## A voting methodology designed to maintain election integrity

#### **OPEN SOURCE Hardware and Software Design Specification and Implementations**

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# Voting methodology objectives

#### ->Keep the voting experience as simple as possible!

• Utilize a "voter hand marked paper ballot", and generate an "immutable ballot image" of the voter's hand marked paper ballot.

• Generate and retain a "cast-vote-record" containing the voter verified interpretation of the hand marked paper ballot selections.

• Provide preliminary polling-place election results when the polling period closes, and replicate the polling-place election data to the polling place precinct.

• Provide timely and accurate hand counted election results in a highly efficient and easily repeatable manner.

## Voting Methodology Features

- #1 <u>Voter marked</u> paper-ballot.
- #2 <u>Voter verified</u> paper-ballot imaging *and* interpretation.
- A\ Retain a cast-vote-record.
- **B**\ Provide preliminary election results at end of polling period.
- C\ Facilitate timely and accurate hand counted election results.
- → Publicly accessible ballot images for post election auditing.

## Voting Methodology Overview

**Compartmentalization** is used to secure the election.

- *Registration* is conducted in a stand-alone compartment.
- *Enablement*\* in a separate compartment that precedes polling.
- *Polling* is done in a series of three polling place compartments:

**#1.** Ballot Marking – voter marked paper ballot

(either manually or with assistance)

#2. <u>Ballot Delivery</u> – ballot imaging and interpretation (voter verified at the voting station)

#3. <u>Ballot Processing</u> – hand counted election results (validated with a cast vote record)

\*enablement provides an individual voter with a paper ballot.

## Voting Methodology Prerequisites

- Maintain voter autonomy
   Access control voters identify
   themselves and gain access to the
   polling place. Within the polling
   place the voter is anonymous.
- Manage ballot distribution
   Document control within the polling place, the anonymous voter receives an unmarked paper ballot.
- The ballot does not identify the voter because there is an air-gap (the voter) in between "access control" and "document control".



## #1. Ballot marking

The first compartment within the polling place is for the voter to hand mark their paper ballot.

• The voter marks their paper ballot with ballot selections, either a) manually (by hand), or b) assisted (with a standalone, single-purpose, paper ballot marking device).



## #1.a) Manual ballot marking

The voter can choose to manually mark their ballot selections with a hand-held, ballot marking instrument.

• This can be done at the polling place or from a remote location (with a vote-by-mail or similar voting process).



#### #1.b) Assisted ballot marking

Or, optionally, the voter can choose to mark their ballot selections with a stand-alone, single-purpose, paper ballot marking device.

• This can be done at the polling place or from a remote location (with a vote-by-mail or similar voting process).



#### #1. Marked ballot handling

Voter hand marked paper ballots are handled as a controlled documents and always properly secured.

• The hand marked paper ballot remains in the sole possession of the voter (or voter proxy) until secured within a locked ballot box.



### **#1. Ballot Marking Summary**



#### **#2. Ballot Delivery and Verification**

The second compartment within the polling place is for the voter to deliver their hand mark paper ballot.

• The voter verifies that the ballot selections are interpreted correctly by the voting station.

With voter verification, the voter's cast-vote-record of the hand marked paper ballot is created in an immutable image.



## #2a. Polling place ballot delivery

• In the polling place, the voter hand marked paper ballot is delivered for voter verification at a voting station.

The voter uses the voting station to create an immutable ballot image, then interprets that ballot image for the voter's ballot selections, and with the voter's approval, it creates the voter's cast-vote-record.



#### #2b. Remote voting ballot delivery

Any other method used to deliver the voter hand marked paper ballot for the voter's verification is done indirectly through a voter proxy.

The proxy uses the voting station to create an immutable ballot image, then interprets that ballot image for the voter's ballot selections, and with the proxy's approval, it creates the voter's cast-vote-record.



#### **#2.** Ballot verification overview

• The voter (or proxy) uses the voting station to create a ballot image, and generate an interpretation of the voter's ballot selections .

• The voter then verifies the ballot image and interpretation of the voter's ballot selections.

 $\rightarrow$  Resulting in the creation of the voter's cast-vote-record.



# #2. Ballot verification step 1 of 9

Using the voting station:

• The voter (or proxy) inserts the hand marked paper ballot into the voting station.



# #2. Ballot verification step 2 of 9

• The voting station creates an immutable image of the voter marked paper ballot.

• The ballot image is visible to the voter (or proxy) on the voting station's monitor.



# #2. Ballot verification step 3 of 9

• The voter's ballot image is interpreted by the voting station to determine the voter's ballot selections.

• The voting station's interpretation of the ballot image is displayed on the voting station's monitor for the voter's (or proxy's) verification.



## #2. Ballot verification step 4 of 9

• The voter (or proxy) verifies that the ballot image matches the paper ballot, and that the voting station's interpretation of the voter's ballot selections are correct.



## #2. Ballot verification step 5 of 9

• With voter (or proxy) verification of the ballot image and interpretation of the ballot selections, that interpretation of the ballot selections is then digitally encoded within the ballot image, creating the voter cast-vote-record.



## #2. Ballot verification step 6 of 9

• The voter's cast-vote-record is copied to the polling place voting server. The voter's original cast-vote record is retained on the polling place voting station.



## #2. Ballot verification step 7 of 9

Polling place validation of <u>the voter cast-vote-record.</u>

• The voting server then interprets the voter (or proxy) verified cast-vote-record copy in the same manner as was previously performed by the voter (or proxy) on the voting station.



## #2. Ballot verification step 8 of 9

• The voting server's interpretation of the ballot image copy is compared to the voter (or proxy) verified interpretation encoded within the ballot image copy.



## #2. Ballot verification step 9 of 9

• When the voting server interpretation of the ballot image matches the voting station's interpretation encoded within the ballot image copy, then the voter's cast-vote-record has been validated.

• The paper ballot is deposited into a locked ballot box.



#### **#2. Ballot Delivery Summary**



#### The voter's election record

At this point in the voting methodology, the voter has provided their hand marked paper ballot (physical), generated an immutable image of that hand marked paper ballot (virtual), and the voter has verified the voting station interpretation of the voter's hand marked ballot selections.



## **Preliminary Polling Place Results**

• Preliminary polling place results are generated when the polling period closes.

• All the polling place voting station totals are combined and compared to the polling place voting server total.

• Polling place preliminary election results are generated.



## **Preliminary Precinct Election Results**

• The polling place cast-voterecords are replicated to their precinct's voting server.

• Each precinct confirms their own preliminary results for the polling place with the polling place's preliminary results.

• Then, precinct preliminary election results are generated.



## **Preliminary State Election Results**

• The precinct's cast-voterecords are replicated to the State's voting server.

• The State confirms their own preliminary results for each precinct with the precinct's preliminary results.

• Then, the State preliminary election results are generated.



## **#3. Ballot Processing**

The third compartment within the polling place is for the voting officials and public observers to hand count the paper ballots.

• A voting official uses the same voting station to hand count the election results.

A hand-count-record is compared with the voter's original cast-vote-record.



# #3. Ballot processing step 1 of 9

Using the voting station:

• The voting official inserts the voter's marked paper ballot into a polling place voting station.



## #3. Ballot processing step 2 of 9

• The voting station creates a second immutable image of the voter marked paper ballot.

• The second ballot image is visible to the voting official on the voting station's monitor, and also visible to the public observers on several overhead monitors.



# #3. Ballot processing step 3 of 9

• The second ballot image is interpreted by the voting station to determine the voter's ballot selections.

• The second ballot image interpretation is displayed on the voting station's monitor, and also on overhead monitors for the public observers.



## #3. Ballot processing step 4 of 9

• The voting official verifies that the voter marked paper ballot matches the second ballot image, and that the voting station interpretation of the voter's ballot selections are correct.



## #3. Ballot processing step 5 of 9

• The voting station's interpretation of the second ballot image is then digitally encoded within the second ballot image.



## #3. Ballot processing step 6 of 9

• A copy of the voting official verified second ballot image is copied to the polling place voting server.



## #3. Ballot processing step 7 of 9

• The voting server interprets the voting official verified second ballot image copy in the same manner as was just performed by the voting official on the voting station.



# #3. Ballot processing step 8 of 9

• The voting server's interpretation of the second ballot image is compared to both the voting official verified hand-count-record, and also with the voter's original cast-vote-record.

 $\bigstar$  Here again, the voting official's hand-count-record is validated with the voter's original cast-vote-record.



## #3. Ballot processing step 9 of 9

• When the voting server's interpretation of the second ballot image matches 1) the voting official verified interpretation encoded within the second ballot image copy, and 2) the voter verified interpretation encoded within the original cast-vote-record, the paper ballot is deposited in a locked ballot box.



#### **#3. Ballot Processing Summary**



## **Polling Place Election Results**

• Polling place election results are generated when the ballot processing is complete.

• All the polling place voting station hand count totals are combined and compared to the polling place voting server hand count total.

• Then, the polling place's hand counted election results are generated.



#### **Precinct Election Results**

• The polling place cast-voterecords are replicated to their precinct's voting server.

• Each precinct confirms their own hand count results for the polling place with the polling place's hand count results.

• Then, the precinct's hand counted election results are generated.



#### State Election Results

• The precinct's cast-voterecords are replicated to the State's voting server.

• The State confirms their own hand count results for each precinct with the precinct's hand count results.

• Then, the State's hand counted election results are generated.



#### The Voting Methodology

## ABSOLUTE ELECTION INTEGRITY

