

A Voting Methodology designed to facilitate Election Integrity

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Voting Methodology

Introduction

Compartmentalization is used to secure the election

- The **Polling Place** can be compared to a SCIF (Sensitive Compartmented Information Facility). There are two compartments within the polling place:
 - During the polling period, the first compartment is for the voter to **mark** their ballot selections, and the second compartment is for the voter to **verify** that their ballot selections are being interpreted correctly.
- **NOTE:** Voters receive and mark the paper ballots within the first compartment, then verify and secure their hand marked paper ballots inside the second compartment.
- After the polling period, the second compartment is used by voting officials and observers to **validate** the voter verified ballot selections, and **tabulate** the polling place's preliminary election results.

NOTE: The paper ballots originate within the polling place, and remain secure inside the polling place until the precinct's preliminary election results are determined.

Voting Methodology

Overview

In the Polling Place, during the Polling Period

- Voters hand **mark** their paper ballot with ballot selections, and **verify** that their ballot selections are being interpreted correctly.

In the Polling Place, after the Polling Period

- Voting officials **validate** that the voter's ballot selections were interpreted correctly, and **tabulate** the polling place's preliminary election results.

Mark - Verify - Validate - Tabulate

Voting Methodology

Mark - Verify - Validate - Tabulate

In the polling place's first compartment:

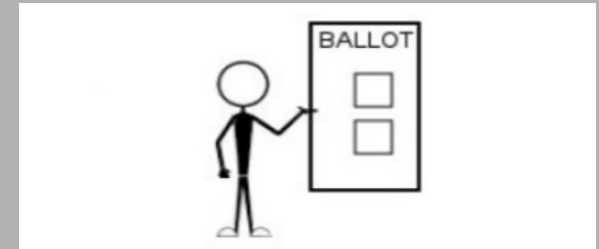
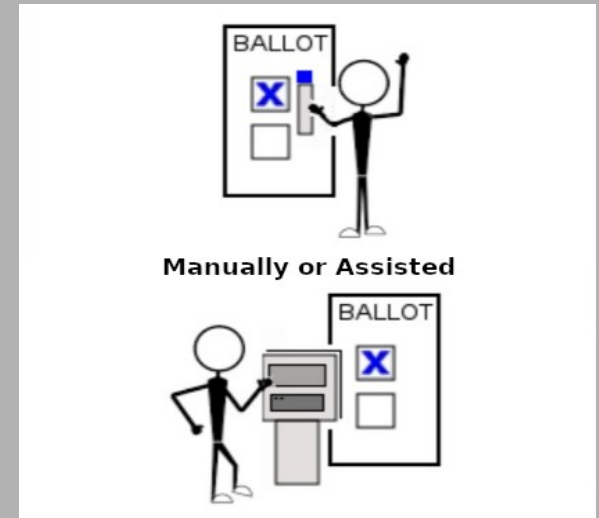
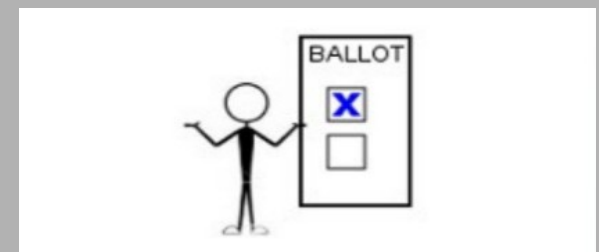
- A blank (unmarked and non-serialized) paper ballot is provided to the voter inside the polling place.



- The voter hand marks the paper ballot with their ballot selections. This is done either *manually* with a hand-held ballot marking instrument, or *assisted* with the use of a "single-purpose", "stand-alone", ballot marking device.



- The hand marked paper ballot is retained by the voter.

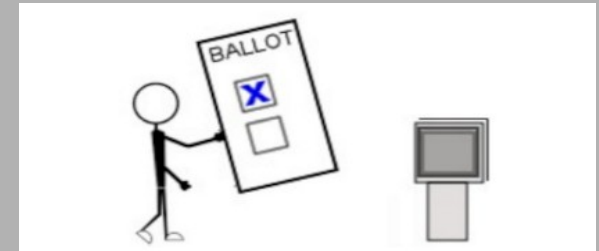
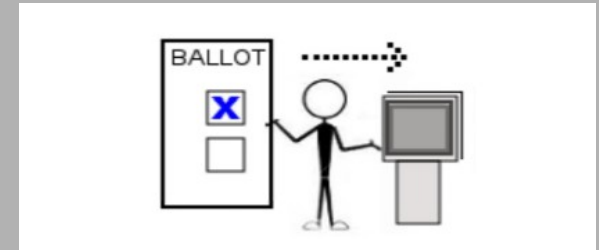
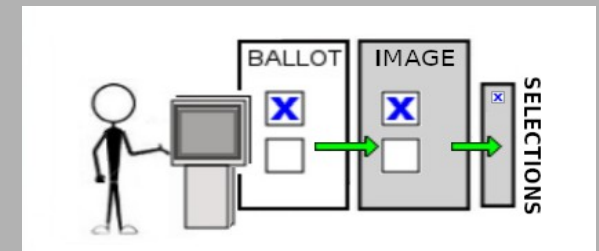
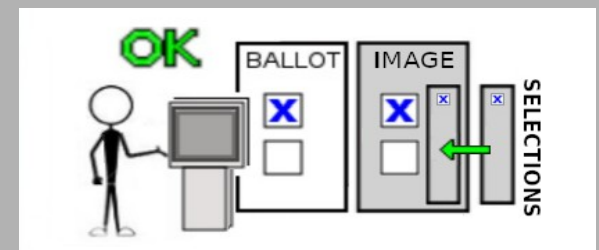


Voting Methodology

Mark - **Verify** - Validate - Tabulate

In the polling place's second compartment:

- The voter uses a voting station to verify that their ballot selections are being interpreted correctly.
- The physical ballot is inserted into the voting station, where it is serialized to identify the polling place and voting station used for the voter's verification.
- An image of the physical ballot is generated, and then interpreted for the voter's ballot selections.
- With the voter's verification of the ballot image and interpretation of the ballot selections, a summary of the voter's ballot selections is then embedded within the ballot image itself.

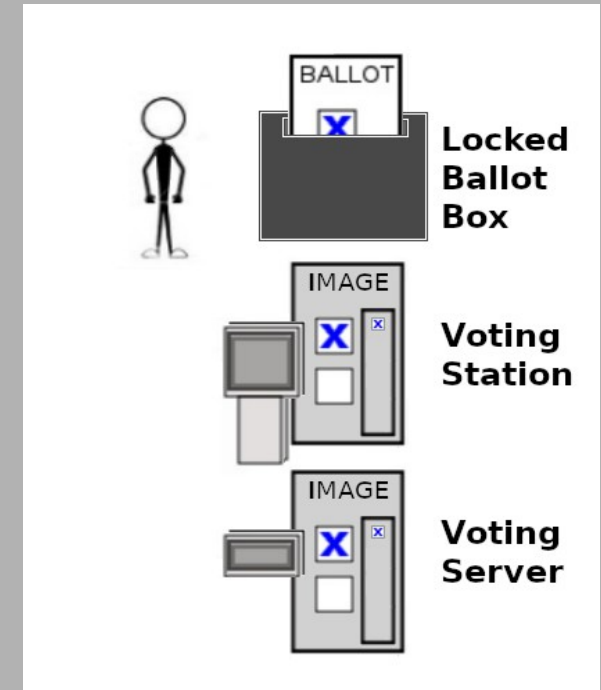


Voting Methodology

Verified Ballot Image Retention

In the polling place's second compartment:

- The voter verified ballot image is made to be cryptographically immutable, and securely stored on the voting station's verified-ballot-blockchain.
- Additionally, the immutable ballot image is copied to the polling place voting server, where it is interpreted for the voter's ballot selections, and checked against the verified ballot selections embedded in the ballot image.
- The voter verified ballot image is securely stored on the voting server verified-ballot-blockchain.
- Confirmation is provided to the voter, and the physical ballot is deposited into the voting station's ballot box.



Voting Methodology

The Voter's Cast-Vote-Record

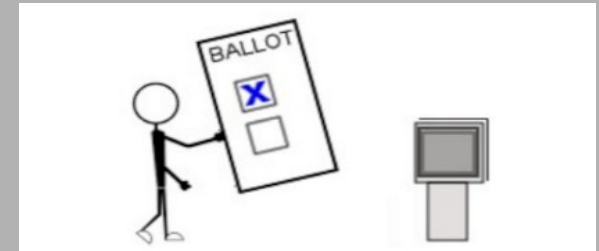
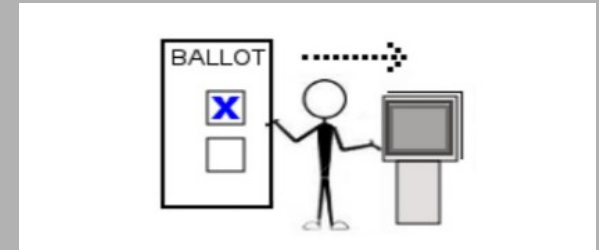
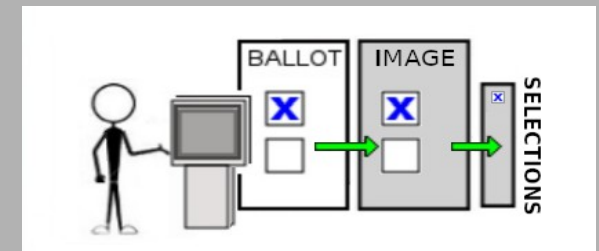
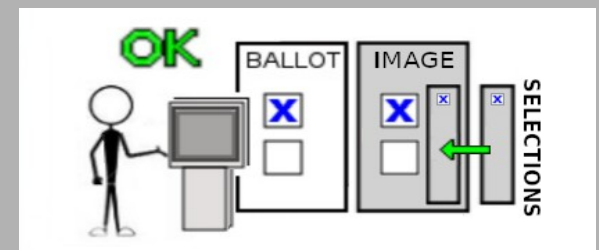
- **One** hand marked ballot (*physical*); serialized to identify the polling place and voting station used (*origination record*).
 - **Two** immutable ballot images (*virtual*); stored and secured cryptographically on both the voting station and the voting server.
 - **Three**, the voter's verification (*parity*) of their ballot selections embedded within each of the ballot images.
- ➔ Provides 3+1 redundancy of the voter's ballot selections: the physical ballot, duplicate copies of the voter verified ballot image, and the voter verified interpretation of their ballot selections embedded within each ballot image.

Voting Methodology

Mark - Verify - Validate - Tabulate

In the polling place's second compartment:

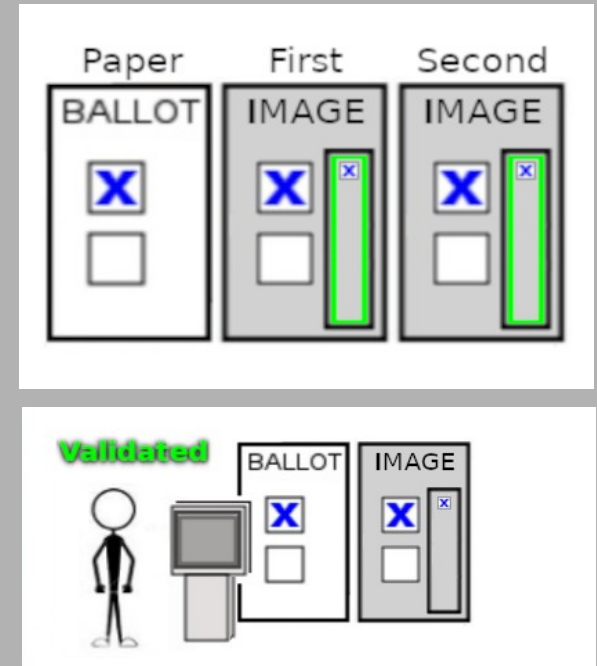
- Voting officials use the voting stations to verify the voter's ballot selections are being interpreted correctly.
- The physical ballot is inserted into the voting station, where the ballot's serialization is appended to identify the voting official and voting station used.
- A second image of the voter's physical ballot is generated, and then again interpreted for the voter's ballot selections.
- With the voting official's approval of the second ballot image and interpretation of the ballot selections, a summary of the voter's ballot selections is then embedded within the second ballot image.



Voting Methodology

Mark - Verify - **Validate** - Tabulate

- The voting official verification of the voter's ballot selections (embedded within the second ballot image) is validated with the voter's own verification of their ballot selections (embedded within the first ballot image).
- This is designed to confirm that the voting official's verification matches the voter's verification, providing a cross-check for the interpretation of the voter's ballot selections.



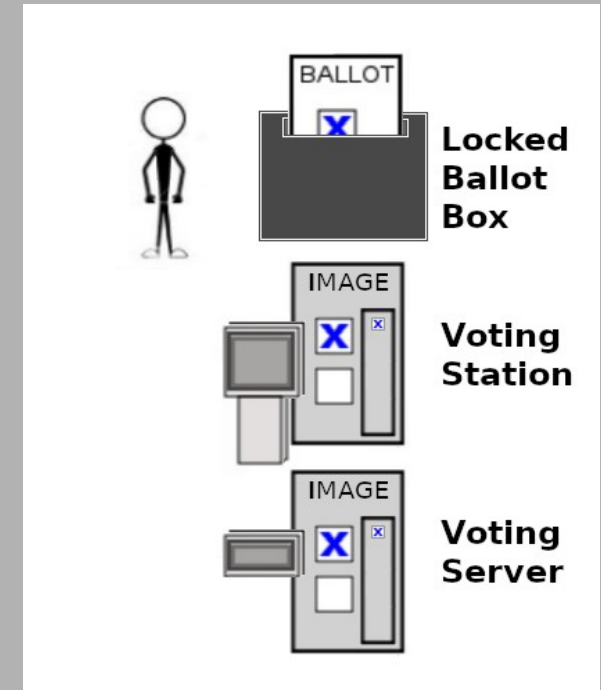
NOTE: The voting official independently checks the interpretation against the voter's physical ballot and records their verification before seeing the voter's recorded verification. Validation then compares the two verifications. Any disagreement can be checked against the physical ballot.

Voting Methodology

Validated Ballot Image Retention

In the polling place's second compartment:

- The voting official validated ballot image is made to be cryptographically immutable, and securely stored on the voting station's validated-ballot-blockchain.
- Additionally, the immutable ballot image is copied to the polling place voting server, where it is interpreted again for the voter's ballot selections, checked against the voting official validated ballot selections embedded within the ballot image, and then securely stored on the voting server's validated-ballot-blockchain.
- Confirmation is provided to the voting official, and the physical ballot is returned to the voting station ballot box.



Voting Methodology

The Voting Official's Hand-Count-Record

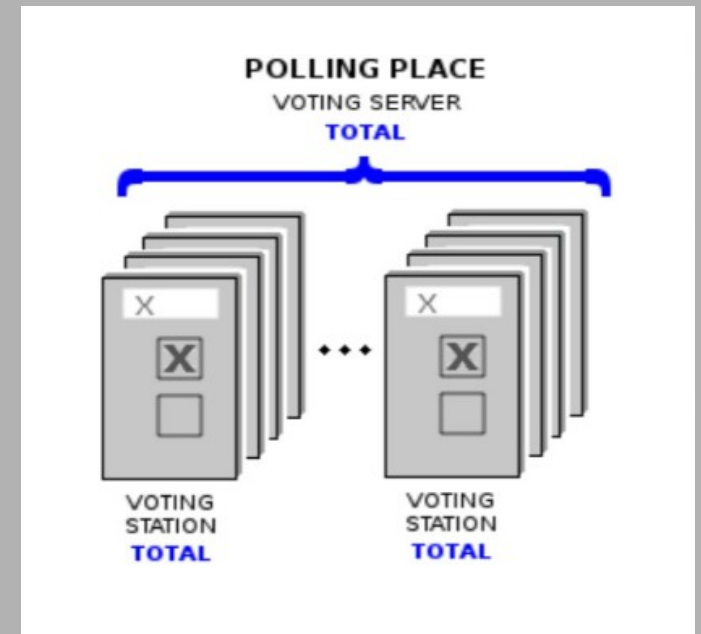
- **One** voter marked ballot (*physical*); serialized to identify the voting official and voting station used (*chain of custody*).
 - **Two** immutable ballot images (*virtual*); stored and secured cryptographically on both the voting station and the voting server.
 - **Three**, the voting official's verification (*parity*) of the voter's ballot selections embedded within each of the ballot images.
- ➔ Provides 3+1 redundancy of the voting official's validation: the physical ballot, duplicate copies of the voting official's verified ballot image, and the voting official's validated interpretation of voter's ballot selections embedded within each of the ballot images.

Voting Methodology

Mark - Verify - Validate - Tabulate

In the polling place:

- #1 Tabulate all the ballot selections on each voting station's validated-ballot-blockchain.
- #2 Combine all the voting station's validated-ballot-blockchain tabulations (#1).
- #3 Tabulate all the ballot selections on the voting server's validated-ballot-blockchain.
- Confirm the combined voting stations' validated-ballot-blockchain tabulations (#2) equals the voting server's validated-ballot-blockchain tabulation (#3).
- Report the confirmed polling place tabulation.
- Copy and securely transport the polling place voting server's validated-ballot-blockchain to the precinct.



Voting Methodology

Mark - Verify - Validate - Tabulate

At the precinct:

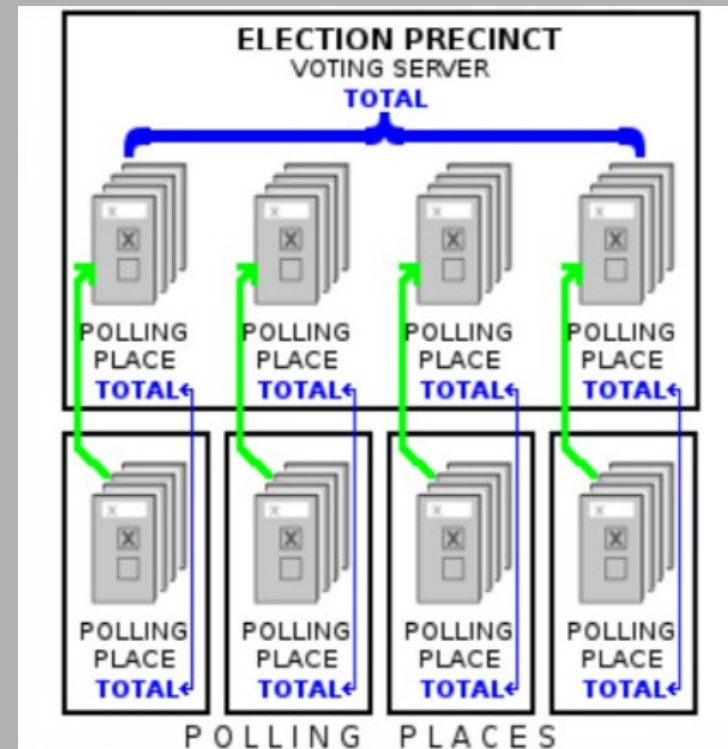
#1 Tabulate all the ballot selections from the polling place voting server's validated-ballot-blockchain.

- Confirm the polling place's reported tabulation equals the precinct's tabulation for the polling place.
- Add each confirmed validated-ballot-blockchain to the precinct's validated-ballot-blockchain.

#2 Combine all the polling places' validated-ballot-blockchain tabulations (#1).

#3 Tabulate all the ballot selections on the precinct's validated-ballot-blockchain.

- Confirm the combined polling place validated-ballot-blockchain tabulation (#2) equals the precinct's validated-ballot-blockchain tabulation (#3).



Voting Methodology

Preliminary Election Results

From the precinct:

- Report the precinct's confirmed tabulation for all the precinct's polling places.
- Publish the precinct's validated-ballot-blockchain.
- Copy and securely transport the precinct's validated-ballot-blockchain to the State.
- Release and transport all the polling places' locked ballot boxes to the State.

From the State:

- Maintain a publicly accessible repository of the precincts' reported tabulations and published validated-ballot-blockchain.
- Provide for "Post Election Auditing" with a publicly accessible suite of analysis tools, and a robust application programming interface (API) for more customized auditing.

A Voting Methodology designed to facilitate Election Integrity

Absolute Election Integrity

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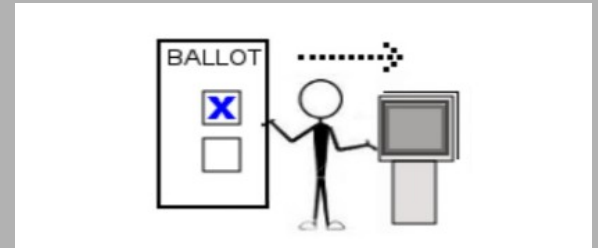
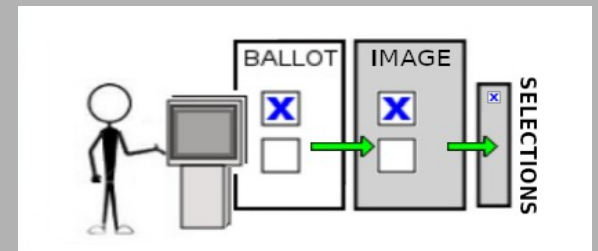
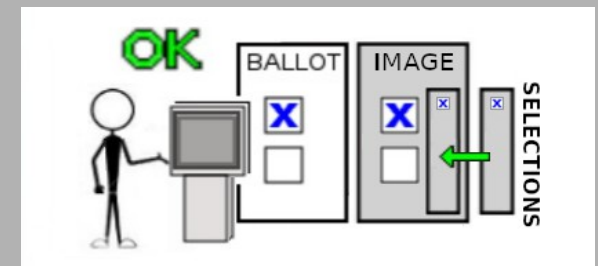
Voting Methodology

Mark - **Verify** - Validate - Tabulate

Appendix for Vote by Mail

- The voter uses a proxy to verify that their ballot selections are interpreted correctly.
- The proxy provides the mail-in ballot identifier to the voter by way of the voter's public key.
- The proxy inserts the physical ballot into a voting station, where it is serialized to identify the mail-in polling place and voting station used by the proxy.
- An image of the physical ballot is generated, and then interpreted for the voter's ballot selections.
- With the proxy's verification of the ballot image and interpretation of the ballot selections, a summary of the voter's ballot selections is then embedded within the ballot image itself.

(part 1)



Voting Methodology

Mark - **Verify** - Validate - Tabulate

Appendix for Vote by Mail

- The proxy verified ballot image is made to be cryptographically immutable, and securely stored on the voting station's verified-ballot-blockchain.
- Additionally, the immutable ballot image is copied to the mail-in polling place voting server, where it is interpreted again for the voter's ballot selections, and checked against the proxy verified ballot selections embedded in the ballot image.
- The proxy verified ballot image is securely stored on the voting server proxy-ballot-blockchain.
- Confirmation is provided to the proxy and voter (by way of the voter's public key), and the physical ballot is deposited into the voting station's locked ballot box.
- With the voter's verification of the ballot image and interpretation of their ballot selections, the ballot image is then copied to the mail-in polling place voting server verified-ballot-blockchain.

(part 2)