

NIST VOTING PROGRAM

MARY BRADY, PROGRAM MANAGER

Outline

- **Motivation & Congressional Mandates**
- Help America Vote Act
- Current Challenges
- Engage the Broader Community
- Summary

Motivation: 2000 Presidential Election



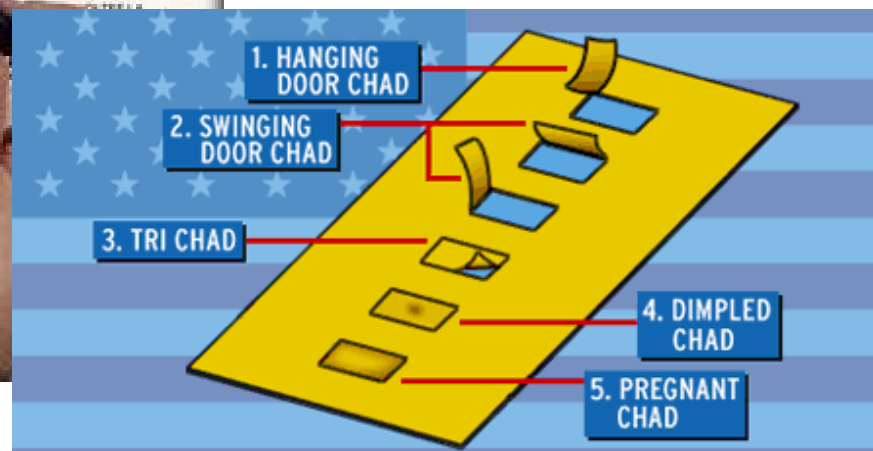
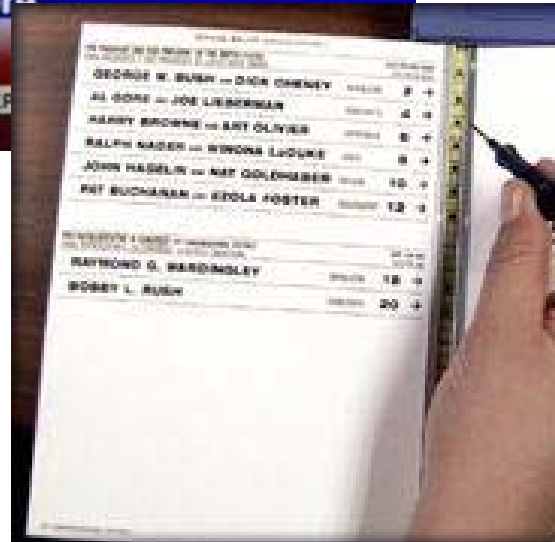
Confusion at Palm Beach County polls
Some Al Gore supporters may have mistakenly voted for Pat Buchanan because of the ballot's design.

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.

(REPUBLICAN)	3	(REFORM)	4
GEORGE W. BUSH - PRESIDENT		PAT BUCHANAN - PRESIDENT	
DICK CHENEY - VICE PRESIDENT		EZOLA FOSTER - VICE PRESIDENT	
(DEMOCRATIC)	5	(SOCIALIST)	6
AL GORE - PRESIDENT		DAVID McREYNOLDS - PRESIDENT	
JOE LIEBERMAN - VICE PRESIDENT		MARY CAL HOLLIS - VICE PRESIDENT	
(LIBERTARIAN)	7	(CONSTITUTION)	8
HARRY BROWNE - PRESIDENT		HOWARD PHILLIPS - PRESIDENT	
ART OLIVIER - VICE PRESIDENT		J. CURTIS FRAZIER - VICE PRESIDENT	
(GREEN)	9	(WORKERS WORLD)	10
RALPH NADER - PRESIDENT		MONICA MOOREHEAD - PRESIDENT	
WINONA LA DUKE - VICE PRESIDENT		GLORIA La RIVA - VICE PRESIDENT	
(SOCIALIST WORKERS)	11	WRITE-IN CANDIDATE	
JAMES HARRIS - PRESIDENT		To vote for a write-in candidate, follow the directions on the long stub of your ballot card.	
MARGARET TROWIE - VICE PRESIDENT			
(NATURAL LAW)	12		
JOHN HAGELIN - PRESIDENT			
NAT GOLDHABER - VICE PRESIDENT			

ELECTORS FOR PRESIDENT AND VICE PRESIDENT
If vote for the candidates will actually be a vote for their electors.
(Vote for Group)



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.

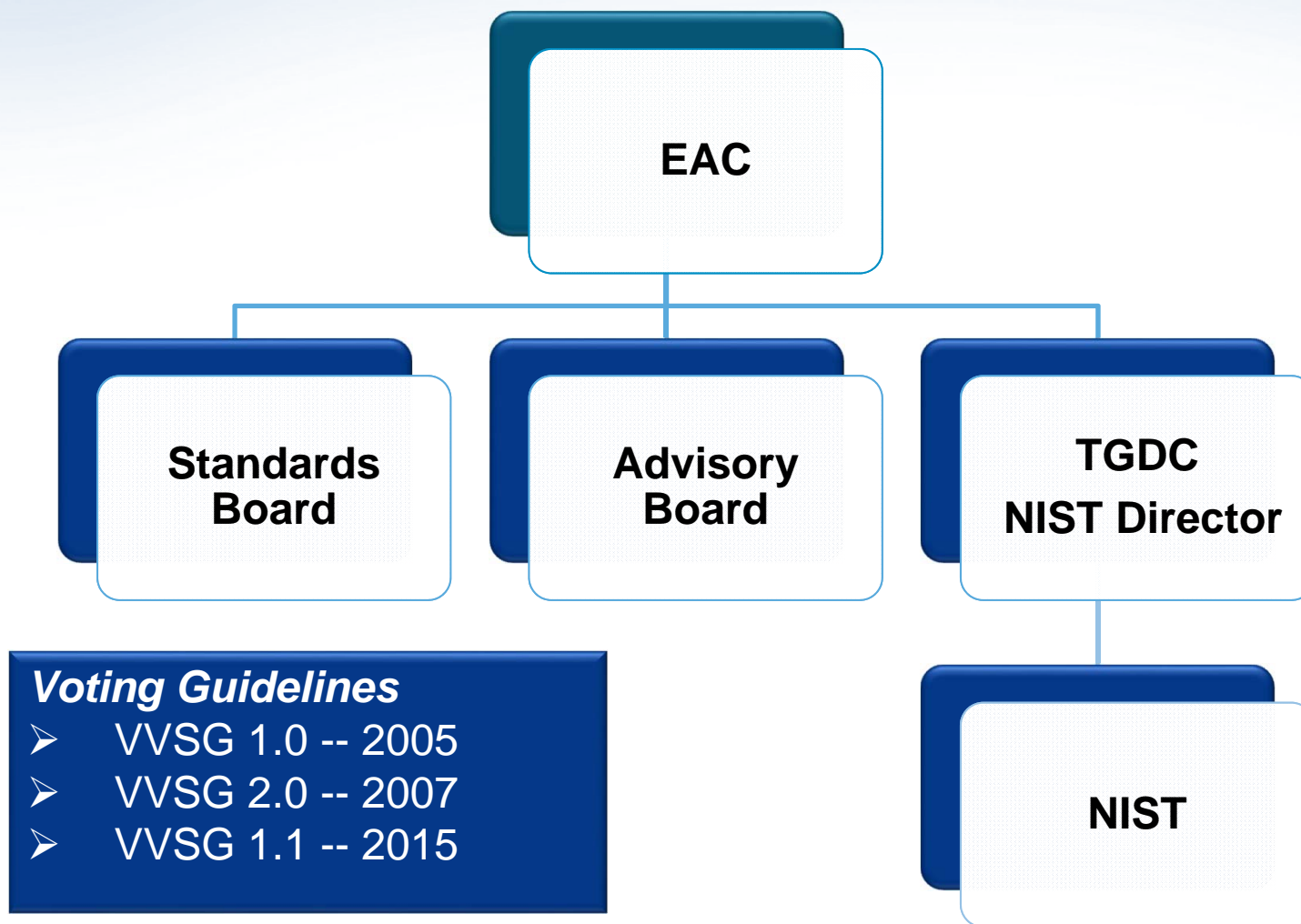
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- **Help America Vote Act**
- Current Challenges
- NIST Response: A New Paradigm
- Summary

Help America Vote Act

- Standards Development
- Accreditation, Testing, and Certification
- Usage by States

VVSG Development



Lab Accreditation, Testing, Certification

VSTL's – Voting System Test Laboratories are recommended for accreditation by NIST NVLAP Program. VSTL's test voting systems and make recommendation to the EAC.

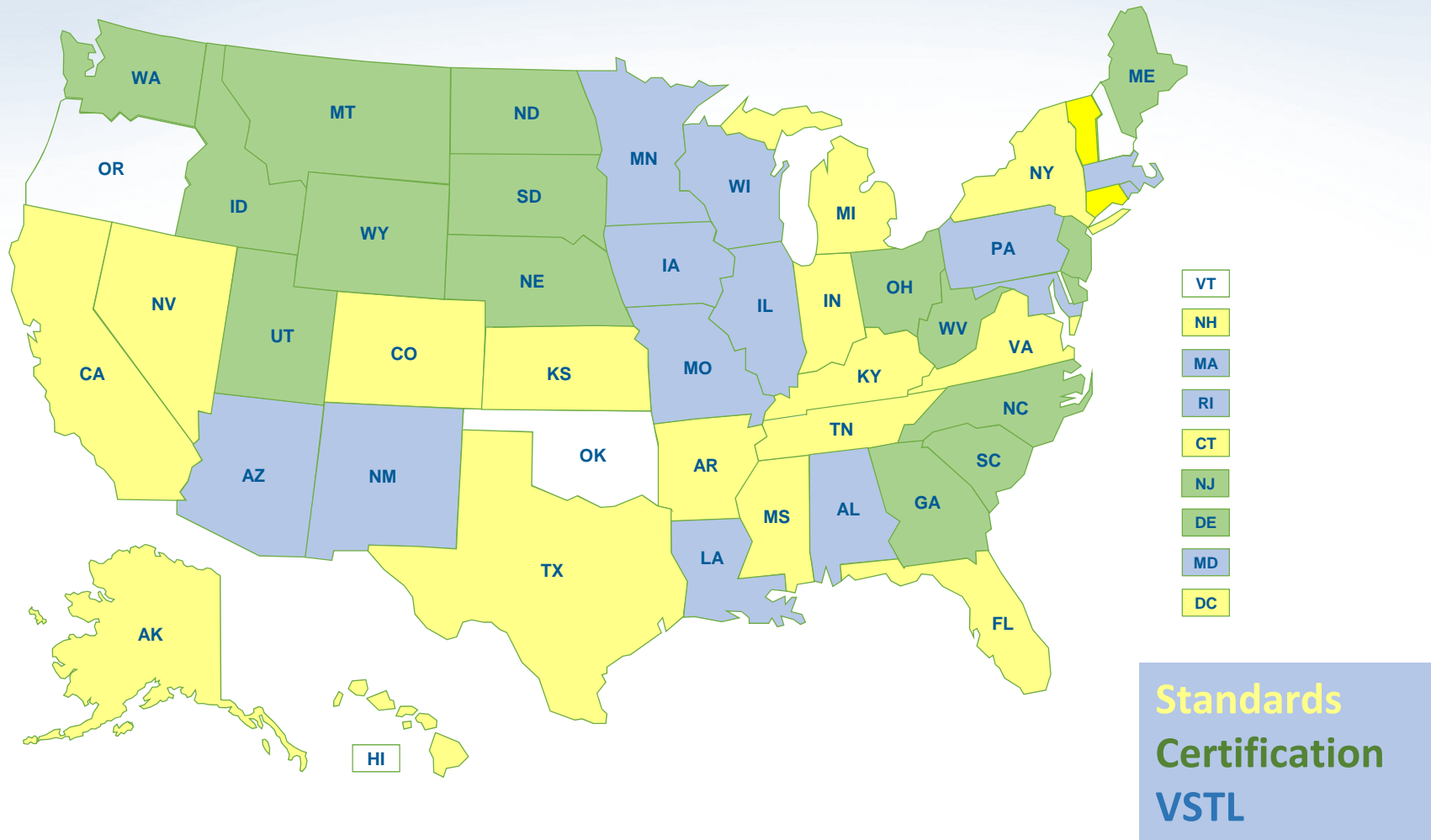
Certification - procedure by which a **third party** gives written assurance that a product, process or service conforms to specified **requirements**.

EAC – Reviews testing information provided by the VSTL's and certifies a system. Also responsible for decertifying a system if necessary.

EAC – In consultation with NIST, may provide a request for interpretation.



VVSG: In use in 47/50 States



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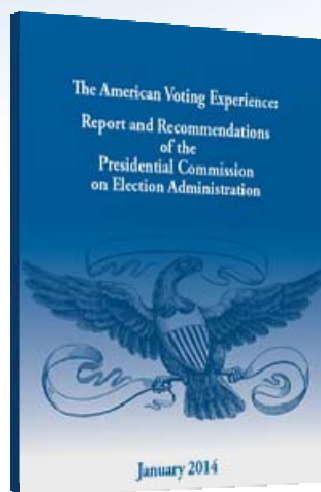
Current Challenges

- Presidential Commission on Election Administration
- Jurisdictions: Large and Small
- Equipment Changes
- Increasing Use of Information Technology in Elections

In Recent Years...

- No EAC Commissioners from 2011 until January 2015
- TGDC has been on a hiatus
- Presidential Commission on Election Administration
- Voting Equipment is Changing
- Election officials looking to capitalize on advances in IT to gain efficiencies and lower cost
- Increasingly complex IT application
- Interconnected devices
- New paradigms for voting systems
- Voter Registration
- Ballot marking devices
- E-pollbooks
- Election Night Reporting

Presidential Commission on Election Administration (PCEA)



The Commission's key recommendations call for:



Modernization of the registration process through continued expansion of online voter registration and expanded state collaboration in improving the accuracy of voter lists



Measures to improve access to the polls through multiple opportunities to vote before the traditional Election Day and the selection of suitable, well-equipped polling place facilities, such as schools



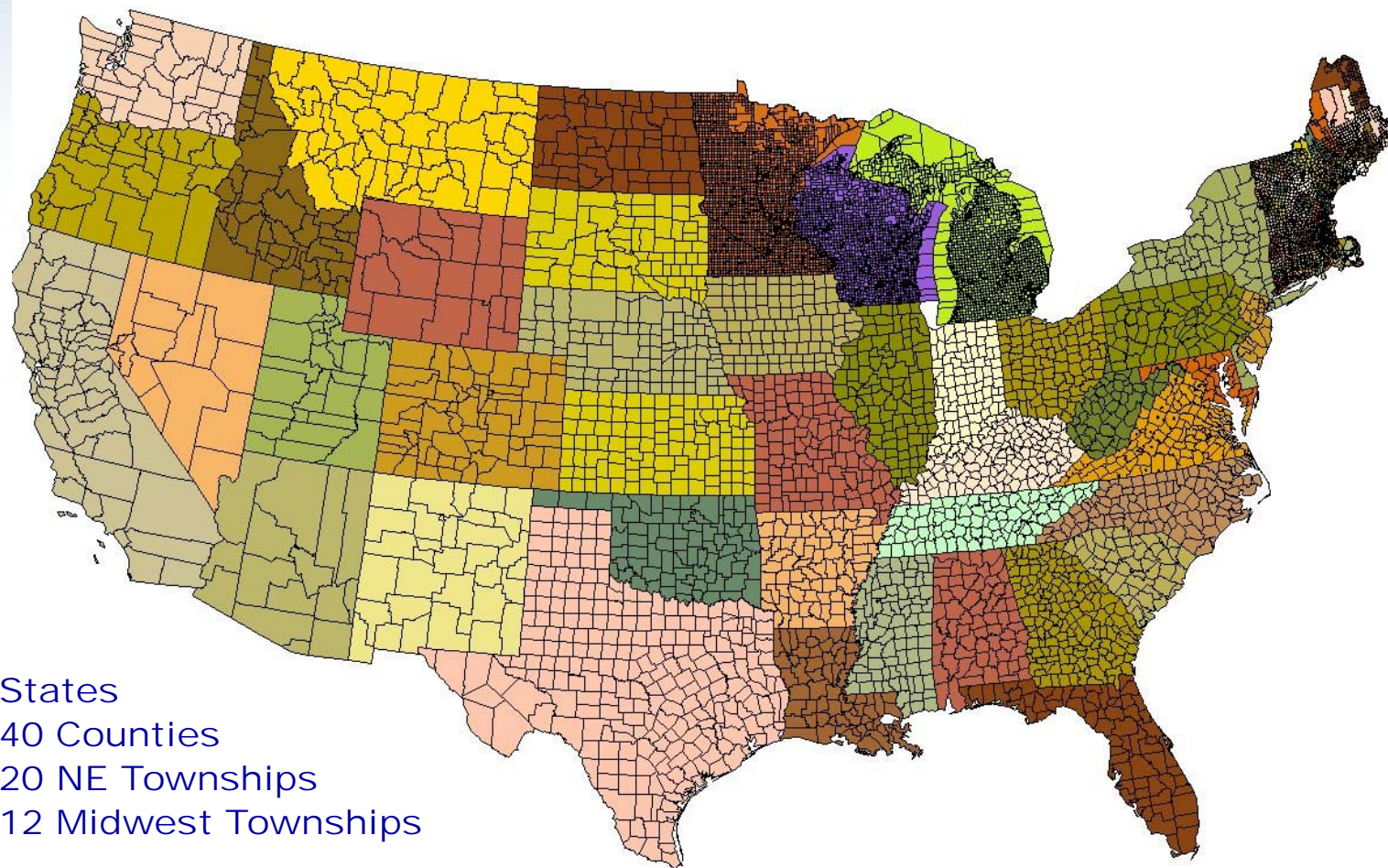
State-of-the-art techniques to assure efficient management of polling places, including tools the Commission is publicizing and recommending for the efficient allocation of polling place resources



Reforms of the standard-setting and certification process for new voting technology to address soon-to-be antiquated voting machines and to encourage innovation and the adoption of widely available off-the-shelf technologies

Basic Election Administration Facts

Diversity is the underpinning of Elections.



50 States

3,140 Counties

1,620 NE Townships

5,312 Midwest Townships

10,072 Election Jurisdictions

Source: Kim Brace

Range of Election Jurisdictions

Distribution of Election Jurisdiction's Size

Criteria	Jurisdictions	% of Juris.	Regis	% of Regis
Over 1 Million	15	0.15%	24,230,121	12.96%
500,000 - 999,999	40	0.40%	27,713,810	14.82%
250,000 - 499,999	87	0.86%	29,977,664	16.03%
100,000 - 249,999	198	1.97%	30,677,526	16.41%
50,000 - 99,999	320	3.18%	22,583,921	12.08%
25,000 - 49,999	545	5.41%	18,613,696	9.95%
10,000 - 24,999	1,212	12.03%	19,400,405	10.37%
5,000 - 9,999	963	9.56%	7,002,430	3.74%
1,000 - 4,999	2,212	21.96%	5,323,877	2.85%
Less than 1,000	4,479	44.47%	1,472,968	0.79%
TOTAL	10,071	100.00%	186,996,418	100.00%

Source: Kim Brace



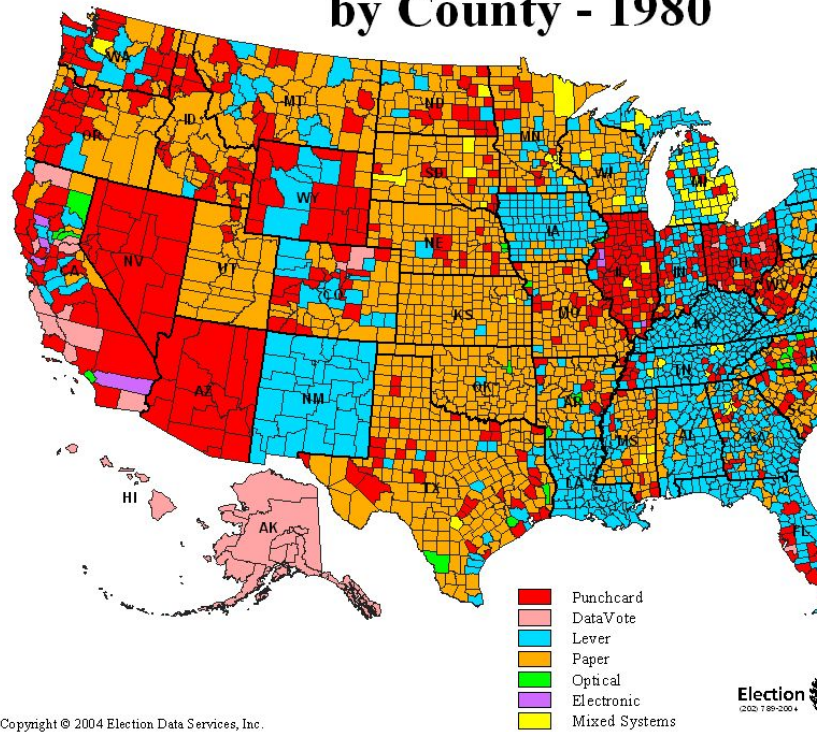
LA County Warehouse

LA County

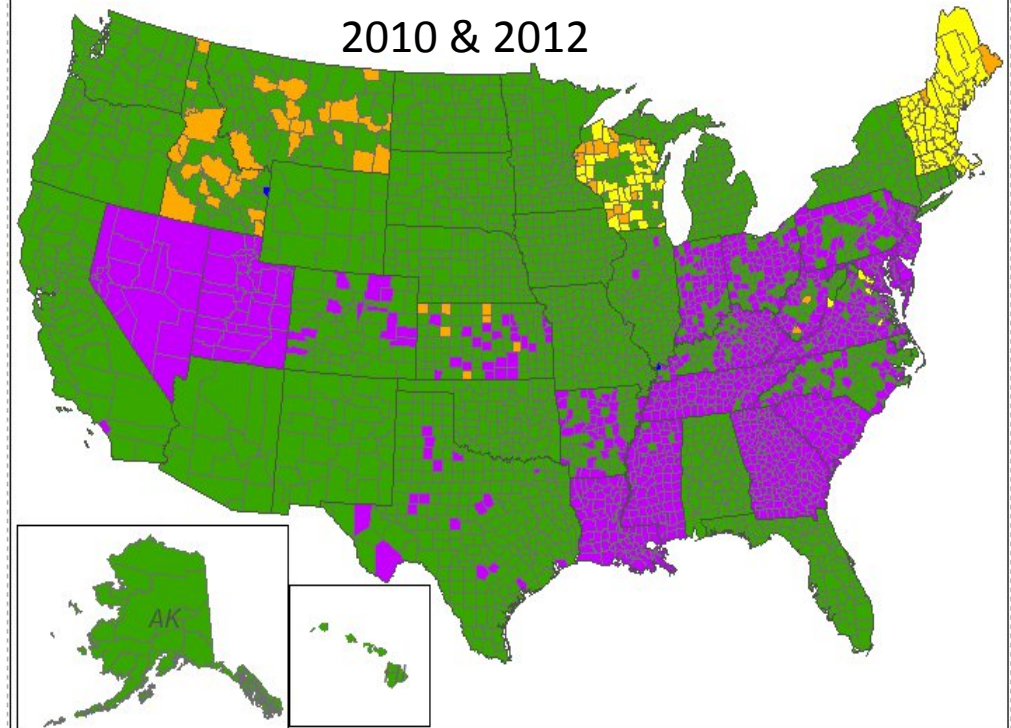
- 4.8 million registered voters
- 9 languages supported besides English (Spanish, Hindi, Japanese, Korean, Thai, Vietnamese, Chinese, Cambodian, Filipino)
- 4,600 polling places
- 22,200 pollworkers

Voting Equipment is Changing

Type of Voting Equipment by County - 1980

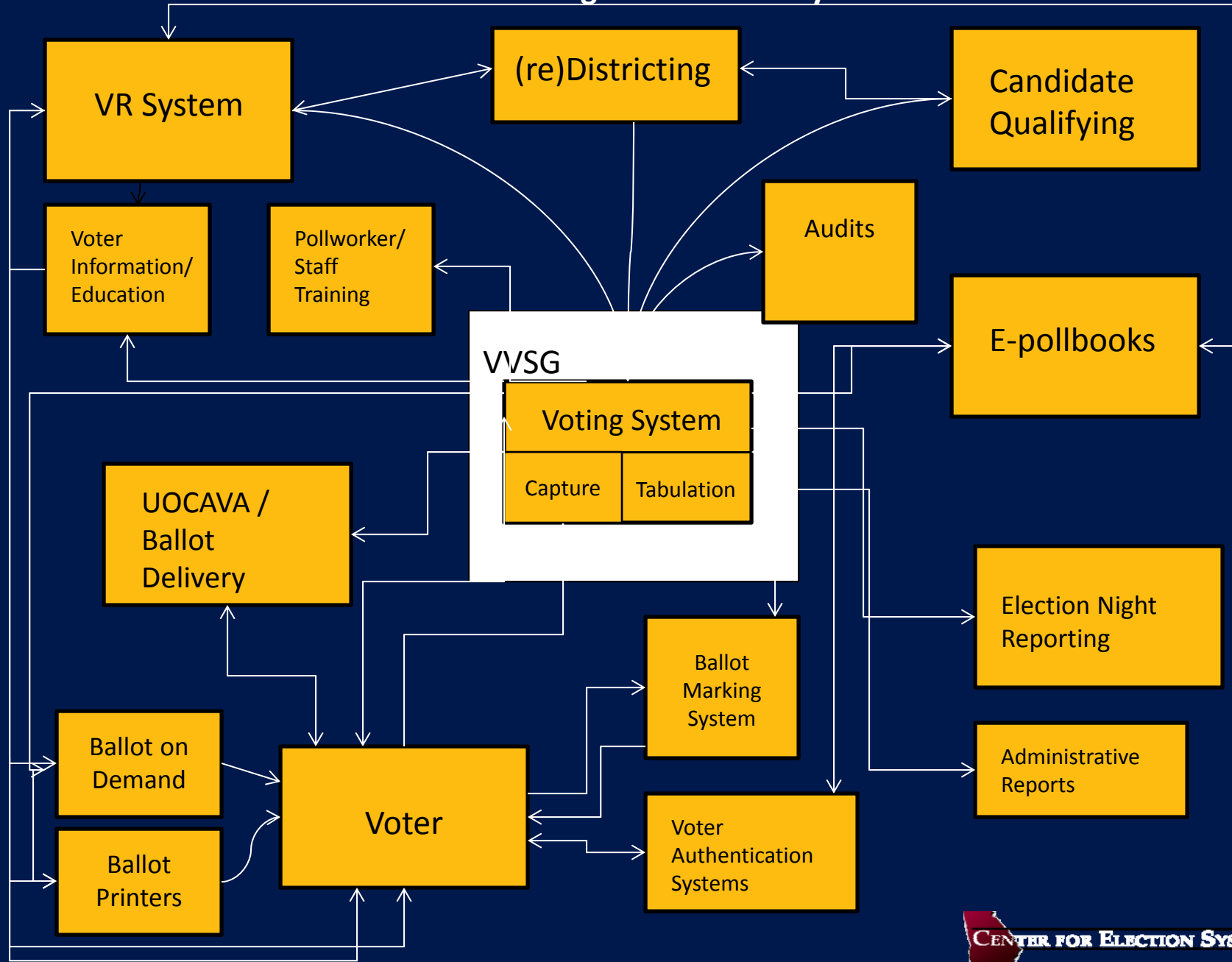


2010 & 2012



Source: Kim Brace

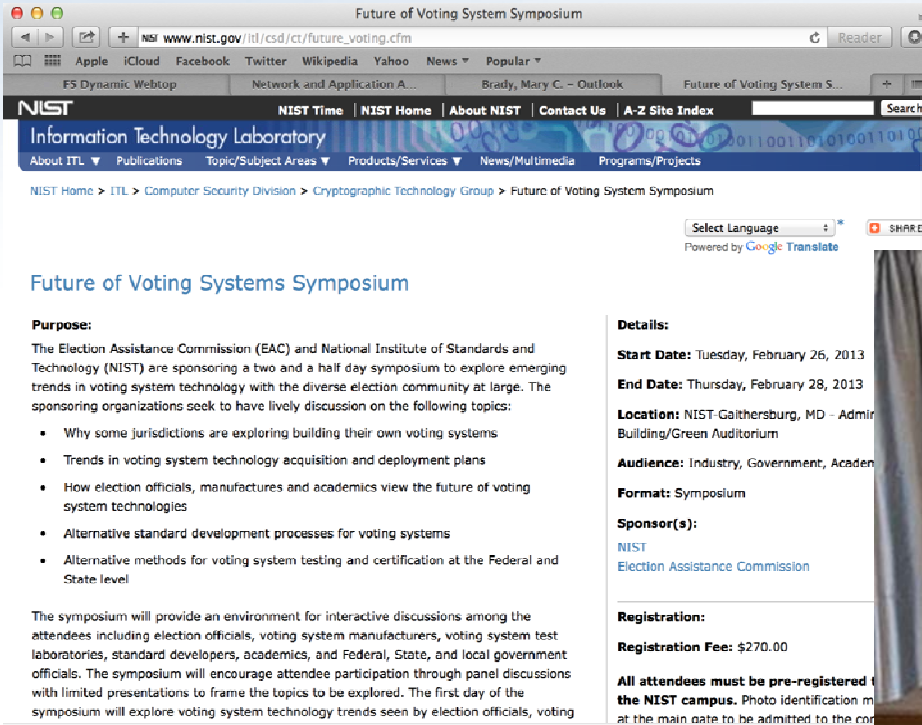
Interaction of Voting and Election Systems



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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 address bar shows the URL: www.nist.gov/itl/csd/ct/future_voting.cfm. The page header includes the NIST logo and navigation links such as "NIST Time", "NIST Home", "About NIST", "Contact Us", and "A-Z Site Index". The main content area is titled "Future of Voting Systems Symposium" and includes a "Purpose:" section with a list of topics, a "Details:" section with event information, and a "Registration:" section.

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

Details:
Start Date: Tuesday, February 26, 2013
End Date: Thursday, February 28, 2013
Location: NIST-Gaithersburg, MD – Administration 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 for the NIST campus. Photo identification must be presented at the main gate to be admitted to the conference.



**NIST/EAC Symposia
Explore Emerging Trends in Voting**

Standards



NIST Roadmap: The Voter Journey

	Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Learn	What is on the ballot?	Where do I go to vote				Who won?
	Am I/How do I register?	What are my choices?	How do I get my ballot	How do I mark as I intend?	How do I cast my ballot?	Did my vote count?
Do		Access to 'Polling Place'	Receive 'ballot'	Mark the ballot	Review the ballot	See election results
	Register to vote	Request a VBM (or other)	Authenticate/ Sign-In	Activate or open the ballot	Cast the ballot	Verify ballot was received
	Registration Forms/OVR	Online VBM SYstem	Pollbook or Sign-in	Pre-Marked Ballot	Mail Ballot Return	E2E Verification System
Use	"My Voter" Portals	"My Voter" Portals	Ballot Delivery System	Ballot Marking System	Electronic Casting	VBM/Ballot Tracking
	Elections Web/Phone	Elections Web/Phone	Transportation to Polls	Ballot	Ballot Scanner	Elections Web/Phone
	Registrar	Elections office	Poll workers	Poll workers	Poll workers	Elections office
People	Voter Ed	Voting Options	Voter ID	Sample Ballots	Counting Rules	Ballot Access
	Eligibility	Hours/Places	Provisional	Helper Rules	Helper Rules	Canvass
Policy						

NIST Roadmap

- Partnered with Center for Civic Design
- Convened 2 Workshops
- Draft Report Available at:
 - <http://civicdesign.org/wp-content/uploads/Roadmap-V1-FINAL-15-0205a.pdf>
- 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

NASED Subcommittee

Principles

- High-level
- Discussion points
- *U&A: 2 pages*

VVSG

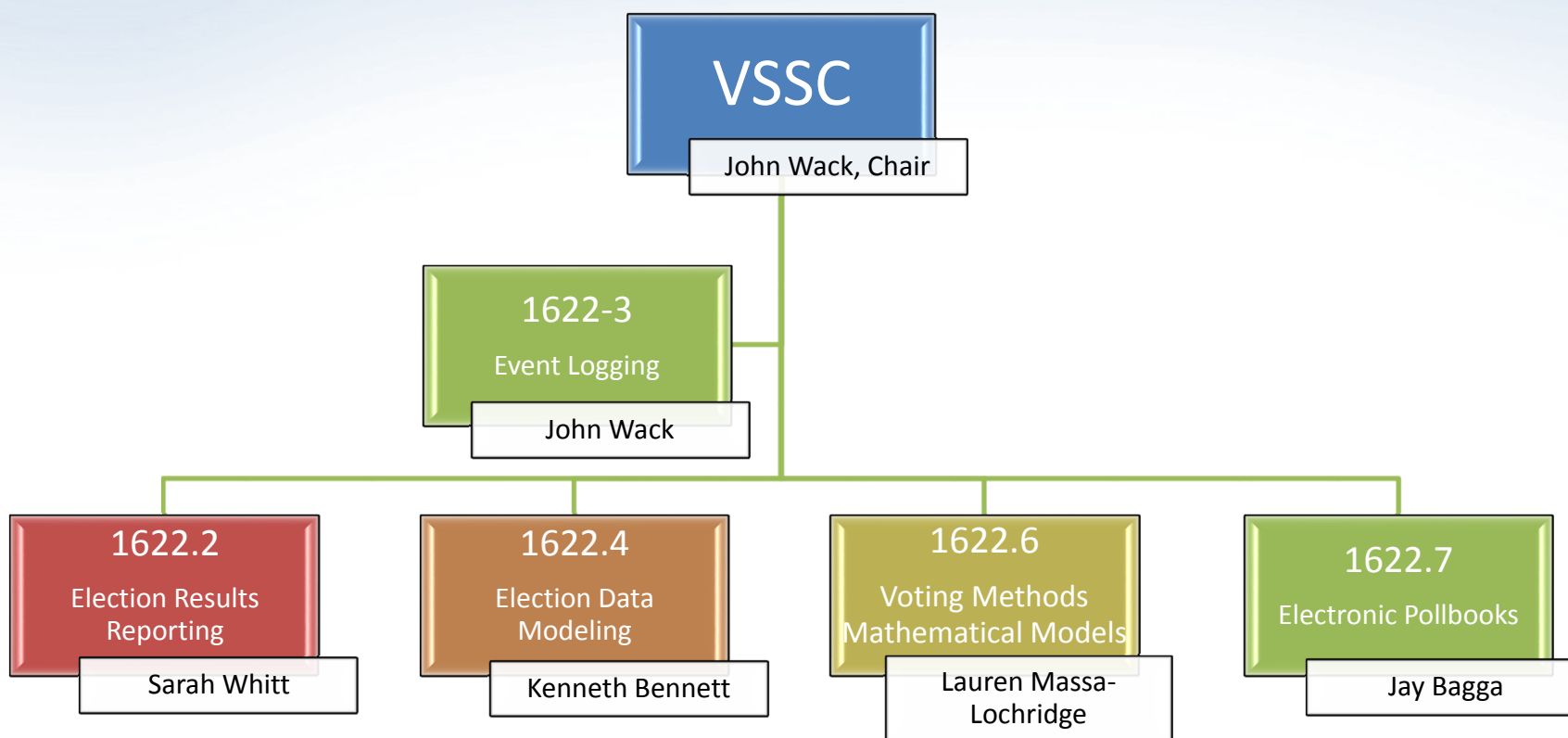
- Additional Information
- *U&A: 100 pages*

Test Assertions

- Low-level details
- *U&A: 65 pages*

- *Encapsulate knowledge from other disciplines:*
- *U&A: >15 other standards activities*

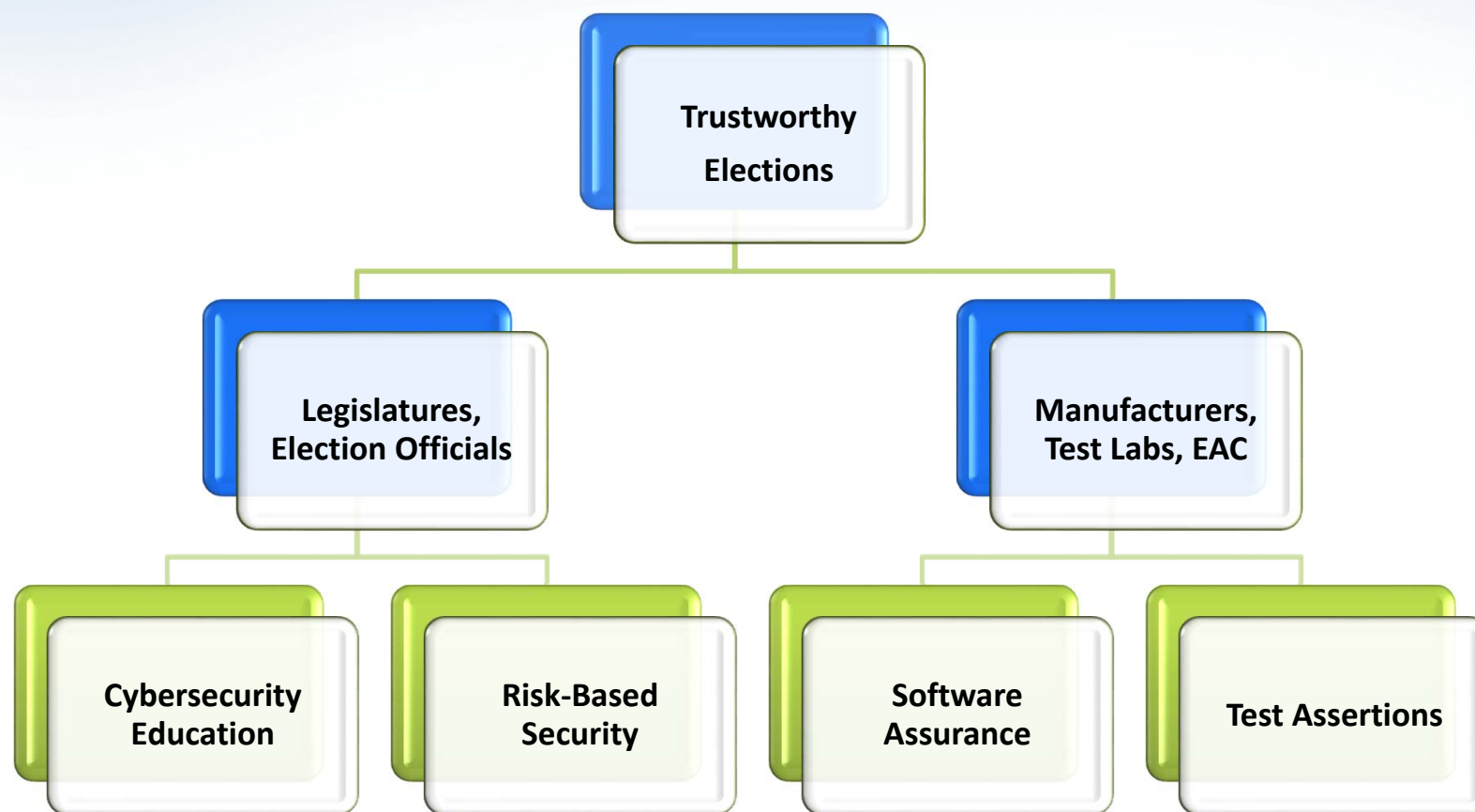
IEEE Voting System Standards



“IEEE effort is most significant work going on in Voting”

*Matt Masterson
EAC Commissioner*

Trustworthy Elections



Test Assertions: Low-level details



Usability/Accessibility (U/A) assertions

- *Covered 19 sections:* 3.1.1-3.2.8, 7.9.5-7.9.7
- **546 TAs** = (204 usability, 287 acc., 55 VVPAT)

Security assertions

- *Covered Chapter 8, 9*
- **404 TAs**

U&A: An Example

- **Principle:** No interference
- **VVSG 1.0 Requirement 3.2.2.2c-iii:** No voting equipment shall cause electromagnetic interference with assistive hearing devices that would substantially degrade the performance of those devices. The voting equipment, considered as a wireless device, shall achieve at least a category T4 rating as defined by American National Standard for Methods of Measurement of Compatibility between Devices and Hearing Aids, ANSI C63.19.
 - **TA3222ciii-1:** Voting equipment, when used with assistive hearing devices, SHALL achieve at least a category T4 rating as defined by American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids, ANSI C63.19.
 - **TA3222ciii-1-1:** Voting equipment, when used with cochlear implants, SHALL achieve at least a category T4 rating as defined by American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids, ANSI C63.19.
 - **TA3222ciii-1-2:** Voting equipment, when used with hearing aids, SHALL achieve at least a category T4 rating as defined by American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids, ANSI C63.19.

Voting Security Studies

Report	Year	Voting System Report Name
[1]	2003	SAIC - Risk Assessment Report Diebold AccuVote-TS Voting System and Processes
[2]	2004	Analysis of an Electronic Voting System
[3]	2004	RABA - Trusted Agent Report Diebold AccuVote-TS Voting System
[4]	2006	Security Analysis of the Diebold AccuBasic Interpreter
[5]	2006	Security Analysis of the Diebold AccuVote-TS Voting Machine
[6]	2006	Diebold TSx Evaluation
[7]	2007	Top to Bottom Review (TTBR)
[8]	2007	EVEREST: Evaluation and Validation of Election-Related Equipment, Standards and Testing
[9]	2007	Software Review and Security Analysis of the Diebold Voting Machine Software
[10]	2007	Software Review and Security Analysis of the ES&S iVotronic 8.0.1.2 Voting Machine Firmware
[11]	2008	Insecurities and Inaccuracies of the Sequoia AVC Advantage 9.00H DRE Voting Machine
[12]	2008	Software Review and Security Analysis of Scytl Remote Voting Software
[13]	2009	Can DREs Provide Long-Lasting Security? The Case of Return-Oriented Programming and the AVC Advantage
[14]	2010	Security Analysis of India's Electronic Voting Machines
[15]	2010	Exploiting the Client Vulnerabilities in Internet E-voting Systems: Hacking Helios 2.0 as an Example
[16]	2010	Maryland State Board of Elections Online Voter Services Penetration Testing Report
[17]	2012	Attacking the Washington, D.C. Internet Voting System
[18]	2012	Security Analysis of the Estonian Internet Voting System
[19]		Review of Scytl's system by Finland (Audit report on pilot electronic voting in municipal elections)

CWE Mapping

➤ **Over 250 Vulnerabilities**

➤ **Top 15 Voting CWE's**

CWE-306 - Missing Authentication for Critical Function

CWE-120 - Classic Buffer Overflow

CWE-522 - Insufficiently Protected Credentials

CWE-345 - Insufficient Verification of Data Authenticity

CWE-311 - Missing Encryption of Sensitive Data

CWE-134 - Uncontrolled Format String

CWE-310 - Cryptographic Issues

CWE-330 - Use of Insufficiently Random Values

CWE-190 - Integer Overflow or Wraparound

CWE-20 - Improper Input Validation

CWE-321 - Use of Hard-coded Cryptographic Key

CWE-327 - Use of a Broken or Risky Cryptographic Algorithm

CWE-269 - Improper Privilege Management

CWE-303 - Incorrect Implementation of Authentication Algorithm

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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
- Restarting the TGDC with recently appointed Commissioners
- Let's get to work!