

Voting Technology Update

Maricopa County Elections Department
Community Network Presentation

October 30th, 2013



Election Technology

- **Status Quo**
- **Challenges Moving Forward**
- **On the Horizon**

Today we will focus on voting equipment technology rather than other arenas such as voter registration (IE online & mobile-ready), voter processing (IE ePollbooks), or list maintenance (IE database management).



Status Quo

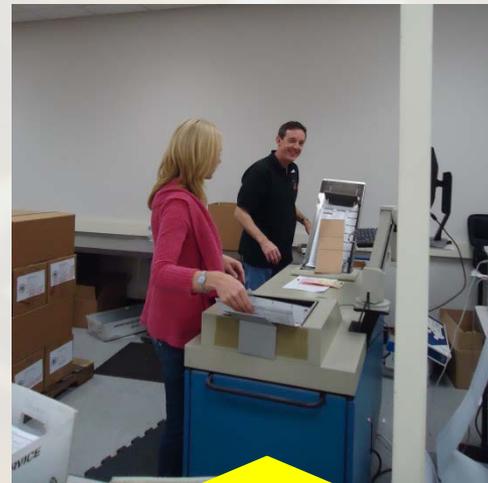


Status Quo

- Elections are conducted in the United States using on-site (at the polls) tabulation or central count (back at the election's department).



On-Site



Central Count

Status Quo

- Voters make their selections and cast their ballots using:
 - Paper ballots counted by optical scan
 - Paper ballots counted by hand
 - Direct Recording Electronic voting equipment



Optical Scan



Hand Tally



DRE



WRITE-INS & HAND TALLY: WASHINGTON STATE & DETROIT, MI

Status Quo

- Some voters select candidates pre-printed on the ballot while other opt to write-in their candidate of choice.
- Some select valid candidates, while many do not.
- Is technology the answer?

King County, WA reduced the number of invalid write-in votes being cast with a very effective voter education campaign.

Fictional characters are great, but they do NOT belong on ballots.

Don't write in frivolous names when you vote.

Be an informed voter.

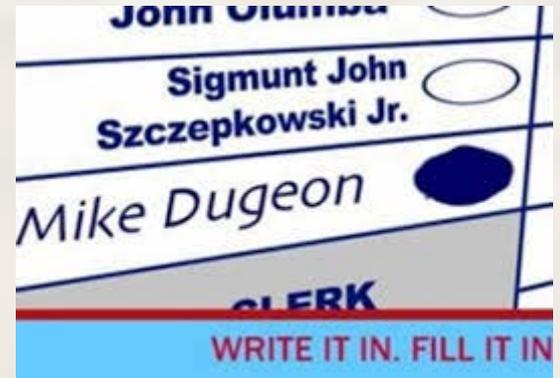
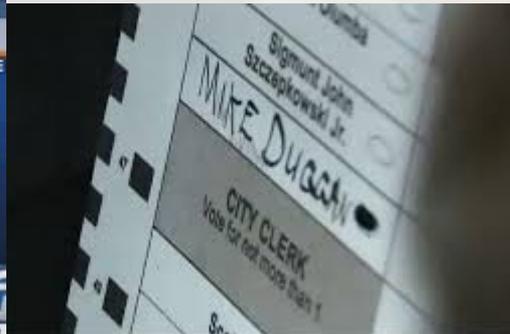
 King County
Elections
206-298-VOTE (8683)

J.A. Jance, *mystery author*



Status Quo

This is what we usually think of when we talk about write-in campaigns: the issue with voter intent and what constitutes the acceptable spelling of the name as a valid vote.



Status Quo

“

The certification of the mayoral primary using the canvass report presented to the Wayne County Board of Canvassers would have resulted in a massive disenfranchisement of voters in a magnitude never seen in my tenure as state election director.

— Christopher Thomas,
Michigan election director

”

- Some human processes cannot be replaced by technology in all instances.
- Current voting equipment, both optical scan and DREs, can count the number of write-ins—but it does not determine validity nor distinction between candidates.
- In Detroit the ballots were recounted and the totals provided by the workers were correct...even if they didn't show their work.



NEW YORK CITY

Status Quo

- A discussion about voting technology in 2013 isn't complete without talking about another mayoral race, this one in NYC.
- NYC rolled out their old lever machines in their recent election due to the short period of time between their primary and their run-off.



Status Quo

- The press reported that there were issues in some locations—the old mechanical type problems such as bent levers and “sticking” levers.
- Some voters loved it.
- Others did not.

At Polls, Return of Levers Brings Problems and Praise



Eric Thayer for The New York Times
People voted in the primary election at Intermediate School 71 on Heyward Street, a polling place in the Williamsburg neighborhood of Brooklyn, on Tuesday.

By THOMAS KAPLAN
Published: September 10, 2013

Delightful to some, confusing to others, New York City's old-fashioned lever voting machines were blamed for a smattering of problems at polling places on Tuesday, but not a full-scale electoral disaster.

FACEBOOK

TWITTER

GOOGLE+

SAVE

New York City election 2013: Voting machine problems

Like 11 Tweet 47 Share 4 Share 8 10



Lever machines at many polling locations across the city didn't work, according to reports. | AP Photo

By KATIE GLUECK | 9/10/13 3:10 PM EDT

Election Day in New York City got off to a rocky start for some voters looking to cast ballots in Tuesday's mayoral primaries: lever machines at many polling locations across the city didn't work, according to reports.

The New York Times noted that many places had long wait times amid mechanical malfunctions and general disorganization. Some people, including a top GOP contender, Joe Lhotu, voted with a paper and pen when the 1960's-era lever machines didn't work, the Times said.

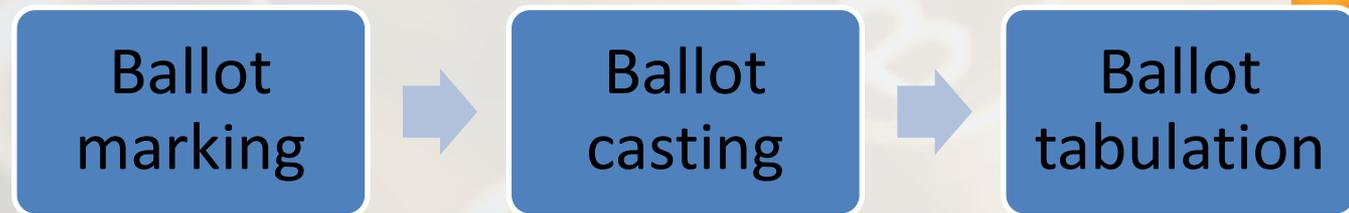
Challenges: Certification





Certification

- Voting equipment is certified federally, at the state level, or both.
- Certification is currently done for voting systems *AS A WHOLE*, or *EN SUITE*, not as components of a system.



This can create lengthy, and costly, certifications.



Certification

- The current market is limited to a handful of vendors offering voting equipment.
- Testing and certification is costly and results in fewer entrepreneurs entering the market.

Certification

Election Assistance Commission and
National Institute of Standards &
Technology

EAC & NIST

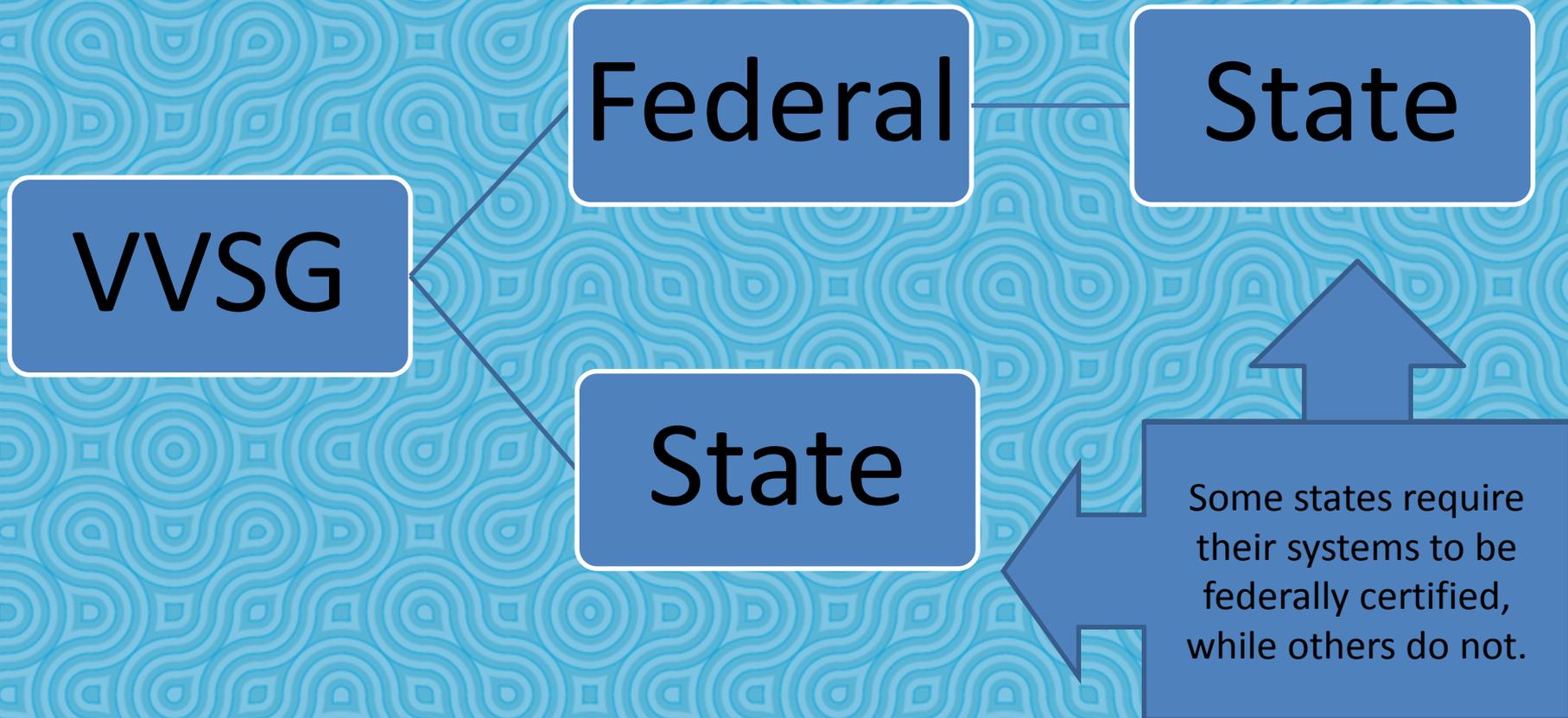
They write the Voluntary Voting Systems
Guidelines that the equipment is tested to

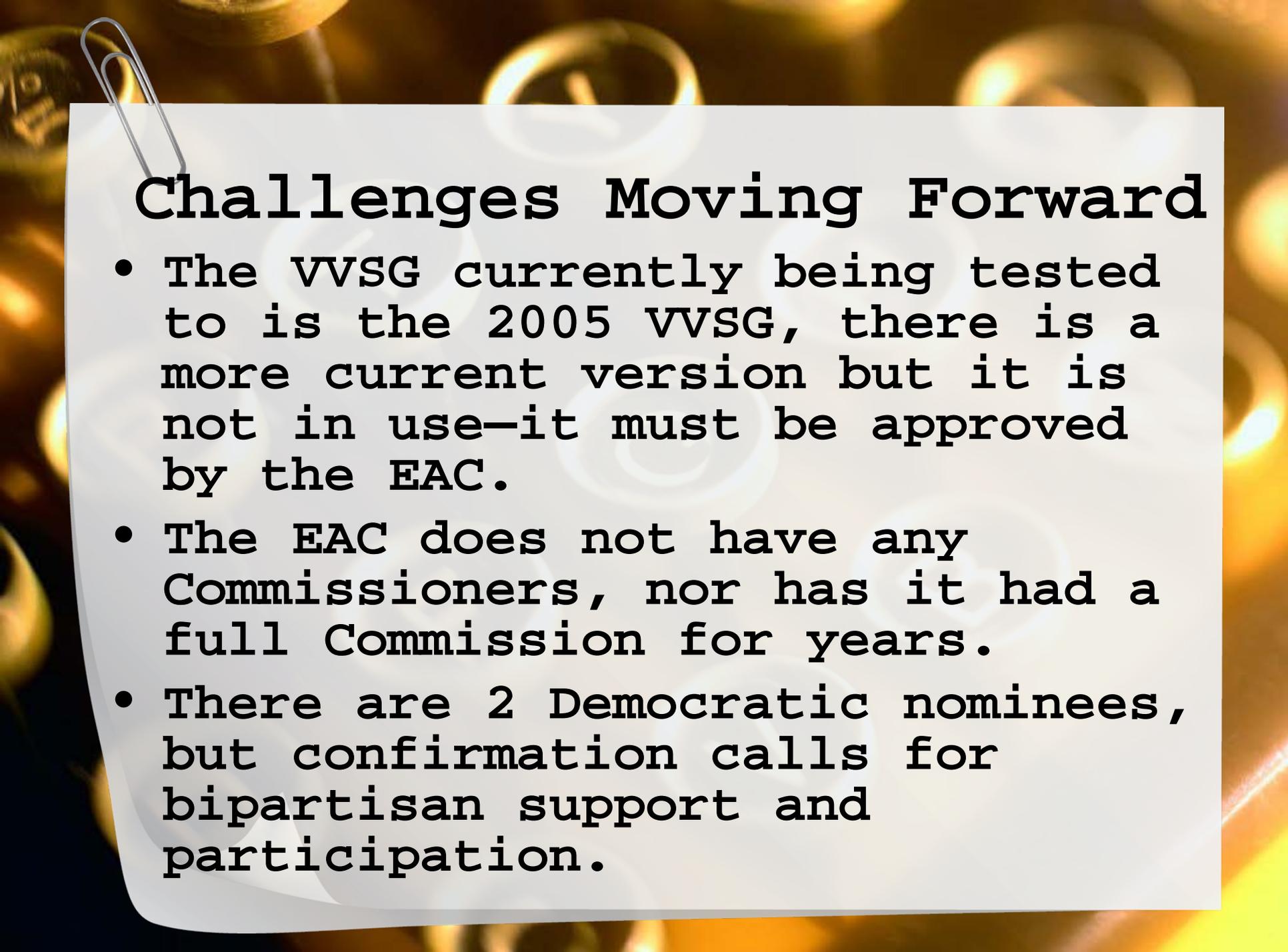
VVSG

Testing is done by certified Voting System
Test Laboratories

VSTLs

Certification of a system
can take 2 paths, but
currently all use the
Federal VVSG standards





Challenges Moving Forward

- The VVSG currently being tested to is the 2005 VVSG, there is a more current version but it is not in use—it must be approved by the EAC.
- The EAC does not have any Commissioners, nor has it had a full Commission for years.
- There are 2 Democratic nominees, but confirmation calls for bipartisan support and participation.



Challenges Moving Forward

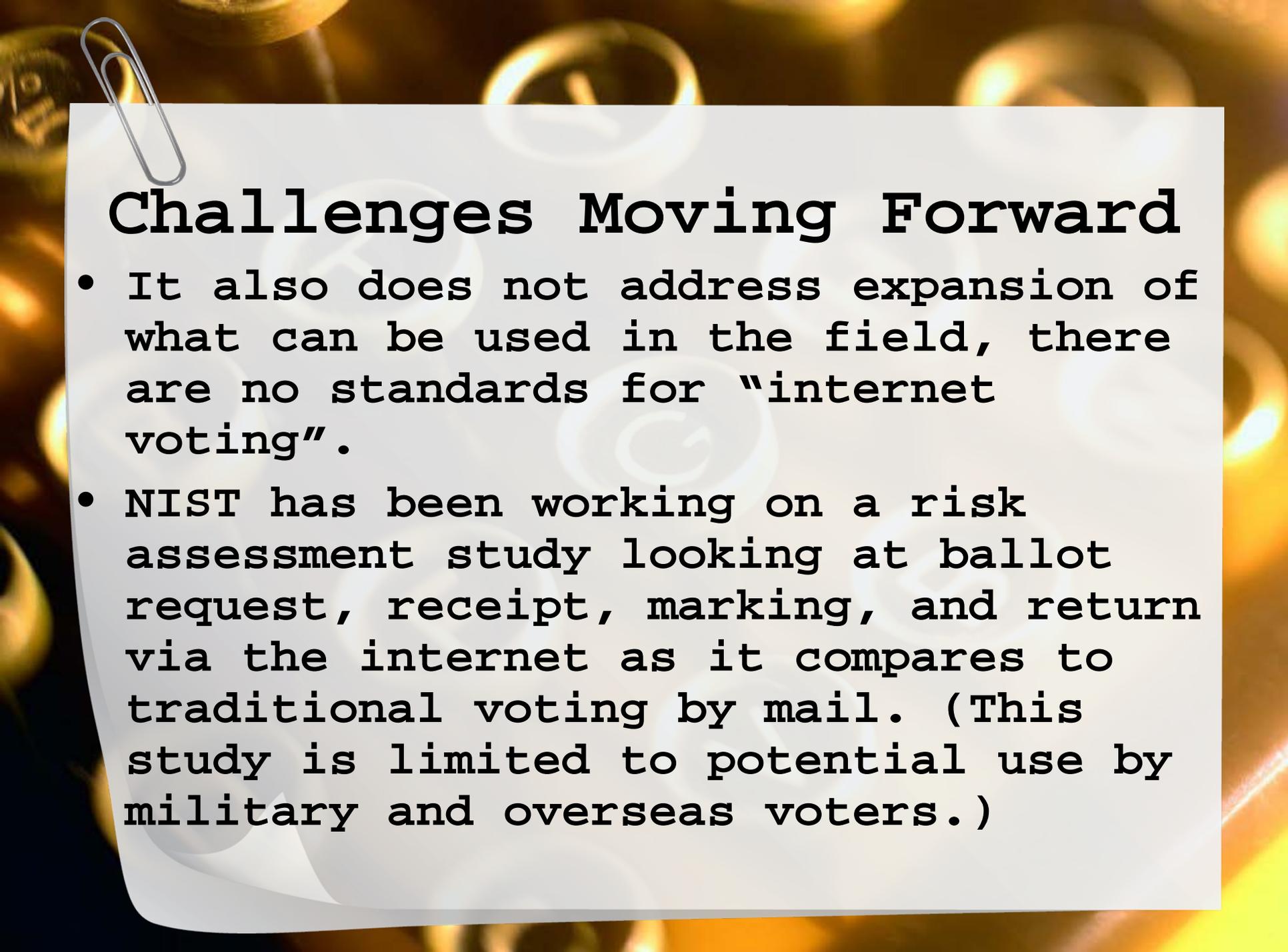
- For the last 2 years there has been legislation introduced in the House to eliminate the EAC and move the certification program to the FEC.
- Without commissioners a more current VVSG cannot be implemented, although certification to the 2005 VVSG can continue.

This too, stifles innovation and utilizing more recent technology in the voting field.

Challenges Moving Forward

- The last VVSG was before all of this:





Challenges Moving Forward

- It also does not address expansion of what can be used in the field, there are no standards for "internet voting".
- NIST has been working on a risk assessment study looking at ballot request, receipt, marking, and return via the internet as it compares to traditional voting by mail. (This study is limited to potential use by military and overseas voters.)

Innovation Class

- However, the current VVSG does have an innovation class of certification that has never been invoked.





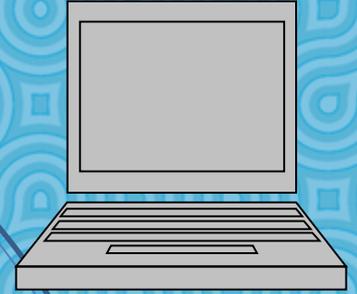
MOVE Act & UOCAVA

- Military and overseas voters are covered under the UOCAVA, federal statute.
- It was amended in 2009 to require all covered voters to have the ability to request to receive their ballot electronically and that all ballots will go out to UOCAVA voters 45 days before Election Day.

(It did not require that the voter be able to mark the ballot or return it electronically.)

What Does AZ Do?

1. Ballot requested



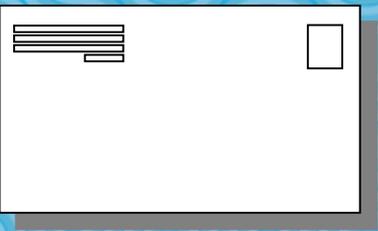
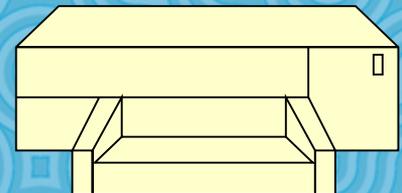
2. Ballot sent via email

7. Ballot duplicated for counting

3. Ballot received & printed

6. Ballot returned via mail
(MPS to USPS)

4. Ballot marked

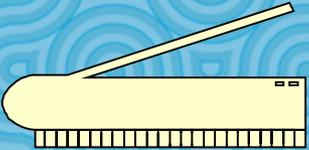


What Does AZ Do?



7. Ballot duplicated for counting

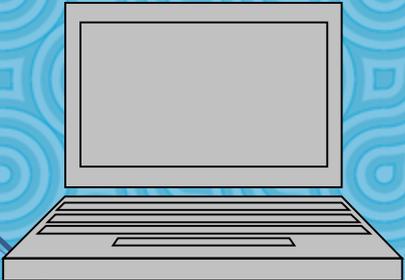
6. Ballot returned via SOS portal



5. Ballot scanned by voter

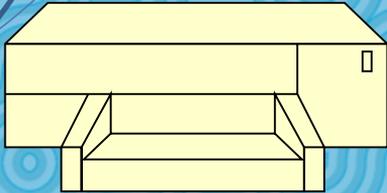


4. Ballot marked

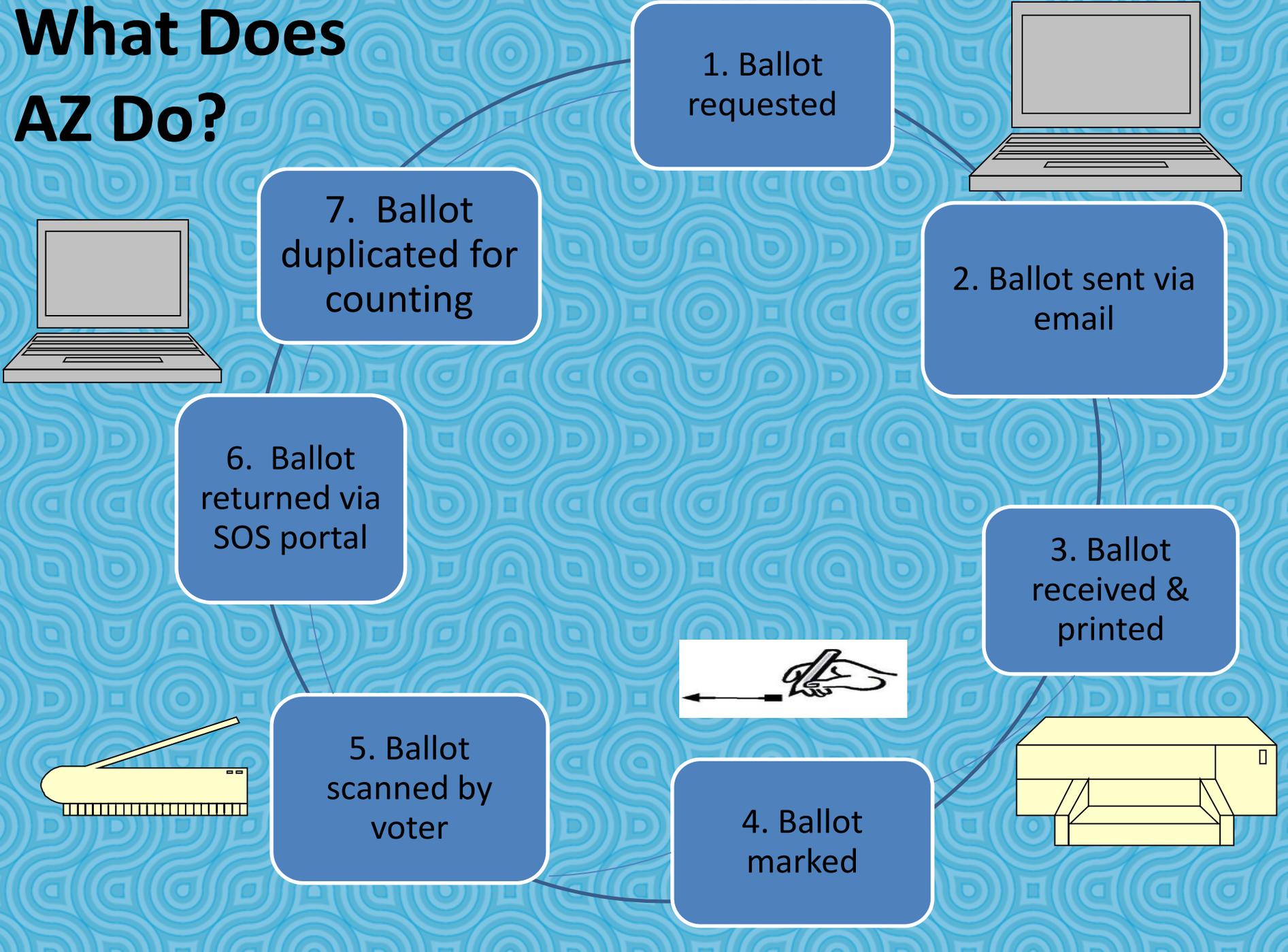


2. Ballot sent via email

3. Ballot received & printed



1. Ballot requested



On the Horizon



On the Horizon?

Recently there was a webinar hosted by the International Foundation for Electoral Systems (IFES) regarding electronic and online voting.

WEBCASTS

Divergent Trends: E-Voting in the U.S. and the World

Divergent Trends: E-Voting in the U.S. and the World

Google+



Divergent Trends: E-Voting in the U.S. and the World

Featuring:

Benjamin Goldsmith
IFES Senior Electoral Adviser

Thad Hall
Associate Professor of Political Science
University of Utah

Rakesh Sharma
Director
IFES Applied Research Center

WEBCASTS

Divergent Trends: E-Voting in the U.S. and the World

Divergent Trends: E-Voting in the U.S. and the World

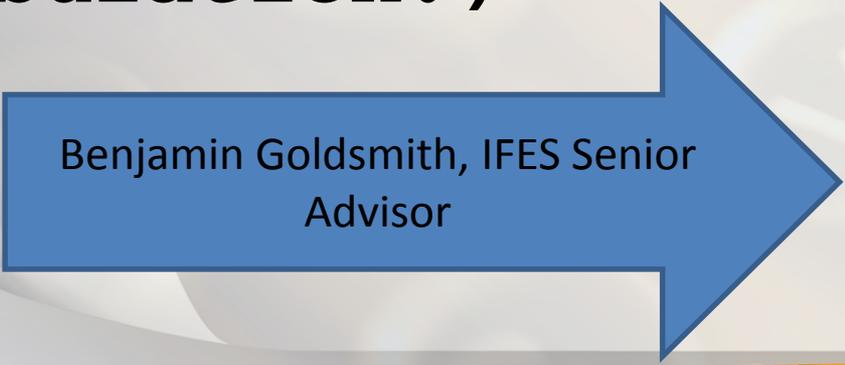
Google+





On the Horizon?

- E-voting: electronic voting
- This is how most of the United States votes &/or has their vote counted.
- (There are a few jurisdictions which still do full hand count tabulation.)



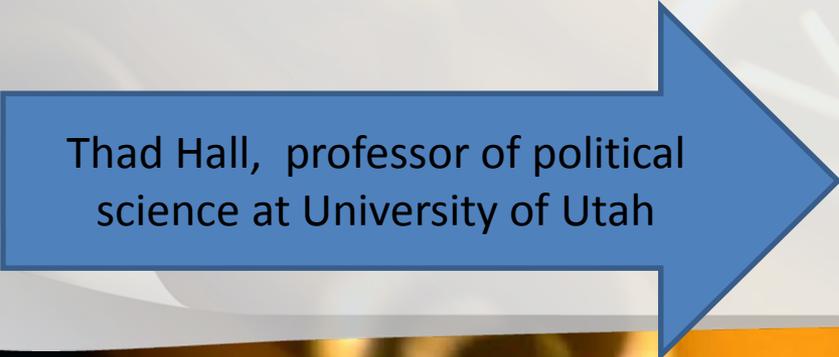
Benjamin Goldsmith, IFES Senior
Advisor





On the Horizon

- I-voting: in US the conversation stops at security (as though the paper-based voting is the “gold standard”)
- Estonia—counts last ballot cast
- Norway—paper supersedes I-voted ballot to mitigate coercion



Thad Hall, professor of political science at University of Utah



TECHNOLOGY ALLOWS
ME TO TALK, EMAIL,
SHOP, BANK, REMOTELY
START MY CAR...



MIKE LUKOVICH
© 2008

...WHILE STANDING SEVEN
HOURS IN A LINE TO VOTE...



“But we bank online!”

- **BIG differences:**
 - Banking offers complete transparency and tracking by the public, you know amount/date/time etc. of each transaction:
 - **Voting is *PRIVATE & ANONYMOUS*.**



"But we bank online!"

- **BIG differences:**
 - The banking industry *does* get hacked, they build this into their business model to cover costs:
 - **Democracy and the electoral process do not have ANY acceptance of a margin of error.**

The CHRISTIAN SCIENCE
MONITOR

Thinking about a cybersecurity policy?

[Download the guide](#)

Russian hackers got 160 million bank card numbers, but that wasn't worst part

Federal prosecutors say they've blown open the largest hacking ring in US history, indicting four Russians and a Ukrainian. The biggest worry: One of them hacked into NASDAQ.

By Mark Clayton, Staff writer / July 25, 2013



New Jersey Attorney Paul Fishman speaks to the media during a news conference in Newark, N.J., Thursday. US prosecutors have charged five foreign nationals with payment-card theft resulting in more than \$300 million in losses for companies in the US and in Europe in what they described as the country's largest hacking fraud case in history.

Eduardo Munoz/Reuters

[+ Enlarge](#)

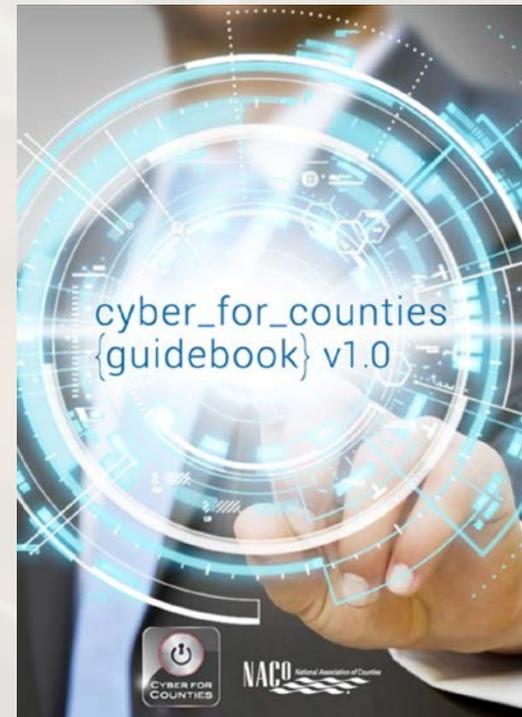


Someday

- This is not to say that it won't happen, but we are still a few years off.
- There is work on end-to-end cryptography and risk limiting audits that may help get us there.

Someday

- Additionally, recently the National Association of Counties, NACo, published a cyber security booklet that helps inform the discussion



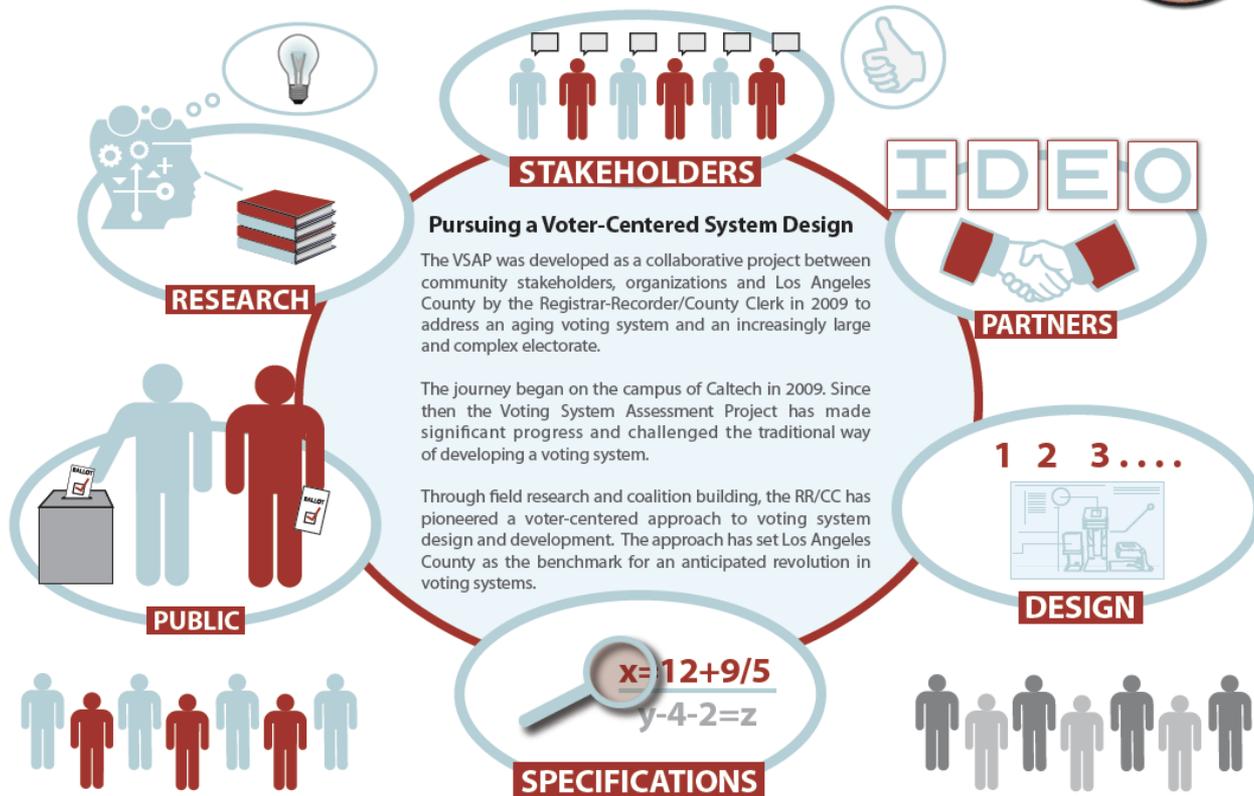


Innovation

- **HOWEVER, there is hope.**
 - **Currently Los Angeles County in California & Travis County in Texas are undergoing projects to create their own voting systems within the existing standards, but shifting the paradigm.**
- Some vendors are also pushing the envelope.**

LA County

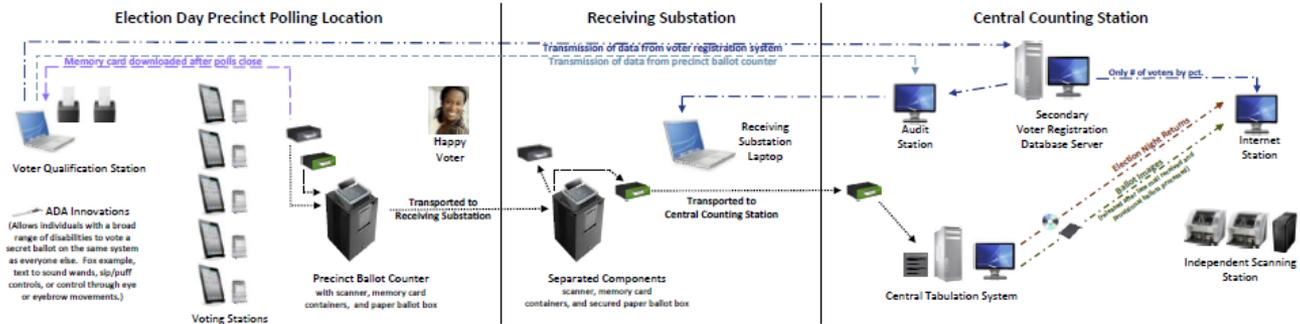
VOTING SYSTEMS ASSESSMENT PROJECT (VSAP)



Travis County

Very First Draft!

Future Voting System for Travis County, Texas



Brief Overview of Process and Explanation of Requirements

The voter begins at the Voter Qualification Station. The Judge locates the voter on the computerized voter registration list and records that a ballot is being cast. This information is transmitted in real time to the central office. Numbers are monitored by election staff throughout the day, and updates regarding lines/wait times are regularly reported on the website, along with periodic reports of precinct turnout.

One label and one receipt are printed for the voter. The voter signs the label that then becomes part of the poll list. The receipt, containing a number or bar code, is given to the voter to take to the voting booth. The code only contains information regarding the ballot format.

The voter moves to a Voting Station, enters the code on an electronic tablet, and the correct ballot format appears. The graphics on the screen are well-designed for maximum readability. The voter navigates through the ballot and easily signs in or out. A bar on the right continuously shows the full list of choices as they are made. A full-screen summary appears at the end, and the voter casts her ballot.

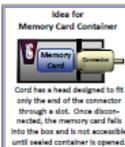
A list of the voter's choices prints next to her. This list only includes the race headings, the voter's choices, and a number associated with each choice. The ballot is easy for the voter to read. It does not resemble a traditional ballot and minimizes the use of paper. Audio validation of the ballot choices is also available for the voter.

This part of the system does not record any votes and stands alone with no connections to the voter registration database or the Precinct Ballot Counter. These are off-the-shelf tablets and printers that are easily upgradeable or replaceable, durable, and competitively priced. At least one tablet and printer is easily made mobile so that it can be carried to a car for curbside voting. The printers are reasonably priced and inexpensive to maintain, designed for high-volume use, and have easy-to-change paper. The printers accept paper that is high enough quality for use as an official ballot and that can handle multiple passes through a scanner. The print is clear, bright, easy to read, and stable enough to maintain high quality for 22 months.

The voter takes the ballot to the Precinct Ballot Counter. This piece of equipment contains a scanner, a tabulating unit, two memory card containers, and a ballot box to hold the paper ballots. The voter feeds the ballot into the scanner which then takes an image of the ballot, records the vote, and drops the paper ballot into the secured paper ballot box. The voter sees a message on a small screen stating that the vote was received, and leaves with a smile on her face. Her thoughts are not about voting security, but about how happy she is that she took a few moments out of her day to participate in her country's democratic process.

The scanner is geared for high volume and is not prone to calibration issues, even after a rough ride in a delivery vehicle. It is lightweight, sturdy, tamperproof, and easily transported. It is easily replaceable using off-the-shelf equipment.

The Precinct Ballot Counter stores the vote count and ballot images on an internal drive and on two memory cards. Two connector cords are attached to the tabulating system, and are enclosed within the unit so that they cannot be detached in the field without detection. The opposite ends of the connector cords connect to the memory cards. Each memory card is stored in a sturdy plastic container designed to prevent tampering. During initial central office election preparation, a secure connection with the memory card and the system connector can be made. After the box is locked down, however, a break in the connection causes the memory card to fall down into the box making it inaccessible until the sealed container is opened (see diagram). Each container is secured with a seal and a special lock containing a time stamp chip. When this lock is opened, the time is recorded. Containers also house GPS chips. While the polls are open, the containers



fit inside the Precinct Ballot Counter and out of the reach of voters or potential troublemakers. The memory cards are set for read-only after the polls are closed. After one use, they are either discarded or recycled for non-election use.

When the polls close, the Judge uses a seal and time stamp lock to secure the top of the paper ballot box (that also contains a GPS chip). The Judge then opens one of the memory card containers. The memory card is removed and connected to the computer at the Voter Qualification Station, and the election returns are sent to the central office. When the central office receives this information, an election worker compares the number of voters who were processed at the qualification station to the number of voters who cast a ballot on the tabulation system. That information is then transmitted to the Receiving Substations so election workers can ensure that the Judge has adequate documentation to support any differences. The Judge replaces the card into the container, locks it, seals it, and returns it back into the Precinct Ballot Counter. The Judge secures the remaining equipment that is lightweight enough for a 70-year old person to disassemble and maneuver. The Judge rolls the secured Precinct Ballot Counter to the car and transports it to the Receiving Substation.

An election worker at the substation checks the items in, counts the number of signatures on the paper poll list, and makes certain documentation regarding any differences in numbers is turned in before the Judge leaves. The second memory card container is removed from the Precinct Ballot Counter and given to a law enforcement officer for delivery to the central office. The paper ballot box and the container with the memory card used by the Judge are safely stored at the substation. These items are delivered to the Central Counting Station after all precincts have reported in.

The central office knows the location of each precinct's memory card container and paper ballot box because they have been "Lo-Jacked" with an inexpensive GPS system. The whereabouts of these

important items can be tracked from the time they are initially picked up by the Judge to the time they reach the Central Counting Station. If a Sheriff is sent out because of potential problems on Election Night, exact locations can be given.

The cards are tabulated at the Central Counting Station and the returns are compared to those received at the polling place. When they match, the returns are downloaded onto a read-only CD, transferred to another computer not connected to any system, and published to the Internet.

After Election Day and before the canvass, a sample number of precincts are run on an independent auditing system. This system is not connected to the voting tabulation system and scans and tallies the paper ballots using numbers, not names. This system allows for a more secure counting program since it does not have to be reset for every election.

After late mail ballots are received and final official returns are prepared, the images of the ballots are made viewable on the Internet. No hired third party auditors are needed; anyone can view and recount the ballots.

The software used through the components of this system is easy for administrators to use without vendor involvement. The software is well-designed, flexible, able to handle a multitude of voting scenarios, able to recognize and separate provisional ballots, and places great emphasis on security and redundancy. The source code must be open or at least reviewable by independent experts not directly associated with the vendor or the certification process.

Note: This diagram does not include the entire voting system, for example, a ballot-by-mail system requires additional design. The graphics used here are representational and do not imply a recommendation of brand or specific design. If you have suggestions as to how to improve this plan, please contact us at 512-534-4996 or email us at Elections@co.travis.tx.us.

The Shift

- By moving the ACT OF VOTING, of MARKING THE BALLOT, away from the polling place and giving the voter the option of how to return the ballot for COUNTING:

Download
ballot &
mark it
online

System creates
QR code of
voter's choices
they can retain
on smart
device or print
off



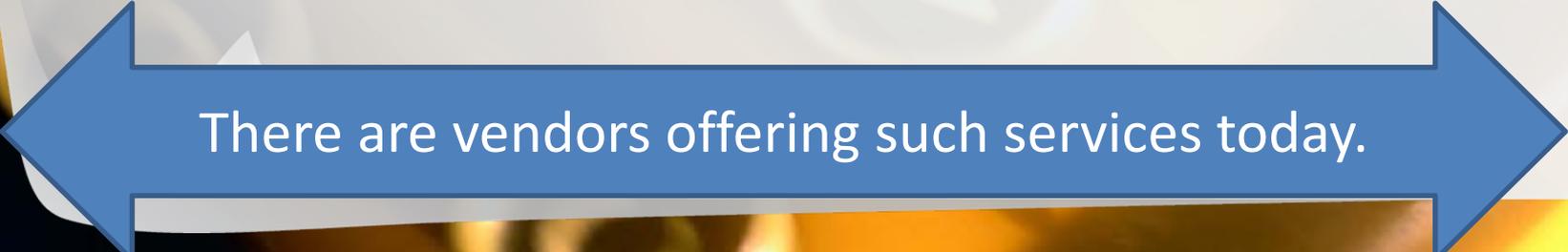
QR code is
read at
the polling
place

Voter
confirms,
or changes,
& then
casts



Impact?

- By offering a “fast track” for voters there should be less congestion at the polling place waiting for voting equipment thus impacting wait times for voters.
- Ballots submitted at the polling place would be tabulated on Election Day with in-person verification of the voter (rather than post-Election Day & signature verification).



There are vendors offering such services today.

On the Horizon



IDEO takes paper prototyping to a whole... nuther... level (LA VSAP TAC)

By joebeone ★ Favorite

LA's project collaboration with IDEO may further advance the field



Summary

- Online voting is currently happening in some democratic countries around the world.
- In the US there is a trend towards electronic delivery & online ballot-marking systems, but not ballot -casting systems. Servicing UOCAVA voters continues to drive the conversation.

The Presidential Commission on Election Administration held hearings and stakeholder meetings around the country. The President outlined in his Executive Order establishing the Commission to address the following areas:

- Technology
- Serving UOCAVA voters
- Usability





- Voting technology experts recently spent a day in Cincinnati, OH discussing the status of voting technology with the Commission:
 - Election Officials
 - Manufacturers
 - VSTL Staff
 - Usability Experts
 - Computer Scientists
 - Standards Experts
 - Academics



What's next?

- It was interesting that almost all of the vendors demonstrated systems that shift the marking of the ballot and the use of a QR code with a voter-verified paper record.
- This paper reliance and manipulation requirement is still a hurdle for many voters with a disability.



Observation of
new voting
technologies.



- 
- The Organization for Security and Co-operation in Europe Office for Democratic Institutions and Human Rights published this very informative handbook for their election observers on what to keep in mind when observing new voting technologies.

OSCE were in Maricopa last year observing the General Election



Handbook

For the Observation of
New Voting Technologies

- 
- The brochure lays out the various areas to consider when analyzing new voting technology.

Assessing New Voting Technologies:

The Work of the NVT Analyst

- 4.1 Procurement and Acquisition of NVT
- 4.2 Role of the Election Administration in the Use of NVT
 - 4.2.1 Voting Process Re-Structuring
 - 4.2.2 Multiple Voting Channels: Integration of Electronic and Paper-Based Voting Processes
 - 4.2.3 Oversight
 - 4.2.4 Risk Management
 - 4.2.5 Role of the Vendors
 - 4.2.6 Training of Polling Officials
 - 4.2.7 Voter Education
- 4.3 Security and Secrecy of the Vote and Integrity of the Results
- 4.4 Usability, Ballot Design, Voter Accessibility and Reliability
 - 4.4.1 Usability
 - 4.4.2 Ballot Design
 - 4.4.3 Voter Accessibility
 - 4.4.4 Reliability
- 4.5 Public Testing
- 4.6 Evaluation and Certification
- 4.7 Verification Methods
 - 4.7.1 Audits
 - 4.7.2 VVPATs and Scanned Ballots
 - 4.7.3 Verification and Internet Voting
- 4.8 Observer Access, Documentation and Other Transparency Measures



- **The booklet contains a very helpful checklist including things like:**

- **Ballot secrecy/privacy**
- **Testing**
- **Certification**
- **Security**
- **Voter verifiability**

Annex B: Master Checklist

- In what environment were the NVT introduced? Was there a public debate about the necessity and modalities of the NVT? Was there overall political agreement or were there divisions about the issue? Was their overall public confidence in the election process and the election administration prior to the introduction of electronic voting?
- Have the NVT been introduced gradually, with time for potential problems to be detected and corrected, and time for voters to become familiar with the system?
- How does the election process with the use of an NVT system compare to a paper-based process in terms of fulfilling fundamental principles for a genuine, democratic election? What is the added value of using NVT in the country? Do contingency plans exist, in case the technology fails?
- If used together with a paper ballot system, how does the use of NVT affect the conduct of the rest of the election process?
- Has the NVT system been certified in a transparent process by a qualified independent body, under both national legislation and international good practice?
- Has the NVT system and its components been comprehensively tested prior to introduction and periodically thereafter?
- To what extent are voters, election administrators and observers capable of understanding and using the system? What skills are needed to make them educated users? What kind of training or voter education could build these skills?
- Are any individuals or groups, including political parties and domestic observers, permitted by law to conduct their own tests, assessments or reviews of documentation?
- Do international observers have full access to the process and to documentation, including certification, testing, verification and audit reports?
- To what extent is there public confidence that the use of NVT in the election in question is conducted in accordance with democratic principles?
- Is secrecy of the ballot guaranteed?
- Are security requirements and procedures in place at each level of the system? Do these, in practice, ensure protection against external intervention, internal manipulation and technological failure?
- Is a voter-verifiable paper record produced in order to ensure that the voter's choice has been recorded accurately and to create the possibility for observers without technical expertise to observe a re-count? If not, what measures ensure universal, end-to-end verifiability of the results?



Why now?

- Pre HAVA jurisdictions purchased equipment on a rolling basis across the country—each year there was equipment being replaced somewhere.
- After HAVA almost the entire nation purchased equipment within a very short span of time.
- And that equipment is aging..

**So stay
tuned!**

