TGDC Update

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Topics

- VVSG 2.0 Development
- VVSG Scope
- VVSG Structure
- VVSG: Principles and Guidelines
- Mapping/Defining Requirements
- Test Assertions
Together...Making It Happen

NIST  NASED  EAC  FVAP  IEEE

High-level, plain language principles

Executive Committee

WG
- Election Processes
- Election Functions
- Technology Solutions

Constituencies
- Technical Approach
- Implementation Details
- Testing Processes

Common Threads

Goals

Election Process

TGDC

VVSG PWG

Military/Overseas Voters

Common Data Format

Legal Requirements
Accessibility

Experts

Standards
- IEEE
- ANSI
- ACCESS Board

Experts

U & A

Cybersecurity

Interoperability

Testing

Verified code

Build, Test

Requirements
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

• Standards Board
• Board of Advisors
• NASED

Core Functions
A New VVSG Structure

HIGH LEVEL Principles

NASED Subgroup / NIST

EAC VVSG Futures Group

NASED Input to EAC / NIST

LOW LEVEL Test Assertions

EAC Roundtable / Public Meetings

TGDC, SB, BoA Adoption

Improve U.S. Voting Systems

TGDC Meeting
September 11 – 12, 2017
50,000 Foot View

Election Process

Input (Ballot) → Voting Process → Output (Selections)

VOTE

Input (Ballot)

Interoperability (CDF)

Security

Human Factors

Transparency

Auditing

Output (Election Results)

Human Factors

Human Factors

Security

Security

Design & Implementation

Election Process

Interoperability

Human Factors

Input (Election Definition)

Output (Election Results)
VVSG 2.0: Principles and 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

### General

<table>
<thead>
<tr>
<th></th>
<th>Principles</th>
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<td>General</td>
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<td>Human Factors</td>
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<td>12</td>
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<td>Security</td>
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<td>21</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>53</strong></td>
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• Feedback from NASED, SB, BoA
• Discussed within/between PWGs
• Simplified text, removed duplicates, merged categories

15 Principles, 52 Guidelines
# VVSG 2.0: Principles & Guidelines

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<thead>
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<th>Principle</th>
<th>Guidelines</th>
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<td>High Quality Implementation</td>
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<tr>
<td>Equivalent and Consistent Voter Access</td>
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<tr>
<td>Voter Privacy</td>
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<td>Marked, Verified, and Cast as Intended</td>
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</table>

<table>
<thead>
<tr>
<th>Principle</th>
<th>Guidelines</th>
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<tbody>
<tr>
<td>Robust, Safe, Usable, and Accessible</td>
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<tr>
<td>Auditability</td>
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<tr>
<td>Ballot Secrecy</td>
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<td>Access Control</td>
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<tr>
<td>Physical Security</td>
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<td>Data Protection</td>
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<tr>
<td>System Integrity</td>
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<td>Detection and Monitoring</td>
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</table>
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

• 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

- 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
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
Security Requirements Status

- 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
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 (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

<table>
<thead>
<tr>
<th>Observations</th>
<th>Considerations / Questions</th>
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<tbody>
<tr>
<td><strong>Software</strong></td>
<td><strong>Goal: Meaningfully verify logic is correct</strong></td>
</tr>
<tr>
<td>• Expanded languages + execution environments</td>
<td></td>
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<tr>
<td>• Basis for review: style, substance</td>
<td></td>
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<tr>
<td></td>
<td>• Appropriate coverage, given scope?</td>
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<tr>
<td></td>
<td>• Most appropriate verification mechanisms?</td>
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<tr>
<td><strong>Hardware/Telecom</strong></td>
<td><strong>Goal: Meaningfully verify reliable, accurate, realistic election workloads</strong></td>
</tr>
<tr>
<td>• MIL-STDs</td>
<td>• Workload characterization methods?</td>
</tr>
<tr>
<td>• Increased usage of COTS</td>
<td>• Acceptable ranges of performance for COTS?</td>
</tr>
<tr>
<td>• New form-factors and configurations</td>
<td>• Best approaches for effectively and meaningfully testing new COTS configurations?</td>
</tr>
<tr>
<td>• Increased forms of inter-connection/communication</td>
<td>• Evaluation of new forms of inter-connection?</td>
</tr>
<tr>
<td><strong>QA/CM</strong></td>
<td><strong>Goal: Meaningfully verify manufacturing processes reliable/reproducible</strong></td>
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<tr>
<td>• Same quality standards/conventions</td>
<td>• Best means for evaluating production process quality transparently and explicitly?</td>
</tr>
<tr>
<td>• Changing environments for development and evaluation</td>
<td></td>
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<tr>
<td><strong>TDP</strong></td>
<td><strong>Goal: Have all information necessary for high-quality evaluations</strong></td>
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<tr>
<td>• Documentation to support evaluation</td>
<td>• Best means to explicitly support evaluations?</td>
</tr>
<tr>
<td><strong>Testing</strong></td>
<td><strong>Goal: Meaningfully interpret observable evidence of required features</strong></td>
</tr>
<tr>
<td>• Need for greater coverage and consistency</td>
<td>• Best means for ensuring accuracy, testability, and consistency of testing?</td>
</tr>
<tr>
<td></td>
<td>• Across tests and testing institutions?</td>
</tr>
<tr>
<td></td>
<td>• Appropriate testing granularity?</td>
</tr>
</tbody>
</table>
Test Assertion Update
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
<table>
<thead>
<tr>
<th>VVSG 1.1 Section</th>
<th>Areas Addressed</th>
<th>Total Assertions</th>
</tr>
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<tbody>
<tr>
<td>2.1: Overall System Capabilities</td>
<td>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</td>
<td>282</td>
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<tr>
<td>2.2: Pre-voting Capabilities</td>
<td>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</td>
<td>221</td>
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<tr>
<td>2.3: Voting Capabilities</td>
<td>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</td>
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<td>2.4: Post-Voting Capabilities</td>
<td>Post-voting Capabilities, Closing the Polls, Consolidating Vote Data, Producing Reports, Voting System Electronic Reports, Tabulator Electronic Reports, EMS Electronic Reports, Election Night Reporting</td>
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<td>2.5: Maintenance, Transportation, and Storage</td>
<td>Maintenance, Transportation, and Storage</td>
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<tr>
<td>3.2: General usability requirements</td>
<td>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</td>
<td>413</td>
</tr>
</tbody>
</table>
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!