



Introducing the Election Technology Framework— Critical Infrastructure to Increase Trust and Preserve Democracy

Open Source Election Technology Foundation
TrustTheVote Project
August 21, 2014

Introduction

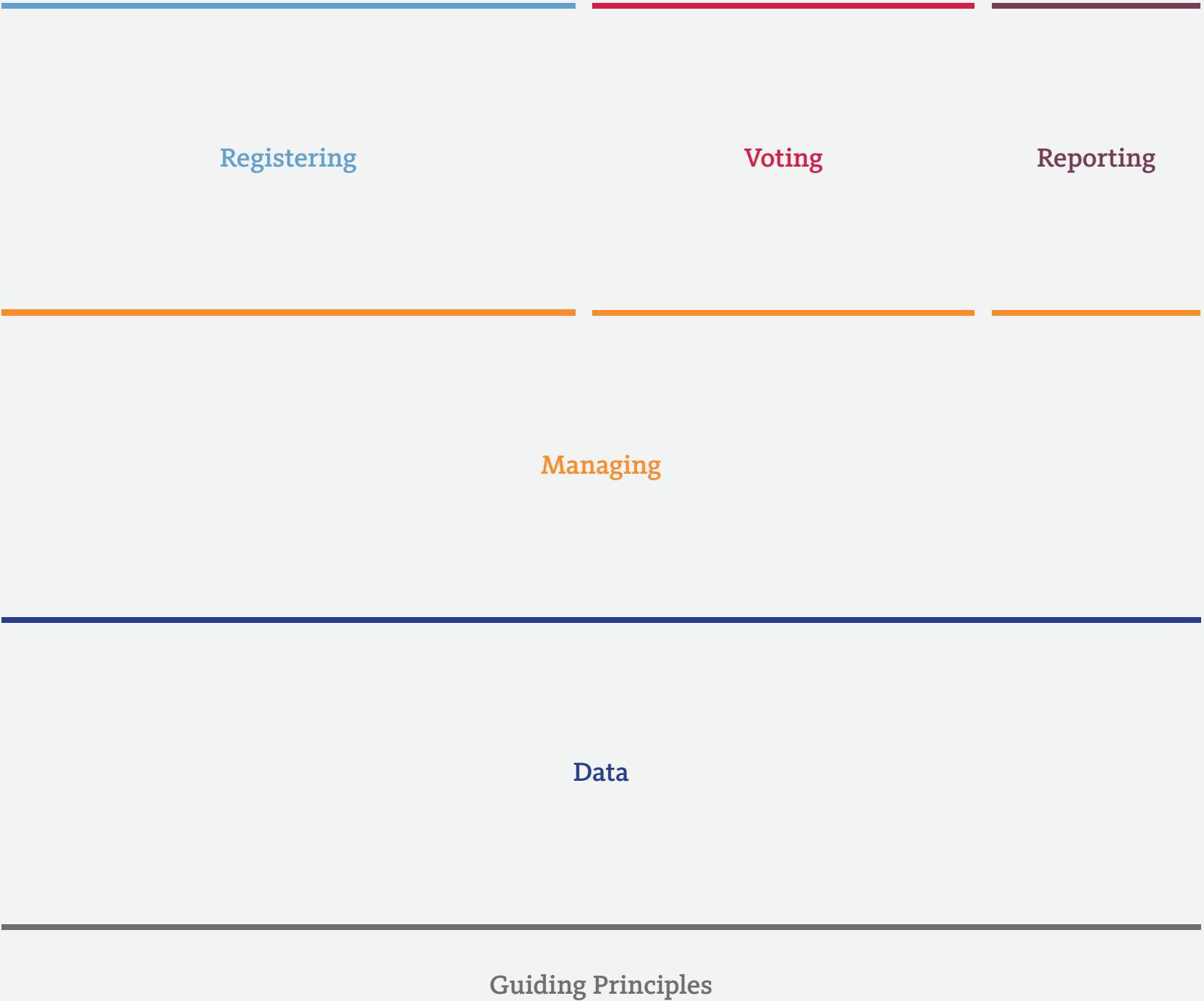
This book provides a technical overview of the TrustTheVote Project. It begins by describing the election process and shows how that process maps to the elections technology framework OSET is proposing. The book provides an overview of the framework’s main components and then “zooms in” to provide details about each component, sub-components, links between components, and data flows that make possible the planning and execution of elections.

The TrustTheVote Elections Technology Framework is a blue-print for developing a complete elections system, something that has not been developed before. The framework represents a substantial body of work that’s already been completed, particularly in gathering input from local elections officials, understanding their needs, and drafting specifications. In addition, some components are already in development. And both the Voter Services Portal and the VoteStream elections results reporting system are in alpha release.

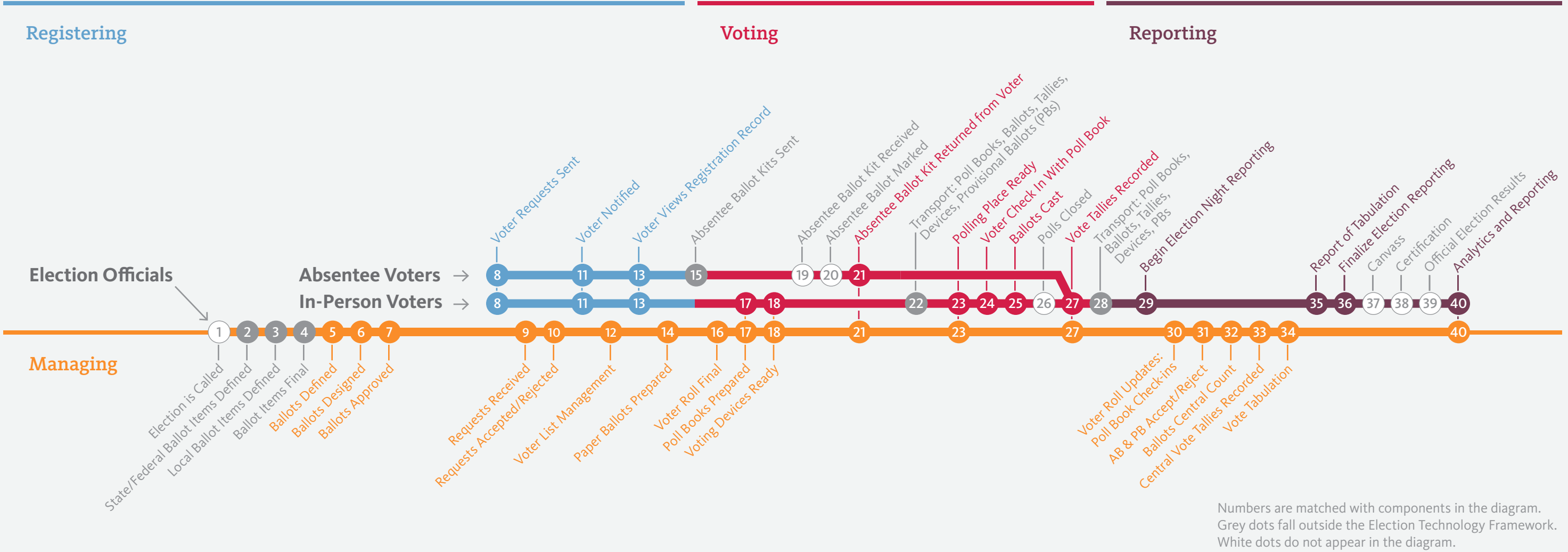
Overview

The TrustTheVote Project is developing the Election Technology Framework, which has six main building blocks:

- Registering
- Voting
- Reporting
- Managing
- Data and
- Guiding Principles



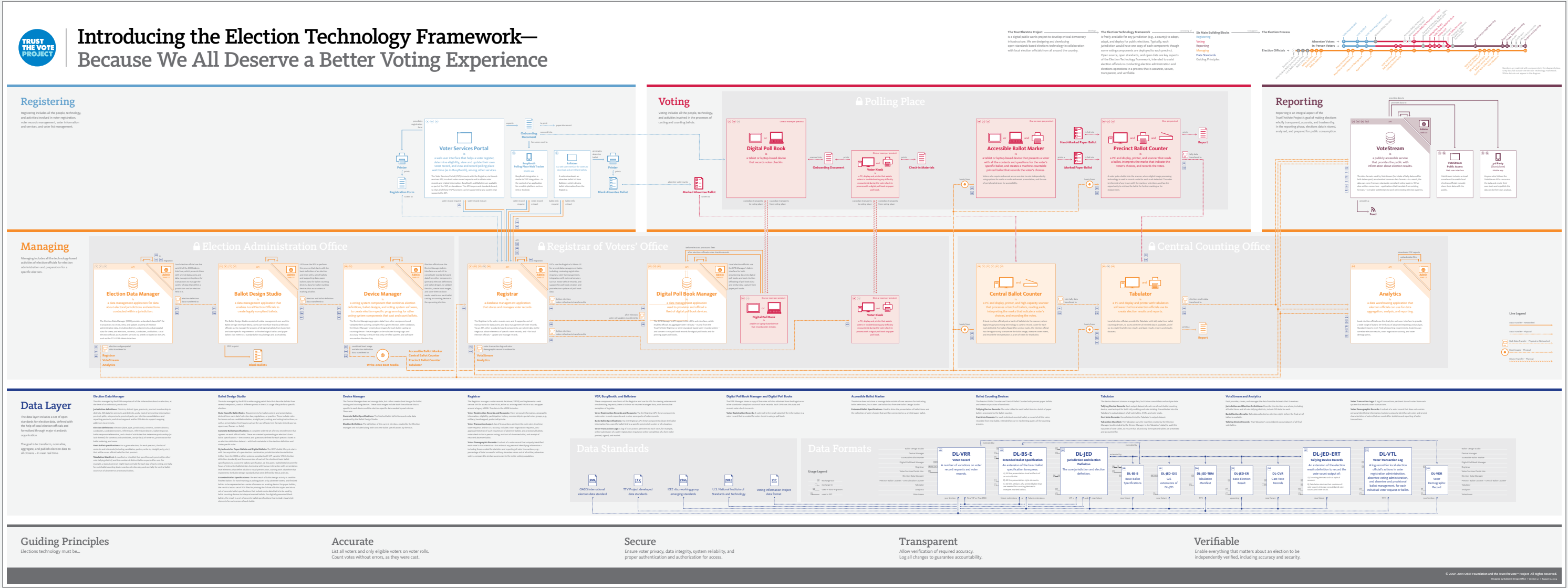
The Election Process



Data

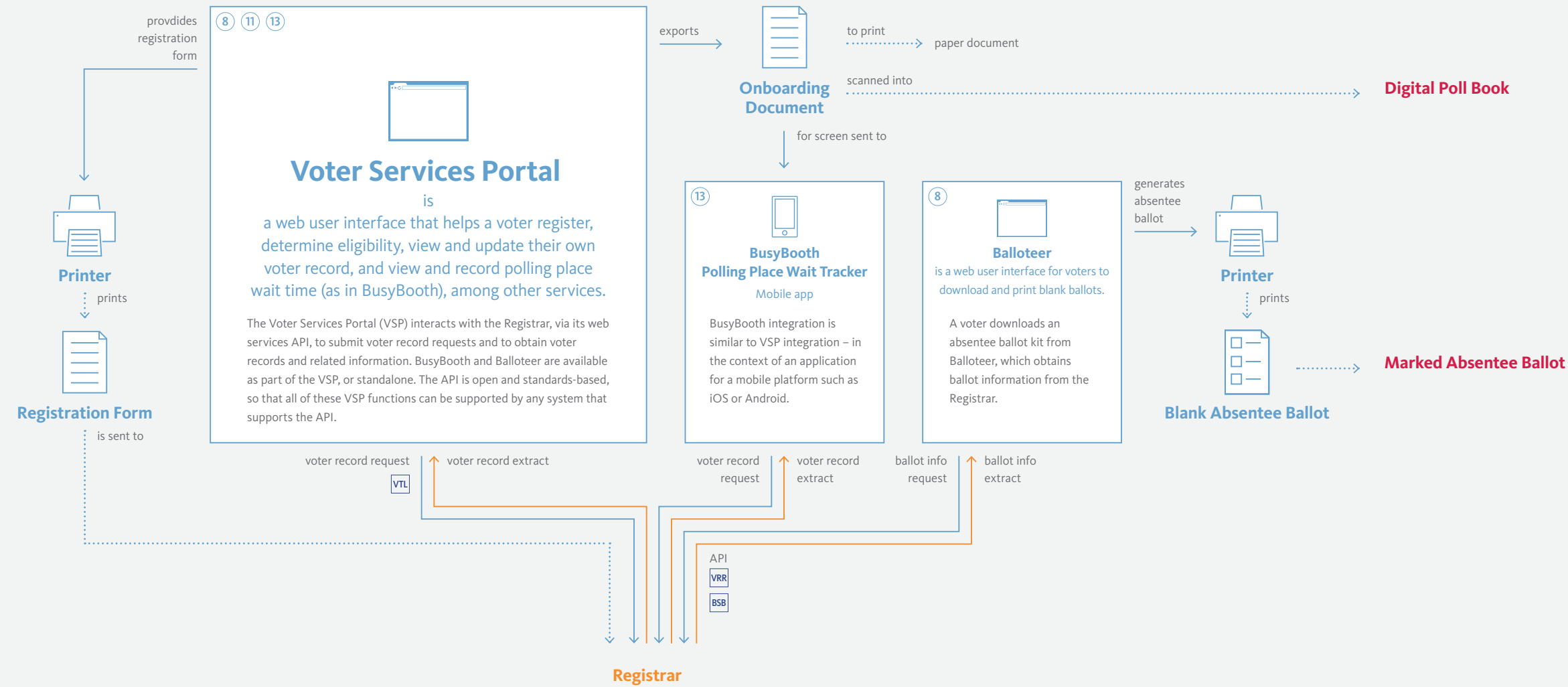
Guiding Principles

Full Architecture Diagram



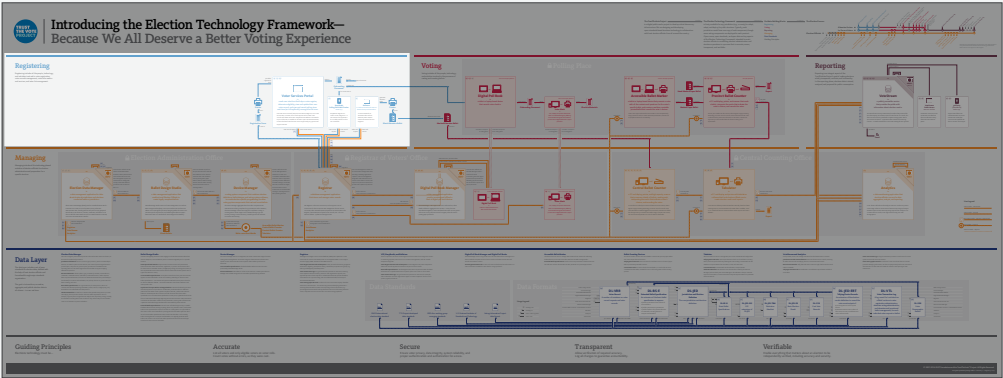
Registering

Registering includes all the people, technology, and activities involved in voter registration, voter records management, voter information and services, and voter list management.



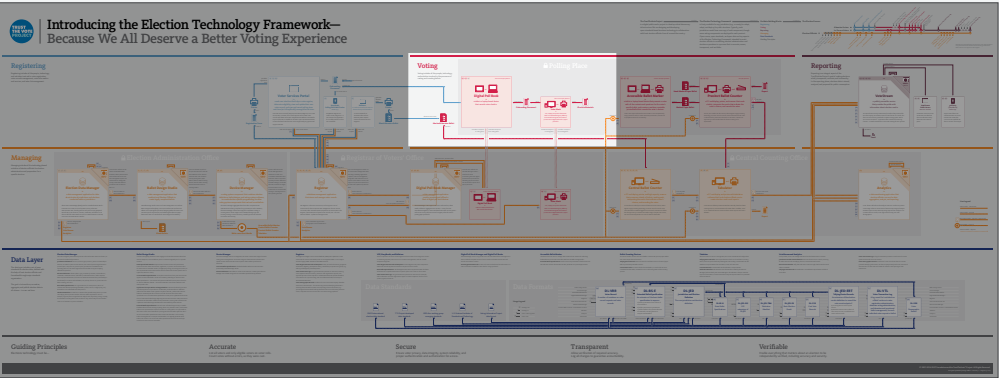
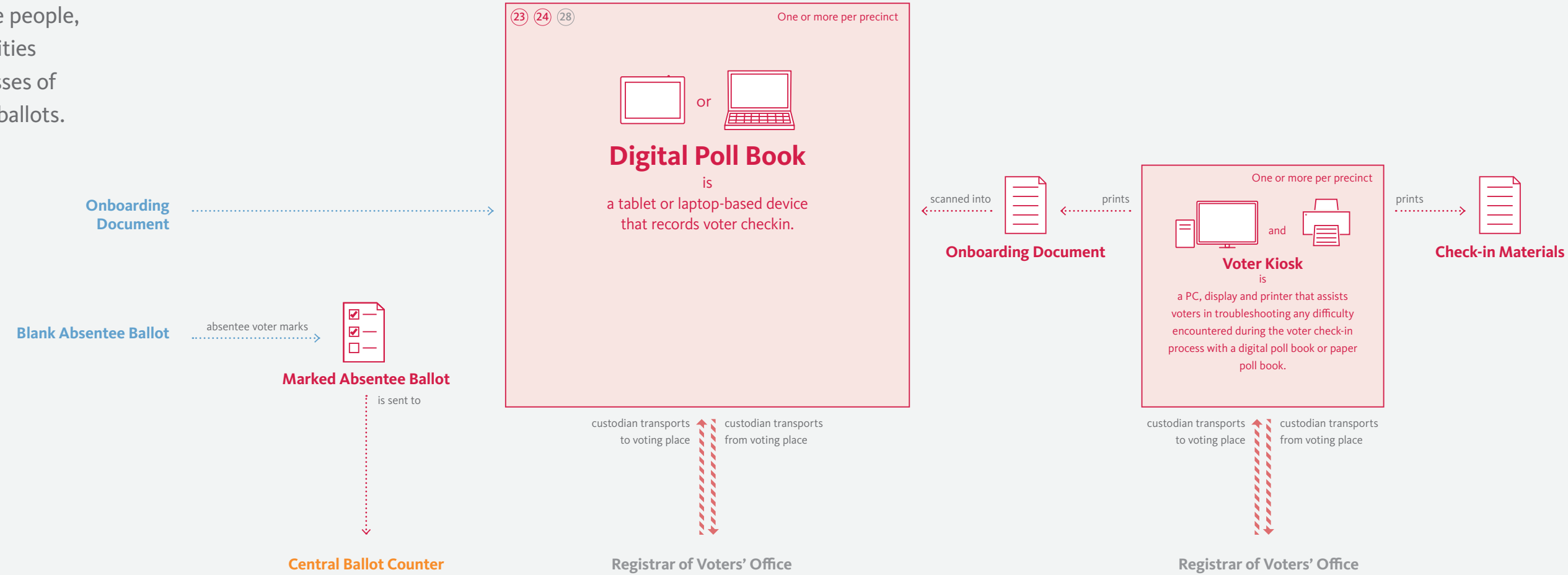
Line Legend

- Data Transfer – Networked
- Data Transfer – Physical
- Bulk Data Transfer – Physical or Networked
- Boot Images – Physical
- Device Transfer – Physical

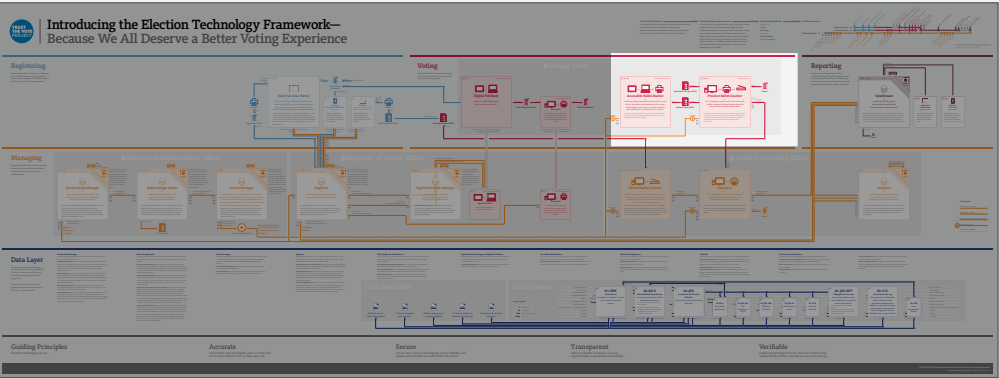
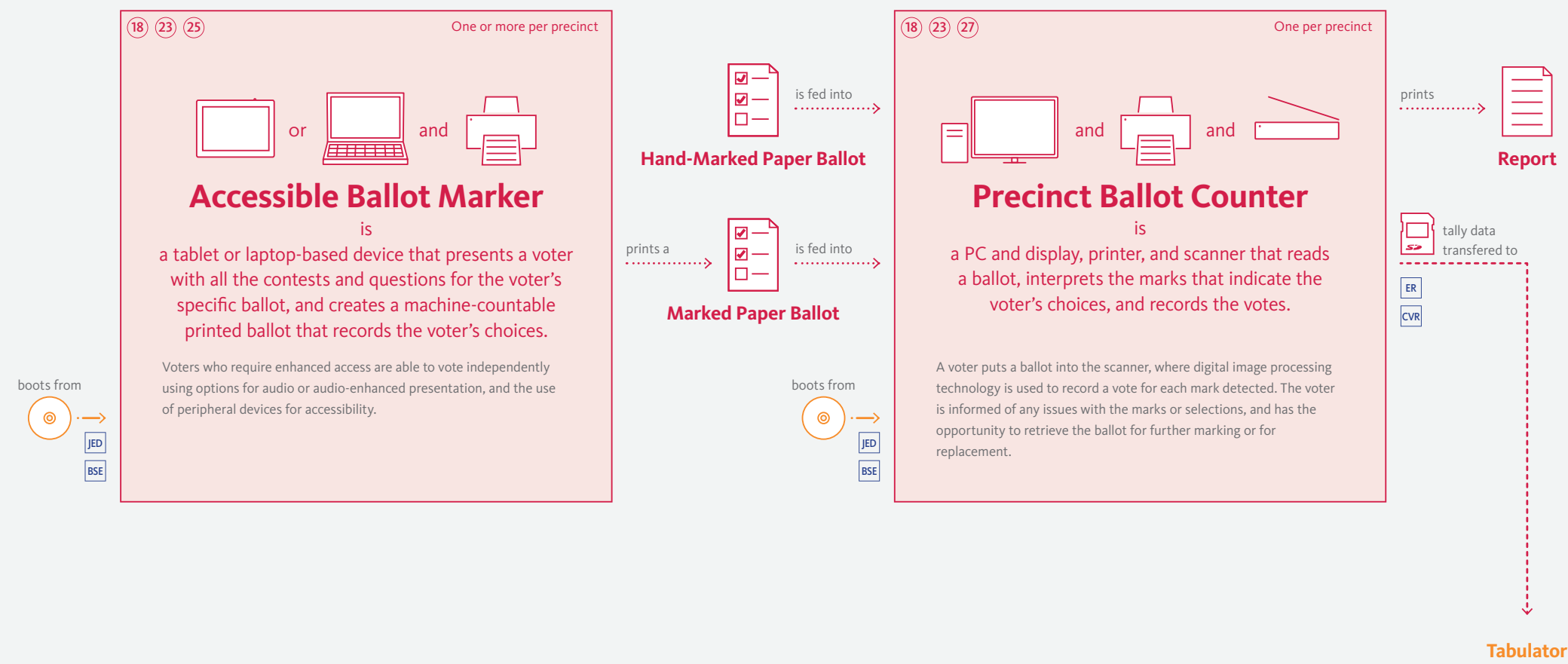


Voting: Voting Place

Voting includes all the people, technology, and activities involved in the processes of casting and counting ballots.

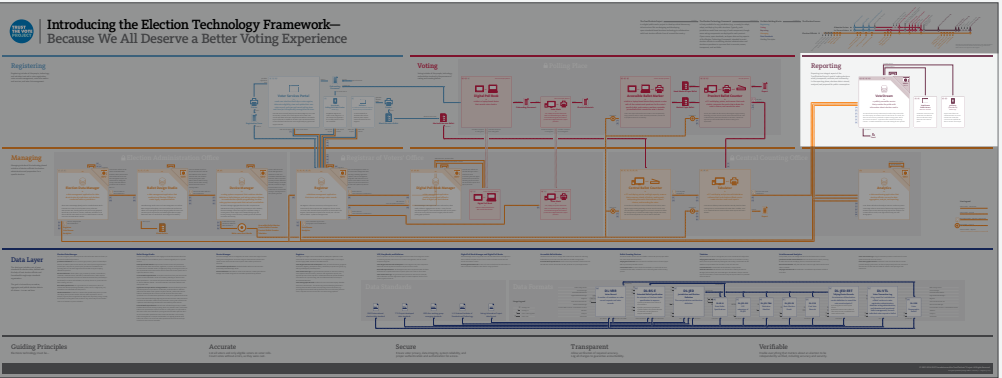
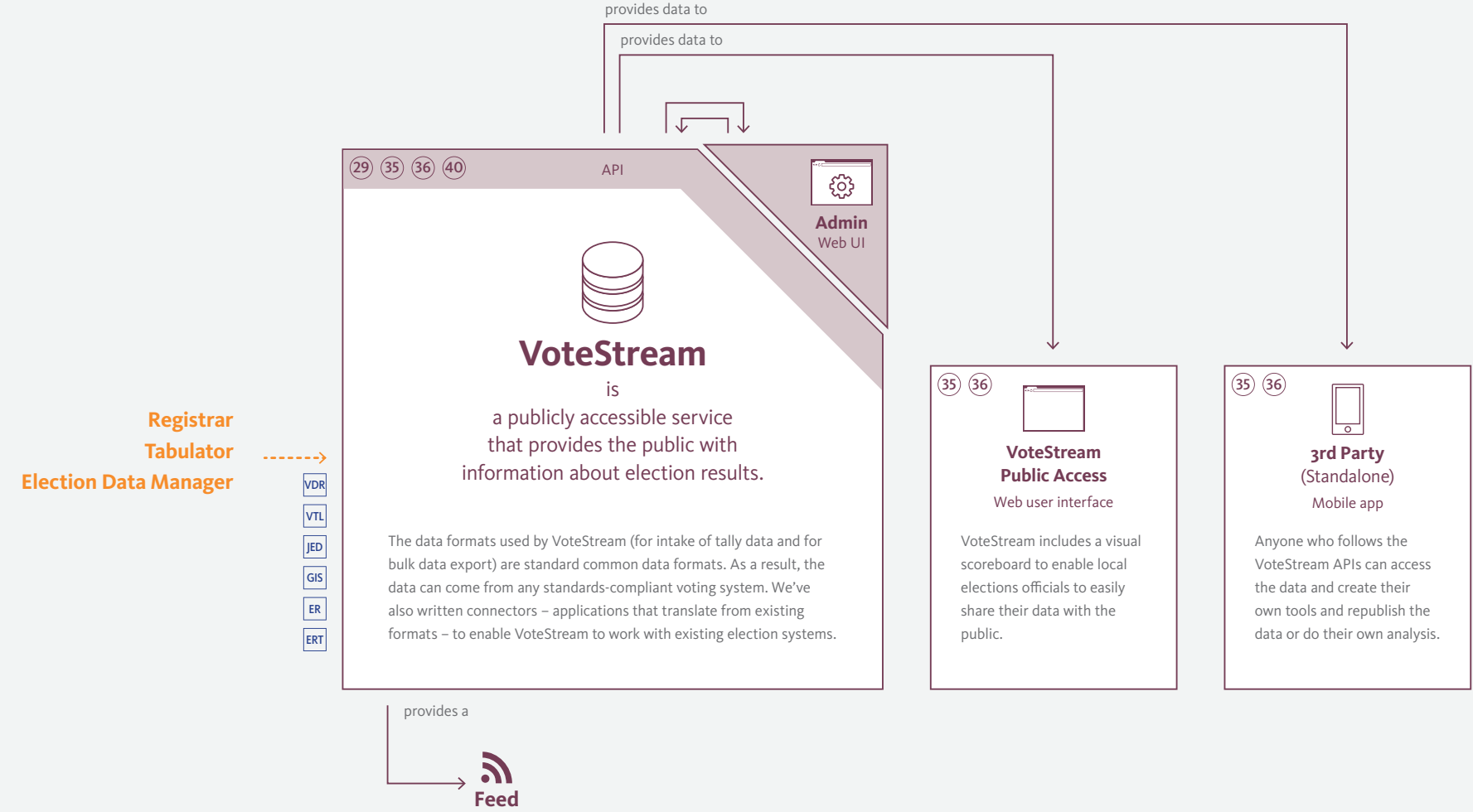


Voting: Voting Place

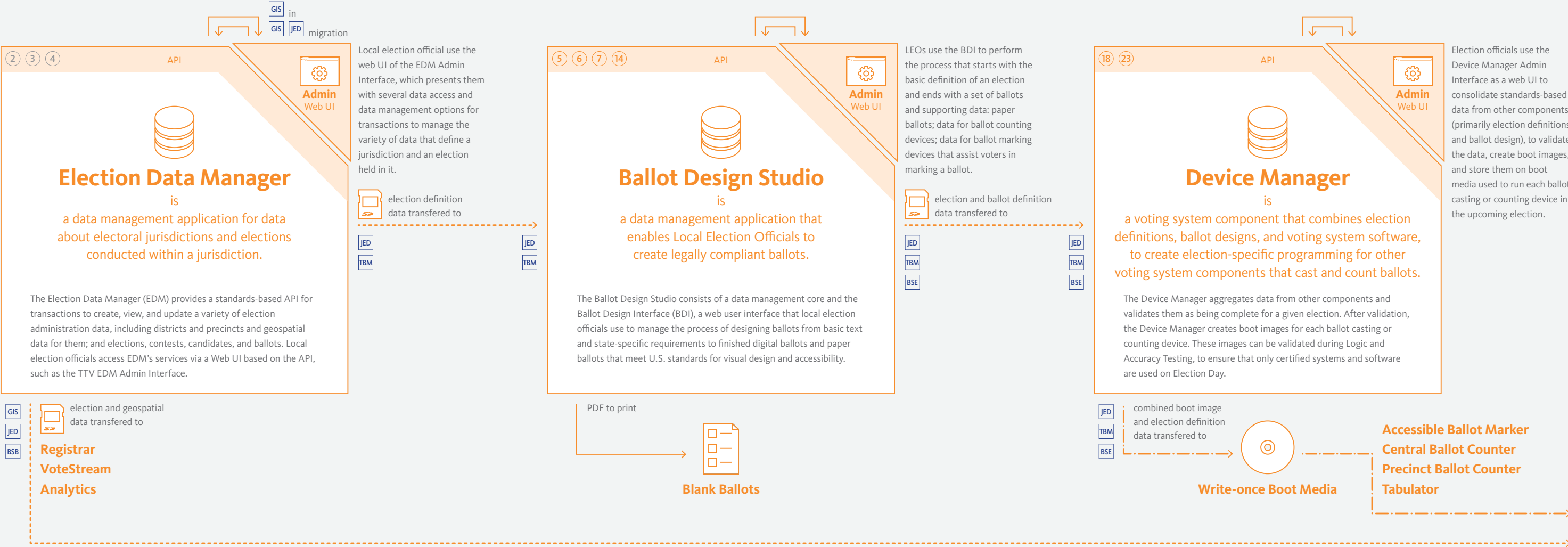


Reporting

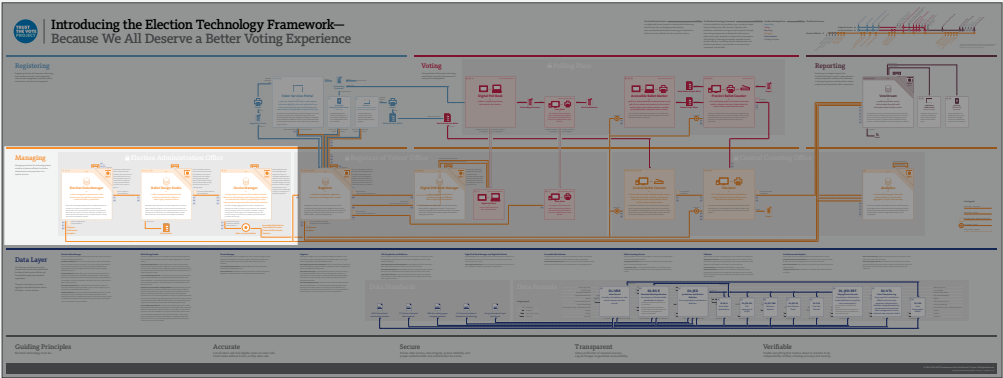
Reporting is an integral aspect of the TrustTheVote Project’s goal of making elections wholly transparent, accurate, and trustworthy. In the reporting phase, elections data is stored, analyzed, and prepared for public consumption.



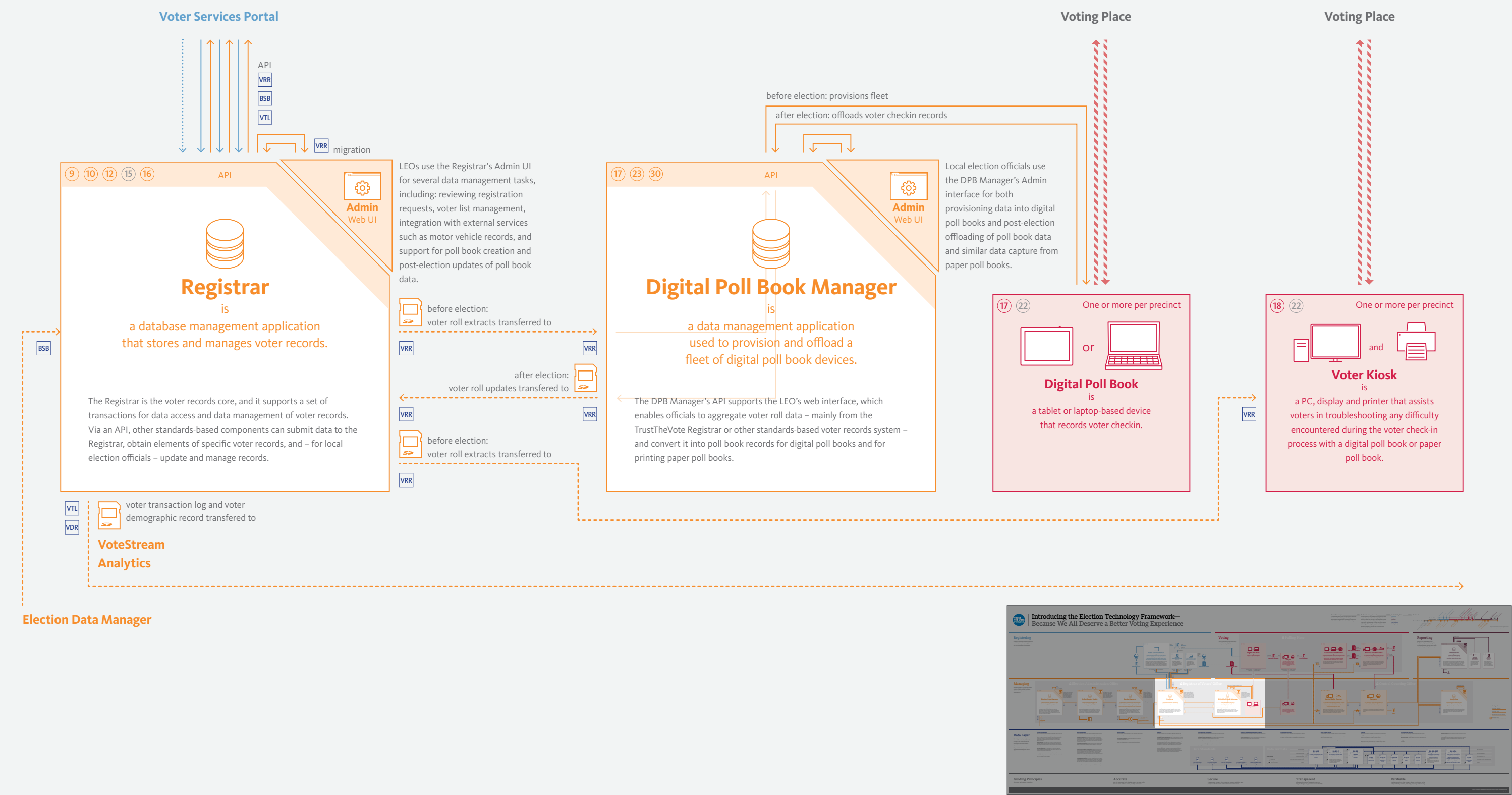
Managing: Election Administration Office



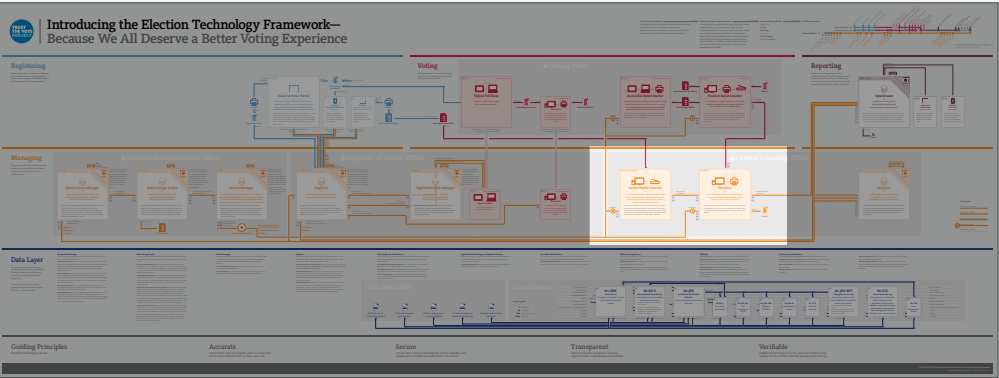
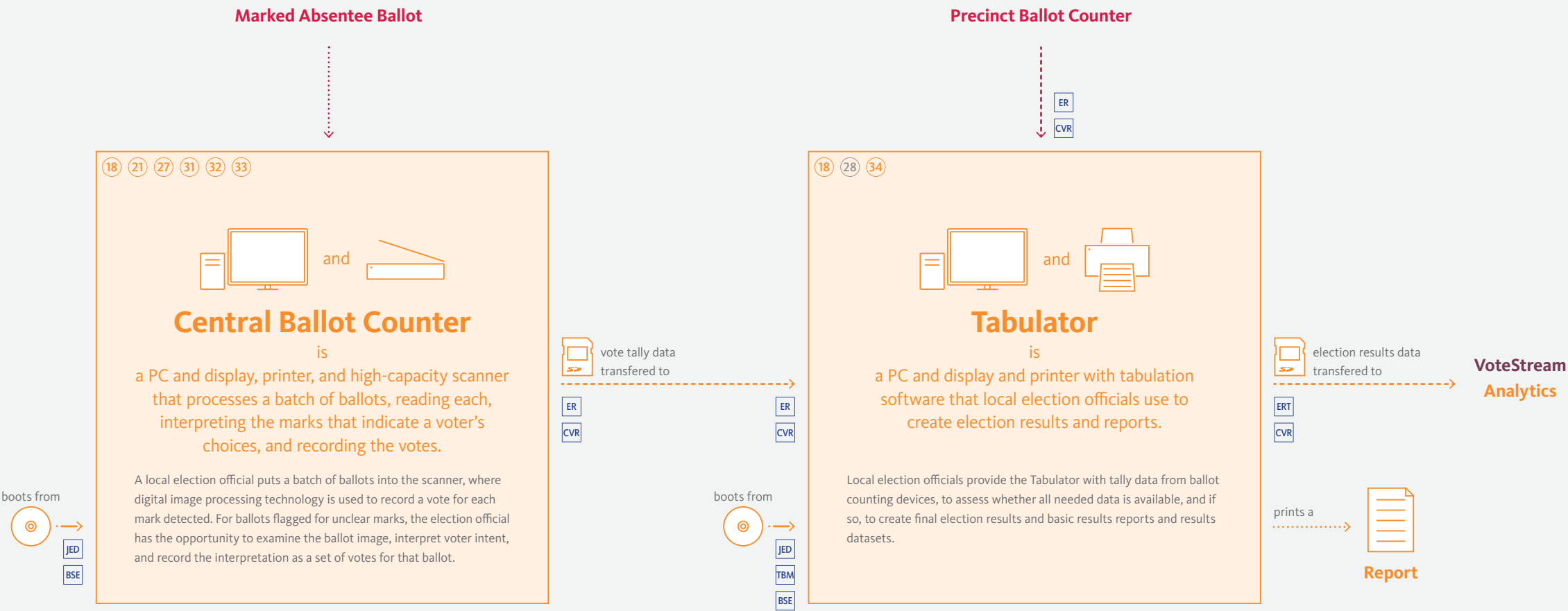
Managing includes all the technology-based activities of election officials for election administration and preparation for a specific election.



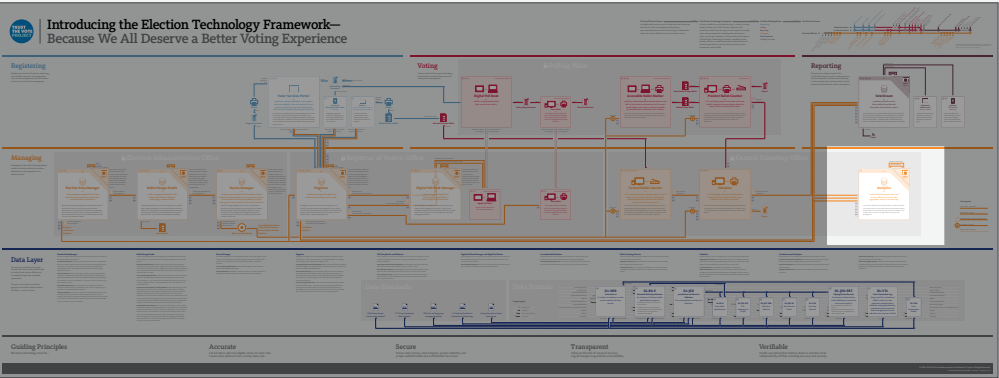
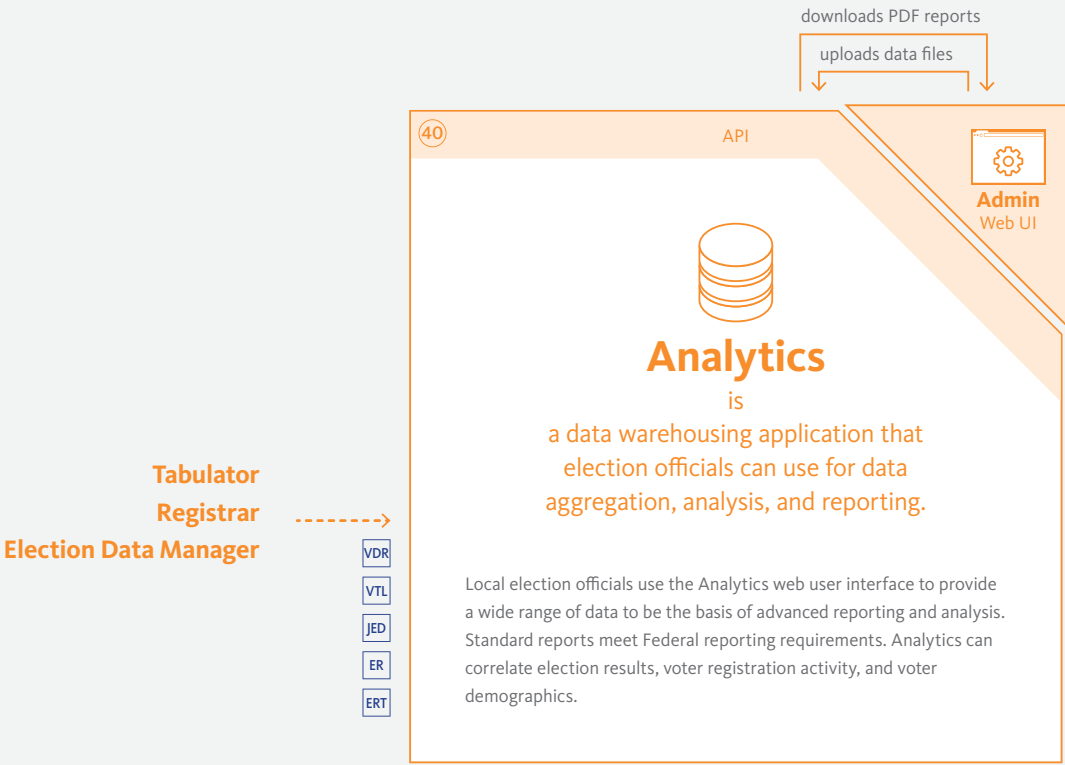
Managing: Registrar of Voters' Office



Managing: Central Counting Place



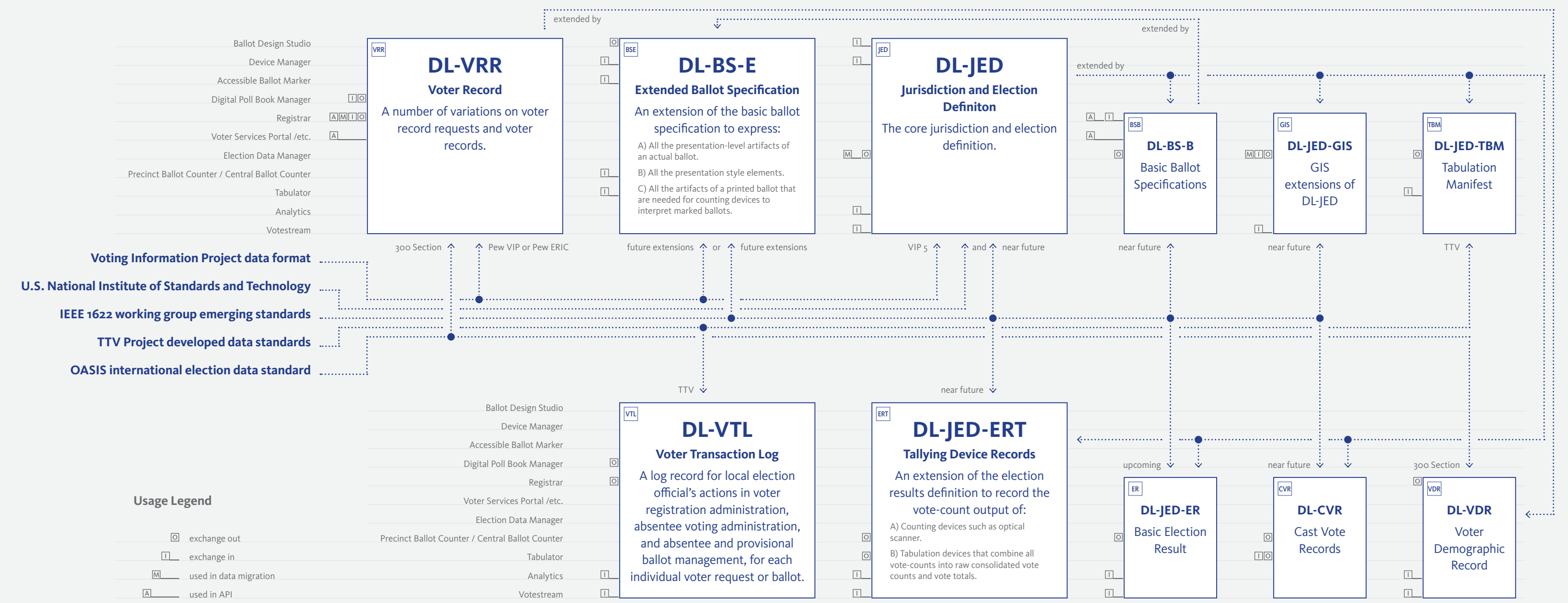
Managing: Analytics



Data

Data includes a set of open standards for election data, defined with the help of local election officials and formalized through major standards organizations.

The goal is to transform, normalize, aggregate, and publish election data to all citizens—in near real time.



Data

Election Data Manager

The data managed by the EDM comprises all of the information about an election, at the level of an individual jurisdiction.

Jurisdiction definitions: Districts, district type, precincts, precinct membership in districts, GIS data for precincts and districts, and a host of precincting information: precinct splits, sub-precincts, precinct-parts, per-election consolidations and reporting precincts, and street segment and/or GIS data to support mapping addresses to precincts.

Election definitions: Election (date, type, jurisdiction); contests, contest/district, candidates, candidate/contest, referendum, referendum/district, ballot-response, ballot-response/referendum, and a host of attributes that determine partisanship (or lack thereof) for contests and candidates, use (or lack) of write-ins, prioritization for ballot ordering, and more.

Basic ballot specifications: For a given election, for each precinct, the list of contests and referenda (including candidates, parties, write-in, straight-party, etc.) that will be on an official ballot for that precinct.

Tabulation Manifest: A manifest or checklist that specifies each precinct (or other vote tallying district) and the number of distinct tallies expected for one. For example, a typical precinct might have one tally for each day of early voting, one tally for each ballot counting device used on election day, and one tally for central ballot count run of absentee or provisional ballots.

Ballot Design Studio

The data managed by the BDS is wide ranging set of data that describe ballots from several viewpoints, used at different points in the BDS usage lifecycle for a specific election.

State-Specific Ballot Rules: Requirements for ballot content and presentation, derived from each state’s election law, regulations, or practice. These include rules for issues such as candidate rotation, straight-party voting, and voting instructions, as well as presentation-level issues such as the use of basic text formats (mixed case vs. uppercase, Roman vs. Italic).

Concrete Ballot Specifications: A complete ordered set of every text element that appears on each official ballot. These are created by extending an election’s basic ballot specifications – the contests and questions defined for each precinct listed in an election-definition dataset – with both metadata in the election definition and state-specific rules.

Stylesheets for Paper Ballots and Digital Ballots: The BDS’s ballot lifecycle starts with the acquisition of a per-election combination jurisdiction/election definition (either from the EDM or other systems compliant with VIP 5 and/or VSSC election definition standards) and the conversion of each of the election’s basic ballot specifications to a concrete ballots specification. At this point, stylesheets become the focus of interactive ballot design, beginning with human interaction with presentation level elements that define a ballot’s visual presentation, starting with a baseline that implements the ballot design standards that were defined by AIGA and EAC.

Extended Ballot Specifications: The end result of ballot design activity is twofold: finished ballots for hand-marking at polling places or by absentee voters; and finished ballots to be represented as a series of screens on a voting device. For paper ballots, the result is both a set of PDF files for printing the full set of ballot styles and also a set of concrete ballot specifications that include meta-data that is to be used by ballot counting devices to interpret marked ballots. For digitally presented blank ballots, the result is a set of concrete ballot specifications that include visual style elements for each screen of each ballot.

Data

Device Manager

The Device Manager does not manage data, but rather creates boot images for ballot casting and counting devices. These boot images include both the software that is specific to each device and the election-specific data needed by each device. These are:

Concrete Ballot Specifications: The finished ballot definitions and meta-data produced by the Ballot Design Studio.

Election Definition: The definition of the current election, created by the Election Manager and included along with concrete ballot specifications by the BDS.

Registrar

The Registrar manages a voter records database (VRDB) and implements a web service API for access to the VRDB, either as an integrated VRDB or as a wrapper around a legacy VRDB. The data in the VRDB includes:

Voter Registration Records and Requests: Voter personal information, geographic information, eligibility, participation history, membership in special voter groups, e.g., military, handicapped, protected/private.

Voter Transaction Logs: A log of transactions pertinent to each voter, involving voter requests and/or LEO activity. Includes: voter registration requests, LEO approval/rejection of such requests or of absentee ballots and provisional ballots; voter check-in for in person voting; mail-out of absentee ballot, and receipt of returned absentee ballot.

Voter Demographic Records: A subset of a voter record that uniquely identified each voter’s characteristics – but without any personal identifying information – including those needed for statistics and reporting of voter transactions, e.g.: percentage of total successful military absentee voters out of all military absentee voters, compared to similar success rate in the entire voting population.

Data

VSP, BusyBooth, and Balloteer

These components are clients of the Registrar and use its APIs for viewing voter records or submitting requests; there is little or no retained managed data, with the notable exception of log data.

Voter Registration Records and Requests: Via the Registrar API, these components make voter records requests and receive some parts of voter records.

Basic Ballot Specifications: Via the Registrar API, these components obtain the ballot information for a specific ballot tied to a specific precinct of a voter or of a location.

Voter Transaction Logs: A log of transactions pertinent to each voter, for example, online submission of a voter registration request or online completion of a form to be printed, signed, and mailed.

Digital Poll Book Manager and Digital Poll Books

The DPB Manager stores a copy of the voter roll data obtained from the Registrar or other standards-compliant source of voter records. Each DPB uses this data and records voter check-in events.

Voter Registration Records: A voter roll is the small subset of the information in a voter record that is needed for voter check-in using a poll book.

Accessible Ballot Marker

The device does not store or manage data outside of user sessions for indicating ballot selections, but it does use ballot data from the Ballot Design Studio:

Extended Ballot Specifications: Used to drive the presentation of ballot items and the collection of voter choices that are then presented on a printed paper ballot.

Ballot Counting Devices

The Precinct Ballot Counter and Central Ballot Counter both process paper ballots and create output data of two kinds:

Tallying Device Records: The vote tallies for each ballot item in a batch of paper ballots processed by the ballot counter.

Cast Vote Records: For each individual counted ballot, a record of all the votes recorded from that ballot, intended for use in risk limiting audits of the counting process.

Data

Tabulator

The device does not store or manage data, but it does consolidate and analyze data:

Tallying Device Records: Each output dataset of each run of each ballot counting device; used as input for both tally auditing and vote totaling. Consolidated into the Tabulator’s output dataset of all vote tallies, CVRs, and vote totals.

Cast Vote Records: Consolidated into the Tabulator’s output dataset.

Tabulation Manifest: The Tabulator uses the manifest created by the Election Manager (and included by the Device Manager in the Tabulator’s data) to audit the input set of vote tallies, to ensure that all and only the expected tallies are presented and accounted for.

VoteStream and Analytics

Each provides, stores, and manages the data from the datasets that it receives:

Jurisdiction and Election Definitions: Describe the election as a whole, including all ballot items and all vote tallying districts, include GIS data for each.

Basic Election Results: Tally data collected on election night, before the final set of tallies is available.

Tallying Device Records: That Tabulator’s consolidated output dataset of all final vote tallies.

Voter Transaction Logs: A log of transactions pertinent to each voter from each system that records voter transactions.

Voter Demographic Records: A subset of a voter record that does not contain personal identifying information, but does uniquely identify each voter and several characteristics of voters that are needed for statistics and reporting of voter transactions.

Guiding Principles

Accurate

List all voters and only eligible voters on voter rolls. Count votes without errors, as they were cast.

Secure

Ensure voter privacy, data integrity, system reliability, and proper authentication and authorization for access.

Transparent

Allow verification of required accuracy. Log all changes to guarantee accountability.

Verifiable

Enable everything that matters about an election to be independently verified, including accuracy and security.