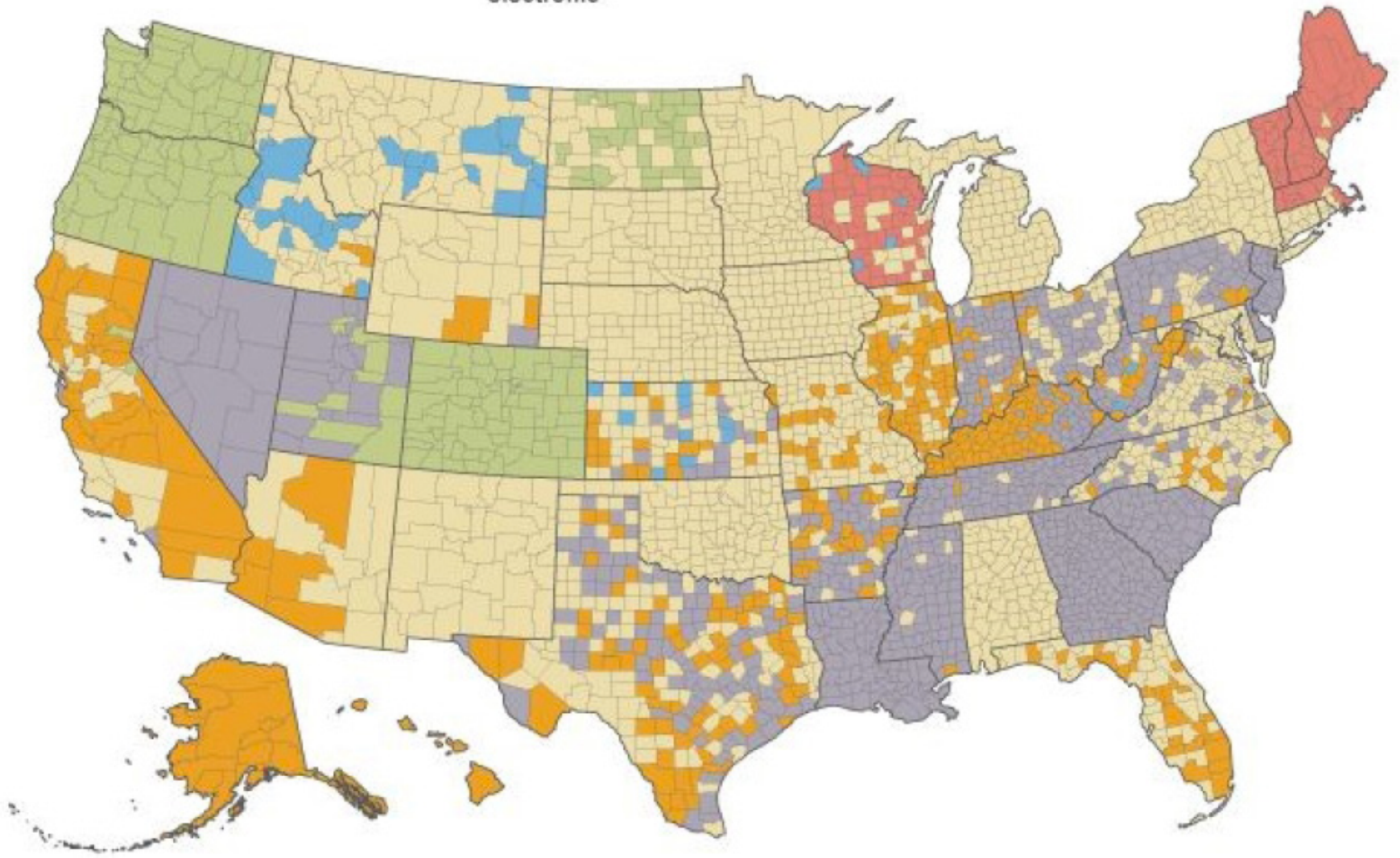
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How do we vote?

- Optical scan
- Direct recording electronic
- Mixed optical scan/direct recording electronic
- All vote by mail
- Mixed optical scan/hand-counted paper
- Hand-counted paper



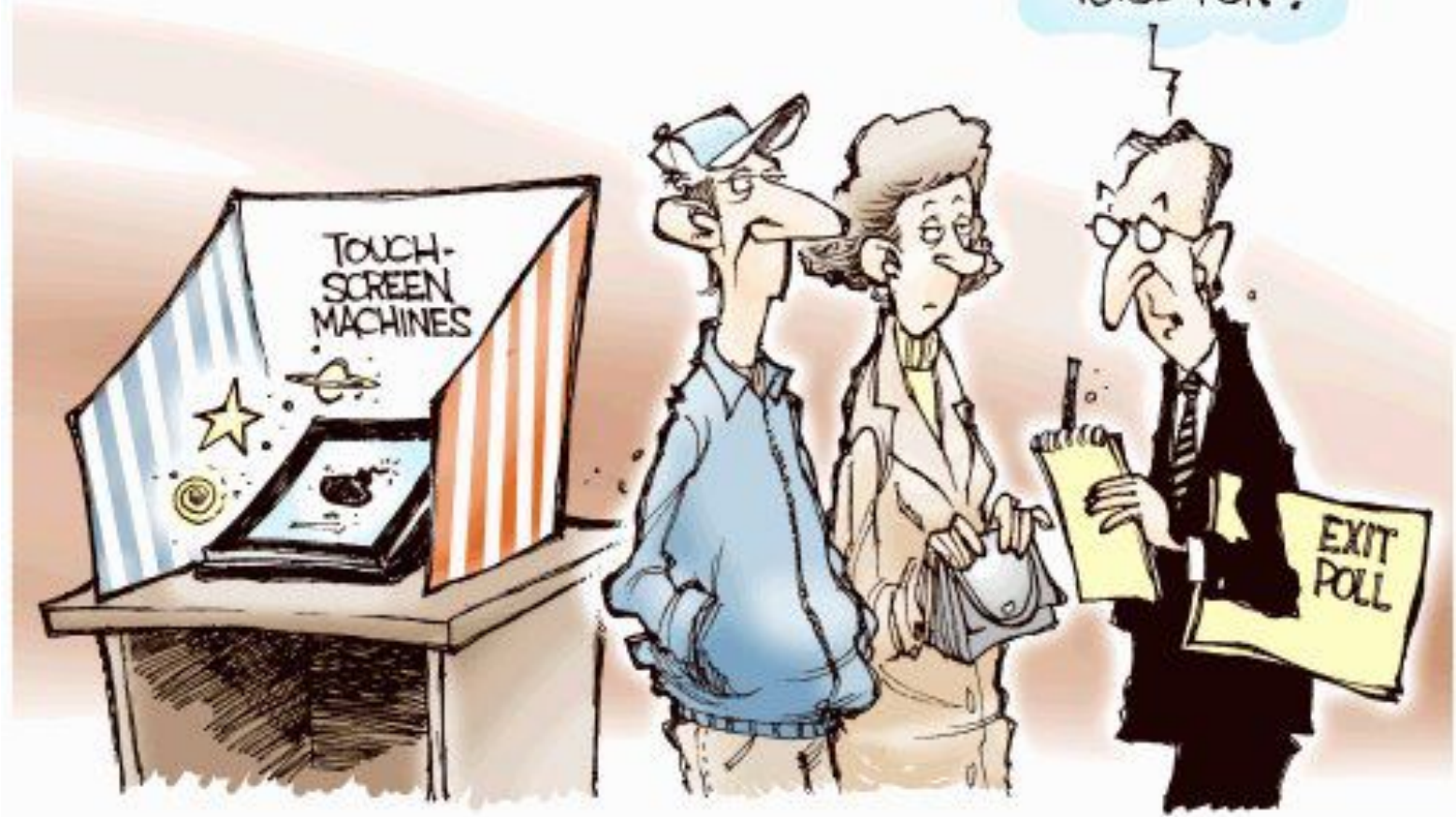
Stats by number of voters

- 55% Voter marked paper ballots
- 13% mixed: paper ballots + DRE w/ VVPAT
- 5% mixed: paper ballots + DRE w/o VVPAT
- 6% DRE w/ VVPAT
- 21% DRE w/o VVPAT
- Roughly: 79% use voter-verifiable paper!

(stats from Verified Voting)

JOHN COLE
THE TIMES-TRIUNE
SCRANTON, PA

∴ AND WHO DO
YOU HOPE YOU
VOTED FOR?



And Who Do You **Hope** You Voted For?

Optical scanners are used
for efficient tabulation

image

DOMINION
VOTING

Security Key



Director District 3
 Director District 4
 Director District 5
 Director District 6
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OPEN

System Ready

BALLOTS CAST: 72

Cast

Return

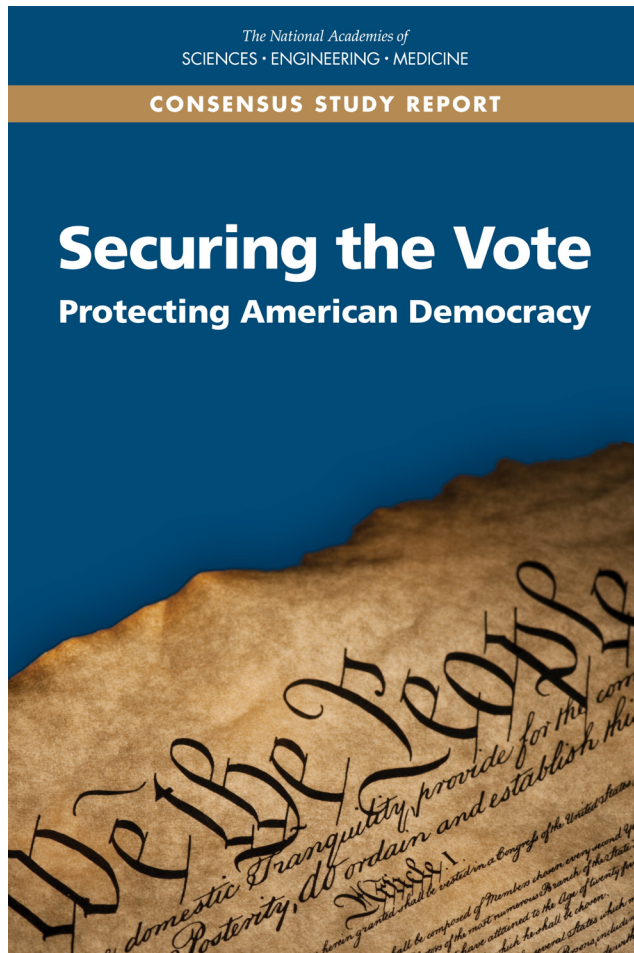
(Concern) Scanners may
introduce systematic errors

Causes of scanner errors

- Differences in **interpretation** between machine interpretation and hand interpretation. Voter intent rules.
- **Stray marks** (e.g. caused by folds)
- **Configuration errors**
- **Programming errors**
- **Hacking (adversarial attack)**

How *should* we vote?

One week ago today...



National Academies
issued report on
"Securing the Vote"

www.nap.edu/futureofvoting

(159 pages; free pdf)

41 recommendations

Recommendation 4.12

***Use voter verifiable paper ballots
everywhere by 2020***

Recommendation 5.11

No Internet voting!

Recommendations 5.7—5.9

Audit election outcomes!

Recommendations 5.7—5.9

Audit election outcomes!

A risk-limiting audit (RLA) uses manual interpretation of randomly chosen cast paper ballots to verify with high probability the reported election outcome (or correct it, if wrong).

What a RLA does **not** do

- A RLA does not address:
 - **correctness of the *tally* (as opposed to the outcome)**
 - **voter eligibility**
 - **voter authentication**
 - **usability**
 - **privacy**
 - **chain of custody of paper ballots**

Who is a RLA for?

- **Losing candidates** – to convince them that “they lost fair and square”
- **The winner** – to provide a mandate
- **The public** – to assuage doubts about “rigged elections”
- **Election officials** – to help them provide accurate and efficiently-verified results

Other recommendations

- States and local jurisdictions should conduct and assess pilots of *end-to-end verifiable* voting systems.
- Voters should be able to **track their mail-in ballots.**
- EAC should be fully commissioned and funded.
- Funding should be made available on a continuing basis for equipment upgrades.
- Funding should be made available for research.

Other recommendations (cont.)

- Election systems should continue to have the DHS designation of “critical infrastructure”.
- Cybersecurity!
- EAC and DHS should develop and promulgate cybersecurity best practices for voting systems.
- NIST should complete the Common Data Format standard for voting systems.

The End

Thanks for your attention!