TGDC Update

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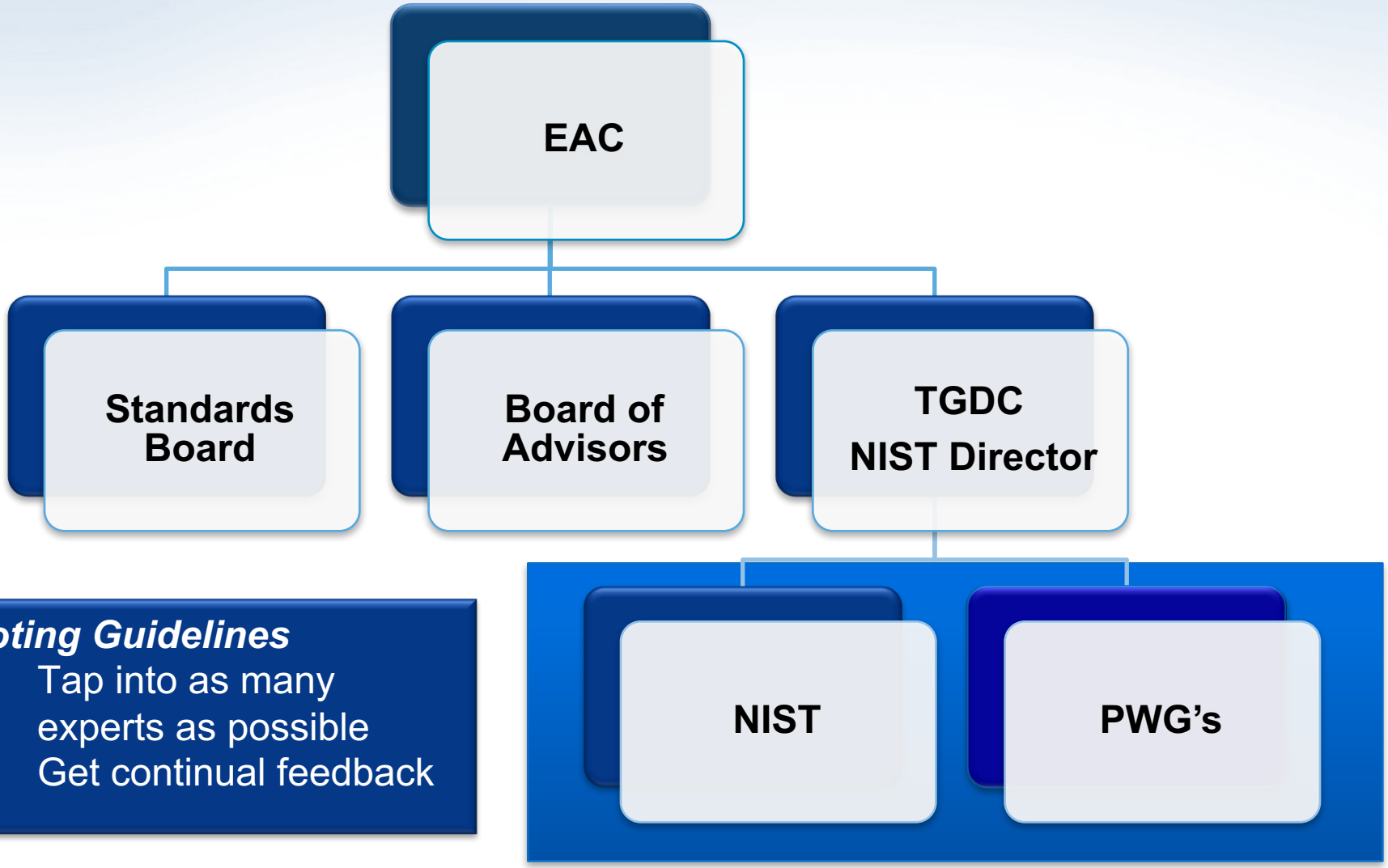
Topics

- VVSG 2.0 Development
- VVSG Scope
- VVSG Structure
- VVSG: Principles and Guidelines
- Mapping/Defining Requirements
- Test Assertions

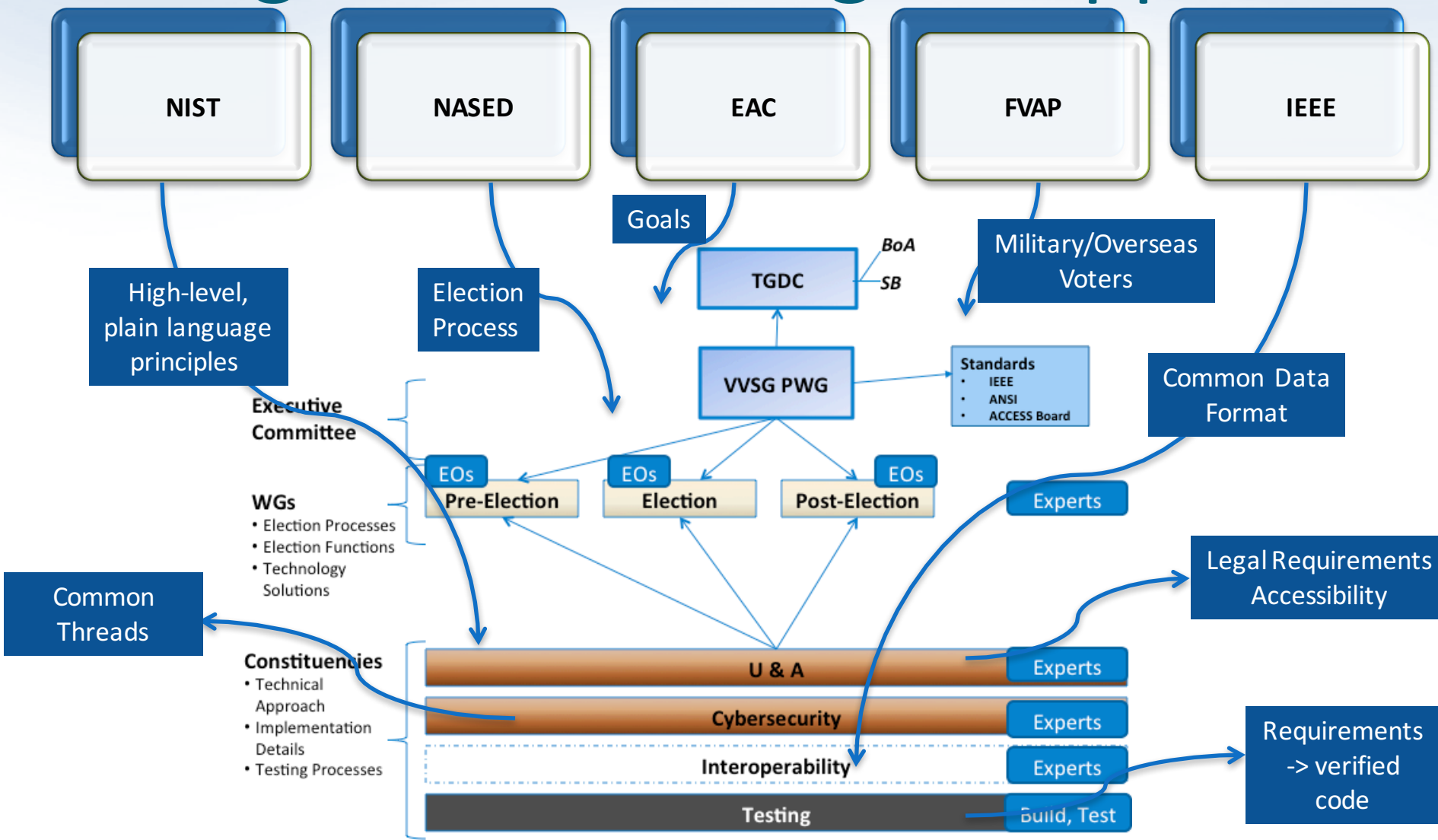
VVSG 2.0 Development



Voting Guidelines

- Tap into as many experts as possible
- Get continual feedback

Together…Making It Happen



NIST-EAC Public Working Groups

Election Groups

- Developed election process models that served as the basis for use cases and the core functions
  - Pre-Election (103 members)
  - Election: (107 members)
  - Post-Election: (96 members)

Constituency Groups

- Conducted gap analyses and developed draft VVSG 2.0 Principles and Guidelines
  - U&A (105 members)
  - Cybersecurity (121 members)
  - Interoperability (158 members)
  - Testing (84 members)

Reaching Consensus on VVSG Scope

Election WGs

Pre, Election, and Post

Election Process Models

- TGDC
- EAC/NIST
- PWG Chairs

Use Case Scenarios

Core Functions

- Standards Board
- Board of Advisors
- NASED

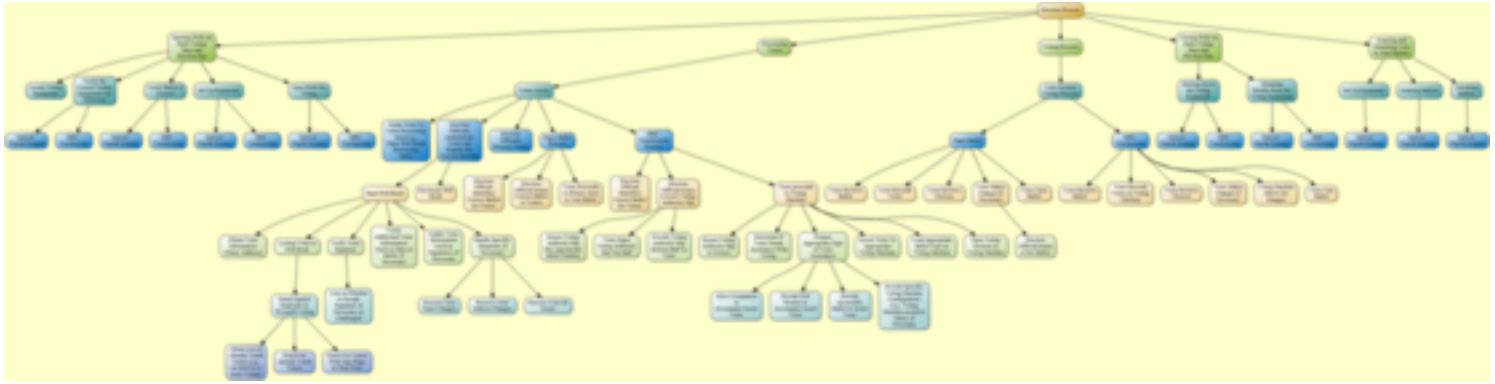
A New VVSG Structure

HIGH LEVEL
Principles

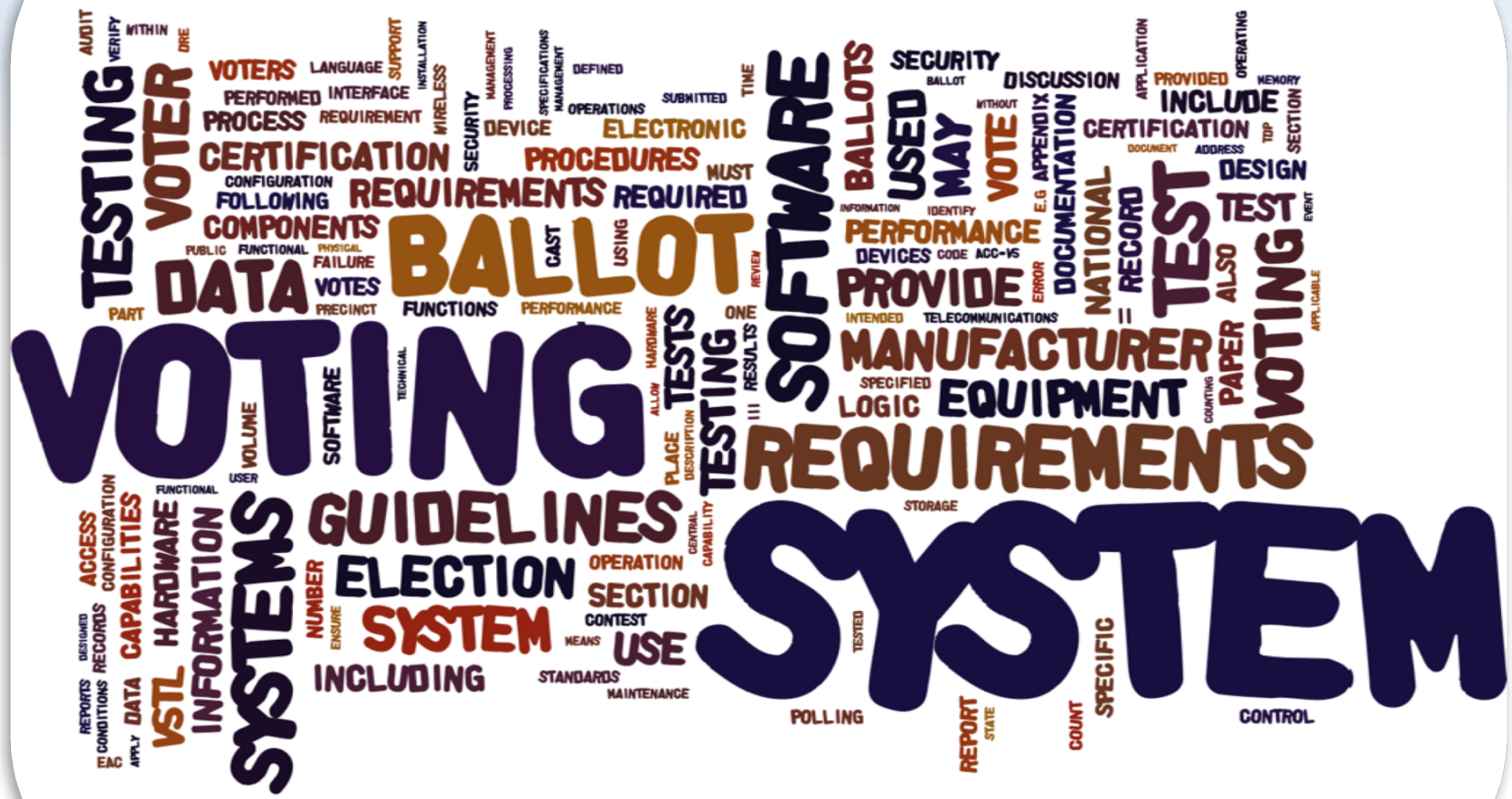
LOW LEVEL
Test Assertions

- NASED Subgroup / NIST
- EAC VVSG Futures Group
- NASED Input to EAC / NIST
- EAC Roundtable / Public Meetings
- TGDC, SB, BoA Adoption

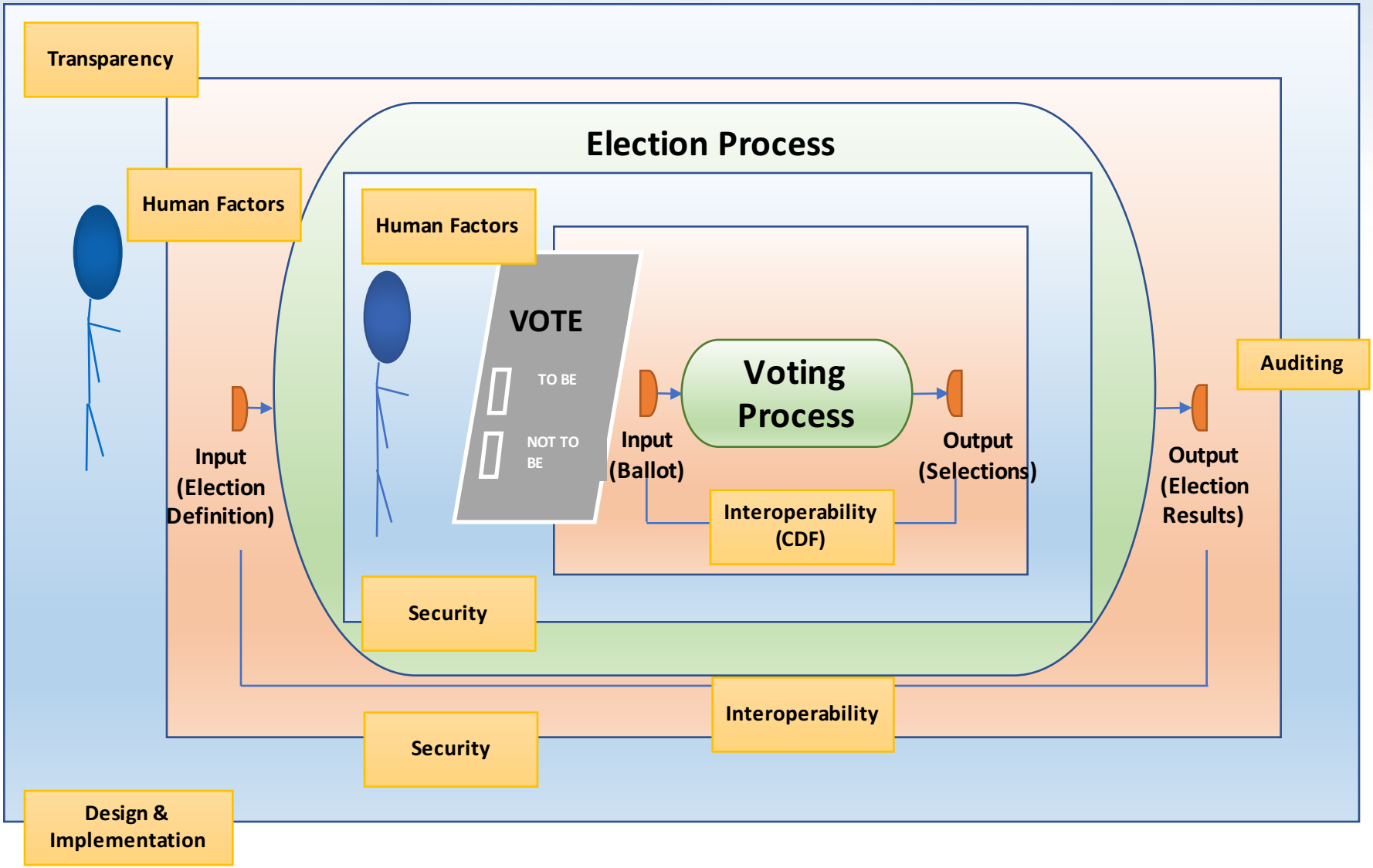
Election Models



NIST
National Institute of Standards and Technology
U.S. Department of Commerce



50,000 Foot View



VVSG 2.0: Principles and Guidelines

	Principles	Guidelines
General	15	52
Interoperability	3	10
Human Factors	5	12
Security	7	21
	18	**53**

- ***Feedback from NASED, SB, BoA***
- ***Discussed within/between PWGs***
- ***Simplified text, removed duplicates, merged categories***

15 Principles, 52 Guidelines

- *Principles*: High-level design goals
- *Guidelines*: Broad system design details for election officials
- Written in plain English
- Greatly reduced size: ~~**221,38, 20, 10**~~**, 5 pages!**
- *Requirements*: Low-level guidance for manufacturers/laboratories
- *Test Methods*: Guidance to ensure necessary breadth/depth when testing voting systems

- Engage NASED, SB, BoA members in discussions and garner feedback
- Present at TGDC September 2017 meeting for discussion/adoption

VVSG 2.0: Principles & Guidelines

Principle	Guidelines
High Quality Design	3
High Quality Implementation	7
Transparency	3
Interoperability	4
Equivalent and Consistent Voter Access	2
Voter Privacy	2
Marked, Verified, and Cast as Intended	3

Principle	Guidelines
Robust, Safe, Usable, and Accessible	3
Auditability	4
Ballot Secrecy	2
Access Control	5
Physical Security	2
Data Protection	4
System Integrity	4
Detection and Monitoring	4

Requirements Update

NIST-EAC PWGs: Recent Activities

Constituency Groups

- Human Factors
  - Turning abbreviated requirements into detailed requirements
  - 2 additional white papers on interactive design (select/deselect) and voter verifiable paper records & accessibility
- Cybersecurity
  - Reviewed/mapped requirements from 2007 TGDC recommendations
  - Provided comments on remote ballot marking, CDF
- Interoperability
  - Near final on cast vote records, event logging, updates to election results, progress on voter registration interchange, voting models, voting variations

Abbreviated Core Requirements

DRAFT: VVSG 2.0 Human Factors Abbreviated Core Requirements based on Gap Analysis

These abbreviated core requirements are based on the VVSG 1.1 Human Factors Technical Requirements Gap Analysis performed by the NIST Human Factors Public Working Group (HF PWG). The document is the first step to VVSG 2.0 and is organized according to the recently developed Principles and Guidelines. It is a skeletal structure of the requirements written at a conceptual level containing abbreviated requirements that are not to be construed as formally-worded requirements.

All requirement modifications resulting from the gap analysis are noted as one of: *UPDATE, NEW, REVIEW, COMBINE, MOVE,* or *REMOVE*. All legal accessibility requirements under HAVA/508/WCAG or the Voting Rights Act (VRA) are noted with the wheelchair icon (note: we may want a different icon for the VRA requirements), and can be extracted into a separate companion document.

Principle 1: Equivalent and consistent

All voters have access to mark and cast their ballot as intended, regardless of their abilities, without discrimination.

Guideline 1.1: Provide voters with a consistent experience of the voting process in all modes of voting.

Draft Abbreviated Requirements for Guideline 1.1:

1.1-A ♿ Presentation in all languages supported
REVIEW: Audio, ASL

1.1-B Records support auditing in English

1.1-C ♿ Integrate accessibility features throughout the voting session
UPDATE: including ballot activation, voting, casting, AND verification
UPDATE: define voting session. Also see 4.1-J related to testing

1.1-D ♿ If a system produces a paper ballot, the system needs to be able to read it
UPDATE: to include all-in-one systems
REVIEW: Paper handling for separate verification system

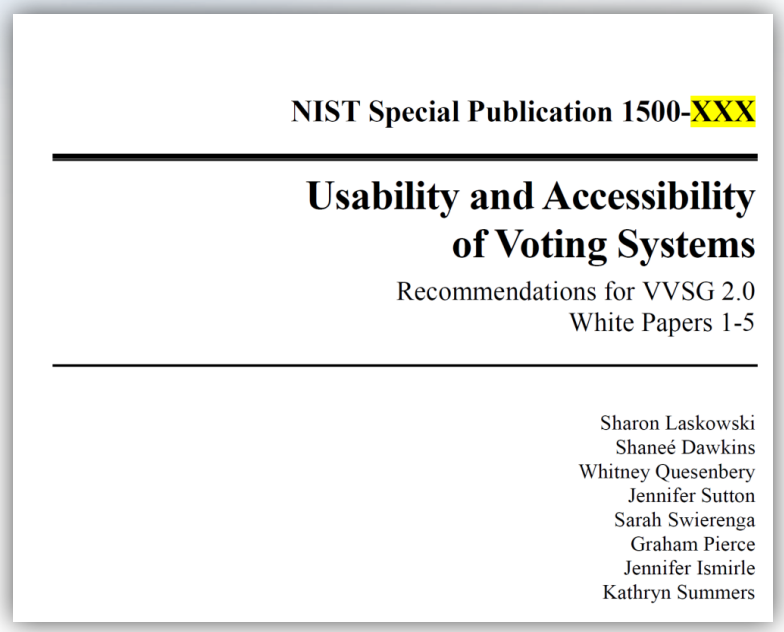
1.1-E ♿ All interaction modes (including audio, tactile, non-manual) must have same capabilities as visual interaction mode (including ballot activation, voting, casting, AND verification)

1.1-F ♿ Documentation of all access functions

DRAFT

- Based on gap analysis performed by HF PWG
- Highlights changes and provides further insight
- Abbreviated requirements written at the conceptual level
- Tagged with UPDATE, NEW, REVIEW, COMBINE, MOVE, REMOVE
- Legal accessibility requirement identified by wheelchair icon – HAVA, 508, WCAG, Voting Rights Act (VRA)

Human Factors Research



NIST Special Publication 1500-XXX

Usability and Accessibility of Voting Systems

Recommendations for VVSG 2.0
White Papers 1-5

Sharon Laskowski
Shaneé Dawkins
Whitney Quesenbery
Jennifer Sutton
Sarah Swierenga
Graham Pierce
Jennifer Ismirle
Kathryn Summers

- Addresses gaps between technology, research advances and VVSG 1.1
- Provides background, latest research, and recommendations
- Topics
  - Text Size
  - Contrast
  - Navigation from Review Screen
  - Scrolling on the Ballot
  - Assistive Technology in the Polling Place
- *Election Materials, including bi-lingual ballots*
- *Universal design, user-centered design, usability, accessibility, and ISO standards*

Human Factors (HF) Requirements Status

- Completed analyses for updating requirements
  - Updates for existing guidance for reporting on "summative testing" with range of voters for efficiency, effectiveness and satisfaction using ISO Common Industry Format (CIF) for usability test reports
  - New user-centered design reporting:
    - Reviewed approaches, including new ISO/IEC 2506x family of CIF standards, e.g., ISO/IEC 25066:2016 describing how to report on evaluations
  - Review of guidance for poll worker usability testing
  - Analysis of status indicator requirements (from VVSG 2007)
  - Analysis of language access requirements

- In process: re-ordering abbreviated HF core requirements to reflect newest VVSG 2.0 principles and guidelines to develop draft of full set of requirements

NIST-EAC PWGs: Recent Activities

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Security Requirements Status

Auditability
- 2007 VVSG Auditing Requirements - Final, June 20, 2017
- 2007 VVSG Auditing Requirements - Draft, June 12, 2017
- 2007 VVSG Auditing Requirements - Draft, June 1, 2017
- 2007 VVSG Auditing Requirements Gap Analysis
- Draft Post Election Outcomes Audit Types (Link to Google Doc)
- Draft Risk Limiting Audits Requirements (Link to Google Doc)
- February 13, 2017 TGDC Presentation on Auditability

Ballot Secrecy
- 2007 VVSG Ballot Secrecy Requirements - Final, June 21, 2017
- 2007 VVSG Ballot Secrecy Requirements - Draft, June 12, 2017
- 2007 VVSG Ballot Secrecy Requirements Gap Analysis

System Event Logs
- 2007 VVSG System Event Log Requirements - Final, July 12, 2017
- 2007 VVSG System Event Log Requirements - Draft, June 12, 2017
- 2007 VVSG System Event Log Requirements Gap Analysis

Communication Security
- 2007 VVSG Communication Security Requirements - Draft, June 26, 2017
- 2007 VVSG Communication Security Requirements Gap Analysis

Physical Security
- 2007 VVSG Physical Security Requirements - Final July 12, 2017
- 2007 VVSG Physical Security Requirements - Draft, June 26, 2017
- 2007 VVSG Physical Security Requirements Gap Analysis

Cryptography
- 2007 VVSG Cryptography Requirements - Draft, July 12, 2017
- 2007 VVSG Cryptography Requirements Gap Analysis

Setup Inspection
- 2007 VVSG Setup Inspection Requirements - Draft, August 7, 2017
- 2007 VVSG Setup Inspection Requirements Gap Analysis

- Reviewed 2007 TGDC recommendations for consistency, gap analyses
- Mapped requirements to principles and guidelines
- Topics
  - Auditability
  - Ballot Secrecy
  - System Event Logs
  - Communications Security
  - Physical Security
  - Cryptography
  - Setup Inspection
  - Software Installation
  - Access Control
  - System Integrity Management
- Work will continue after TGDC meeting

NIST-EAC PWGs: Recent Activities

Constituency Groups

- Human Factors
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  - 2 additional white papers on interactive design (select/deselect) and voter verifiable paper records & accessibility
- Cybersecurity
  - Reviewed/mapped requirements from 2007 TGDC recommendations
  - Provided comments on remote ballot marking, CDF
- Interoperability (aka, Common Data Format)
  - Near final on cast vote records, event logging, updates to election results, progress on voter registration interchange, voting models, voting variations

Democracy Fund Assistance

- To assist development/deployment of CDF materials.
- Initial **development** focus is Election Process Modeling.
  - Shows election processes at detailed levels.
  - John Dziurlaj primary lead (formerly of OH SoS).
- Initial **deployment** focus is improved outreach to and participation from states.
  - Improved introductory/overview material targeted towards EO audiences and needs.
  - Outreach to States upgrading or purchasing new systems and could employ/require CDF specs.
  - Better communication and understanding of State needs.
  - Language for use in RFPs, contracts.
  - Katy Owens-Hubler primary lead.

High Quality Design, Implementation

Observations	Considerations / Questions
Software • Expanded languages + execution environments • Basis for review: style, substance	**Goal:** Meaningfully verify logic is correct • Appropriate coverage, given scope? • Most appropriate verification mechanisms?
Hardware/Telecom • MIL-STDs • Increased usage of COTS • New form-factors and configurations • Increased forms of inter-connection/communication	**Goal:** Meaningfully verify reliable, accurate, realistic election workloads • Workload characterization methods? • Acceptable ranges of performance for COTS? • Best approaches for effectively and meaningfully testing new COTS configurations? • Evaluation of new forms of inter-connection?
QA/CM • Same quality standards/conventions • Changing environments for development and evaluation	**Goal:** Meaningfully verify manufacturing processes reliable/reproducible • Best means for evaluating production process quality transparently and explicitly?
TDP • Documentation to support evaluation	**Goal:** Have all information necessary for high-quality evaluations • Best means to explicitly support evaluations?
Testing • Need for greater coverage and consistency	**Goal:** Meaningfully interpret observable evidence of required features • Best means for ensuring accuracy, testability, and consistency of testing? • Across tests and testing institutions? • Appropriate testing granularity?

Test Assertion Update

Background

- Test Assertions have been in development for VVSG 1.0, and more recently, 1.1
- Test assertions articulate requirements as testable logical statements
- Identify necessary breadth and depth necessary for testing voting systems
- Provide consistency in testing across Voting System Test Laboratories
- In 2017, for VVSG 1.1, nearly 1200 assertions developed to date, covering 6 sections, addressing functional requirements and general usability requirements

VVSG 1.1 Section	Areas Addressed	Total Assertions
2.1: Overall System Capabilities	Security, Accuracy, Error Recovery, Integrity, System Audit, Operational Requirements, Use of Multitasking Operating Systems, Election Management System, Vote Tabulating Program, Functions, Voting Variations, Ballot Counter, Telecommunications, Data Retention	282
2.2: Pre-voting Capabilities	Pre-voting Capabilities, Ballot Preparation, Election Programming, Ballot and Program Installation and Control, Readiness Testing, Verification at the Polling place, Verification at the Central Location	221
2.3: Voting Capabilities	Voting Capabilities, Opening the Polls, Precinct Count Systems, Paper-based System Requirements, DRE System Requirements, Activating the Ballot, Casting a Ballot, Common Requirements, Paper-based System Requirements, DRE and EBM System Requirements	130
2.4: Post-Voting Capabilities	Post-voting Capabilities, Closing the Polls, Consolidating Vote Data, Producing Reports, Voting System Electronic Reports, Tabulator Electronic Reports, EMS Electronic Reports, Election Night Reporting	133
2.5: Maintenance, Transportation, and Storage	Maintenance, Transportation, and Storage	18
3.2: General usability requirements	General Usability, Functional Capabilities, Editable Ballot Interfaces, Non-Editable Ballot Interfaces, Privacy at the Polls, No Recording of Alternative Format Usage, Voter Instructions, Plain Language, and Information Presentation, Visual Display Characteristics, Voter-Interface Interaction, Timing, Alternative Languages, Usability for Pollworkers, Operation, Safety	413

Summary

- VVSG 2.0
  - Principles and Guidelines: Draft ready for TGDC review
  - Developed through open and transparent WG process
- PWGs are busy and have already started on requirements
  - Human Factors: Research complete; abbreviated core requirements
  - Cybersecurity: Gap Analysis, mapped 2007 TGDC Recommendation to Principles and Guidelines
  - Interoperability: Much progress on CDF
  - Testing: Expand focus to "Implementation & Testing" – draft requirements for High Quality Design, Implementation, Transparency; best practices for testing
- Requirements, test methods will be developed using an open and transparent process

Thank You!