September 18, 2017

From: Chris Jerdonek, OSVTAC Chair

To: Open Source Voting System Technical Advisory Committee (OSVTAC)

RE: Agenda Item #6 – Proposed text re: Terminology, including Voting System

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## 1. Goals [move this section to be the first]

[Same text as before]

## ~~1.~~ 2. Background

2.1. History of Open Source Voting

[Same text as before]

2.2. Voting System

2.2.1. Definition

The Help America Vote Act (HAVA) of 2002 defines a voting system as follows (from 52 USC §21081: Voting systems standards):

> **(b) Voting system defined**
> In this section, the term "voting system" means—
> (1) the total combination of mechanical, electromechanical, or electronic equipment (including the software, firmware, and documentation required to program, control, and support the equipment) that is used—
> (A) to define ballots;
> (B) to cast and count votes;
> (C) to report or display election results; and
> (D) to maintain and produce any audit trail information; and
> (2) the practices and associated documentation used—
> (A) to identify system components and versions of such components;
> (B) to test the system during its development and maintenance;
> (C) to maintain records of system errors and defects;
> (D) to determine specific system changes to be made to a system after the initial qualification of the system; and
> (E) to make available any materials to the voter (such as notices, instructions, forms, or paper ballots).

### 2.2.2. Components

This section provides one possible way of listing the components of a "generic" optical-scan paper-ballot voting system. This list is not rigorous or exhaustive. Rather, it is meant for discussion purposes and to provide a sense of what functionalities are needed and how they are divided up, etc.

For simplicity, we assume the voting system uses pre-printed ballots, as opposed to being a ballot on-demand system. We also assume that in-precinct voters are allowed to mark their ballot with a pen, as opposed to being required to interact with an electronic device.

The components in this particular list are not necessarily independent. They may overlap or contain one another. For example, the precinct ballot scanner hardware component contains a scanner device driver, the ballot image interpreter, and the high-level scanner software components.

Finally, note that there are many possible ways to divide a given voting system into components. For example, the granularity at which one views the system affects the number of components. We chose a mid-level granularity for this list. This lets us show how some software components are used in more than one hardware component. Differences can also result from where the "boundaries" are drawn between components (e.g. what functionalities one assigns to different components).

#### 2.2.2.1. Hardware Components

Each of the hardware components below also needs software to function. In most cases, we list this software in the "Software Components" section.

1. **Accessible Ballot-Marking Device**
   A device used in polling places that lets people with disabilities vote independently. It supports different accessible interfaces like audio, sip-and-puff, etc. If the computer is COTS, it may also need a custom casing or shell to increase durability and assist with polling-place transport and setup.
2. **Central Ballot Scanner**
   A device responsible for high-speed, high-volume ballot scanning (e.g. for vote-by-mail ballots). The scanning with these machines is done in a controlled environment under staff supervision.
3. **Precinct Ballot Scanner**
   A device used in polling places to scan and tabulate ballots cast in person. It has features like returning the ballot to the voter for possible correction if the ballot contains an overvote. Similar to the accessible device, this device may also need a custom casing or shell for durability and to facilitate polling-place use.

4. **Standard laptop or desktop computers**
   Standard computers will also be needed for administrative tasks like ballot layout, adjudicating digital images of ballots, aggregating and totaling votes, and generating results reports.

2.2.2.2. Software Components

1. **Voting System Database / Management**
   Central store (e.g. file system and/or database) storing and providing access to the voting-system information needed to conduct an election. This can include things like contest and ballot definitions, ballot images, cast vote records, and election results. A management interface can let staff perform tasks like import and export data in open data formats, digitally evaluate "out-stacked" ballots and ballots with write-in candidates, and perform other functions needed during the canvass. This software may support running other software components like EMS integration, tabulation, and results reporting.
2. **Election Definition EMS Integration**
   Interfaces with the Department's Election Management System (EMS) to import and convert election definition information from the EMS into the voting system database. This can include things like what offices, candidates, and measures, etc. are in the election and in what precincts and districts, etc.
3. **Ballot Layout**
   This is a software application that lets staff generate paper-ballot layouts from the election definition for each ballot type in automated or semi-automated fashion, including support for multiple languages.
4. **Ballot Image Interpreter**
   This is a software library responsible for interpreting ballot images. It generates a cast vote record (CVR) from a digital image of a ballot. This software component could potentially be used in all of the precinct scanners, the central scanners, and a software-only ballot adjudication application.
5. **Scanner Device Drivers (one for precinct and one for central)**
   This is low-level software needed on both precinct and central ballot scanners that provides a software API to the basic hardware functionality of a ballot scanner (e.g. out-stacking a ballot, returning a ballot, advancing a ballot, etc.). This might come with COTS hardware. Separate versions are likely needed for the precinct and central scanners.
6. **High-level Scanner Software (one for precinct and one for central)**
   This is high-level software controlling the precinct and central ballot scanners. It interacts with the scanner device driver and ballot image interpreter components and is responsible for things like scanning and storing ballot images, detecting the ballot layout, interpreting and tabulating ballot markings, controlling the scanner in response to the markings on a ballot, and exporting ballot data after scanning is complete. Separate versions are likely needed for the precinct and central scanners.

7. **Vote Totaler**
   Aggregates and counts all vote totals and generates the results in an open data format. Includes the RCV tabulation algorithm.
8. **Results Reporter**
   Generates human-readable results reports from the results data from the vote totaler (e.g. printable results and results posted on the Department website).

## 6. Glossary [after section 5. Recommendations]

[Below are some initial ideas of words to include in a glossary.]

- Agile
- Ballot adjudication
- Ballot image
- Ballot on-demand
- Cast vote record (CVR)
- Central ballot scanner
- Commercial-off-the-shelf (COTS)
- Component
- Hardware
- Hardware component
- Open-source software
- Precinct ballot scanner
- Software
- Software API
- Software application
- Software component
- Software library