Improving U.S. Voting Systems
- NIST activities supporting the Help America Vote Act

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EAC Standards Board/Board of Advisors Meeting
Standards 101

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Objectives of this session

- **Establish a common understanding of general concepts and terminology**
    - Standard, requirements, conformance
- **Motivation for the new VVSG**
- **Set the stage for the rest of the presentations on the VVSG**

Focus of Work

- Focused the work in 3 areas:
  - Core requirements
  - Security requirements
  - Human factor (accessibility and usability) and privacy requirements

- Equivalent terms (as I speak)
  - Implementation = System = Voting System
  - Implementer = Developer = Manufacturer
  - Standard = Specification = Guideline

Outline

- What is a standard
- Conformance to Standards
- Conformance vs. Certification
- Conformance Testing
- Improvements to Previous Standards

What is a Standard?
VVSG = Voluntary Standard

- **Voluntary**
  - Use is not mandated by law or regulation
  - If <u>you</u> decide to use it (claim conformance), then you need to conform to it (adhere to its requirements)

- **Standard**
  - Established by consensus or authority, and
  - Prescribes technical requirements to be fulfilled by a product, process or service

- **Requirement**
  - Criteria, characteristic, behavior, or functionality that a system must do/have

What is a Standard?
Good Standards are the Key

- Goal is correct, reliable software

- Requirements are captured in a standard

- Standard needs to be clear, precise, unambiguous, complete, and testable

- Ideal standard would be defined in a mathematical language – not English – but, it needs to be readable and understandable

What is a Standard?
English is not Precise

- The girl touched the cat with a feather
  - (Girl + feather) touched cat

  - Girl touched (cat + feather)

What is a Standard?
What makes a good standard?

- One that gets used, used correctly and implemented in a consistent manner
- One that defines
  - What/who needs to implement the standard (Voting Systems, VSTLs)
  - Normative vs. Informative (Requirements vs. Discussion)
  - What needs to be implemented (Mandatory vs. Optional)
    - SHALL - mandatory
    - SHOULD – optional, recommended
    - MAY – optional, permitted
- One that is modular with minimal redundancy
- One that is adaptable as things change
- One that is technology- and design- independent

What is a Standard?
Independence

- **Technology independent**
  - Requirements not tied to a specific technology

- **Design independent**
  - Requirements tell developers what to build, not how to build it

What is a Standard?
Type of Requirements

- Functional:
  - Specifies that the object is capable of performing a certain action

    e.g., The system shall allow the voter to cast a straight party vote

- Performance:
  - Specifies not only the object is capable of performing a certain action, but also sets a benchmark for how well it performs.

    e.g., The system shall provide visual feedback within .5 seconds when the voter makes or changes a choice within a contest.

- Design:
  - Specifies something about the static structure of the object.

    e.g., Any control buttons on a voting system must be at least 1 inch apart
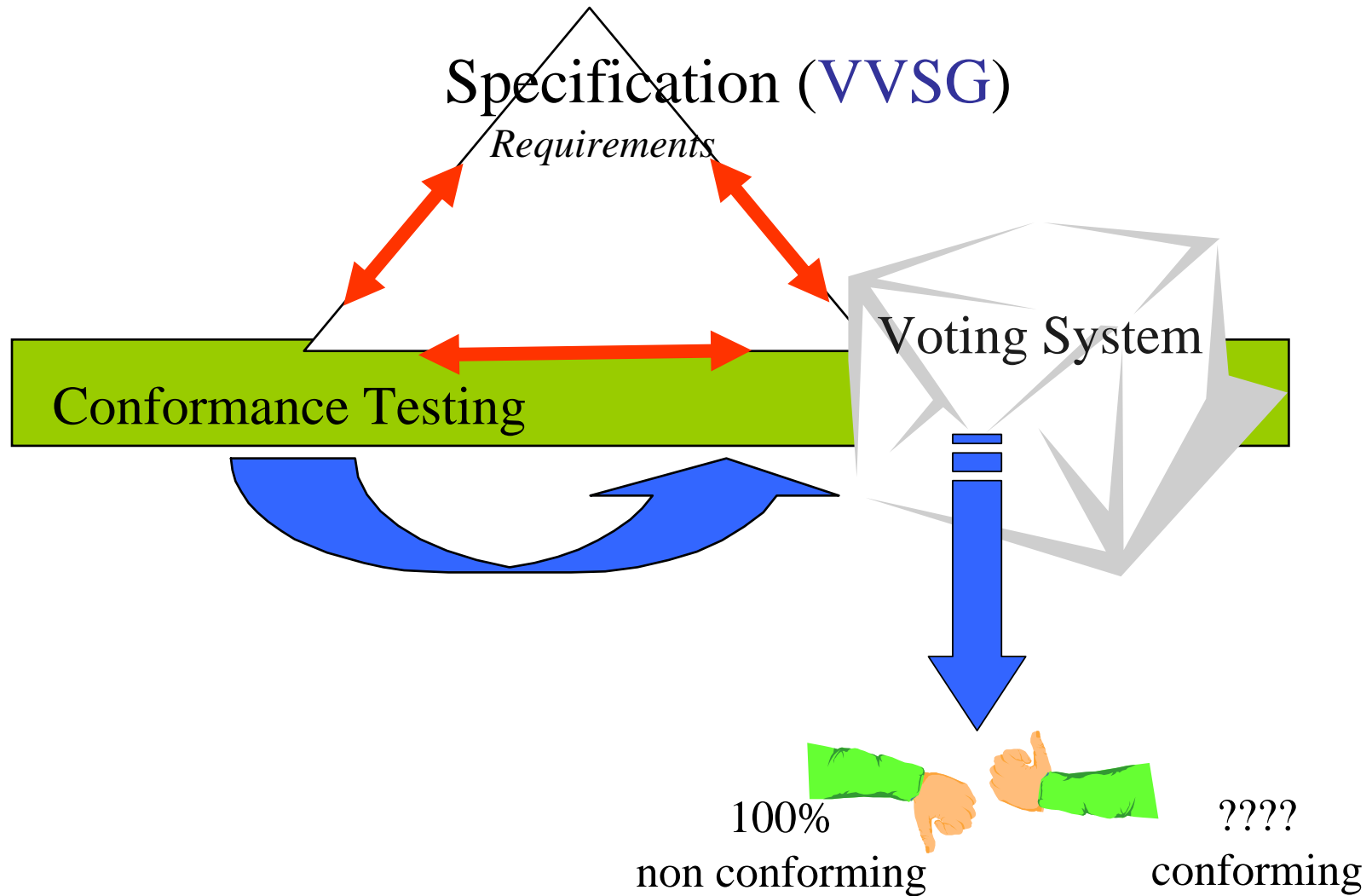
Are Standards Enough?

- No
- Standards are worthless
  - Unless they are implemented
- Standards are useless
  - Unless they are implemented correctly
- That's where conformance and testing comes in

Specification (VVSG)

Requirements

Voting System

Conformance Testing

100%
non conforming

????
conforming

Conformance
Conformance Clause

Conformance Clause should address

1. What Needs to Conform

2. How to conform and claim conformance

3. Subdividing and categorizing groups of requirements

4. Variability – ways a specification allows variation among conforming implementations

   e.g., DREs vs. OpScan

Conformance
Terminology

- **CONFORMANCE** – the fulfillment of a product, process or service of specified requirements. *(ISO Guide 2)*
  - The requirements are specified in a standard or specification as part of a conformance clause or in the body of the specification

- **CONFORMANCE CLAUSE** - a section of a specification that states all the requirements or criteria that must be satisfied to claim conformance

Conformance
Terminology

- **CONFORMANCE TESTING** – a way to determine directly or indirectly that relevant requirements are fulfilled.
  - Serves as a communication between buyer and sellers
    - Buyers increased confidence
    - Sellers substantiate claims
  - Performed by Test Labs to determine if voting system conforms to the VVSG

Conformance
Terminology

- **CONFORMITY ASSSESSMENT** - process necessary to perform conformance testing in accordance with a prescribed procedure and official test suite
  - ensures that testing can be repeatable and reproducible
  - ensures that conclusions are consistent with facts presented in the evaluation

- **CERTIFICATION** - acknowledgement that a conformity assessment was completed and the criteria established for issuing certificates was met.

Conformance Testing

- One can only test for requirements in the standard
- Testing is not exhaustive – can only show presence, not absence, of errors

Conformance Testing
VVSG

- **VVSG includes testing requirements for Test Labs**

- **VVSG indicates**
  - General testing approaches
    - Test method is indicated for each requirement
  - Documentation to be provided pre and post testing
  - Procedures to perform testing

- **VVSG does not contain the actual tests**

Conformance VS. Certification

Certification (EAC)
qualified bodies to do the testing and certification
Control Board - advisory and arbiter

Conformity Assessment (EAC + VSTLs)
Process - policy and procedures for testing

Conformance Testing (VSTLs)
Test suite
(test software, test scripts, test criteria)

Standard (VVSG)
Conformance clause, requirements

Improvements to Previous Standards

- Define what it means for a voting system to conform
- Create precise, testable requirements
  - Refine and clarify requirements from previous voting standards
  - Create new core, security and HF requirements
- Create performance benchmark requirements
- Address new technological advances
- Add security, accessibility, and usability requirements

Improvements to Previous Standards
What it means to conform to the VVSG

- **Conformance Clause defines**
  - What is normative vs informative
  - Conformance is 100% - no partial conformance
  - Classes
  - Implementation statement
  - Extensions
  - Software independence

Improvements to Previous Standards
Specify precise, testable requirements

- ## Precise and unambiguous
  - Only 1 interpretation
  - Everyone understands what is meant
- ## Testable
  - Ability to determine that requirement has been met – implies that there is a method to test the requirement

Improvements to Previous Standards

Specify performance benchmark requirements

- *Usability performance metrics and benchmarks*
  - *Total Completion Score*
  - *Voter Inclusion Index*
  - *Perfect Ballot Index*

- *Updated reliability and accuracy testing*
  - *Reliability*
  - *Accuracy*
  - *Misfeed rate*

Improvements to Previous Standards
Address new technological advances,
including

- VVPAT

- Wireless

- Electronic Pollbooks

- Electronic Ballot Markers

- Digital Signatures

Improvements to Previous Standards
Additional security, accessibility, and usability requirements, including

- Expanded security coverage
    - Cryptography
    - Setup inspection
    - Software Installation
    - Access control
    - Security Integrity management
    - Communication security
- Expanded human factors
    - Usability benchmarks
    - Plain language, Alternative Languages, Icons and Language
    - End-to-end accessibility
    - Accessibility of paper records