

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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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9.1-B – Tamper Evident Records

The voting system SHALL produce tamper-evident records ~~that~~ enable detection of incorrect election outcomes.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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9.1-B.3 – Tamper-evident Record of Errors

Detected errors SHALL be recorded in a tamper-evident manner.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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9.1-C – Auditor Verification

Voting systems records SHALL enable external auditors to verify that cast ballots were correctly tabulated.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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9.1-E – Paper-based or Cryptographic E2E System

Voting systems SHALL meet the requirements within the Paper-based System Architectures and / or Cryptographic E2E System Architectures section.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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Paper-based System Architectures

The following requirements apply to paper-based voting systems.

9.1-F – Paper Record Production

The voting system SHALL produce a paper record of the voter's ballot selections.

[\[icon\] Requirement source](#) [Applies to: Paper-based System Architectures](#)

Discussion

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

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9.1-F.1 – Paper Record Intelligibility

The recorded ballots selection SHALL be presented in a manner understandable by the voter.

[\[icon\] Requirement source](#) [Applies to: Paper-based System Architectures](#)

Discussion

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

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Gap notes:

9.1-F.2 – Matching Selections

All representations of a voter’s ballot selections produced by the voting system SHALL agree with regard to the selections made by the voter.

[\[icon\] Requirement source](#) [Applies to: Paper-based System Architectures](#)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-F.3 – Paper Record Transparency & Interoperability

All representations of a voter’s ballot selections SHALL use an open and interoperable format.

[\[icon\] Requirement source](#) [Applies to: Paper-based System Architectures](#)

Discussion

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

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9.1-F.4 – Identification of Errors

The voter SHALL have the opportunity to identify ballot errors before it is cast.

[\[icon\] Requirement source](#) [Applies to: Paper-based System Architectures](#)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-F.5 – Ballot Error Correction

The voting system SHALL allow a voter to restart a voting session if a ballot is deemed unacceptable.

[icon] Requirement source Applies to: Paper-based System Architectures

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-F.6 – Ballot Integrity

Each ballot's integrity SHALL be maintained throughout the voting process.

[icon] Requirement source Applies to: Paper-based System Architectures

Discussion

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

Comment [FJM(1)]: A little too process oriented. Need to stick with what's possible via the machine.

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9.1-F.7 – Unique Identifier

Each paper ballot that is counted MAY contain a unique identifier.

[icon] Requirement source Applies to: Paper-based System Architectures

Discussion

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

Comment [FJM(2)]: Does this duplicate 9.4-B?

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9.1-F.7.1 – Unique Identifier Application

Paper ballot identifiers MAY be printed onto the ballot or affixed via some other external mechanism.

[icon] Requirement source Applies to: Paper-based System Architectures

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Status: New
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Cryptographic E2E System Architectures

The following requirements apply to voting systems using cryptographic E2E technology.

9.1-G – Cryptographic E2E Transparency

The underpinning cryptographic E2E protocol SHALL be publicly available for open review for 2 years prior to entering the voting system certification process.

[icon] [Requirement source](#) [Applies to: Cryptographic E2E System Architectures](#)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-G.1 – Cryptographic E2E Voter Verification

Individual voters SHALL have the opportunity to confirm that the voting system correctly interpreted their ballot selections.

[icon] [Requirement source](#) [Applies to: Cryptographic E2E System Architectures](#)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-G.2 – Opportunity to Identify Errors

The voter SHALL have the opportunity to identify ballot errors before their ballot is cast.

[icon] [Requirement source](#) [Applies to: Cryptographic E2E System Architectures](#)

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Status: New
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9.1-G.3 – 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.

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[icon] Requirement source Applies to: Cryptographic E2E System Architectures

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-G.3.1 – Plaintext Receipt

Receipts provided to voters SHALL not display any ballot selections made by voters.

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[icon] Requirement source Applies to: Cryptographic E2E System Architectures

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
Notes: Ballot Secrecy

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9.1-G.3.2 – Preventing Vote Buying & Voter Coercion

Receipts SHALL not enable voters to prove to others their selections on any cast ballots.

[icon] Requirement source Applies to: Cryptographic E2E System Architectures

Discussion

Status: New
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VVSG 1.1:
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9.1-G.4 – Ballot Receipt Transparency & Interoperability

Receipt data SHALL be represented in an open and interoperable format.

[icon] Requirement source Applies to: Cryptographic E2E System Architectures

Discussion

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Updated: Nov. 3, 2017
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9.1-G.4.1 – Ballot Receipt Identifier

Each ballot receipt SHALL contain a unique identifier.

[icon] Requirement source Applies to: Cryptographic E2E System Architectures

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-G.5 – Receipt Transparency

The voting system SHALL be capable of exporting receipt batches in an open format.

[icon] Requirement source Applies to: Cryptographic E2E System Architectures

Discussion

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Updated: Nov. 3, 2017
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9.1-G.6 – Mandatory Ballot Availability

The voting system SHALL make publicly available all encoded ballots.

[\[icon\] Requirement source](#) [Applies to: Cryptographic E2E System Architectures](#)

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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9.1-G.7 – Verification of Encoded Votes

Voters SHALL have the opportunity to verify that their ballots are included within the tabulation results.

[\[icon\] Requirement source](#) [Applies to: Cryptographic E2E System Architectures](#)

Discussion

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

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Comment [FJM(4)]: Note that 9.1-E.17 was removed as it was duplicative with this requirement. The requirement's text was:

The voting system allows any individual to verify that the encoded votes were properly tabulated

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9.1-G.7.1 – Sufficient Information for Verification

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

[\[icon\] Requirement source](#) [Applies to: Cryptographic E2E System Architectures](#)

Discussion

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

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

A compliance audit ensures that the election audit trail is sufficiently accurate to reconstruct the outcome according to how voters cast their ballots. Compliance audits provide assurance that a full hand count of the election audit trail shows the outcome according to how the voters really voted.

Status: New
Updated: Nov. 29, 2017
VVSG 1.1: N/A
Gap notes:

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9.2-B – General Post-Election Audit Procedures

The voting system documentation SHALL specify the election procedures necessary to perform a post-election audit.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

Status: New
Updated: Nov. 29, 2017
VVSG 1.1: N/A
Gap notes:

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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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

Status: New

Comment [FJM(5): Do we need anything about ballot images? Specifically, the quality of the image? What happens if images are not always straight for instance, or are difficult to read?

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Updated: Nov. 29, 2017
VVSG 1.1: N/A
Gap notes:

9.2-D – Reporting Intermediate Results

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

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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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).

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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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.

[\[icon\] Requirement source](#) [Applies to: Voting Device](#)

Discussion

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

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9.2-G – Reporting Format

The voting system manufacturer SHALL document the intermediate and final election audit results in an open format.

[icon] Requirement source Applies to: Voting Device

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1: N/A
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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.

[icon] Requirement source Applies to: Voting Device

Discussion

Status: New
Updated: Nov. 3, 2017
VVSG 1.1:
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Comment [FJM(6)]: Stub for mapping to data protection requirements

9.4 - The voting system supports efficient audits.

The following requirements apply to voting systems, or auditing systems, that perform risk limiting audits.

9.4-A – Minimum RLA 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.

[icon] Requirement source Applies to: Voting Device or External Auditing System

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Discussion

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

9.4-B – Unique Ballot Identifiers

Election auditors SHALL be able to uniquely address individual ballots.

[icon] Requirement source Applies to: Voting Device or External Auditing System

Discussion

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Status: New
Updated: Nov. 29, 2017
VVSG 1.1:
Gap notes:

9.4-C – Multipage Ballots

The voting system SHALL be able to appropriately manage multipage ballots.

[icon] Requirement source Applies to: Voting Device or External Auditing System

Discussion

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

9.4-D – Notification of Full Count Efficiency

The voting system or auditing system is capable of alerting election officials when a full count would be more efficient than conducting the risk limiting audit.

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[icon] Requirement source Applies to: Voting Device or External Auditing System

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Updated: Nov. 17, 2017

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9.4-E – Selection of Sample or Batch Size

The voting system or auditing system SHALL be able to assist election jurisdictions with selecting a sample size and/or batch size.

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[icon] Requirement source Applies to: Voting Device or External Auditing System

Discussion

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9.4-F – Notification of Reaching the Desired Confidence Level

The voting system or auditing system alerts an auditor once the desired confidence level is attained.

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[icon] Requirement source Applies to: Voting Device or External Auditing System

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Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
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9.4-G – Modifying the Desired Confidence Level

The voting system is able to modify the desired confidence level for each audit.

[icon] Requirement source Applies to: Voting Device or External Auditing System

Discussion

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

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9.4-H – Concurrently Auditing Multiple Contests

The voting system SHALL be able to audit multiple contests concurrently.

[icon] Requirement source Applies to: Voting Device or External Auditing System

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
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9.4-I – Tracking Audited Ballots

The voting system SHALL keep a queryable list of which ballots were already audited.

[icon] Requirement source Applies to: Voting Device or External Auditing System

Discussion

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

[icon] Requirement source Applies to: Voting Systems performing Ballot Level Audits

Discussion

Status: New
Updated: Nov. 17, 2017
VVSG 1.1:
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9.1-K – Selecting Individual Ballots

The voting system SHALL be capable of selecting which individual ballot to audit.

[icon] Requirement source Applies to: Voting Systems performing Ballot Level Audits

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Discussion

Status: New
Updated: Nov. 17, 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.

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Discussion

Status: New

Updated: Nov. 3, 2017

VVSG 1.1:

Gap notes: