NIST VOTING PROGRAM

MARY BRADY, PROGRAM MANAGER

TGDC MEETING: FEBRUARY 2016
Motivation: 2000 Presidential Election

Confusion at Palm Beach County polls
Some Al Gore supporters may have mistakenly voted for Pat Buchanan because of the ballot's design.

Although the Democrats are listed second in the column on the left, they are the third hole on the ballot.

Punching the second hole counts a vote for the Reform party.

Sun-Sentinel graphic
Congressional Mandates

**HAVA 2002** (Public Law 107-252): The Help America Vote Act (HAVA) requires NIST/SSD to provide technical support for the development of Voluntary Voting Standard Guidelines (VVSG). Such technical work includes computer security, methods to detect and prevent fraud, protection of voter privacy, the role of human factors, including assistive technology for voters with disabilities, and remote access voting, including voting through the internet.

**MOVE 2009**: The Military and Overseas Voters Empowerment Act of 2009 (MOVE) directs NIST and EAC to provide ”best practices or standards in accordance with electronic absentee voting guidelines established”… to support the pilot program or programs developed by DOD as directed by the Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA) of 1986 as amended.
VVSG Development

- EAC
  - Standards Board
  - Advisory Board
  - TGDC NIST Director

**Voting Guidelines**
- VVSG 1.0 -- 2005
- VVSG 2.0 -- 2007
- VVSG 1.1 -- 2015
VVSG: In use in 47/50 States

Standards Certification VSTL
Interaction of Voting and Election Systems

VR System

Voter

UOCAVA / Ballot Delivery

Ballot on Demand

Ballot Printers

Pollworker/ Staff Training

Candidate Qualifying

Audits

E-pollbooks

Election Night Reporting

Administrative Reports

Voter Authentication Systems

Ballot Marking System

Vote Capture

Vote Tabulation

(re)Districting
Future of Voting Systems Symposium

Purpose:
The Election Assistance Commission (EAC) and National Institute of Standards and Technology (NIST) are sponsoring a two and a half day symposium to explore emerging trends in voting system technology with the diverse election community at large. The sponsoring organizations seek to have lively discussion on the following topics:

- Why some jurisdictions are exploring building their own voting systems
- Trends in voting system technology acquisition and deployment plans
- How election officials, manufacturers and academics view the future of voting system technologies
- Alternative standard development processes for voting systems
- Alternative methods for voting system testing and certification at the Federal and State level

The symposium will provide an environment for interactive discussions among the attendees including election officials, voting system manufacturers, voting system test laboratories, standard developers, academics, and Federal, State, and local government officials. The symposium will encourage attendee participation through panel discussions with limited presentations to frame the topics to be explored. The final day of the symposium will explore voting system technology trends seen by election officials, voting

Details:
- Start Date: Tuesday, February 24, 2015
- End Date: Thursday, February 26, 2015
- Location: NIST-Gaithersburg, MD - Building/Green Auditorium
- Audience: Industry, Government, Non-Profit Organizations
- Format: Symposium
- Sponsor(s): NIST, Election Assistance Commission

Registration:
- Registration Fee: $270.00
- All attendees must be pre-registered at the NIST campus. Photo identification at the main gate to be admitted
Standards

Standards Efforts

- NIST Roadmap
- NASED Subcommittee
- EAC Future VVSG
- CSG Technology Group
- IEEE VSSC
Voting Guidelines

- Input on front-end
- Shorter public comment period
Public Working Groups

- Public working groups gather inputs from election officials and locales to inform the standards work
  - Established e-mail lists, Twiki for collaboration
  - Twiki: ~8,000 views, ~500 file uploads
  - Initial election models generated
- Top down/bottom up approach to identifying priorities for both public working groups and constituency groups
  - TGDC-Feb2016: Review models, discuss priorities
  - Constituency Groups: Meeting & discussing priorities
- Identify Priority Action Plans (PAPs)
- Public working groups and constituency groups work to fill needs highlighted by priority areas
Public Working Groups: Doing the Work

1. Sign up for Group Email Lists
2. Receive and Activate TWiki Account
3. Learn / Use Twiki
4. Participate in group meetings
5. Define Processes on TWiki
6. Develop and Carry Out Action Plans
Learn / Use the TWiki

Process WG Pages

- Pre-Election
- Election
- Post-Election

Table of Contents
- General Information
- NIST Voting Public Working Groups
- Public Working Group Guidance
- This Topic is Referenced By

Useful Links

GETTING STARTED
1. Subscribe To Working Group Email Lists
2. TWiki Quick Start Guide
3. Working Group Quick Start Guide

HELP
- Voting TWiki Help
- TWiki Users' Quick Reference Sheet (pdf)
- Webinars and Step-by-step Video Tutorials

Subscribe / Activate
Get Started
Group Guidance
Step-by-step Help
Quick Ref. Guide
Webinars / Step-by-step Video Tutorials
Process Model Creation

Voting TWiki Page

Process Spreadsheet

Pre-Election Process Model Output: Prepare Voting Materials and Equipment

Process Model

PlantUML Code Generator

TWiki Processes

Process Model Creation

Prep Process Output: Prepare Voting Materials and Equipment
Progress...Election Models
Election Results CDF Specification

- For pre- and post-election data, reporting aggregated and detailed election results
- Earlier version already in use in OH, used in PEW/Google’s VIP 5.0
- 1500 series publications for public working group outputs
Usability & Accessibility Roadmap

- Partnered with Center for Civic Design, convened 2 Workshops

- Identified **Six Priority Areas**:  
  - Support the design process  
  - Engage voters effectively  
  - Address the entire voter journey  
  - Support evolving technology  
  - Provide useful guidance and standards  
  - Improve testing in design and certification
VVSG U&A Requirements

- Follow-on from U&A Roadmap and NASED Principles/Test Assertion effort
- Support universal design that will make all voting systems accessible.
- Clearly identify requirements necessary to meet legal accessibility requirements in HAVA and the ADA.
- Make the VVSG more usable by organizing the requirements around clear principles.
- Show how detailed requirements and other guidance can be organized to meet these principles.
1. Identify key election processes
2. Discuss use cases that touch different layers (technology, security, human factors, interoperability) and occur in different contexts (pre-election, election, post-election)
3. Create a plan to fill in the details of that map (processes, principles, concepts)
4. Use that high-level map and plan to prioritize and drive activities in all groups toward formal description of that process

1. Develop Template for overall process (PAP Template)
2. Develop Template for each case of that process (PAP Case Templates)
PAP Map: Ballot Marking

- Absentee
  - Pen / Paper
- Votomatic
  - Punch Card
- Electronic Ballot Marking
  - Traditional
  - Tablet
    - Constrained Env.
    - COTS Env.
- Online Ballot Marking
  - Client / srv
  - You own data
  - cloud
  - Don’t Know where data is
- Mark @ home + QR Codes
# Improving U.S. Voting Systems

## PAP Matrix (Ballot Marking): A Single PAP Touches all Groups

<table>
<thead>
<tr>
<th>Election Process Function(s)</th>
<th>admin, voter info mgmt</th>
<th>ballot delivery</th>
<th>mark + count</th>
<th>markers</th>
<th>verify</th>
<th>ballot media</th>
<th>interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-ELECTION WG</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>begin election</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>decide to include contest on ballot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>register candidate for election</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>register voter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>define ballot</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>select ballot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>implement ballot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>verify election equipment is ready for election</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELECTION WG</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>open polls</td>
<td>x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>authenticate identity voter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>connect voter to clerk ballot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voter interacts with ballot interface and marks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voter edits ballot (prints, changes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voter manipulates ballot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voter verifies content selections</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voter cast an electronic ballot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voter confirms paper ballot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>close polls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>POST-ELECTION WG</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>count votes</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>consolidation votes</td>
<td>x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transfer information</td>
<td>x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>report results</td>
<td>x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>track election status throughout</td>
<td>x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>store election information and equipment</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>store election information and equipment</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONSTITUENCY GROUPS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Factors</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interoperability</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TECHNOLOGY ARCHITECTURES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>custom (e.g., SW, etc)</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUT (client, WG)</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>standalone</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>client-server</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cloud</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>others, ?</td>
<td>x x x x x x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Ballot Marking Summary View

<table>
<thead>
<tr>
<th>Ballot Marking Case</th>
<th>Ballot Medium</th>
<th>Ballot Marker</th>
<th>Target Architecture Context / Considerations</th>
<th>Pre-E.</th>
<th>Election</th>
<th>Post-E.</th>
<th>Security</th>
<th>Human-Factors</th>
<th>Interop.</th>
<th>Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absentee (Paper Ballot Marking)</td>
<td>Paper</td>
<td>Pen</td>
<td>Postal mail; email; custom HW/SW; standalone;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Votomatic&quot; (Punch card)</td>
<td>Punch card</td>
<td>Stylus</td>
<td>In-person; Custom HW/SW; standalone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBM (Traditional; &quot;AutoMark&quot;)</td>
<td>Paper, Elec.</td>
<td>UI (elect; Acc)</td>
<td>In-person; Custom HW/SW; standalone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBM (Emerging; &quot;Tablet&quot;)</td>
<td>Paper, Elec.</td>
<td>UI (elect; Acc)</td>
<td>In-person; COTS HW/SW; standalone; client-server; cloud</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online Ballot Marking (Traditional)</td>
<td>Elec.</td>
<td>UI (elect; Acc)</td>
<td>Anywhere; client-server; Custom HW/SW; know where data is physically</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online Ballot Marking (Emerging)</td>
<td>Elec.</td>
<td>UI (elect; Acc)</td>
<td>Anywhere; cloud; COTS HW/SW; don't know where data is physically</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark @ home + QR-Code</td>
<td>Elec.</td>
<td>UI (elect; Acc)</td>
<td>Anywhere; cloud; COTS HW/SW; don't know where data is physically</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Summary

• Elections are complex and the elections community is very diverse
• Wider engagement of state and local election officials, manufacturers, test laboratories, academics, and a number of advocacy groups
• Working with the broader elections community on laying the foundation for the next version of the VVSG
• Let’s get to work!