Principle 9
AUDITABLE

The voting system is auditable and enables evidence-based elections

9.1 - An error or fault in the voting system software or hardware cannot cause an undetectable change in election results.

9.1-A – Software Independence
An undetected error or fault in the voting system’s software or hardware SHALL not be capable of causing an undetectable change in election results.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
Gap notes:

9.1-B – Tamper Evident Records
The voting system SHALL produce tamper-evident records to enable detection of incorrect election outcomes.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
Gap notes:

9.1-B.1 – Voter Verification
Tamper-evident records SHALL provide individual voters the opportunity to verify that the voting system correctly interpreted their ballot selections.
9.1-B.2 – Tamper-evident Record Creation
A tamper-evident record of the contents of each vote SHALL be captured at the time of each vote’s casting.

9.1-B.3 – Tamper-evident Record of Errors
Detected errors SHALL be recorded in a tamper-evident manner.

9.1-C – Auditor Verification
Voting systems records SHALL enable external auditors to verify that cast ballots were correctly tabulated.
9.1-C.1 – Auditable with Software Independence
The voting system SHALL enable a meaningful audit in the presence of compromised or malicious software resident on the system.

(Add icon)

Discussion

9.1-C.2 – Auditable with Hardware Independence
The voting system SHALL enable a meaningful audit in the presence of compromised or malicious hardware components.

(Add icon)

Discussion

9.1-D – Voter Reports Errors
Voting systems SHALL document and provide a method, either through procedural or technical means, for voters to report detected errors or incorrect results.

(Add icon)

Discussion
9.1-E – Paper-based or Cryptographic E2E System
Voting systems SHALL meet the requirements within either the Paper-based System Architectures and/or Cryptographic E2E System Architectures section.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
Gap notes:

Paper-based System Architectures

The following requirements apply to paper-based voting systems.

9.1-E.1 – Paper Record Production
The voting system SHALL produce a paper record of the voter’s ballot selections.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
Gap notes:

9.1-E.2 – Understandable Paper Record
The recorded ballots selection SHALL be presented in a manner understandable by the voter.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
9.1-E.3 –
All representations of a voter’s ballot selections produced by the voting system SHALL agree with regard to the selections made by the voter.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
Gap notes:

9.1-E.4 – Paper Record Transparency & Interoperability
All representations of a voter’s ballot selections SHALL use an open and interoperable format.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
Gap notes:

9.1-E.5 – Identification of Errors
The voter SHALL have the opportunity to identify ballot errors before it is cast.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
Gap notes:
9.1-E.6 – Ballot Error Correction
The voting system SHALL allow a voter to restart a voting session if a ballot is deemed incorrect.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: Gap notes:

9.1-E.7 – Ballot Integrity
Each ballot’s integrity SHALL be maintained throughout the voting process.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: Gap notes:

9.1-E.8 – Unique Identifier
Each paper ballot that is counted SHALL contain a unique identifier.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: Gap notes:

9.1-E.8.1 – Unique Identifier Application
Paper ballot identifiers may be printed onto the ballot or affixed via some other mechanism.

(Add icon)
9.1-E.9 – Cryptographic E2E Transparency
The underpinning cryptographic E2E protocol SHALL be publicly available for open review.

(Add icon)

9.1-E.10 – Cryptographic E2E Voter Verification
Individual voters SHALL have the opportunity to confirm that the system correctly interpreted their ballot selections.

(Add icon)

9.1-E.11 – Identification of Errors
The voter SHALL have the opportunity to identify ballot errors before it is cast.

(Add icon)
9.1-E.12 – Ballot Receipt
Before casting a ballot, the voter receives a receipt that allows them to verify that their ballot has been correctly recorded by the system.

9.1-E.12.1 – Plaintext Ballot Receipt
Receipts provided to voters SHALL not display selections made by voters.

9.1-E.12.2 –
Receipts SHALL not enable voters to prove to others their selections on any cast ballots.
9.1-E.13 – Ballot Receipt Transparency & Interoperability
Any receipt information provided SHALL be represented in an open and interoperable format.

(Add icon)

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9.1-E.13.1 – Ballot Receipt Unique Identifier
Each ballot receipt SHALL contain a unique identifier.

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9.1-E.14 – Receipt Transparency
The voting system SHALL be capable of exporting receipts in an open format.

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9.1-E.15 –
The voting system SHALL make publicly available all encoded ballots.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
Gap notes:

9.1-E.16 – Ballot Counted
Voters SHALL have the opportunity to verify that their ballots are included within the tabulation results.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
Gap notes:

9.1-E.16.1 –
The receipt provides sufficient information for voters to verify that their cast ballots are uniquely contained within the publicly available list of encoded ballots.

(Add icon)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1: 
Gap notes:

9.1-E.17 – Verification of Encoded Votes
The voting system allows any individual to verify that the encoded votes were properly tabulated.
9.2 - The voting system produces readily available records that provide the ability to check whether the election outcome is correct and, to the extent possible, identify the root cause of any irregularities.

9.2-A – Compliance Audit Procedures
The voting system documentation SHALL specify the election procedures necessary to perform a compliance audit.

9.2-B – General Post-Election Audit Procedures
The voting system documentation SHALL specify the election procedures necessary to perform a post-election audit.
9.2-C – Generation of Per-Ballot CVRs

The voting system SHALL be capable of recording and reporting a cast vote record for each ballot.

(Add icon)

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9.2-D – Reporting Intermediate Results

The voting system SHALL be able to report intermediate results as the audit is being conducted.

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9.2-E – Reporting Anomalous Audit Events

The voting system SHALL be capable of reporting problems as they arise (e.g., matching failures).

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9.2-F – Reporting of Audit Results

The voting system SHALL be able to report the final results of the audit.
9.2-G – Reporting Format
The voting system manufacturer SHALL document the intermediate and final election audit results in an open format.

9.3 - Voting system records are resilient in the presence of intentional forms of tampering and accidental errors.

9.1-A – Blank
This is a stub.

9.4 - The voting system supports efficient audits.
The following requirements apply to voting systems that perform risk limiting audits.

**9.4-A – Defining Minimum Risk Limiting Audit Functionality**
The voting system’s risk limiting audit logic SHALL use the audit trail to guarantee that there is a large, pre-specified probability that the audit will correct a preliminary outcome if the preliminary outcome is wrong.

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**Discussion**

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**9.4-B – Unique Ballot Identifiers**
Election auditors SHALL be able to uniquely address individual ballots.

(Add icon)

**Discussion**

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**9.4-C – Multipage Ballots**
The voting system SHALL be able to appropriately manage multipage ballots.

(Add icon)

**Discussion**

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9.4-D – Notification of Full Count Efficiency
The voting system is able to alert election officials when a full count would be more efficient than conducting the risk limiting audit.

(Add icon)

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
Gap notes:

9.4-E – Selection of Sample or Batch Size
The voting system SHALL be able to assist election jurisdictions with selecting a sample size and/or batch size.

(Add icon)

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
Gap notes:

9.4-F – Notification of Reaching the Desired Confidence Level
The voting system is able to alert an auditor once the desired confidence level is attained.

(Add icon)

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
Gap notes:
9.4-G – Modifying the Desired Confidence Level
The voting system is able to modify the desired confidence level for each audit.

(Add icon)

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
Gap notes:

9.4-H – Concurrently Auditing Multiple Contests
The voting system SHALL be able to audit multiple contests concurrently.

(Add icon)

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
Gap notes:

9.4-I – Tracking Audited Ballots
The voting system SHALL keep track of which ballots were already audited.

(Add icon)

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
Gap notes:
The following requirements apply to voting systems that perform ballot level comparison audits.

9.4-J – Accepting Audit Input
The voting system SHALL be capable of manually accepting ballot information from election auditors.

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9.1-K – Selecting Individual Ballots
The voting system SHALL be capable of selecting which individual ballot to audit.

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