

NIST VOTING PROGRAM

MARY BRADY, PROGRAM MANAGER

TGDC MEETING: FEBRUARY 2016

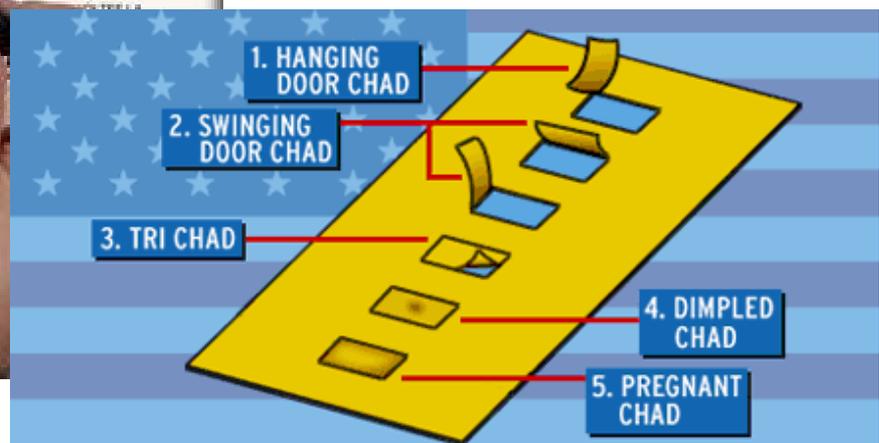
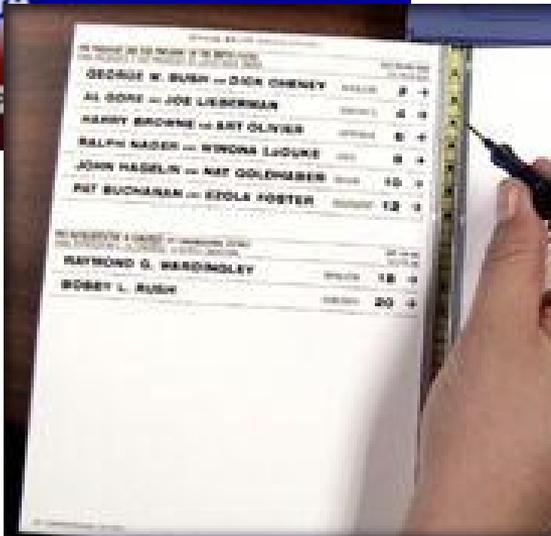
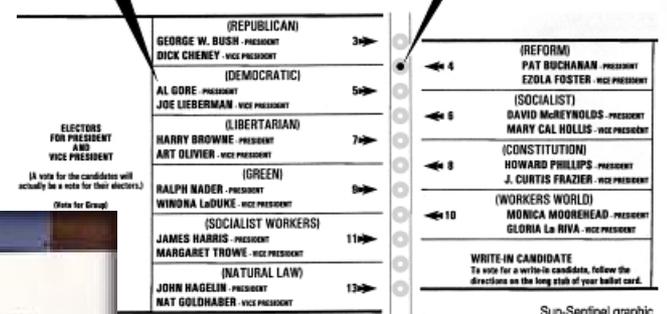
Motivation: 2000 Presidential Election



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 casts a vote for the Reform party.

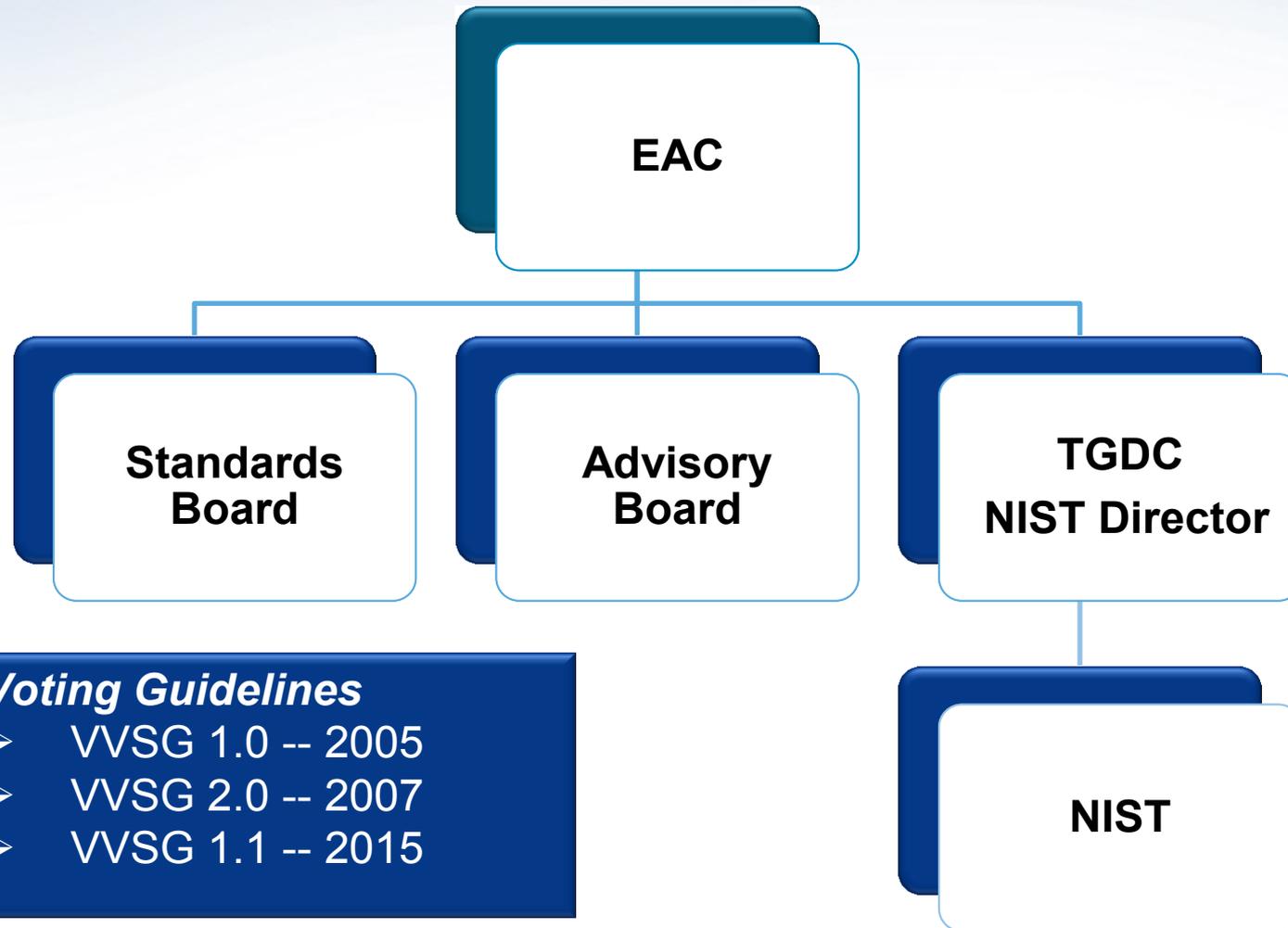


Congressional Mandates

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.

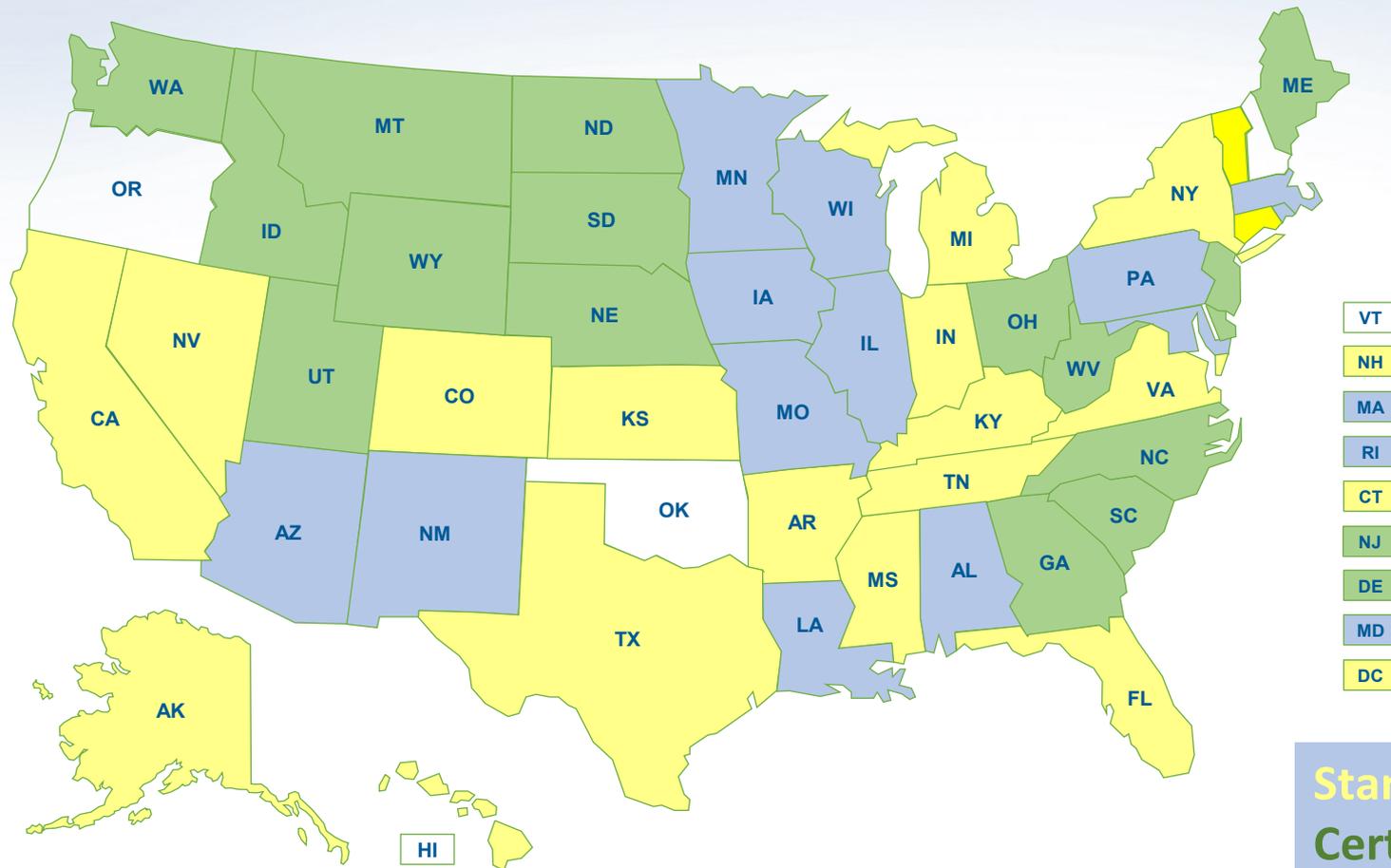
VVSG Development



Voting Guidelines

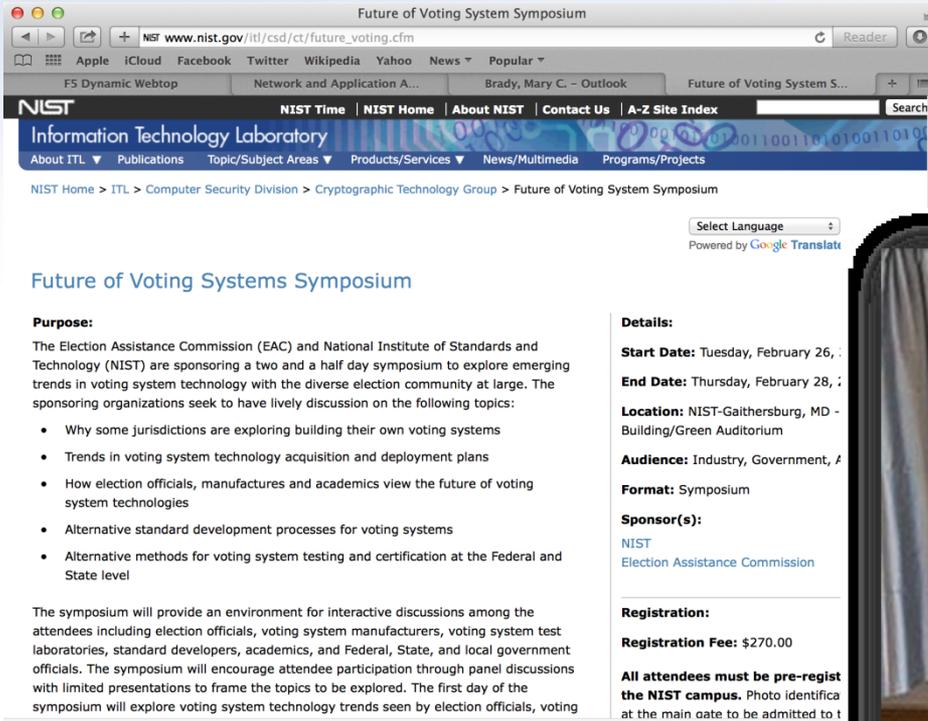
- VVSG 1.0 -- 2005
- VVSG 2.0 -- 2007
- VVSG 1.1 -- 2015

VVSG: In use in 47/50 States



Standards
Certification
VSTL

Future of Voting – Feb 2013, 2015



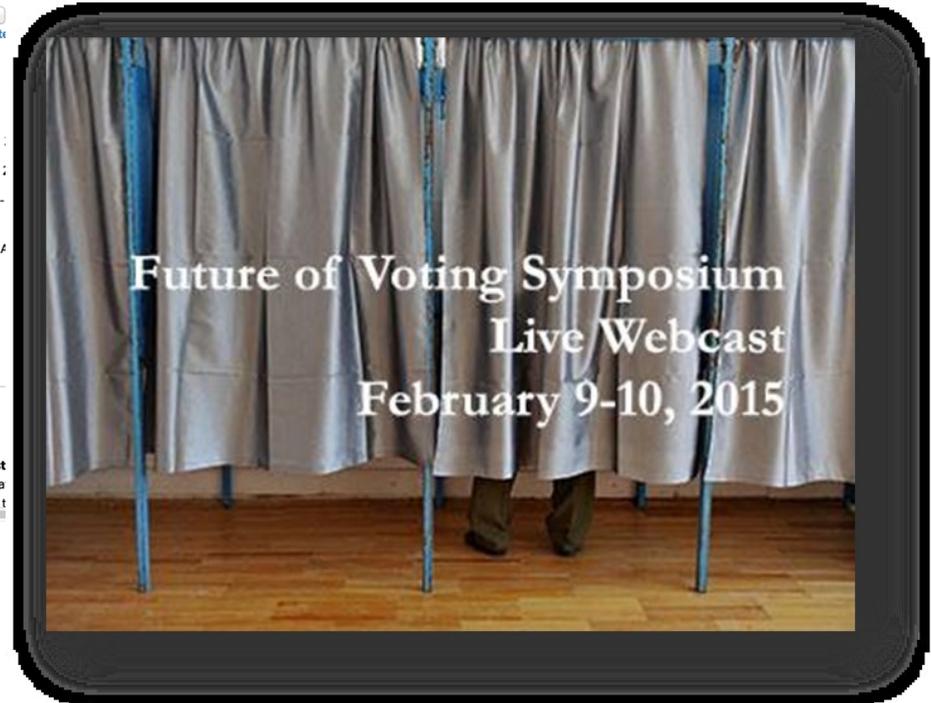
The screenshot shows a web browser window displaying the NIST website for the Future of Voting System Symposium. The browser's address bar shows the URL www.nist.gov/itl/csd/ct/future_voting.cfm. The website header includes the NIST logo and navigation links such as "NIST Time", "NIST Home", "About NIST", "Contact Us", and "A-Z Site Index". Below the header, there is a search bar and a "Select Language" dropdown menu. The main content area is titled "Future of Voting Systems Symposium" and contains a "Purpose:" section with a paragraph and a bulleted list of topics. To the right, there is a "Details:" section with fields for "Start Date", "End Date", "Location", "Audience", "Format", "Sponsor(s)", "Registration:", and "Registration Fee".

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 first day of the symposium will explore voting system technology trends seen by election officials, voting

Details:
Start Date: Tuesday, February 26, 2015
End Date: Thursday, February 28, 2015
Location: NIST-Gaithersburg, MD - Building/Green Auditorium
Audience: Industry, Government, Academia
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 to the event.

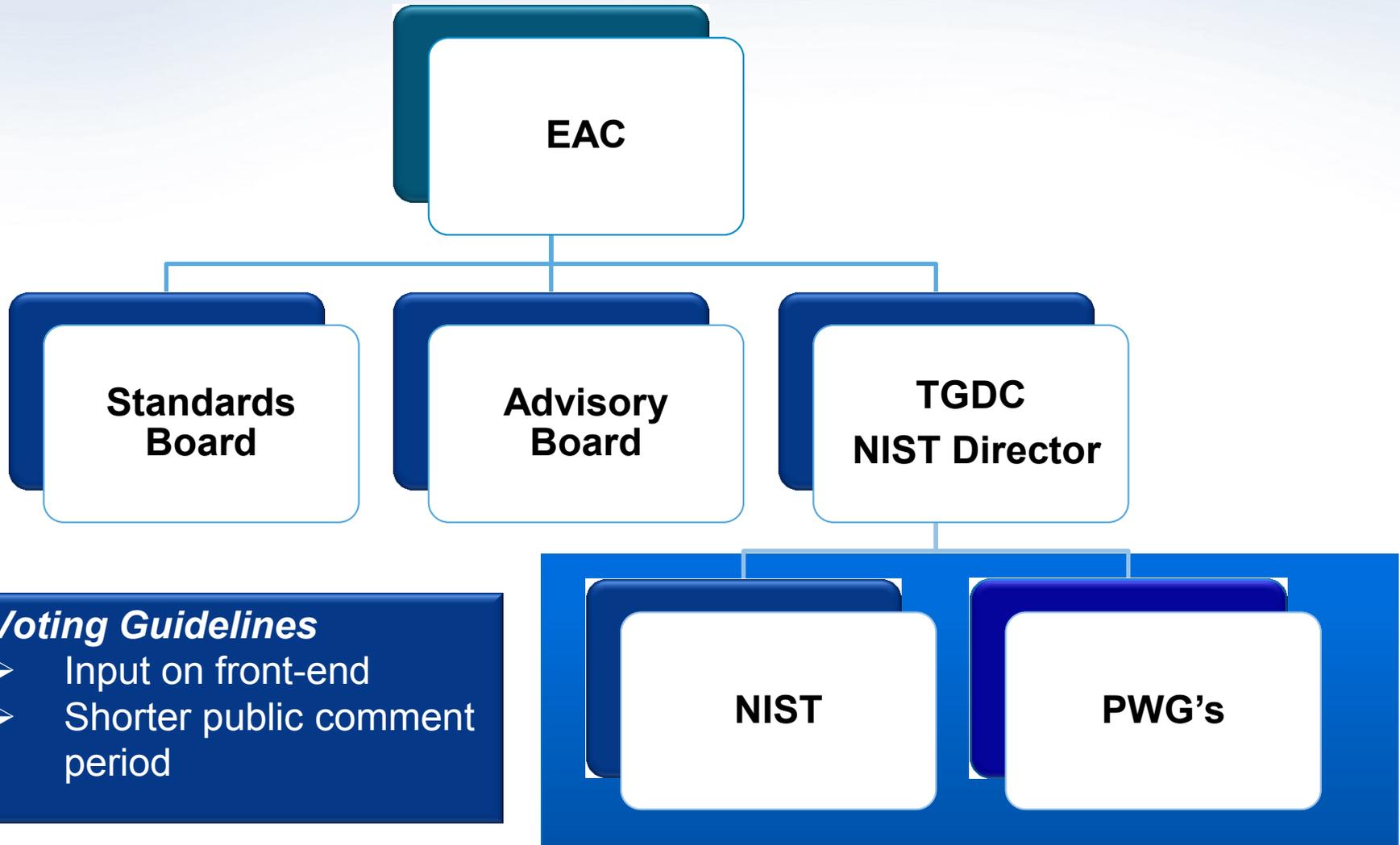


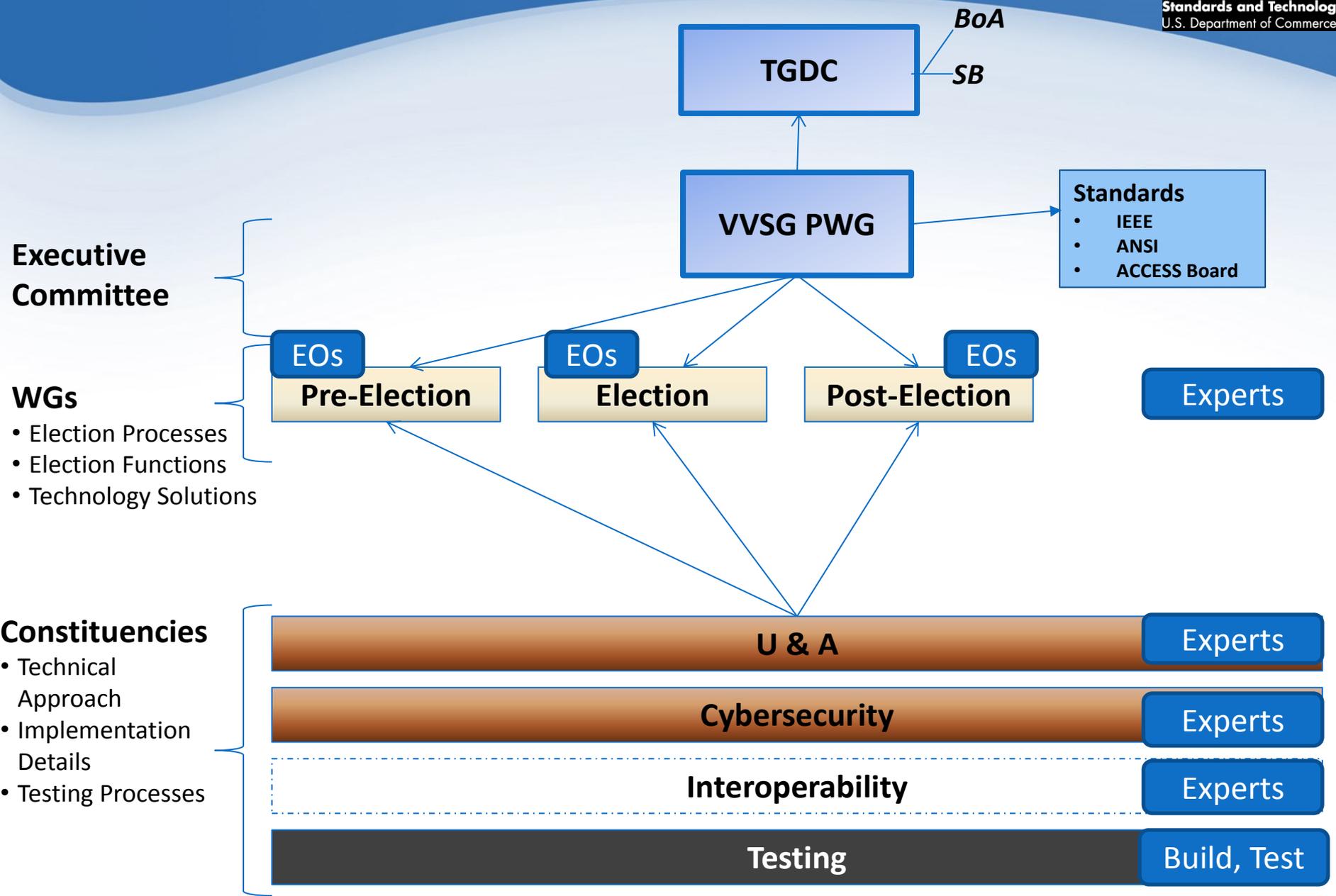
NIST/EAC Symposia
Explore Emerging Trends in Voting

Standards



VVSG Development





Executive Committee

- WGs**
- Election Processes
 - Election Functions
 - Technology Solutions

Constituencies

- Technical Approach
- Implementation Details
- Testing Processes

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



Voting Public Working Groups

Table of Contents	Useful Links
<ul style="list-style-type: none">↓ General Information↓ NIST Voting Public Working Groups↓ Public Working Group Guidance↓ This Topic Is Referenced By	<p>GETTING STARTED</p> <ul style="list-style-type: none">1 Subscribe To Working Group Email Lists NEW2 TWiki Quick Start Guide NEW3 Working Group Quick Start Guide NEW <p>HELP</p> <ul style="list-style-type: none">• Voting TWiki Help• TWiki Users' Quick Reference Sheet (pdf) NEW• Webinars and Step-by-step Video Tutorials NEW

- 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

starts process	ends proce	starts subte	ends subte	ste p	step	process	color
T	T			1	Prepare Voting Materials and Equipment Setup and Proof Election Coding	PrepareVotingMaterialsAndEquipment	RFEE1C3
		T		2	Create Ballots (Open Ballots, Digital Scan Ballots, MOVE Act Compliant Ballots, DRE Touchscreen Ballots)	PrepareVotingMaterialsAndEquipment	RSBCE1E
			T	3	Select Contests By Ballot Style	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Order Contests	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Sort Candidates	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Rotate Candidates	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Determine Boundaries of Unique Ballot Styles	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Proof Ballots	PrepareVotingMaterialsAndEquipment	RSBCE1E
			T	3	Print Ballots	PrepareVotingMaterialsAndEquipment	RSBCE1E
			T	3	Identify Quantities Of Paper Ballots To Order	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Test Voting Systems	PrepareVotingMaterialsAndEquipment	RSBCE1E
			T	3	Perform Internal Pre-Testing	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Perform Official Logic and Accuracy (L&A) Testing	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	2	Create Voters' Pamphlets and/or Sample Ballots	PrepareVotingMaterialsAndEquipment	RSBCE1E
			T	3	Proof Voters' Pamphlets and/or Sample Ballots	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Publish Voters' Pamphlets and/or Sample Ballots	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	2	Setup and Test Ballot-On-Demand Systems	PrepareVotingMaterialsAndEquipment	RSBCE1E
			T	3	Extract Eligible Voter And Other Data From VRDB	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Prepare Database Of Eligible Voters	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Collate Eligible Voter Data and Address Indexes	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Load E-Poll Books With Voter Names and Addresses	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	4	Test E-Poll Books	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Proof Poll Book Data	PrepareVotingMaterialsAndEquipment	ROTE1AF
			T	3	Print Poll Books and Indexes	PrepareVotingMaterialsAndEquipment	ROTE1AF

Twiki Processes

PlantUML Code Generator

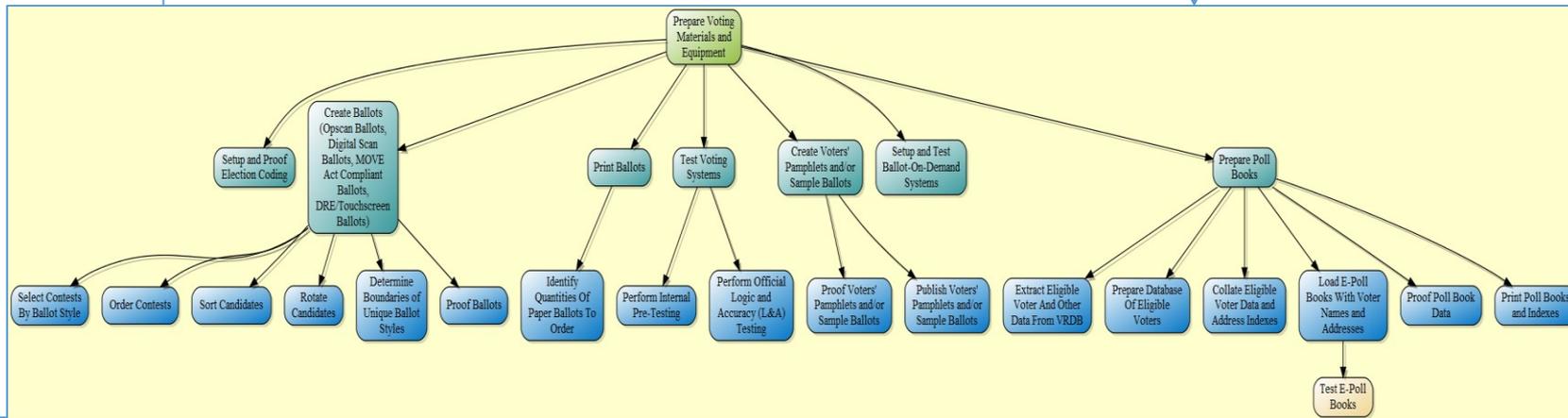
Process Model

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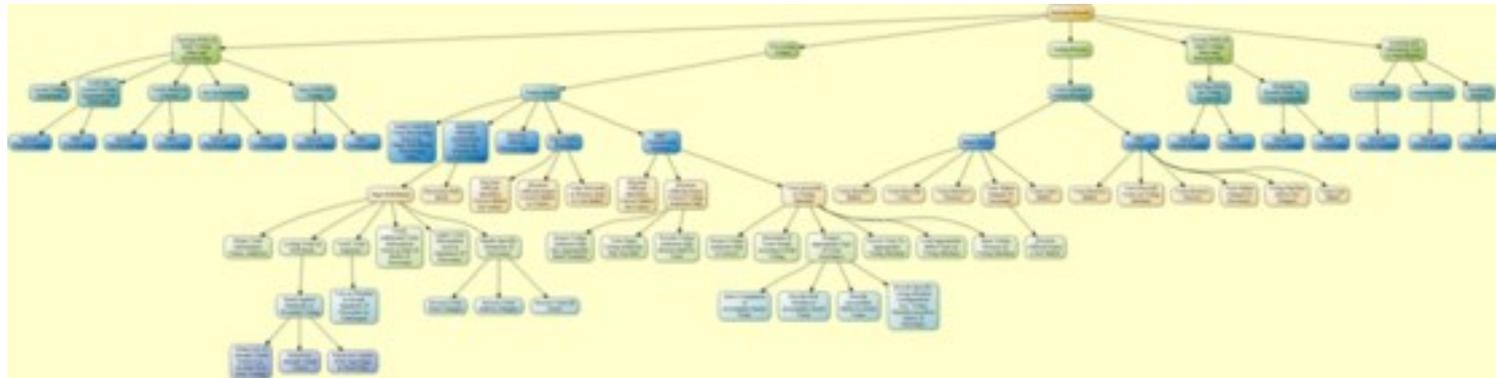
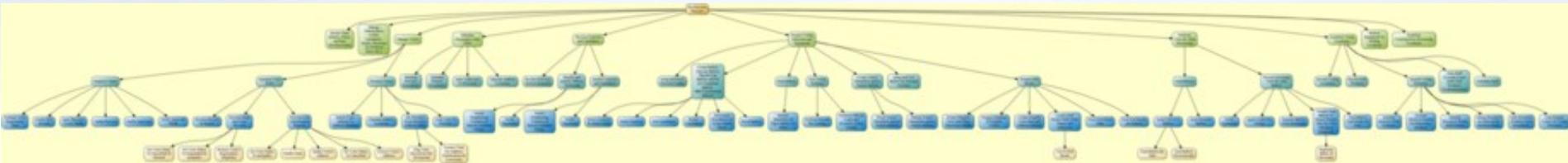
graph TD
    subgraph "Pre-Election Process Model Output: Prepare Voting Materials and Equipment"
        A[Prepare Voting Materials and Equipment] --> B[Create Ballots (Open Scan Ballots, Digital Scan Ballots, MOVE Act Compliant Ballots, DRE Touchscreen Ballots)]
        A --> C[Print Ballots]
        A --> D[Test Voting Systems]
        A --> E[Create Voters' Pamphlets and/or Sample Ballots]
        A --> F[Setup and Test Ballot-On-Demand Systems]
        A --> G[Prepare Poll Books]
    end
    B --> H[Select Contests By Ballot Style]
    B --> I[Order Contests]
    B --> J[Sort Candidates]
    B --> K[Rotate Candidates]
    B --> L[Determine Boundaries of Unique Ballot Styles]
    B --> M[Proof Ballots]
    B --> N[Identify Quantities Of Paper Ballots To Order]
    C --> O[Perform Internal Pre-Testing]
    C --> P[Perform Official Logic and Accuracy (L&A) Testing]
    D --> Q[Create Voters' Pamphlets and/or Sample Ballots]
    D --> R[Proof Voters' Pamphlets and/or Sample Ballots]
    D --> S[Publish Voters' Pamphlets and/or Sample Ballots]
    E --> T[Setup and Test Ballot-On-Demand Systems]
    E --> U[Extract Eligible Voter And Other Data From VRDB]
    F --> V[Prepare Database Of Eligible Voters]
    F --> W[Collate Eligible Voter Data and Address Indexes]
    F --> X[Load E-Poll Books With Voter Names and Addresses]
    F --> Y[Test E-Poll Books]
    F --> Z[Proof Poll Book Data]
    F --> AA[Print Poll Books and Indexes]
    G --> AB[E-Poll Books]
    
```

Election Process Model

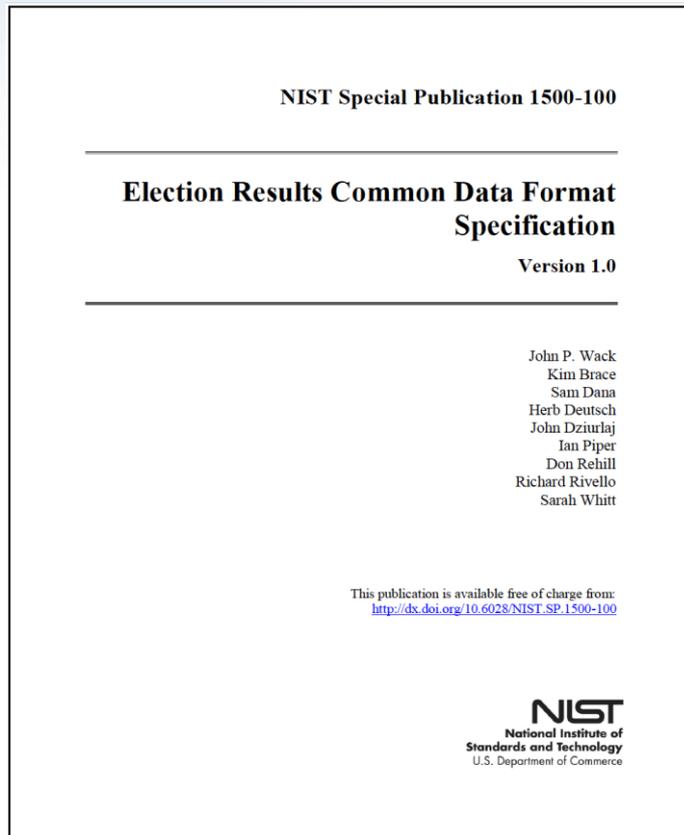
Pre-Election Process Model Output: Prepare Voting Materials and Equipment



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

National Institute of Standards and Technology

Preliminary report

A roadmap for future usability and accessibility guidance

Draft: February 9, 2015

Sharon Laskowski
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NIST

Whitney Quesenbery
Dana Chisnell
Center for Civic Design

Kathryn Summers
Caitlin Rinn
University of Baltimore

Send comments and questions to usroadmap@nist.gov

VVSG U&A Requirements

National Institute of Standards and Technology:
Work Supporting the Roadmap for Usability and Accessibility
of Future Voting Systems

Draft Report

**Organizing Requirements by Principles:
Exploring a revised structure for
VVSG Chapter 3**

Whitney Quesenbery
Caitlin Rinn
Center for Civic Design

September 15, 2015

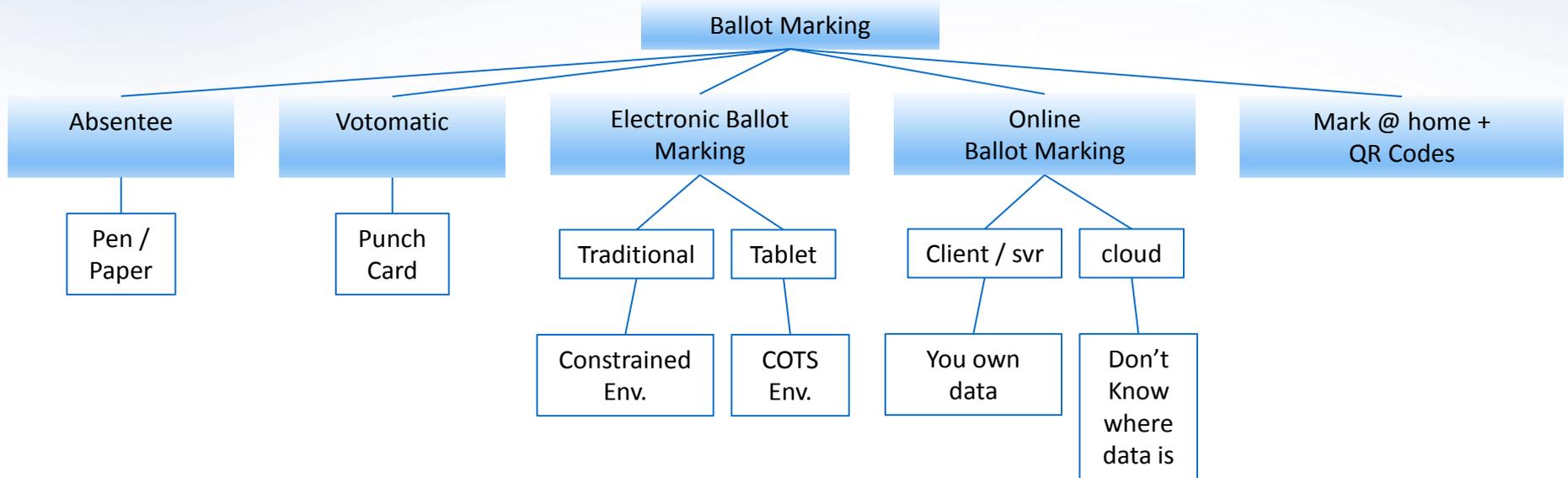
This work was performed as part of a collaboration between NIST and the Center for Civic Design, under grant 70NANB14H280 from the U.S. Department of Commerce, National Institute of Standards and Technology.

- 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.

TGDC February 2016

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



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

Election Process Function(s)	admin. voter info mgmt				ballot delivery				mark + count			markers				verify	ballot media				interfaces						
	Voter reg. sys.	EMS	Poll books	EPB	postal mail deliv	Online ballot deliv (PDF)	Email ballot deliv	BoD	DRE	PCOS	CCOS	stylus	pencil / pen	EBM	online ballot marker	VVPAT	punch card	paper	elec.	QR code	punch card ballot	paper ballot	touch-screen ballot UI	audio ballot UI	physical controls UI	Sip 'n Puff UI	
PRE-ELECTION WG																											
begin election																											
decide to include contest on ballot																											
decide to include candidate on ballot																											
register candidate for election																											
register voter																											
define election		x						x	x	x	x																
define ballot		x						x	x	x	x			x	x					x	x	x	x	x	x	x	x
implement ballot		x						x	x	x	x			x	x					x	x	x	x	x	x	x	x
install ballot on equipment		x						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
verify election equipment is ready for election		x				x		x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
ELECTION WG																											
open polls									x	x	x			x	x												
authenticate/identify voter									x	x	x			x	x												
connect voter to blank ballot					x	x	x	x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
voter interacts with ballot via interfaces and markers								x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
voter edits ballot (selects, deselects) contest choices								x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
voter navigates ballot								x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
voter verifies contest selections								x	x	?	x	x	x	x	x					x	x	x	x	x	x	x	x
voter casts/records ballot								x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
voter cancels/spoils ballot								x	x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
close polls									x	x	x			x	x												
POST-ELECTION WG																											
count votes									x	x	x									x	x	x	x	x	x	x	x
consolidate votes		x							x	x	x																
transfer information (physically, electronically)									x	x	x									x	x	x	x	x	x	x	x
report results (intermediate, final)									x																		
track/log election status throughout									x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
archive election information and equipment									x	x	x									x	x	x	x	x	x	x	x
audit election information and equipment									x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
accept election results																											
end election																											
CONSTITUENCY GROUPS																											
Security									x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
Human Factors									x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
Interoperability									x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
Testing									x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
TECHNOLOGY ARCHITECTURES																											
custom (HW, SW, etc)									x	x	x	x	x	x	x					x	x	x	x	x	x	x	x
CDTS (Tablet, etc)															x					x	x						
standalone									x	x	x																
client-server														x	x												
cloud															x												
others ...?															x												

Ballot Marking Summary View

Ballot Marking Case	Ballot Medium	Ballot Marker	Target Architecture Context / Considerations	Pre-E.	Election	Post-E.	Security	Human-Factors	Interop.	Testing
Absentee (Paper Ballot Marking)	Paper	Pen	Postal mail; email; custom HW/SW; standalone;	ballot def, impl, deploy	ballot mark, edit, record / cast	ballot count, audit, archive	Confidentiality, Integrity, Availability	Access, Use	Meaningful, Translatable	Observable, Testable
"Votomatic" (Punch card)	Punch card	Stylus	In-person; Custom HW/SW; standalone							
EBM (Traditional; "AutoMark")	Paper; Elec.	UI (elect; Acc)	In-person; Custom HW/SW; standalone							
EBM (Emerging; "Tablet")	Paper; Elec.	UI (elect; Acc)	In-person; COTS HW/SW; standalone; client-server; cloud							
Online Ballot Marking (Traditional)	Elec.	UI (elect; Acc)	Anywhere; client-server; Custom HW/SW; know where data is physically							
Online Ballot Marking (Emerging)	Elec.	UI (elect; Acc)	Anywhere; cloud; COTS HW/SW; don't know where data is physically							
Mark @ home + QR-Code	Elec.	UI (elect; Acc)	Anywhere; cloud; COTS HW/SW; don't know where data is physically							

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!