

Voting System Risk Assessment

Election Process Models and Voting System Models

EAC Standards Board Draft

Voting Systems Risk Assessment Project Overview and Scope

Overview

At the end of FY2008, the Election Assistance Commission conducted a competitive procurement to obtain the services of an inter-disciplinary team to perform a scientifically founded comprehensive Voting System Risk Assessment. The University of Southern Alabama team, with Dr. Alec Yasinsac as the Principal Investigator, was selected. The results of this effort are expected to facilitate making informed decisions relative to future voting system standards. The study products will assist the EAC and the election community in developing a broadly-based consensus regarding what is a prudent and acceptable degree of risk for voting systems.

The effort is laid out in three phases. The first phase will create two sets of reference models: 1) election process models to define the operational context in which voting systems are used, and 2) voting system models by generic technology type (direct recording electronic, precinct count optical scan, central count optical scan, vote by mail, vote by phone, internet voting, hand counted paper ballots) to identify the variations in threats and potential impacts across the range of voting technologies.

In the second phase, these models will be analyzed to identify the threats associated with each voting technology and to perform risk assessments of the potential harms and possible mitigations for these threats. The intention of this analysis is not to rate one technology as “better” or “worse” than another or to identify the “best” system, but rather to identify the security requirements necessary for all types of systems to achieve a specified level of confidentiality, integrity, and availability.

In the third phase, the team will recommend an appropriate level of protection for voting systems based on the methodology defined in NIST SP 800-53, *Recommended Security Controls for Federal Information Systems*. They will also document the models and analyses so they will be easy to use by the EAC, election officials, and other stakeholders. The team will use this risk model to construct a Voting System Risk Assessment tool for use by the EAC and the elections community. This will enable a user to graphically manipulate model parameters to perform “what-if” types of analysis. Adjusting parameters will re-run the model to show the impact of re-prioritizing threats and/or modifying degrees of risk.

Tasks for the Standards Board

The project is nearing the completion of Phase I. Before proceeding to the next phase, it is important to have Standards Board approval on the scope of the analysis. The scope can be adjusted at this point with manageable schedule and cost impacts, but it will not be possible to make significant scope adjustments later. The EAC wants the Standards Boards to comment on the domain models, the activity and data flow diagrams, and the glossary contained in the document. Here are some questions to consider when doing your review:

1. Do the domain models depict all the important elements and their correct relationships?
2. Do the activity diagrams correctly identify and relate the persons and steps involved in each activity?
3. Are there missing elements?
4. Are there significant, widely implemented variations that need to be reflected? (Although please keep in mind that it is impractical to cover all of the variations.)
5. Do the data flow diagrams capture all the significant types of information that are used or created by each activity?

Note: Some terms in the glossary are defined somewhat differently than in common elections community usage or the Voluntary Voting System Guidelines. These definitions were created to reflect how these terms are used in this modeling activity. Consequently, the easiest way to review the glossary is to refer to the definitions while going through the diagrams, so you can consider the terms in the context of how they are used in this analysis.

Project Scope Discussion

As stated above, the purpose of this effort is to perform a risk assessment of voting systems. To do this, voting systems have to be examined in the context of the overall election administration process. The scope was determined, in part, by examining the movement of the ballot through the election process. The scope of the project was linked with ballot programming at the beginning and recount at the end of the voting system process. The equipment and the processes that move ballots through the election process are considered for all forms of voting system.

Some elements of election administration are more indirectly associated with voting system performance than others. For example, there are many activities essential to maintaining the infrastructure needed to conduct elections, i.e., recruiting and training staff, storing and maintaining equipment, acquiring locations for polling places. While a deficiency in any of these activities may have an impact on how well the voting system functions, it is a fairly low impact. So in the interest of economy and efficiency of effort, we have eliminated some elements from consideration in the risk assessment. The following list of election administration functions illustrates what is included and what is not.

- Voter Registration – not included
- Candidate Qualification – not included
- Voting System Storage and Maintenance – not included
- Polling Place Administration (e.g., obtaining locations, recruiting pollworkers) – not included
- Election Definition (e.g., type of election, voting period, ballot instructions, ballot style mapping, tabulation rules) – included
- Voting System Set Up and Validation (e.g., printing paper ballots, programming electronic voting devices, logic and accuracy testing, pollworker training, e-pollbook/voter list creation) – not included
- Voting System Deployment (e.g., setting up early voting centers, precinct polling places, absentee mailing) – not included
- Voting (e.g., verify voter identification and eligibility, present ballot to voter, selection and verification by voter, ballot choices recorded and stored in ballot box/optical scan memory/direct recording electronic cast vote record/web-based server) – included
- Tabulation (e.g., tabulate in-person votes [precinct count optical scan/central count optical scan, direct recording electronic]; canvass absentee, provisional, etc., ballots; initial [unofficial] results reporting; special processing [audit, recount, etc.]; special processing/final local jurisdiction reporting) – included
- Election Closeout (e.g., results certified, post-certification system audit, data archived, voting system returned to storage) – included.

Summary

As defined in the solicitation and award documentation, this project will conduct a voting system risk assessment. The project scope is geared toward the procedures and equipment that move the ballot through the electoral process. The end goal of the risk assessment is to create a work product that allows election officials, policy makers, equipment manufacturers, and test laboratories to effectively evaluate the risks posed to a specific voting system and costs and benefits of mitigating those risks

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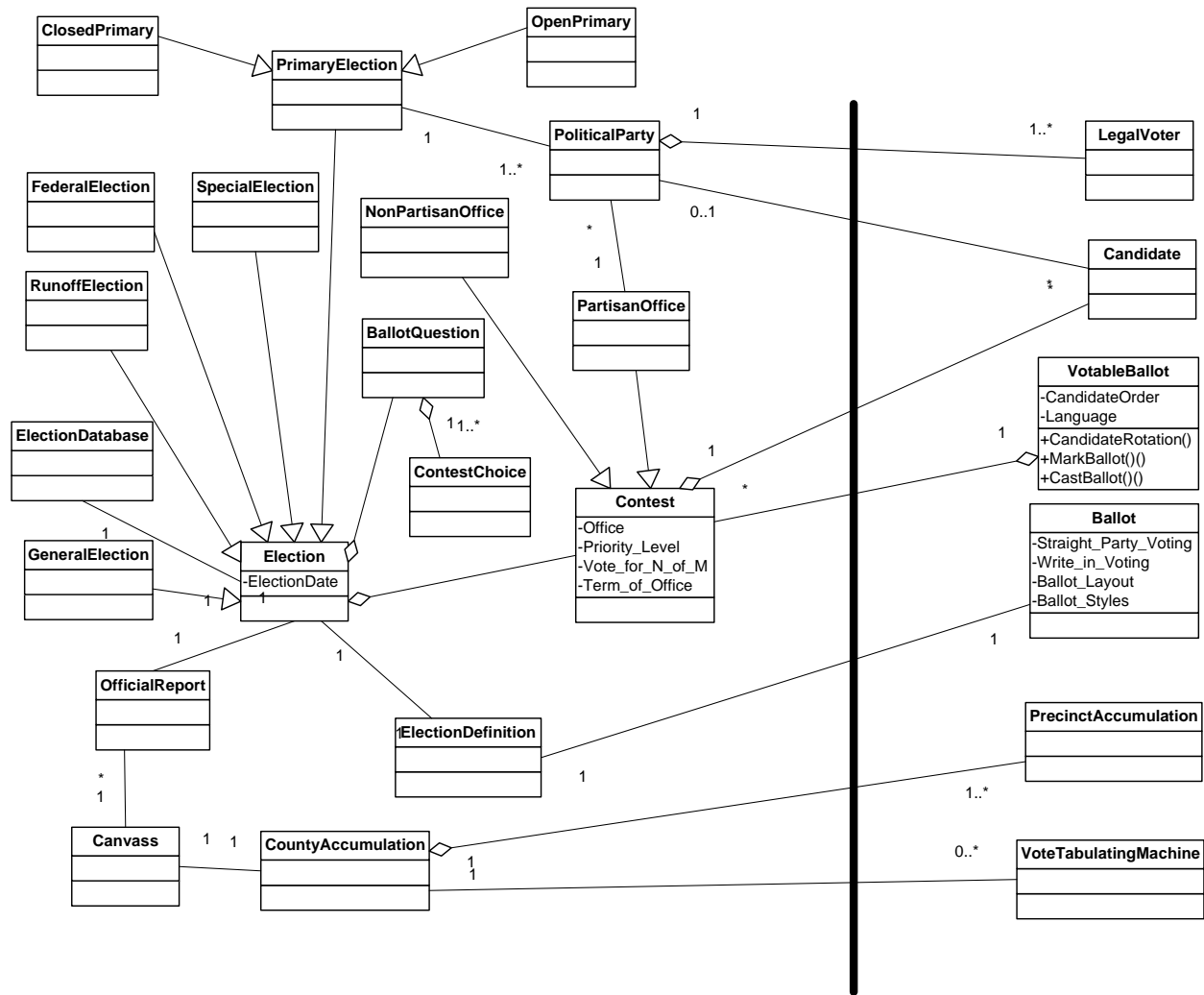
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1 Domain Models

The VSRA project's goal -- developing guidance on risk assessment of voting systems -- has as a pre-requisite the definition of voting systems models, so that risk assessment methodologies can be applied to the models. The voting system models, in turn, have as a pre-requisite an election system model, of which the voting system is a part. A clear distinction is needed because the project's risk assessment work focuses specifically on voting, rather than the larger group of election activities. Defining an election system model helps demarcate the scope of risk assessment work and provides context for how the voting systems fit into the broader election processes.

As a result, the election system model is the starting point for following the modeling work and is the basis for understanding where the voting system model begins and ends. The election system model is intended to capture election activities at a high level, including the entire set of voting system activities -- which are modeled as one activity in the election systems model. Understanding of this high level view depends on two critical parts of the election system model: a Glossary of Key Terms, and a set of Domain Models that illustrate the relationships between many of the key actors, activities, and information defined in the glossary.

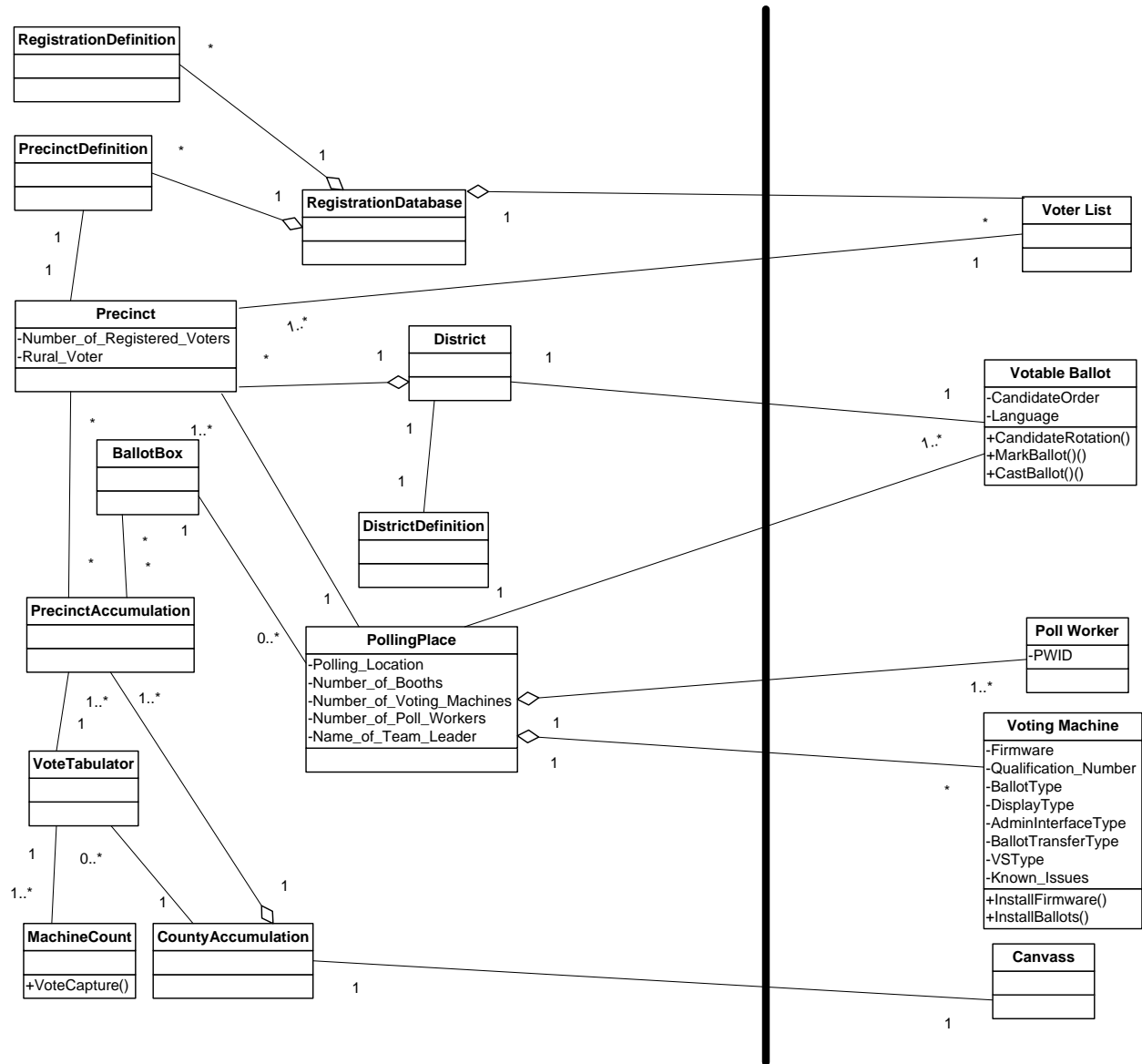
1.1 Election



1-1 Election Domain Model¹

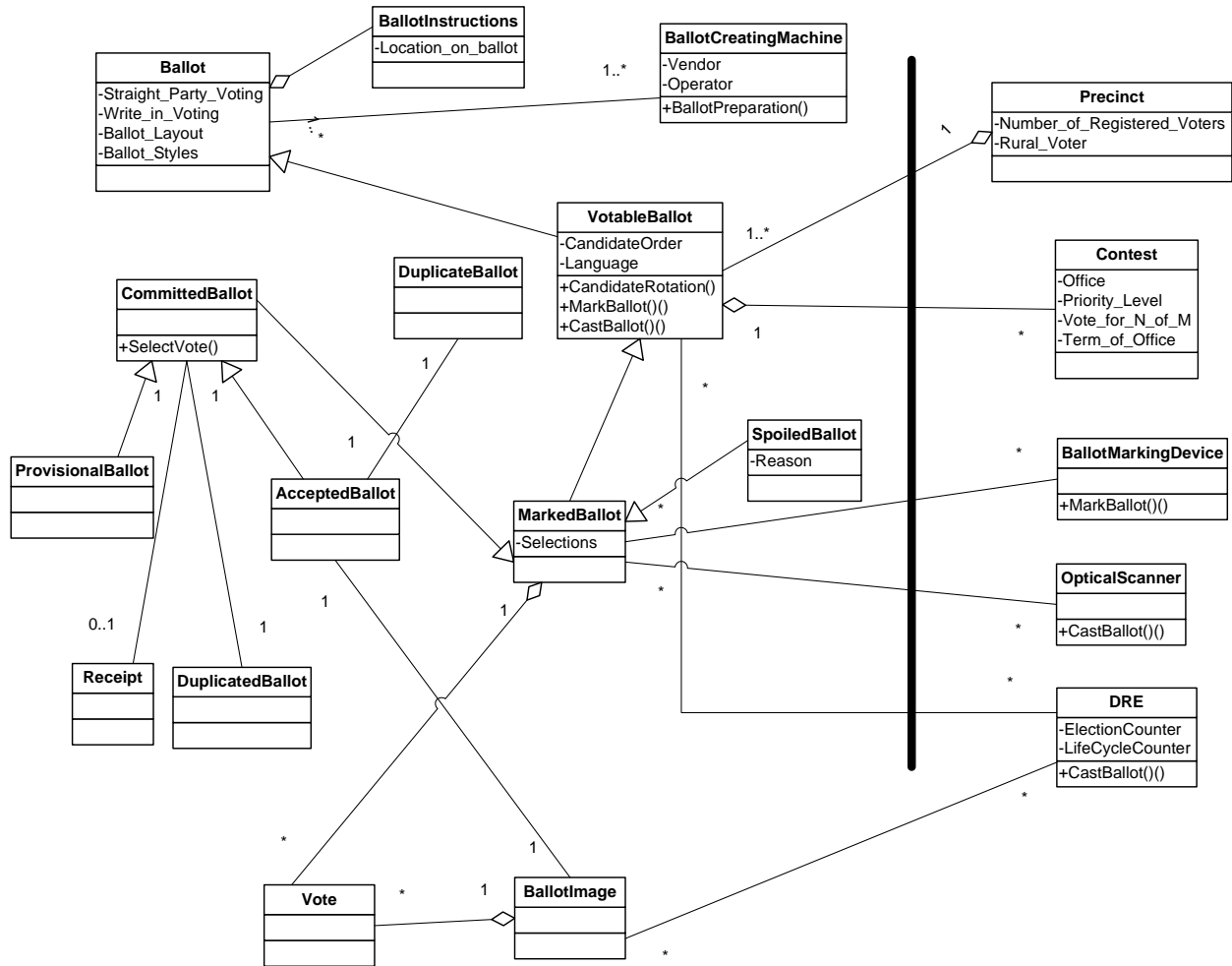
¹ A Key to Model Symbols is located in Section 5

1.2 Precinct



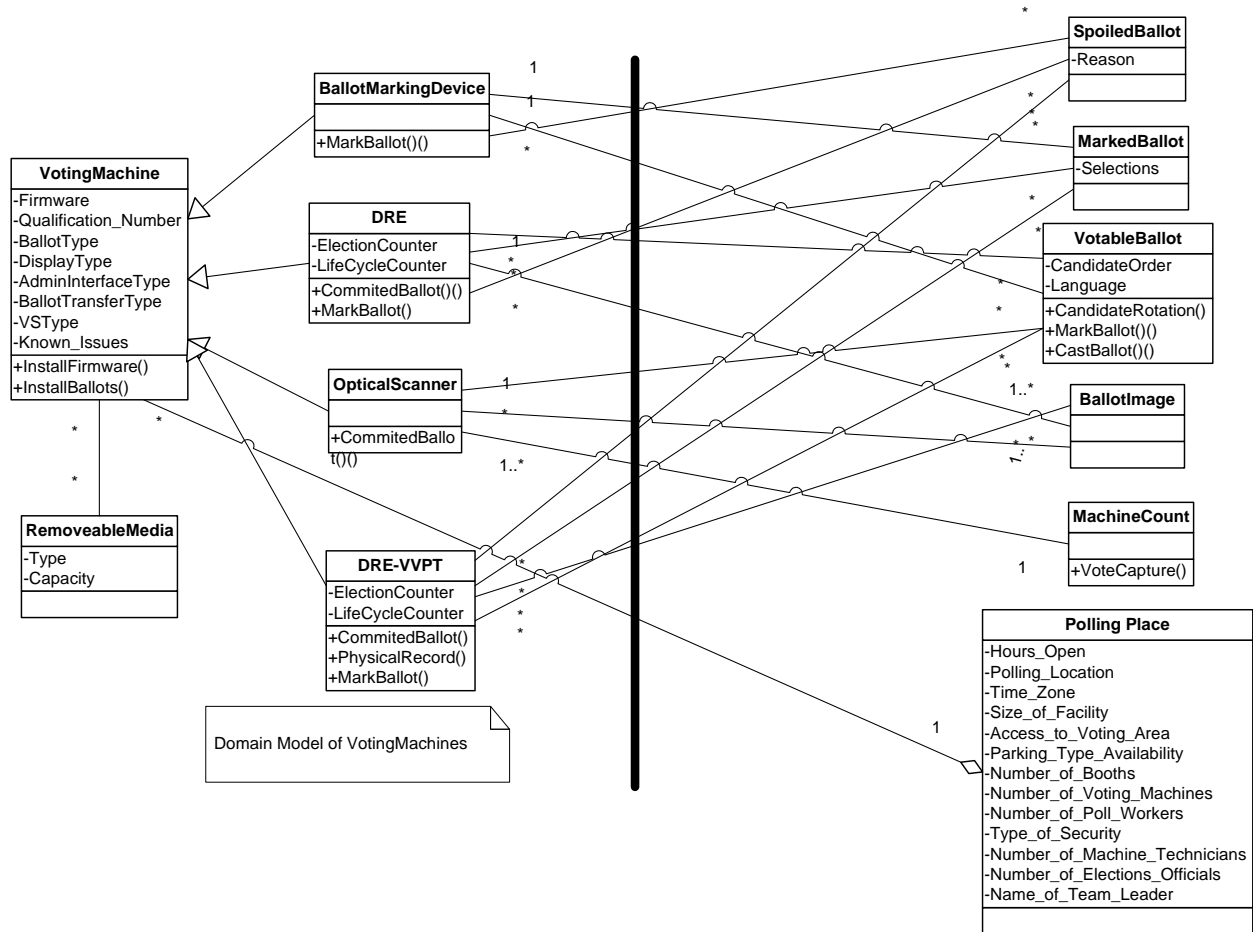
1-2 Precinct Domain Model

1.3 Ballot



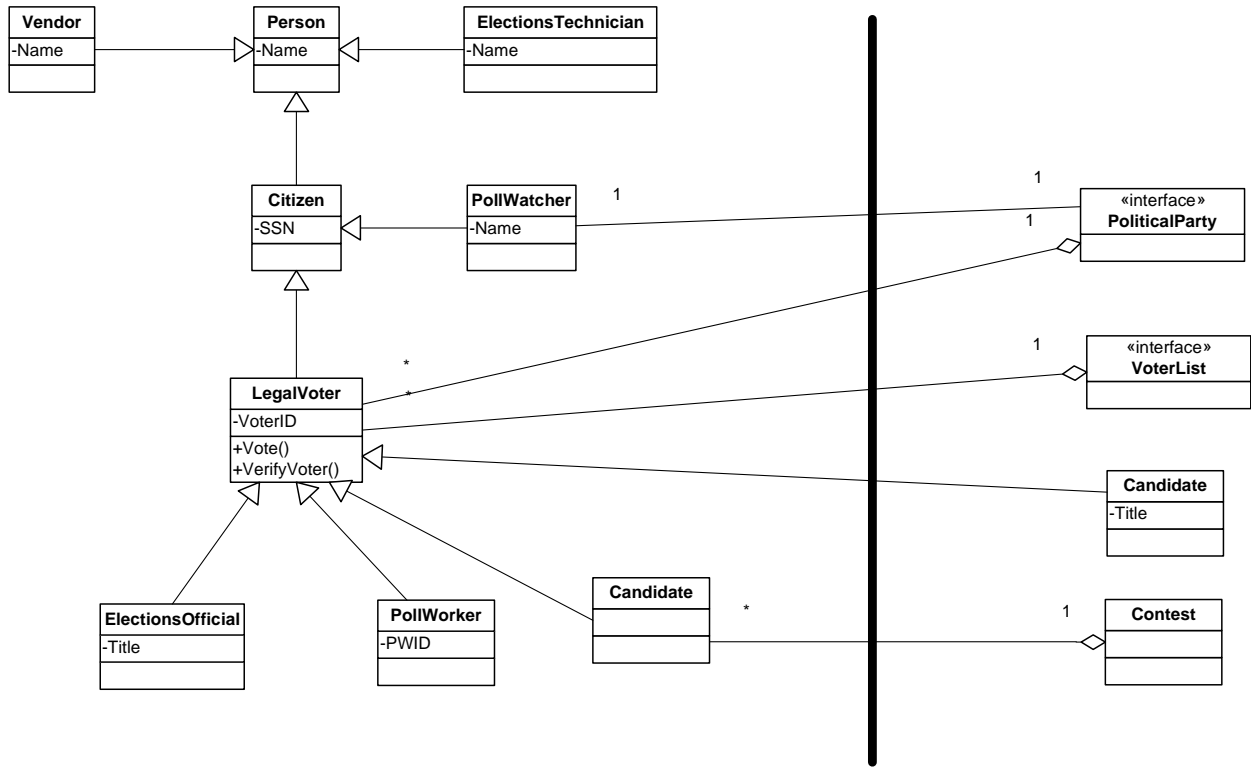
1-3 Ballot Domain Model

1.4 VotingMachine



1-4 Voting Machine Domain Model

1.5 Person

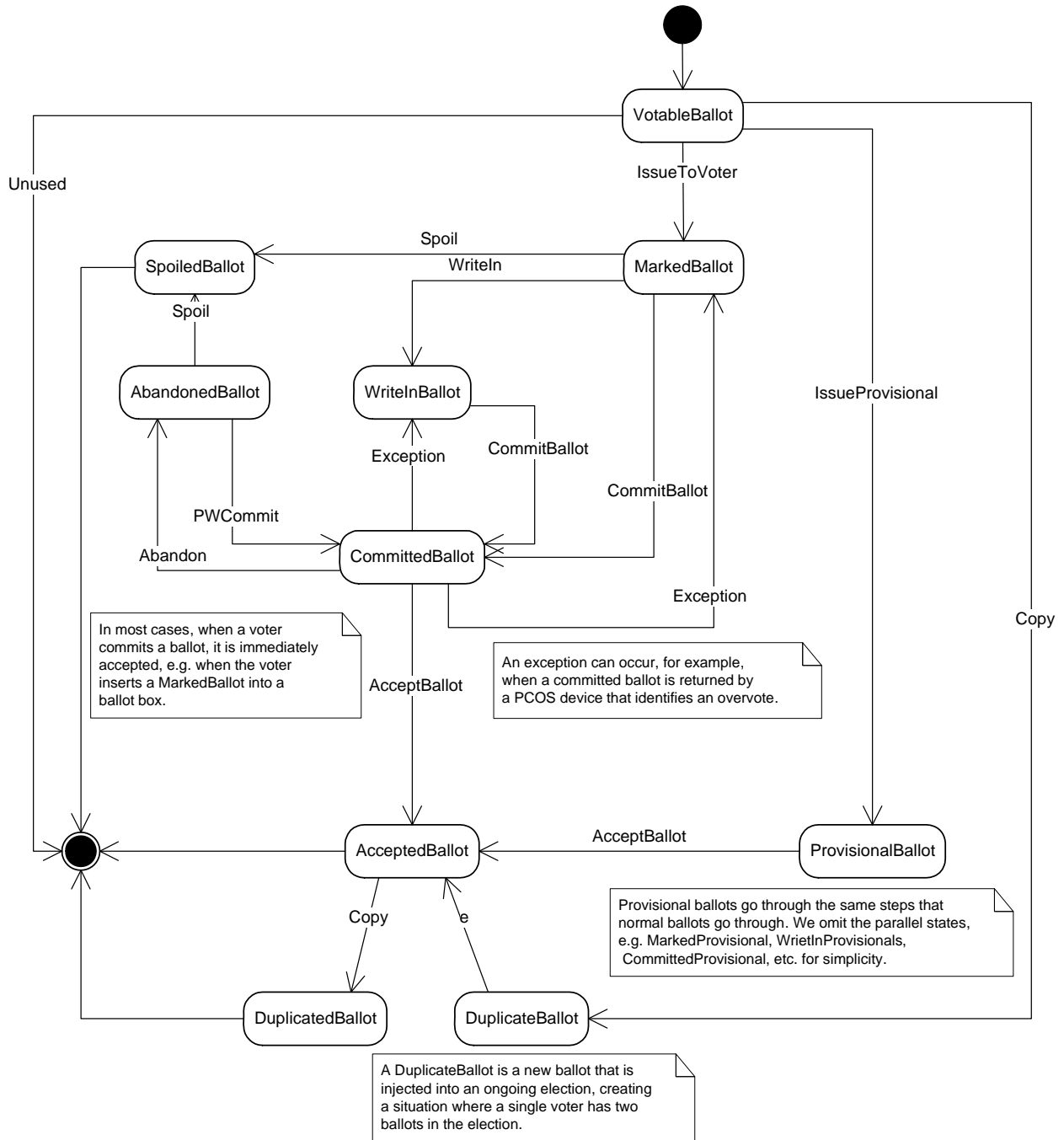


1-5 Person Domain Model

2 State Transition Diagrams

State transition diagrams describe the various states objects such as ballots and voters can have. Because objects change as they travel through processes, it is helpful to understand all of their potential states before considering how the system is changing (transitioning) them.

2.1 Ballot



2-1 Ballot State Transition Diagram²

² A Key to Model Symbols is located in Section 5

VotableBallot

A **VotableBallot** is an instance of a **BallotStyle** that incorporates rotation rules and **BallotFormat** to form a physical, electronic, audio, etc. ballot that a voter can mark or otherwise use to indicate their selections. Every distinct, legitimate ballot used in an election is termed a **VotableBallot**.

Since **VotableBallots** become **MarkedBallots** when they are issued to a voter, **VotableBallots** remaining at the end of the **VotingPeriod** are unused ballots.

MarkedBallot

A **MarkedBallot** is a **VotableBallot**, physical or electronic, that has been presented to a voter during **VoterInteraction**; that is, a **VotableBallot** becomes a **MarkedBallot** when it is presented to the voter before it is actually marked.

CommittedBallot

A physical or electronic **MarkedBallot** that contains the selections of a **Voter** in an **Election**, which are final and irreversible with respect to the **Voter**. A **CommittedBallot** that is a **BallotImage** may contain only **Votes**, while a **CommittedBallot** that is a **PhysicalBallot** usually contains all **Contests** but reflects each **Vote** with a predefined **LegalMark**.

AcceptedBallot

An **AcceptedBallot** is a **CommittedBallot** that:

- Is in the possession of **ElectionsOfficials** and
- Has successfully negotiated all filtering processes prior to **Canvass** and has retained its status as a legal ballot

SpoiledBallot

A **SpoiledBallot** is a **MarkedBallot** that whose votes will not be included in the **ContestVoteTotals**, but for which a replacement **VotableBallot** is provided to the **Voter** that spoiled the **Ballot**.

AbandonedBallot

A **MarkedBallot** that was not **Committed** by the **Voter**.

WriteInBallot

A **WriteInBallot** is an instance of a **MarkedBallot** that includes at least one contest in which the voter made a write-in selection. Write-in selections generally cannot be interpreted by an optical scanner.

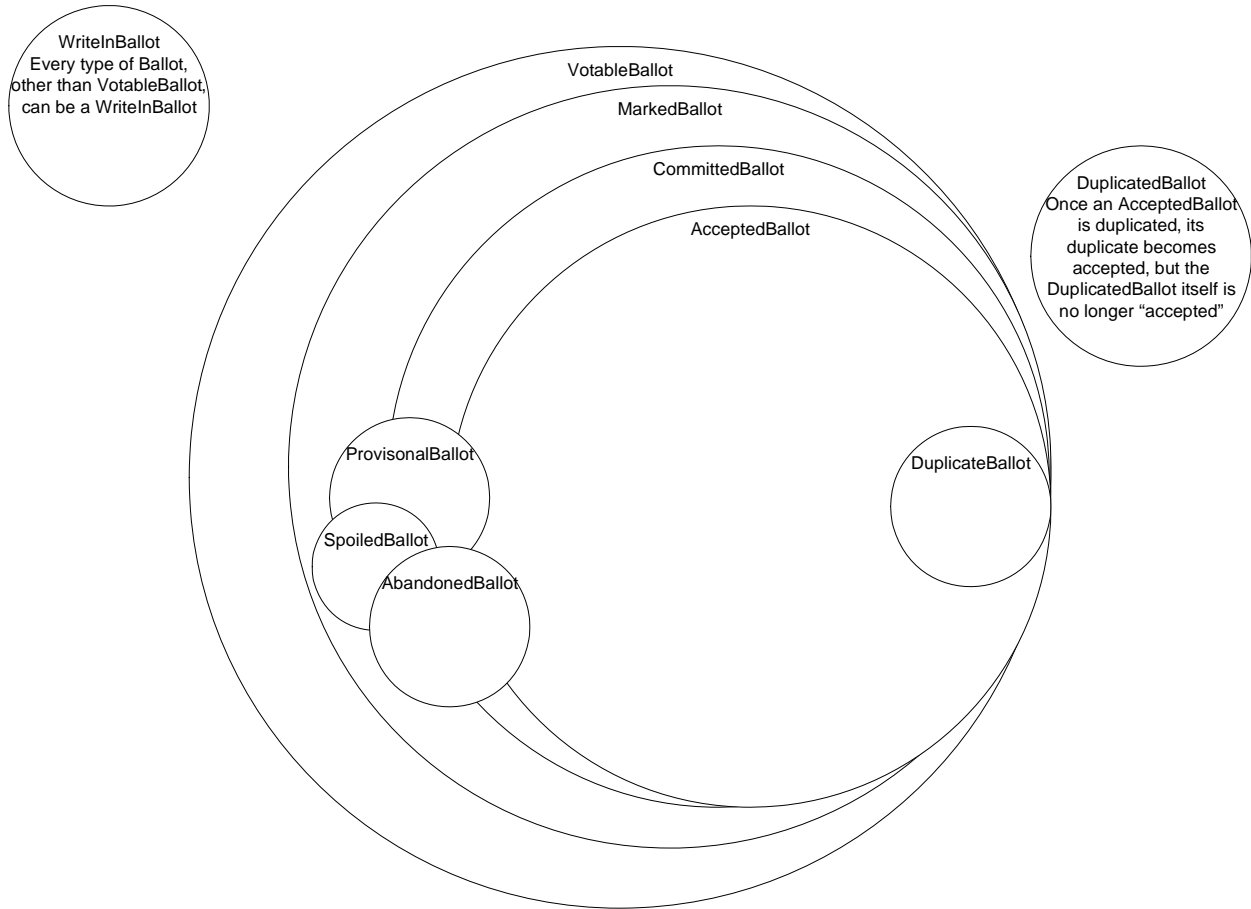
DuplicatedBallot

A **DuplicatedBallot** is an instance of an **CommittedBallot** that was duplicated by elections officials to facilitate further processing, e.g. to create a mark-sense ballot from an **AcceptedBallot** that was damaged or otherwise cannot be read by an optical scanner. **DuplicatedBallots** require exceptional handling procedures to ensure that:

Each DuplicateBallot is included in the official count and

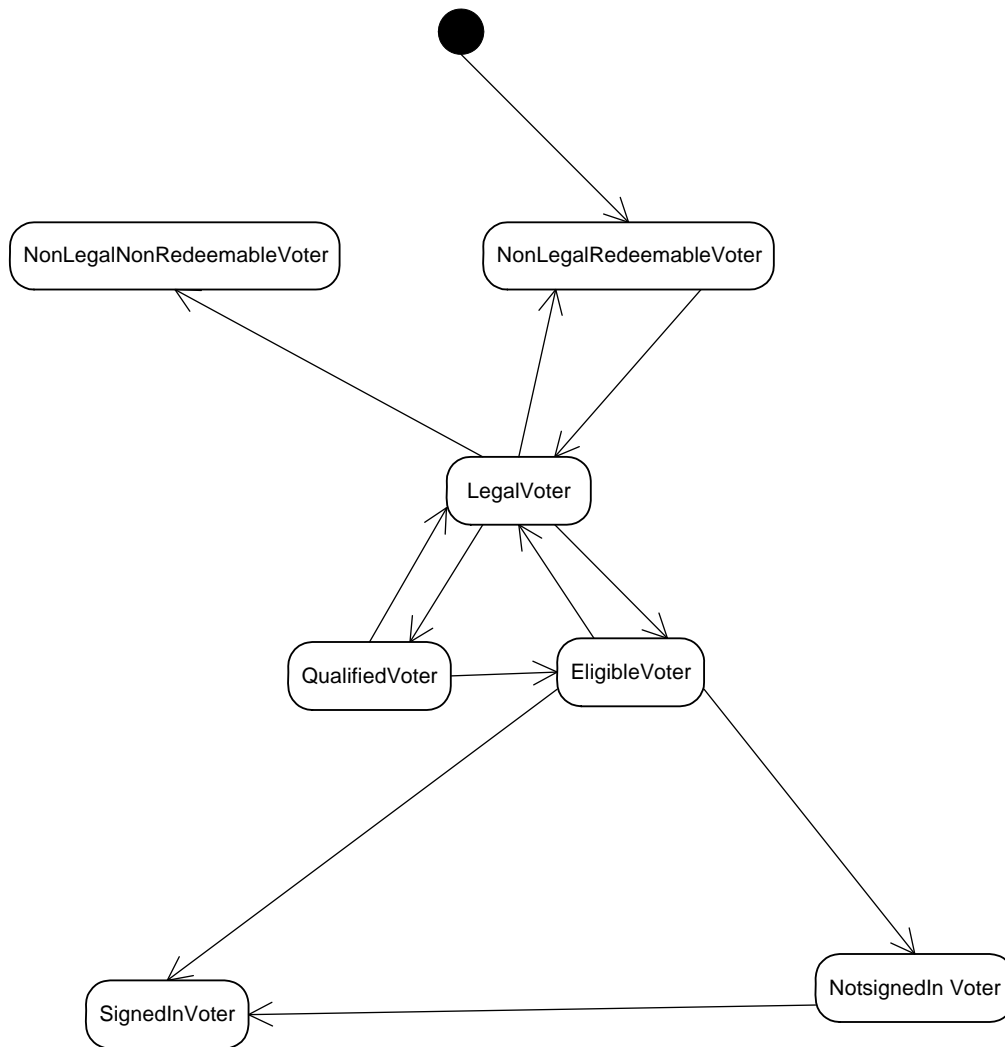
The DuplicatedBallot, of which any DuplicateBallot is a duplicate, is NOT included in the official count and

Ballot counts are carefully recorded to ensure that accurate numbers are available for any subsequent ElectionAudit.



2-2 Ballot Venn Diagram

2.2 Voter



2-3 Voter State Transition Diagram

NonLegalNonRedeemableVoter

NonLegalNonRedeemableVoter - In some states this refers to felons. Also, these can be citizens who have lost their citizenship & are unable to recover it (e.g., as a result of being convicted of treason).

NonLegalRedeemableVoter

NonLegalRedeemableVoter refers to citizens who are not yet LegalVoters for various reasons (i.e. under 18 years old) or those who have lost their status as LegalVoters due to felony conviction or mental incapacity for example. These citizens can become LegalVoters. In some states, this can include felons whose voting rights may be restored.

QualifiedVoter

QualifiedVoter is a type of LegalVoter who has registered to vote but did not register in time to be an EligibleVoter for a specific election. A QualifiedVoter and an EligibleVoter can both return to LegalVoter status if the voter moves and is no longer registered to vote in their new location.

EligibleVoter

An LegalVoter who has registered to vote meeting all federal and state requirements and can therefore receive a VotableBallot. It is possible for an individual to be qualified to vote but not be an EligibleVoter. This can occur if the individual registers to vote after the deadline for a specific election. In this case, the person will be a QualifiedVoter but not an EligibleVoter for that election.

A QualifiedVoter and an EligibleVoter can both return to LegalVoter status if the voter moves and is no longer registered to vote in their new location.

LegalVoter

An individual who meets the federal age and citizenship requirements and any additional requirements define by their state of residence and who is not disqualified by any other criteria (e.g. felon).

SignedInVoter

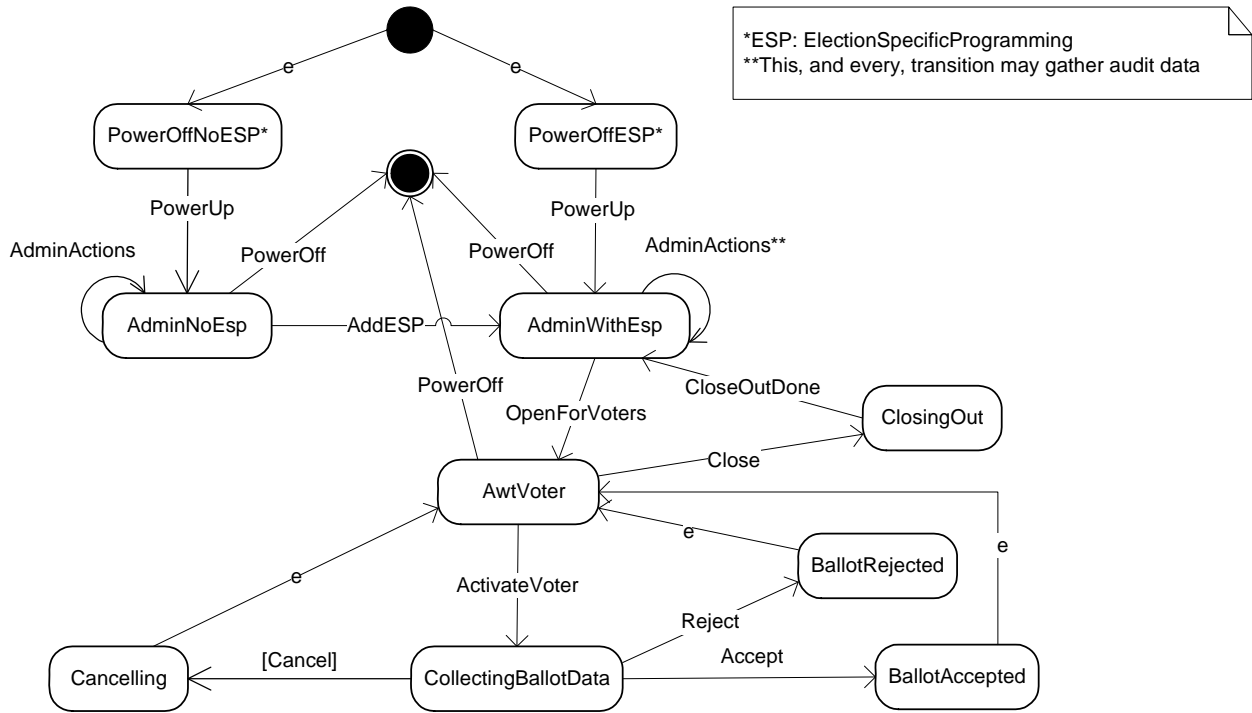
An EligibleVoter who has signed in at the PollingPlace for the current Election. The counterpart to SignedInVoter is NotSignedInVoter.

NotSignedInVoter

An EligibleVoter who has not signed in at the PollingPlace for the current Election. The counterpart to NotSignedInVoter is SignedInVoter.

A NotSignedInVoter, once they have signed in for the current election at the polling place, becomes a SignedInVoter

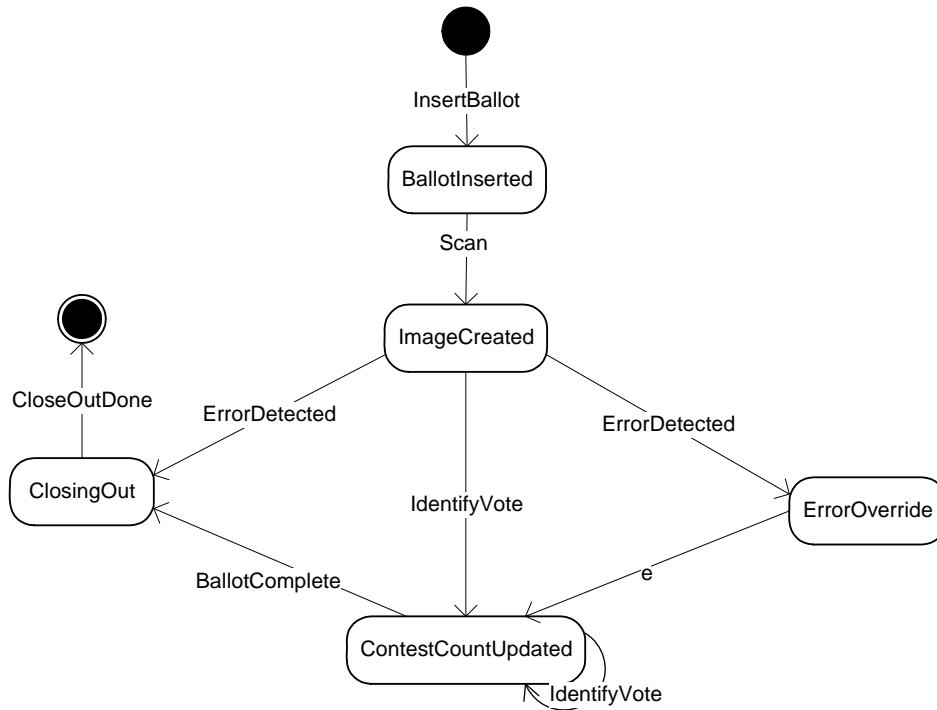
2.3 VotingMachine



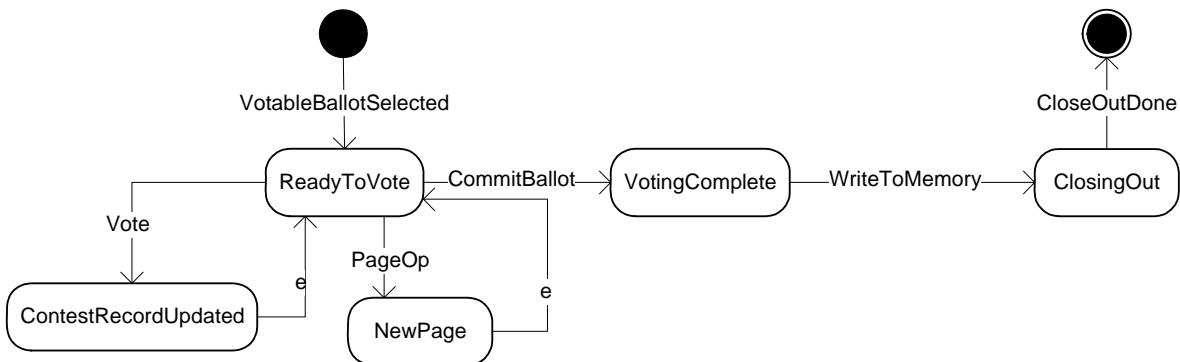
2-4 Voting Machine State Transition Diagram

CollectingBallotData

Voting machines collect ballot data according to their voting paradigm. Optical Scanners scan paper ballots, while touch screen machines interact with voters to create ballot images.



2-5 Collect Ballots by Scanning State Transition Diagram

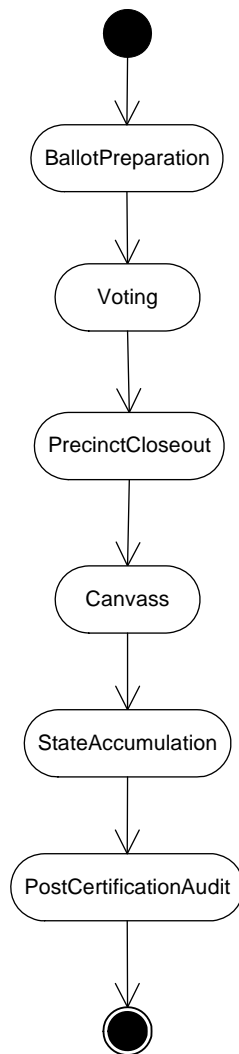


2-6 Collect Ballots by Touchscreen State Transition Diagram

3 VotingSystem

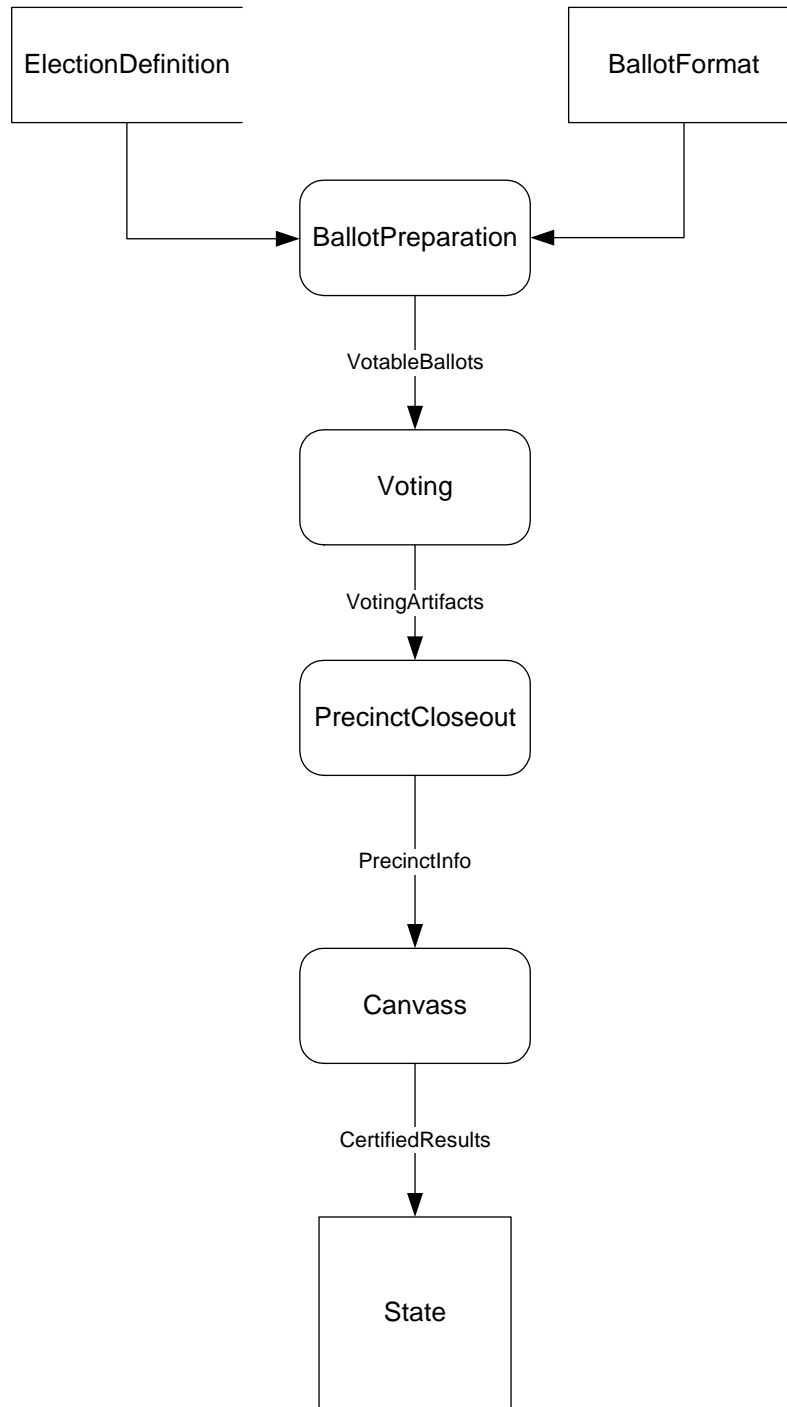
The voting system models begin with the following top-level activity diagram. As this activity diagram shows, the voting system at the highest level has been divided into six activities. Each activity is briefly described below followed by additional diagrams and information. Details are found in the diagrams associated with each activity and subsequent activities generally have additional diagrams and information to describe their detail. The complete voting process is understood by proceeding sequentially through each of these top level activities.

For the purposes of this project, voting system is defined as the equipment (including hardware, firmware, and software), materials, and documentation used to define elections and ballot styles, configure voting equipment, identify and validate voting equipment configurations, perform logic and accuracy tests, activate ballots, capture votes, count votes, reconcile ballots needing special treatment, generate reports, transmit election data, archive election data, and audit elections.



3-1 Voting System Activity Diagram³

³ A Key to Model Symbols is located in Section 5

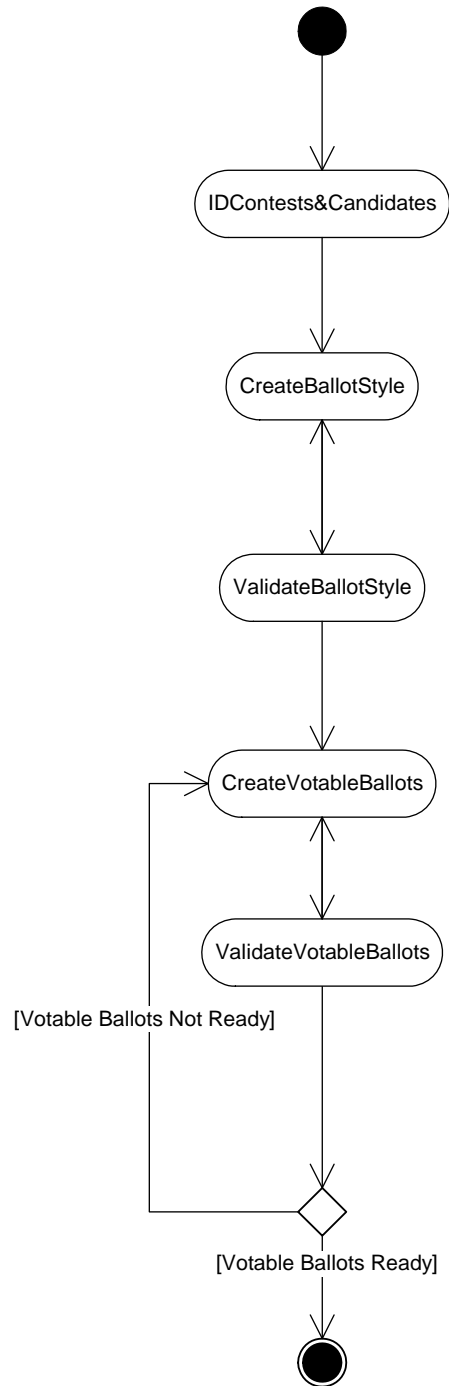


3-2 Voting System Data Flow Diagram⁴

3.1 BallotPreparation

Creation of the VotableBallots to be used in an election by selecting the specific contests to be represented and applying the BallotFormat and related instructions for each distinct VotableBallot. BallotPreparation also includes preparing and testing election-specific software containing these selections.

⁴ A Key to Model Symbols is located in Section 5



3-3 Ballot Preparation Activity Diagram



3-4 Ballot Preparation Data Flow Diagram

IDContests&Candidates

IDContests&Candidates identifies the specific contests, and the qualified candidates, that will appear on each BallotStyle for the election.

CreateBallotStyle

ElectionsOfficials combine the contest and candidate data that is relative to the election with state and local policy on BallotFormat to generate the final form for each BallotStyle for the election.

ValidateBallotStyle

ElectionsOfficials review and test each BallotStyle for accuracy and effectiveness. LogicAndAccuracyTesting is one validation approach in the ValidateBallotStyle process.

CreateVotableBallots

ElectionsOfficials utilize validated, final BallotStyles to mass produce VotableBallots for the election.

ValidateVotableBallots

ElectionsOfficials may review and test VotableBallots for accuracy and effectiveness, e.g., by reviewing samples of printed VotableBallots or by examining a samples of installed touch screen devices.

AllVotableBallotsReady?

The BallotPreparation process does not end until every VotableBallot that is required for the election is ready to be used [1]. This decision is made by ElectionsOfficials using feedback from the ValidateVotableBallots, ValidateBallotStyle, and the Voting processes when necessary.

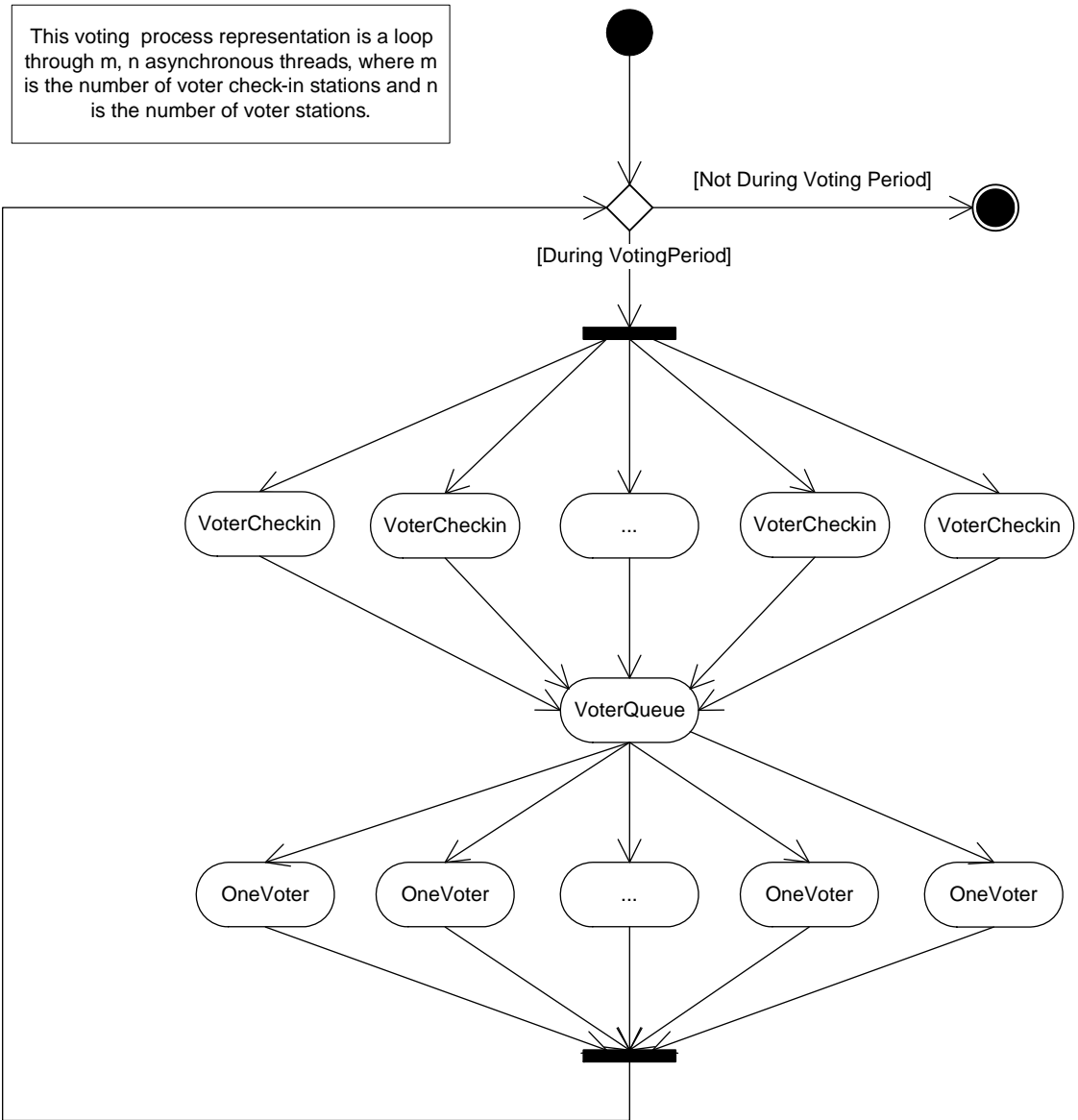
3.2 Voting

There are two activities that occur during the voting period:

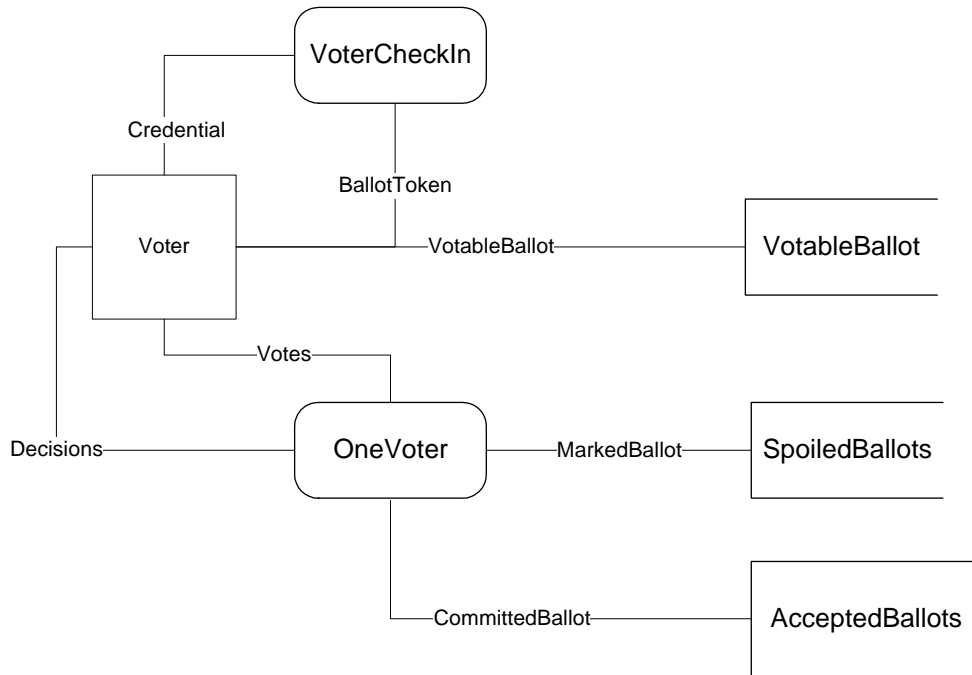
- The voter is authenticated and receives a ballot and
- The voter marks and commits the ballot.

These are the only two required steps whether in a precinct or voting remotely.

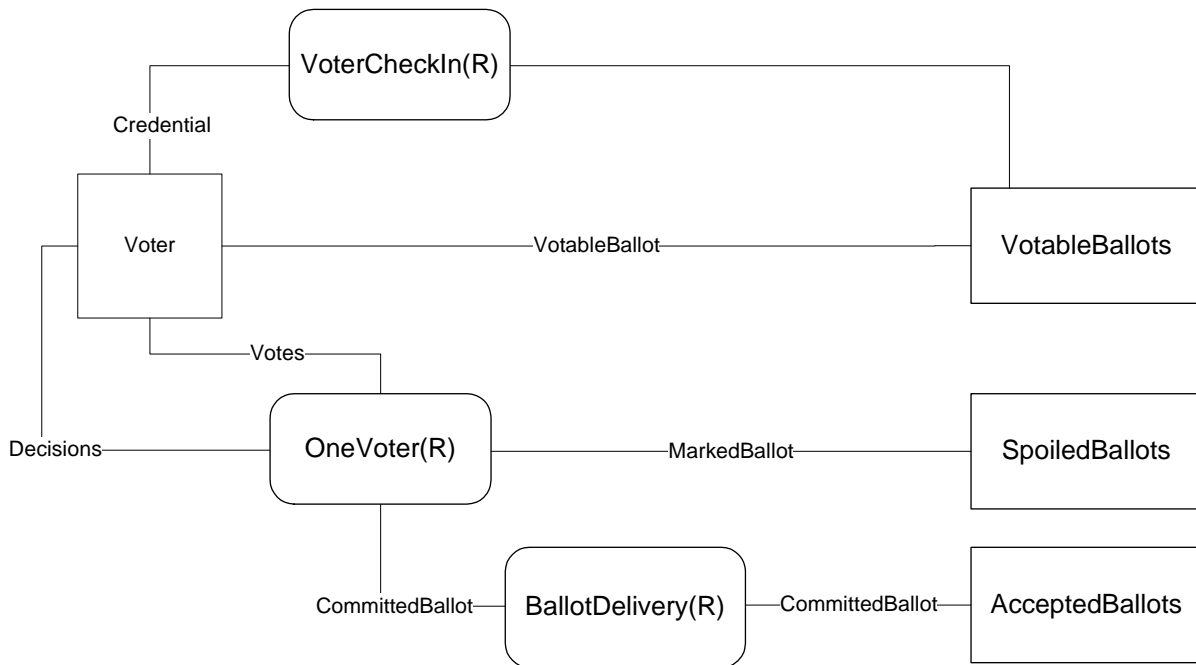
As a naming convention, we distinguish remote operations by suffixing the function name with predicate notion of "(R)" for functions that are specific to remote voting.



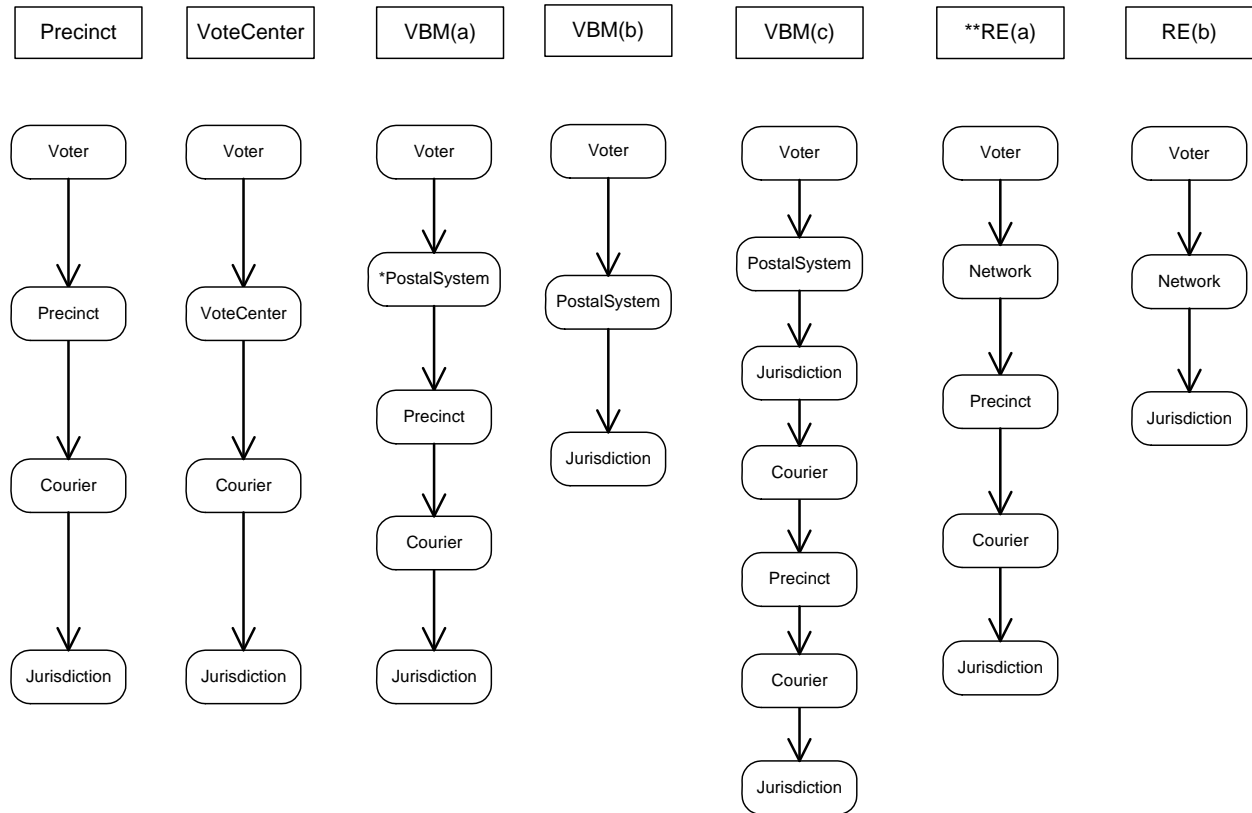
3-5 Voting Activity Diagram



3-6 Voting Data Flow Diagram



3-7 Voting (Remote) Data Flow Diagram



*Refers to any postal service, USPS, FedEx, etc. permitted to deliver VoteByMail CommittedBallots. In some instances, VoteByMail CommittedBallots may be delivered in person.
 **RE = Remote Electronic voting. This includes VoteByInternet, VoteByPhone, etc.

3-8 Ballot Possession Sequence by Voting System

PollingPlace

A PollingPlace is a facility where voters may cast their ballots in person. There are several types of polling places utilized in elections, including:

Election Day Precinct-Specific Polling Place – Each voting precinct is assigned to a unique polling place.

Election Day Consolidated Precinct Polling Place – Two or more voting precincts are assigned to a unique polling place. This is often based on several factors, including the number of voters in each precinct, size/location of the polling place facilities and the expected voter turnout for each polling place.

Election Day Vote Center (jurisdiction-wide) – Several polling place/vote centers strategically located throughout the jurisdiction where any voter in the entire jurisdiction can vote on Election Day.

Election Day Vote Center (regional) – Several polling place/vote centers strategically located by region where any voter within a specific region can vote on Election Day.

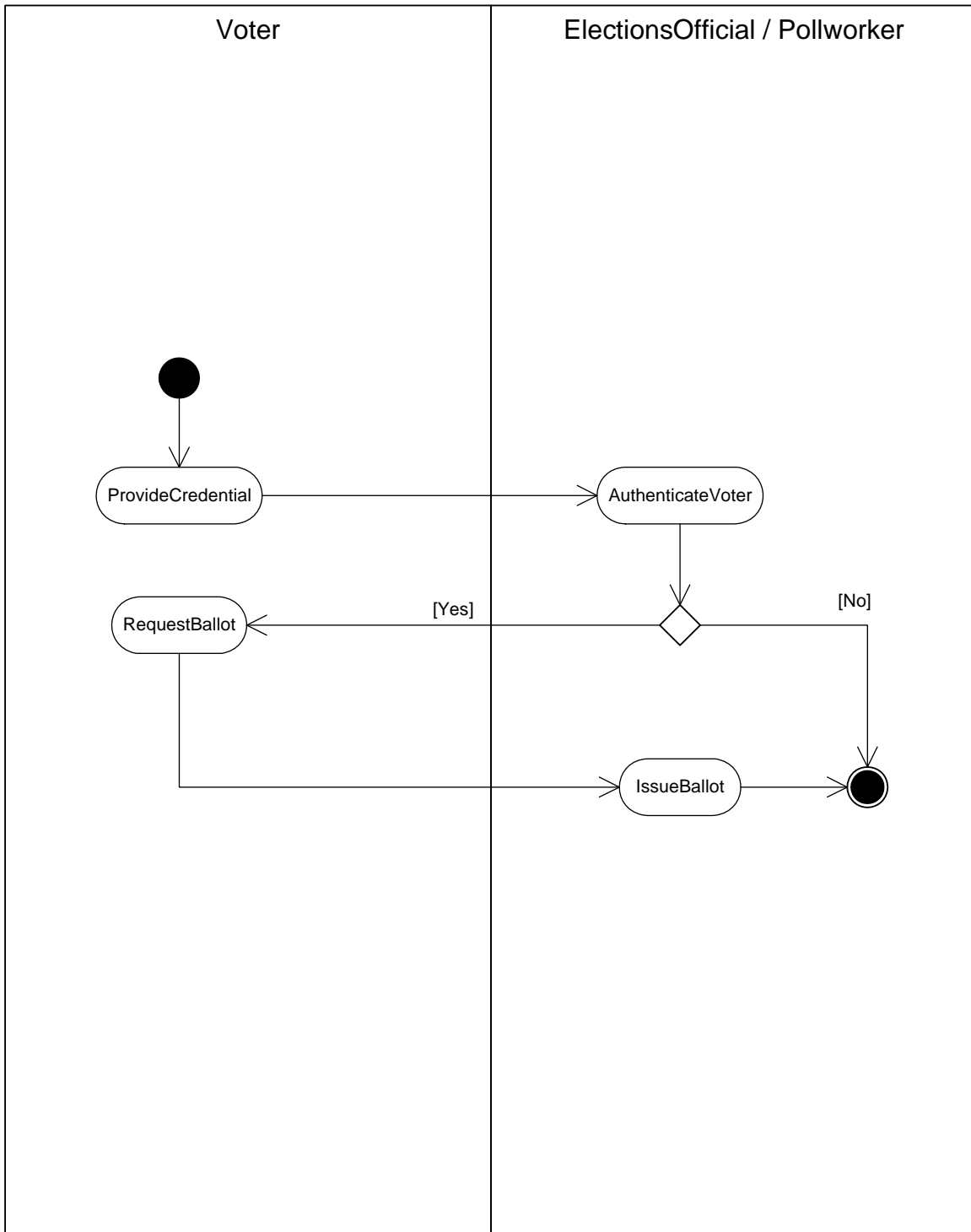
Early Voting Vote Center (jurisdiction-wide) – Several early voting vote centers strategically located throughout the jurisdiction where any voter in the entire jurisdiction can vote during the designated early voting time period.

Early Voting Vote Center (regional) – Various early voting vote centers strategically located by region where any voter within a specific region can vote during the designated early voting time period.

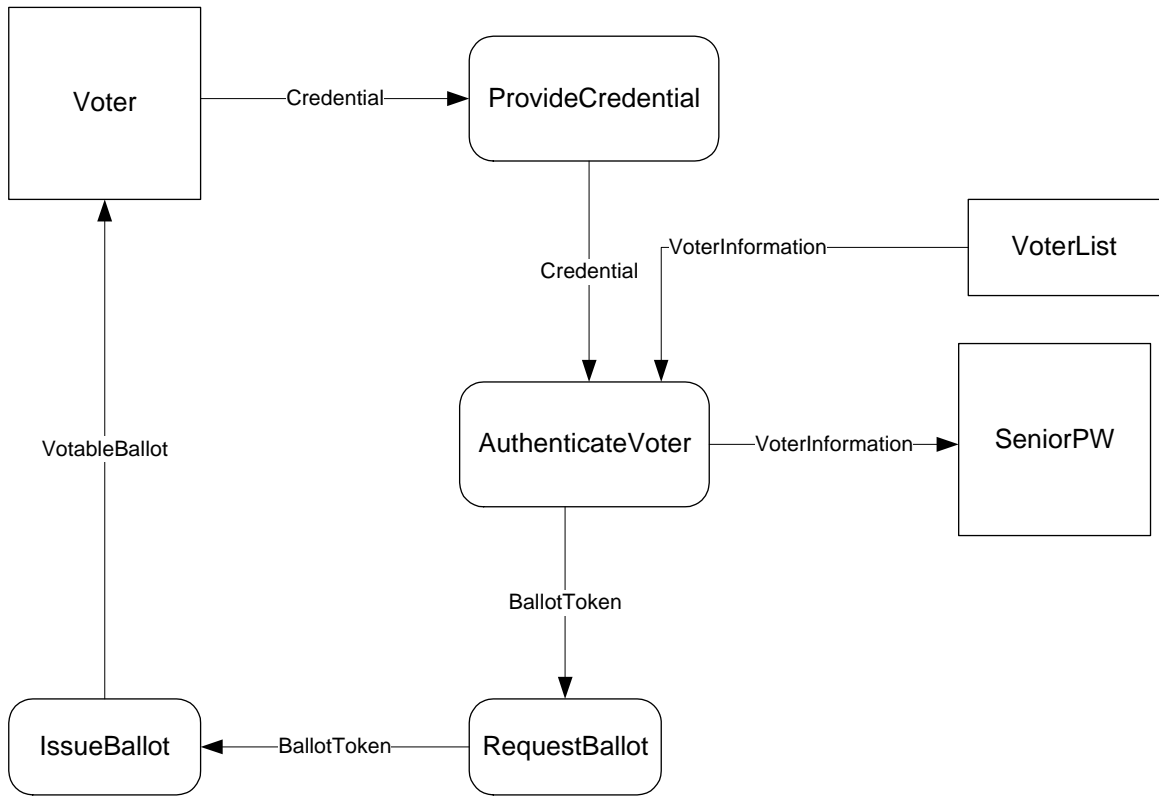
We model PollingPlace functionality into two separate components:

- VoterCheckIn
- OneVoter

VoterCheckIn

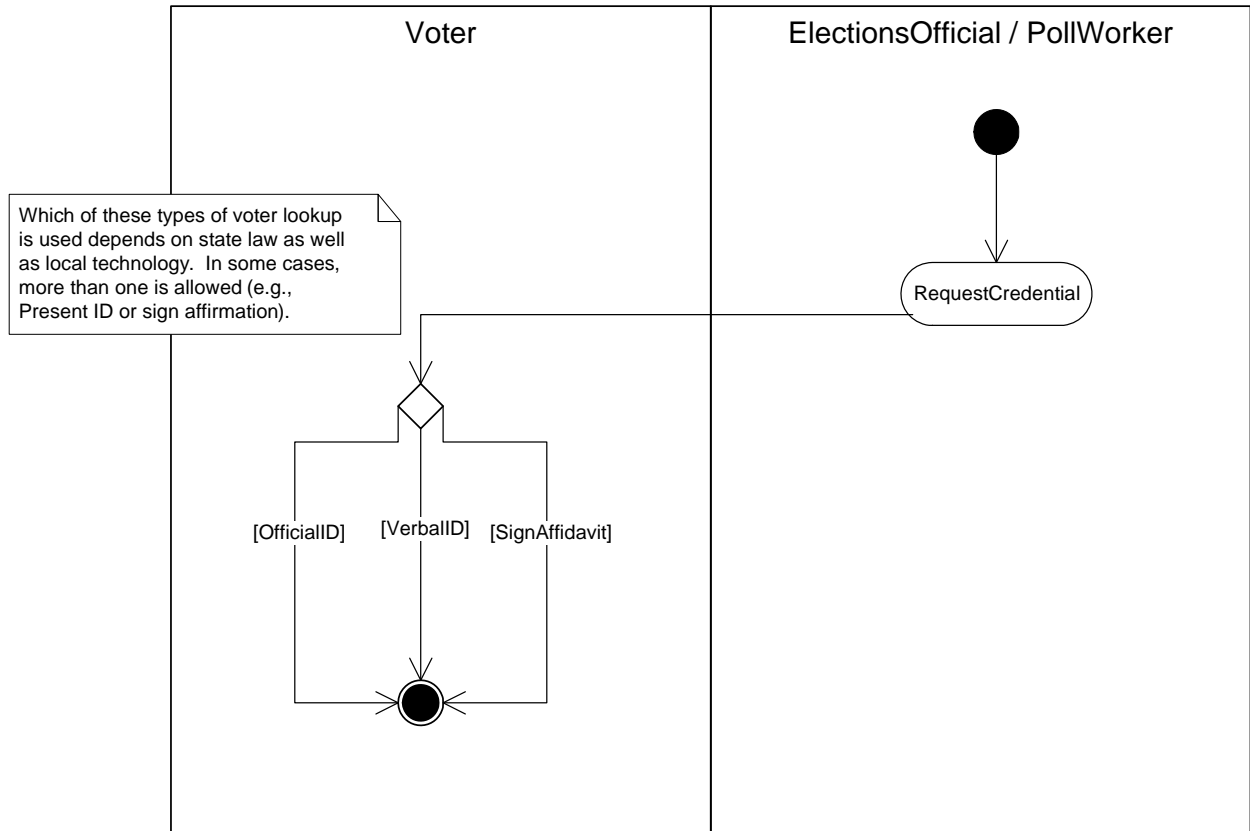


3-9 Voter Check In Activity Diagram



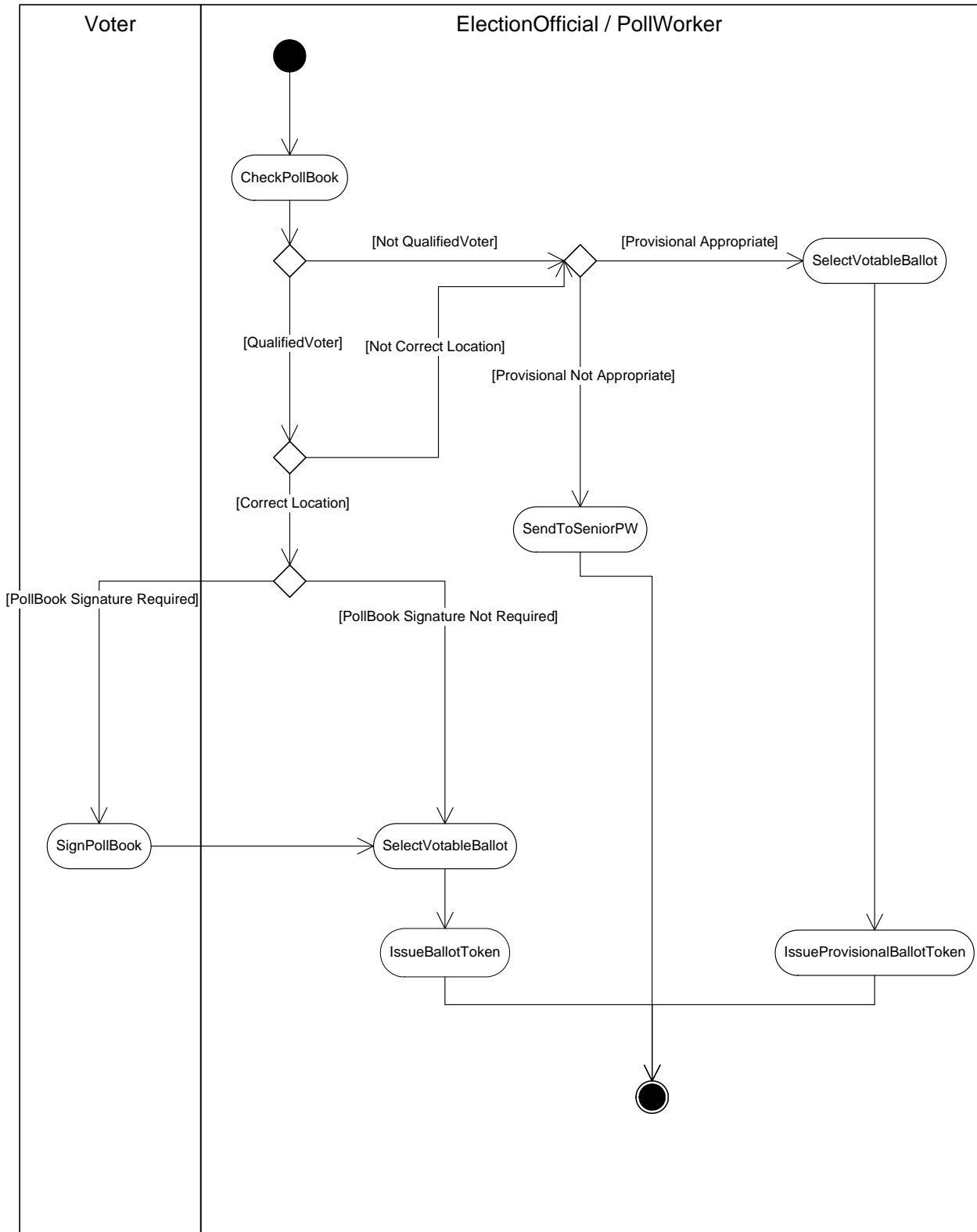
3-10 Voter Checkin Data Flow Diagram

ProvideCredential



3-11 Provide Credential Activity Diagram

AuthenticateVoter



3-12 Authenticate Voter Activity Diagram

SelectVotableBallot

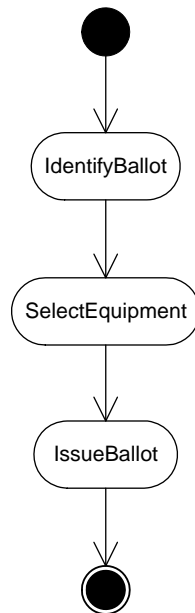
Based on the voter-provided credentials and the corresponding voter information contained in the PollBook, the PollWorker identifies the appropriate VotableBallot for that voter and issues the voter a BallotToken that corresponds to the correct VotableBallot.

IssueBallotToken

During the VoterCheckIn process, each voter is associated with their correct VotableBallot. This association is based on the VotingDistrict in which they reside.

Once a voter is authenticated and their address is verified, they can be issued a BallotToken that corresponds to their VotingDistrict.

RequestBallot



3-13 Request Ballot Activity Diagram

IdentifyBallot

In a GeneralElection, the voter's VotingDistrict of residence determines the voter's correct VotableBallot. In a PrimaryElection, the voter's PoliticalParty may also be required to select the correct VotableBallot.

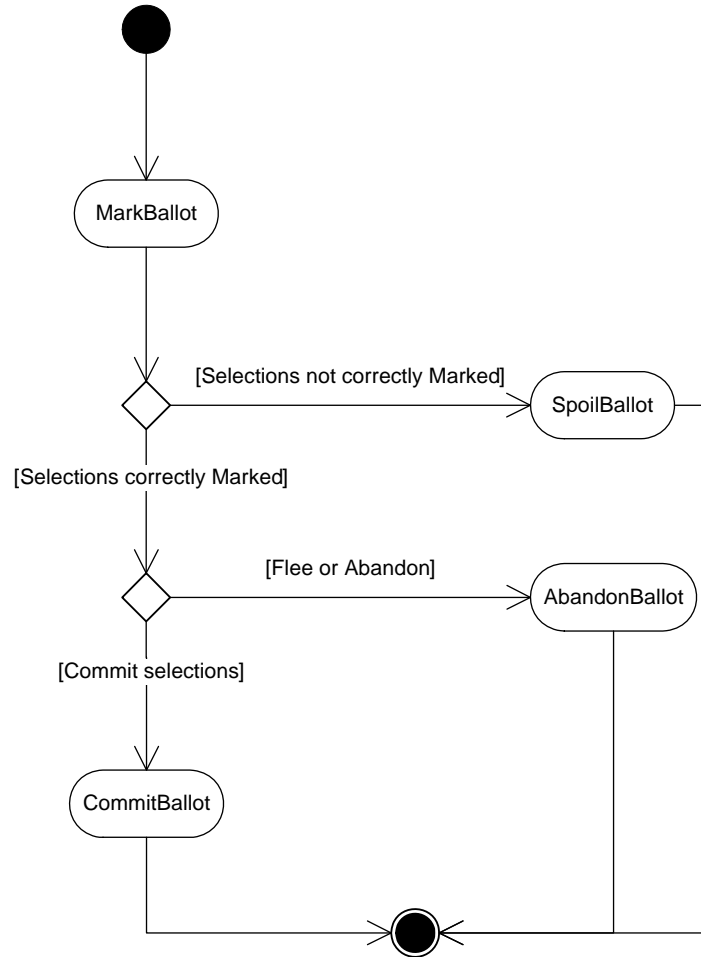
SelectEquipment

Many PollingPlaces offer multiple VotingMachine options to voters. HAVA dictates that accessible machines must be available to disabled voters, otherwise, selection is subject to state and jurisdiction standards.

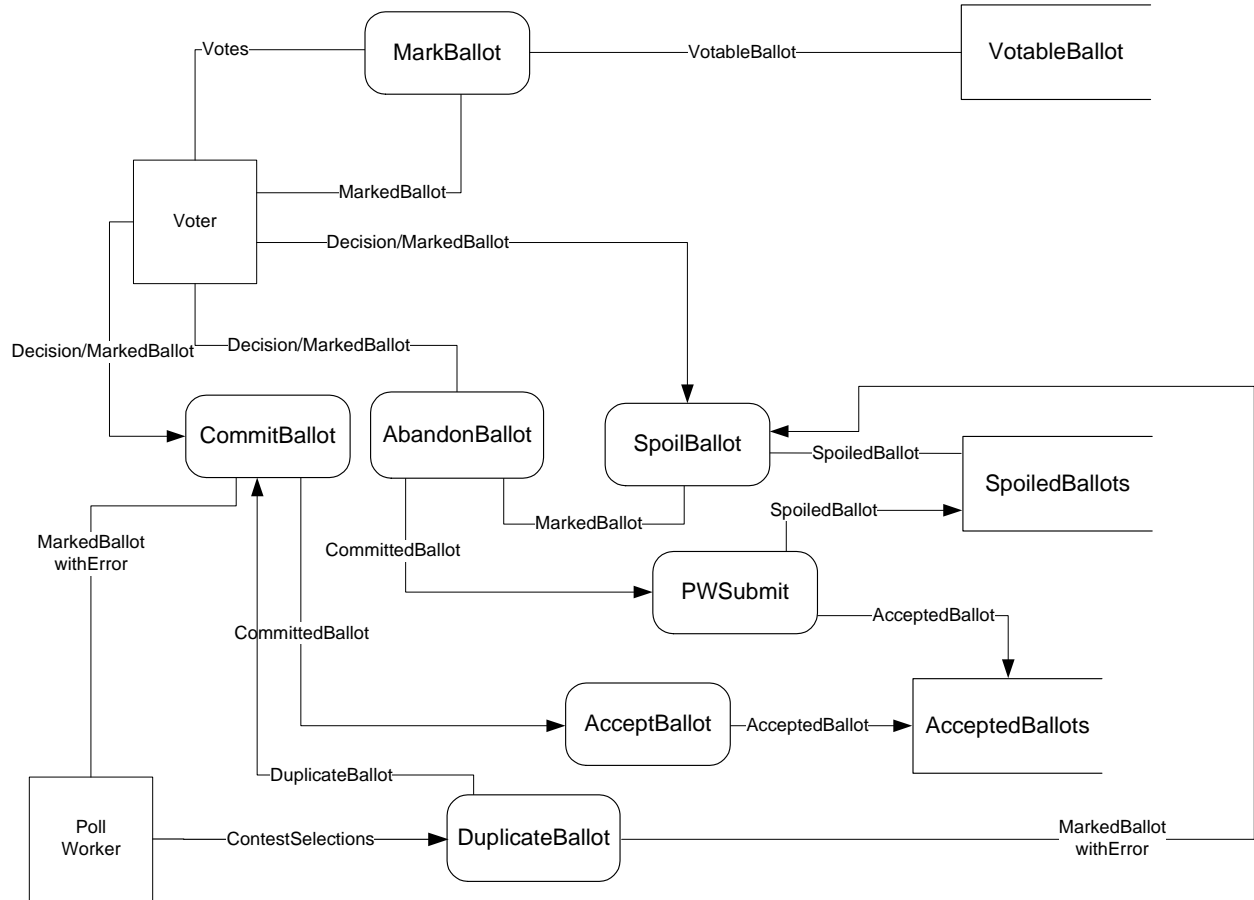
SelectEquipment address the issue of determining the type of equipment that each voter uses, not the specific device that is assigned to each voter.

SelectEquipment is a matter of policy. It is not a decision by the Voter or PollWorker.

OneVoter

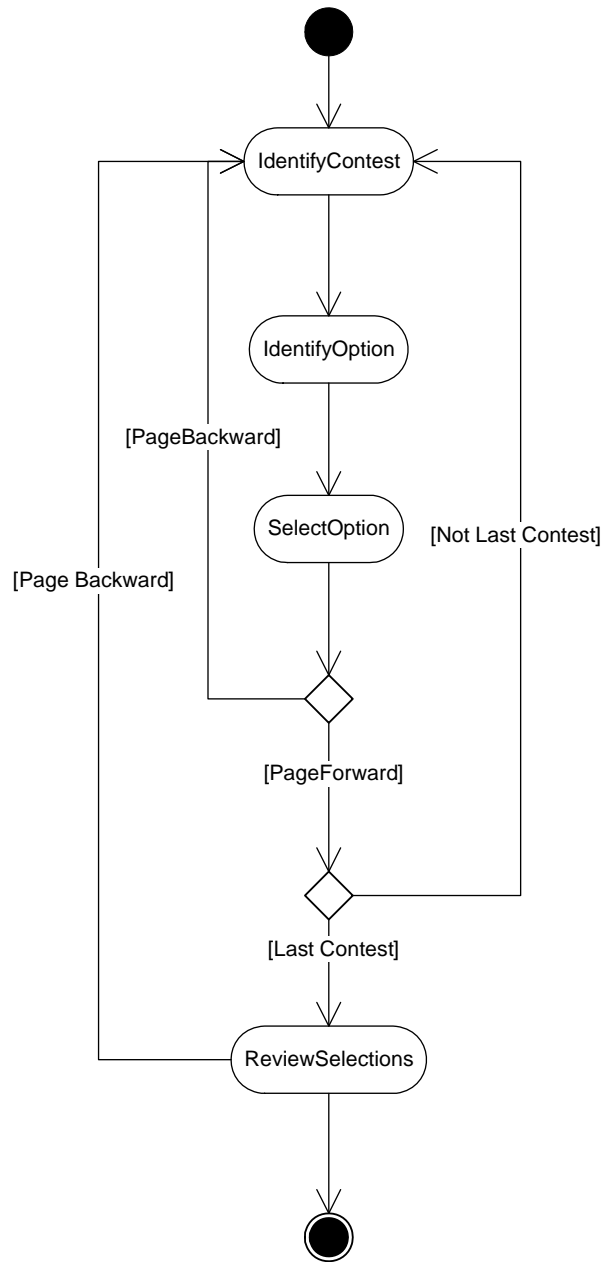


3-14 One Voter Activity Diagram

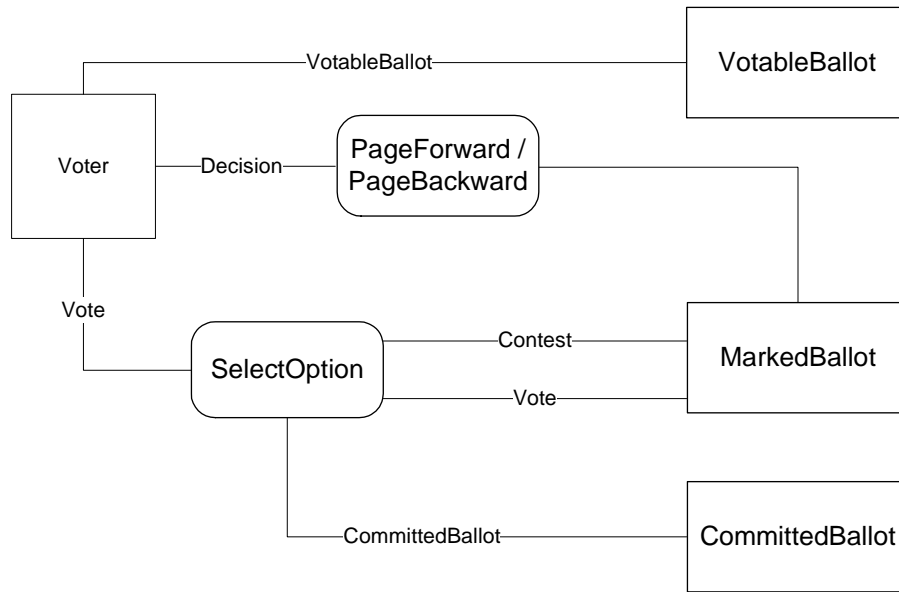


3-15 One Voter Data Flow Diagram

MarkBallot



3-16 Mark Ballot Activity Diagram



3-17 Mark Ballot Data Flow Diagram

IdentifyContest

In US elections, votes are cast in contests that are organized on a VotableBallot for a voter's review, analysis, and selection. In order to make a selection, a voter routinely identifies the nature of the contest, recognized either by the contest name or by the identities of the options.

Most voters make selections on contests in the order that they appear on the ballot, but some voters may search the ballot for specific contests that are of interest to them.

IdentifyContest is a cognitive process that is not associated with any action and that is uniform across voting system paradigms and technology.

IdentifyOption

Before a selection can be effected, a voter must review and recognize the prospective selections shown or given for a contest on a VotableBallot.

IdentifyOption is a cognitive process that is not associated with any action and that is uniform across voting system paradigms and technology.

SelectOption

SelectOption is the specific action that may be most closely associated with the word: "vote". Once a voter has decided which of the options they desire to select in a contest, they indicate their choice by selecting their preferred option on the MarkedBallot.

The method a voter uses to select their preferred option is dictated by the VotingSystem technology and rules. Some common methods of SelectOption include:

- Filling in an oval/circle on a mark-sense ballot

- Completing an arrow on a mark-sense ballot
- Writing a name on a line (for write-in votes)
- Touching a screen at a designated spot
- Typing a name (for write-in votes)
- Pressing a designated button on a voting machine or phone
- Speaking the name of the candidate or the identifier of the preferred option into a microphone

PageForward

We think of a "page" as being the amount of information contained on a VotableBallot that is, or can be, displayed to a voter at one time on a display screen or on paper. When a voter triggers a PageForward operation, the view advances to the next viewable increment of either a physical or electronic ballot.

PageBackward

We think of a "page" as being the amount of information contained on a VotableBallot that is, or can be, displayed to a voter at one time on a display screen or paper ballot. When a voter triggers a PageBackward operation, the view changes to the previous viewable increment.

ReviewSelections

ReviewSelections refers to the voter's act of examining and evaluating their marked selections.

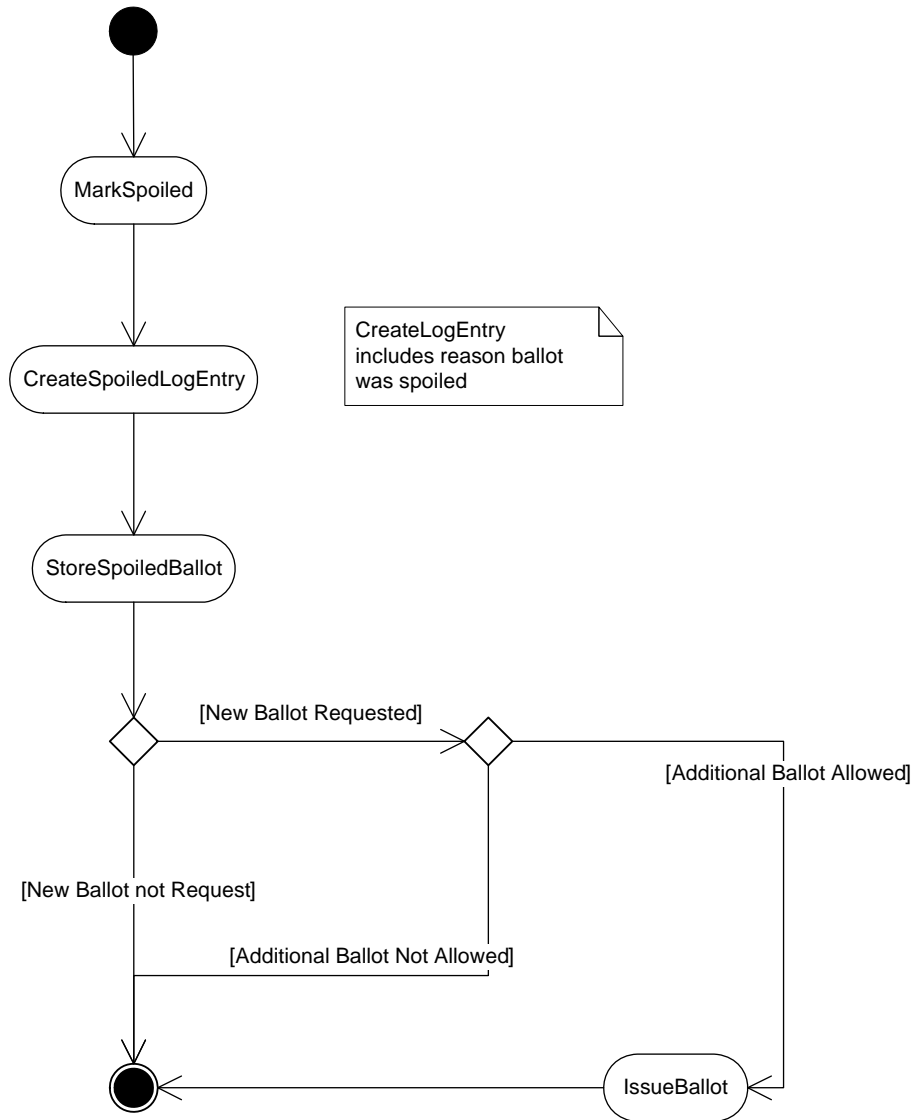
For voter-marked paper ballots the ReviewSelections process is not a fundamental requirement; though limited review may be required (e.g., PCOS systems).

On the other hand, electronic voting machines routinely generate user interactions that require positive voter action to acknowledge the accuracy of their selections before proceeding to further action, such as CommitBallot or SpoilBallot.

SpoilBallot

The activity steps for SpoilBallot depend on some local policies that vary by jurisdiction.

The ability to IssueBallot depends on local policy about when a new ballot is to be issued in place of the spoiled ballot. For example, in some jurisdictions, a voter gets "three tries" but if they spoil a 3rd ballot, then they are denied a further ballot. In other cases, this is not a local policy per se, but a side effect of a feature of DRE. In some cases this is irrelevant, e.g., the ballot was spoiled because it was abandoned.



3-18 Spoil Ballot Activity Diagram

MarkSpoiled

The MarkSpoiled step depends on a local policy of whether to mark the ballot itself as spoiled.

- If so, paper ballot can be directly marked, or marked by attaching to another piece of paper that contains an explanation.
- For e-ballots (DRE) the spoiled ballot (cancelled e-ballot) is electronically marked (recorded in a log entry)
- In some systems there is a paper analog to the e-ballot-- a paper DRE activation code -- that is used in place of a paper ballot

CreateSpoiledLogEntry

The CreateLogEntry step is for creating some PrecinctData that logs the reason why the ballot was spoiled

- Sometimes in a log book, sometimes a separate piece of paper, sometimes written on the DRE activation code, sometimes on the ballot
- Associating the log entry with the ballot is critical
 - Staple a log record to the ballot
 - Staple DRE activation code to the log record
 - Copy the DRE activation code (or other DRE identifier for the ballot) to the log record

StoreSpoiledBallot

StoreSpoiledBallot is very important to segregate and store the spoiled ballot, to avoid accidentally counting spoiled ballots

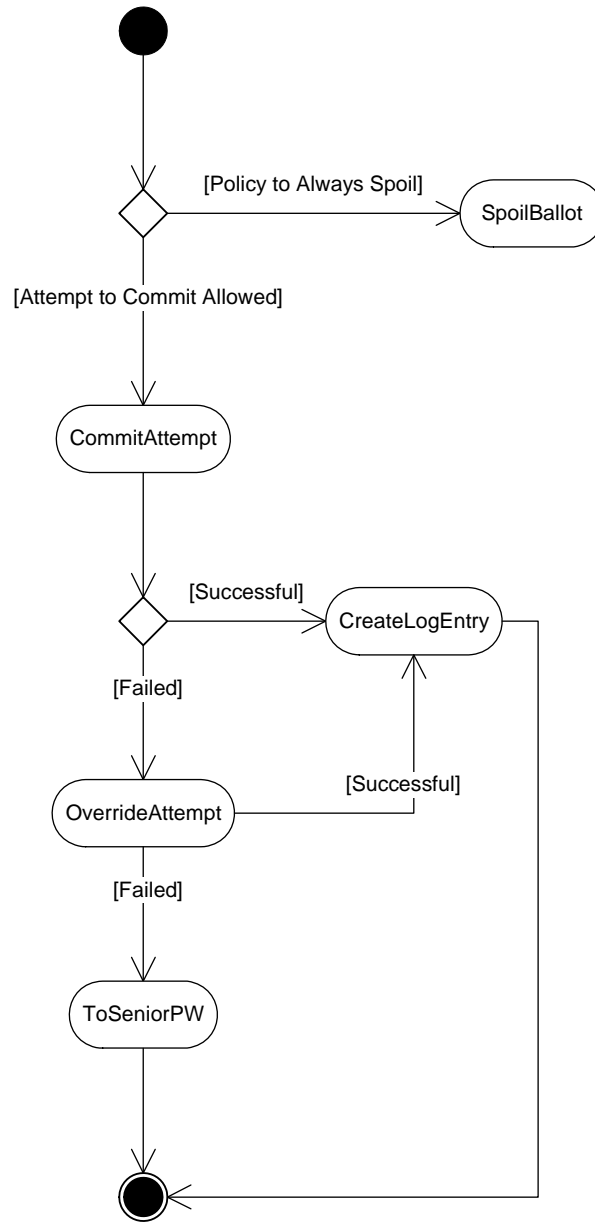
- E-ballots stored separately on DRE
- Paper ballots usually in a designated bag/bin
- DRE paper activation code usually in designated bag/bin

AbandonBallot

This describes how an AbandonedBallot is handled at the PollingPlace.

The processing of an abandoned ballot depends on local policy that varies between jurisdictions.

Some jurisdictions have a policy to always spoil abandoned ballots; if not, then further processing of the ballot is needed to determine whether it can be committed.



3-19 Abandon Ballot Activity Diagram

CommitAttempt

CommitAttempt refers to the voter's attempt to transfer control to their MarkedBallot from the voter to the VotingSystem. In a CommitAttempt, the voting system may transfer control of the CommittedBallot back to the voter, thus reverting the CommittedBallot to a MarkedBallot.

The CommitAttempt step varies by voting method.

- For CCOS and PBHC the commit and accept are simultaneous, always succeed, and occurs when the MarkedBallot is placed in the BallotBox.
- With PCOS and DRE, the MarkedBallot might have an UnderVote or OverVote that is flagged by the device. With PCOS, the device may flag the ballot for other reasons, e.g. stray marks.

CommitAttempt mechanics differ relative to the system. A CommittedBallot becomes an AcceptedBallot when:

- PCOS: The scanner accepts ballot
- DRE: The BallotImage stored in persistent memory and the voting session is terminated
- VBP: The BallotImage stored in persistent memory and the voting session is terminated

OverrideAttempt

OverrideAttempt step is an attempt to commit a MarkedBallot in spite of being flagged during CommitAttempt. This will not always be successful, depending on the device and whether it permits override of, for example, OverVote (some DREs will not commit a MarkedBallot with an OverVote).

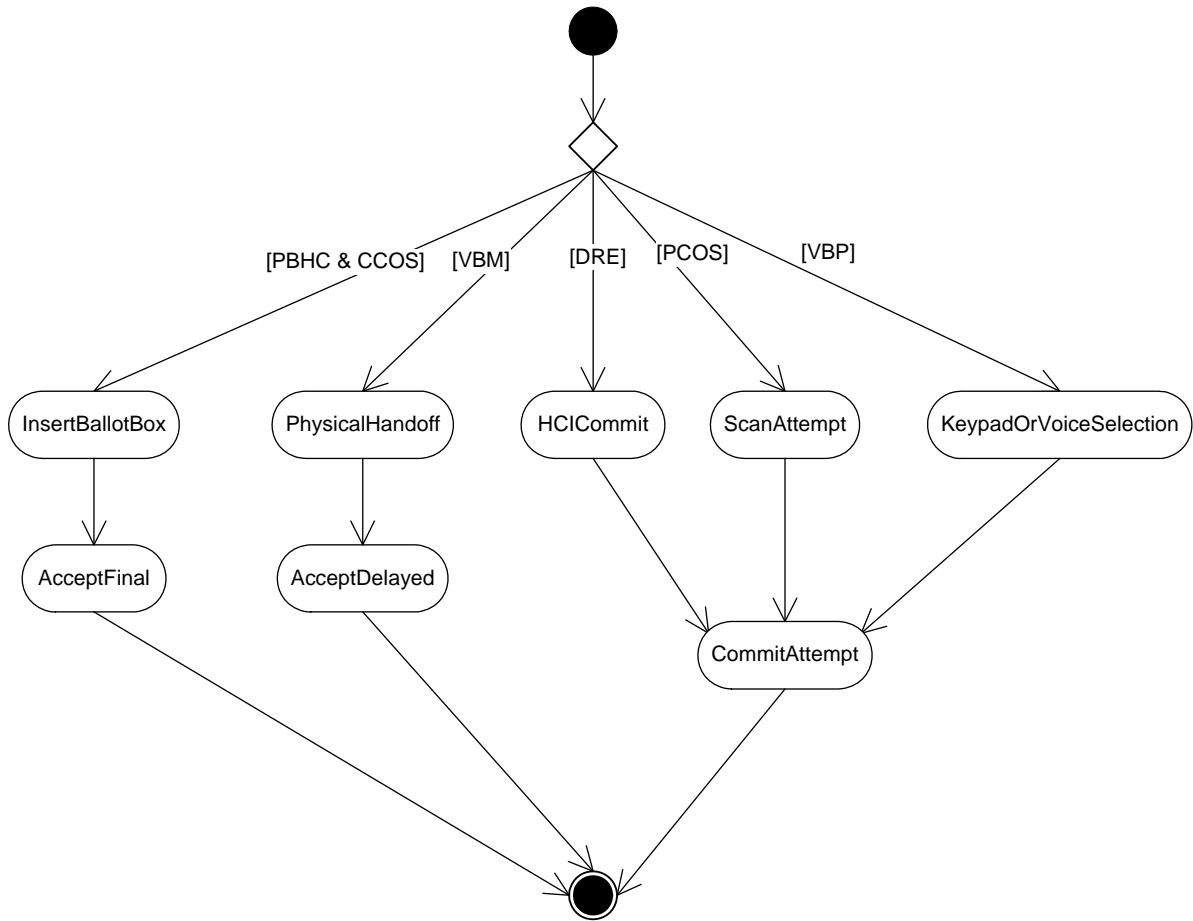
ToSeniorPW

ToSeniorPW is an the escalation of the AbandonBallot process when OverrideAttempt has failed. The MarkedBallot is taken to the PollingPlace's SeniorPW or ElectionsOfficial to carry out the local policy. For example, the case where an AbandonedBallot cannot be overridden with a PCOS, a SeniorPW could do an alternate commit by putting into a separate BallotBox for "scanner problem" MarkedBallots. In the case of DRE, the SeniorPW could take the responsibility for canceling (SpoilBallot) the MarkedBallot and CreateLogEntry of the incident.

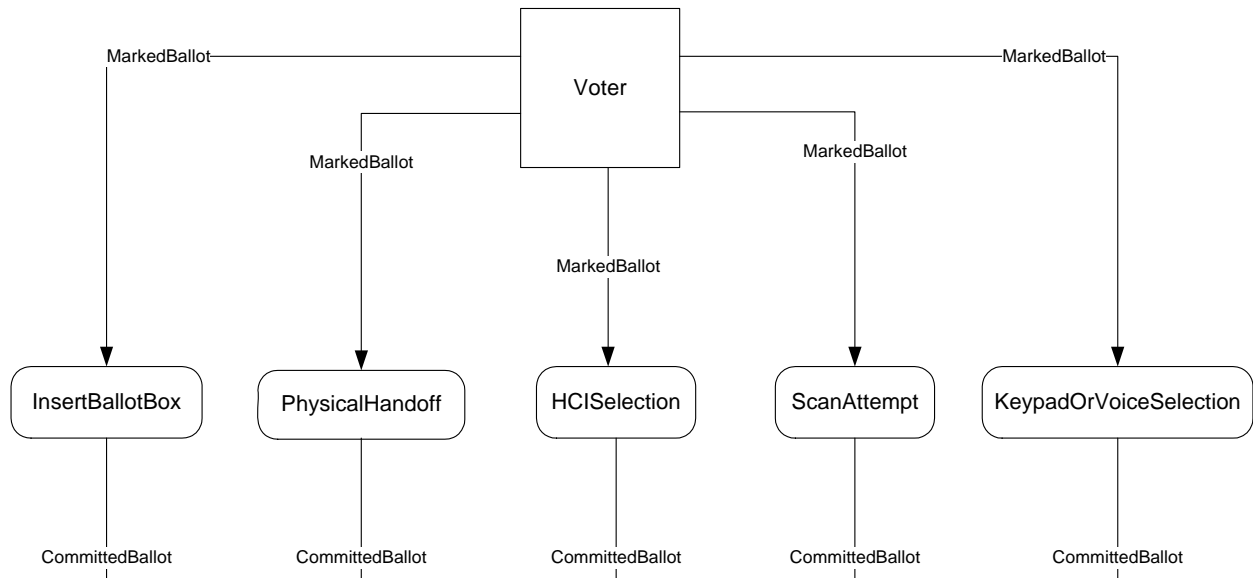
CommitBallot

When a Voter finishes making their selections, they must take some positive action to commit those selections as final and to transfer control of these final ContestChoices. In some cases, the commitment and transfer are simultaneous (e.g. pressing the "vote" button on a DRE) while other times commitment occurs before the control transfer is complete (e.g., a Voter flees just before a PCOS scanner rejects their ballot).

The commit process is fundamentally different for paper and electronic MarkedBallots.



3-20 Commit Ballot Activity Diagram



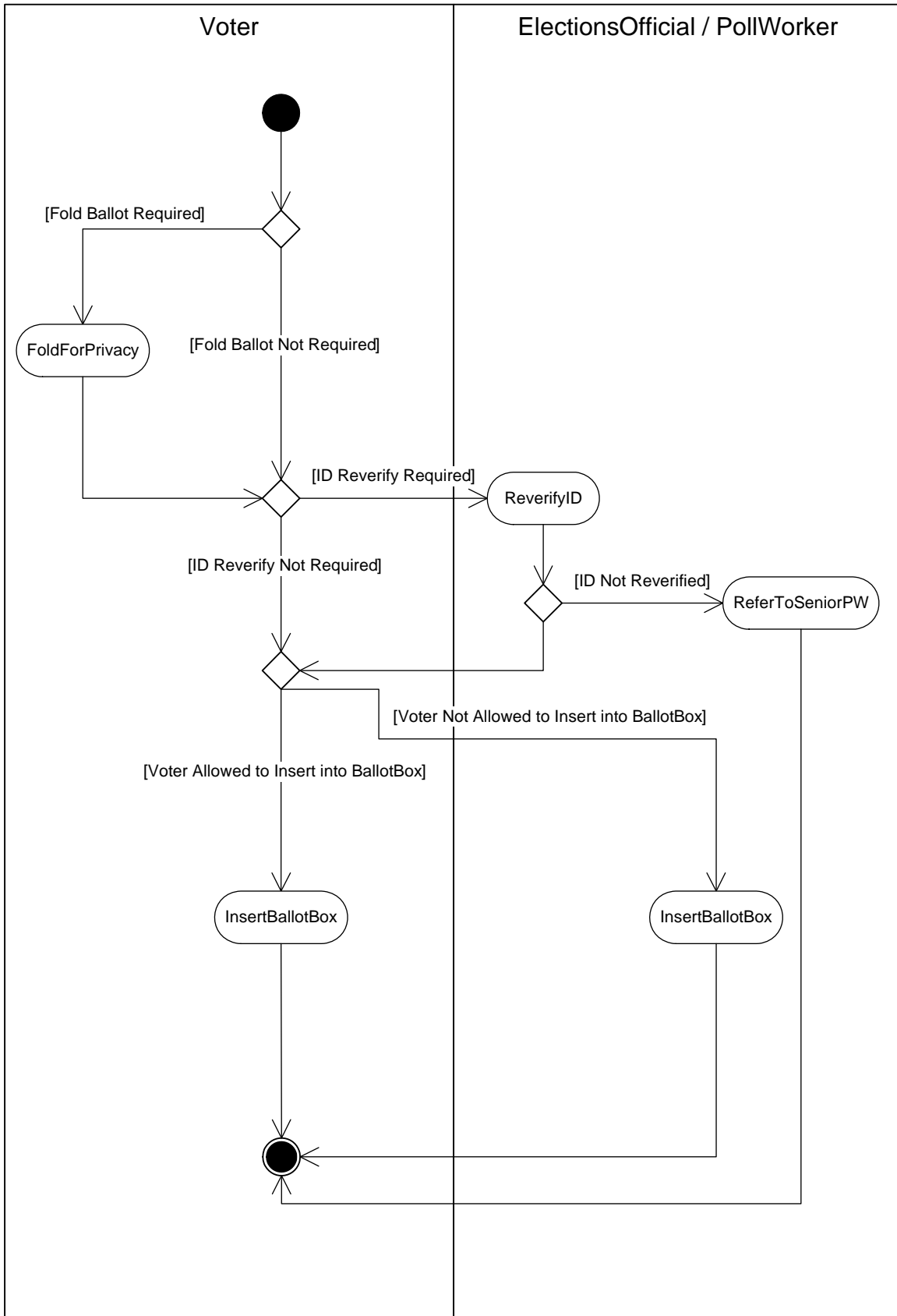
3-21 Commit Ballot Data Flow Diagram

InsertBallotBox

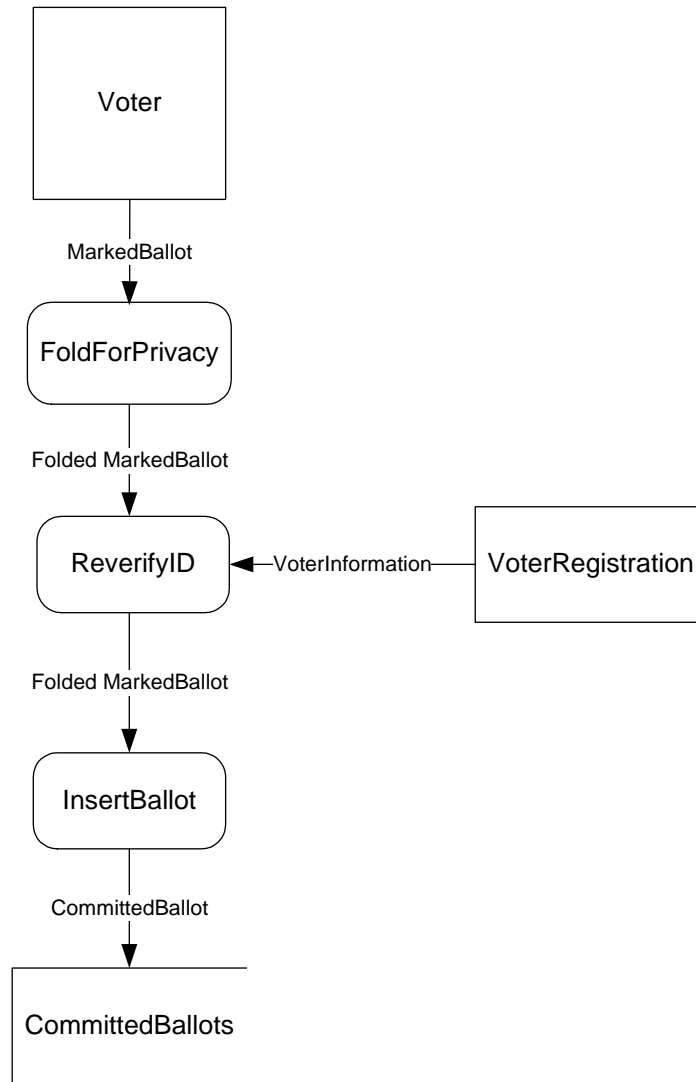
This process is complicated by the necessity to ensure the absolute integrity of the BallotBox.

In some jurisdictions, Voters are not allowed to insert their Ballot directly into the BallotBox, but present their MarkedBallot to an ElectionsOfficial, who inserts the MarkedBallot for the Voter while the Voter watches. In this case, there must be privacy protection mechanisms available to the Voter to prevent the PollWorker from being able to see Voters' selections.

Also in some jurisdictions, Voter identity is reverified by a PollWorker before the MarkedBallot is inserted into the BallotBox.



3-22 Insert Ballot Box Activity Diagram



3-23 Insert Ballot Box Data Flow Diagram

FoldForPrivacy

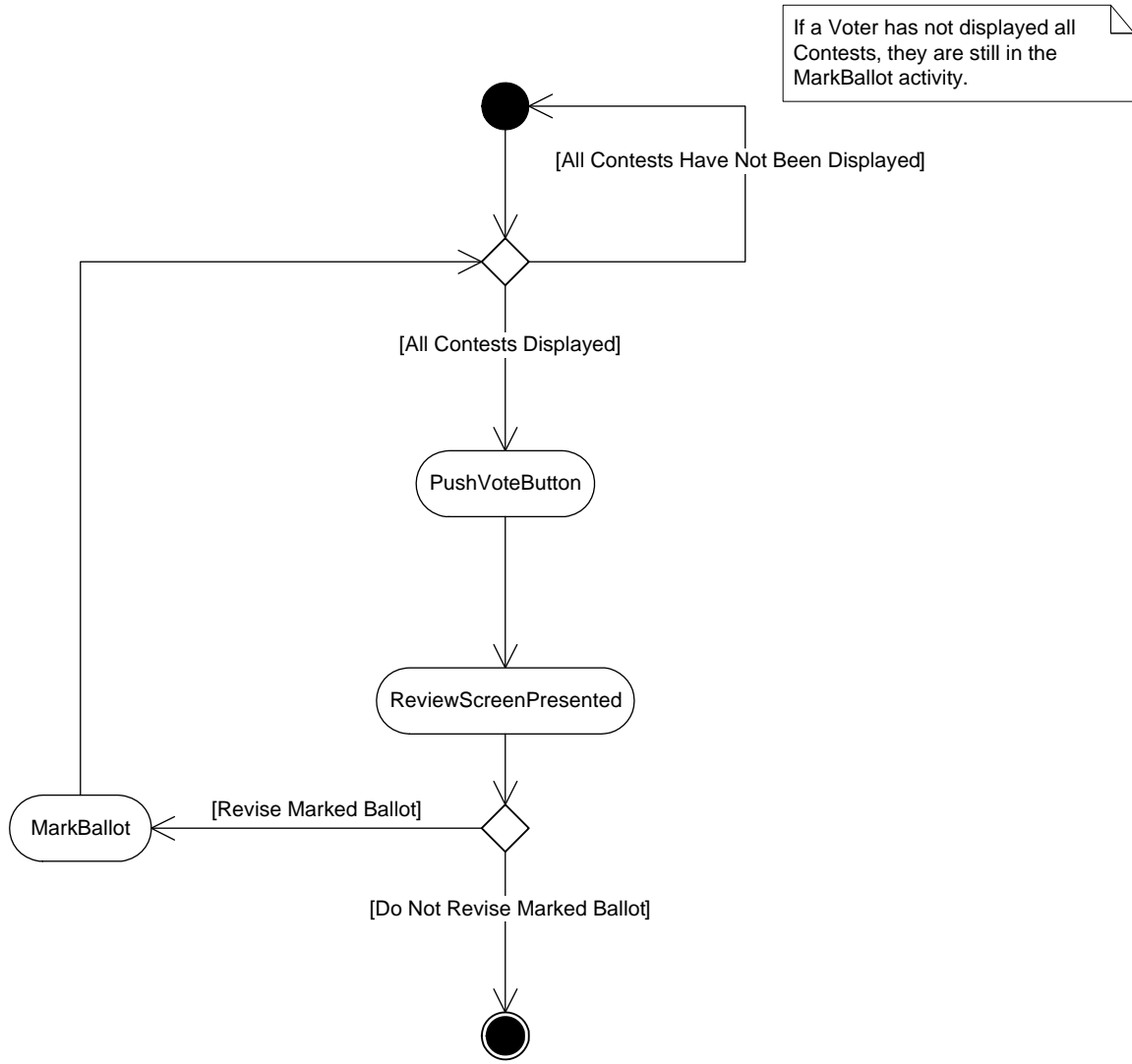
FoldForPrivacy is a process whereby a MarkedBallot is folded in half to hide the voter's ContestChoices.

ReverifyID

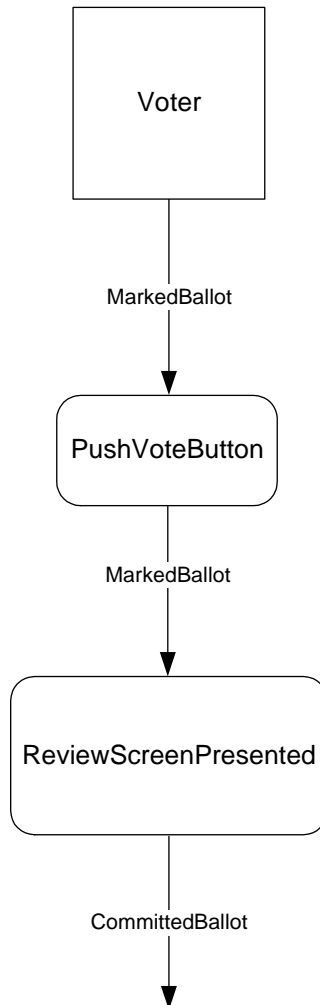
ReverifyID is a process where a PollWorker verifies that a Voter's identity is valid.

HCICommit

The electronic nature of an HCI allows for more control over the Voter's interaction with the MarkedBallot. For example, an HCI can require that a review screen with the Voter's selections is presented to the Voter before the Voter is allowed to commit their MarkedBallot.



3-24 HCI Select Activity Diagram



3-25 HCI Commit Data Flow Diagram

AllContestsDisplayed

AllContestsDisplayed is a condition where a Voter using a DRE or similar VotingMachine must display all Contests that are part of the VotableBallot before indicating they are finished voting

PushVoteButton

VoterPushesVoteButton is the process of the Voter pushing a button on the VotingMachine which is an attempt to create a CommittedBallot.

ReviewScreenPresented

ReviewScreenPresentedToVoter is the process where the Voter is shown a screen which allows them to review and alter their ContestChoices.

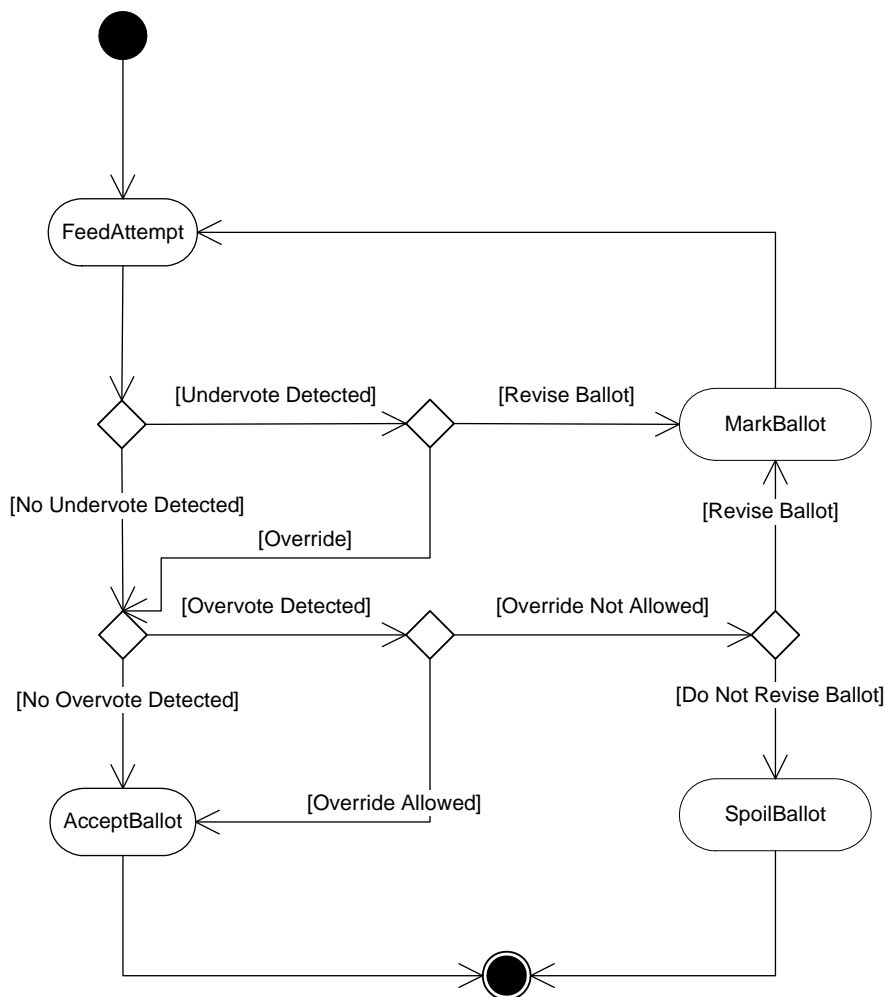
ReviseMarkedBallot

ReviseMarkedBallot is a decision as to whether a Voter, when using a DRE or similar VotingMachine, would like to revise their MarkedBallot prior to committing it.

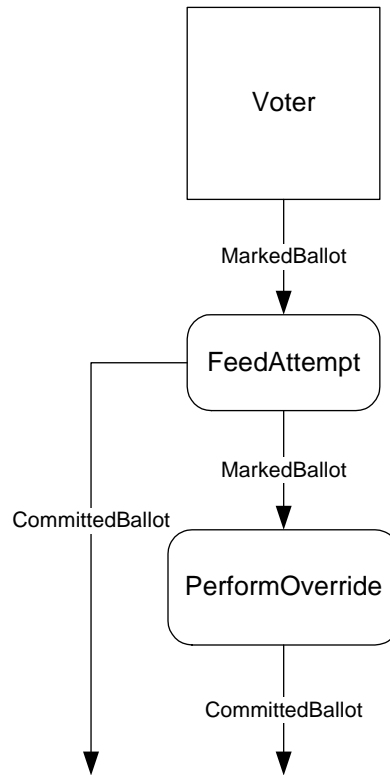
ScanAttempt for PCOS

Most PCOS devices can be programmed to detect UnderVotes and OverVotes. The decision whether or not to detect UnderVotes and/or OverVotes varies by Jurisdiction. For Jurisdictions that do detect UnderVotes, most only detect when a MarkedBallot is complete devoid of Voter selections. Although it is possible to detect UnderVotes on a Contest by Contest basis, the large number of intentional UnderVotes on downballot Contests makes this impractical.

Although the activity diagram shows that UnderVotes are detected first, some PCOS devices may detect OverVotes first.



3-26 Scan Attempt for PCOS Activity Diagram



3-27 Scan Attempt for PCOS Data Flow Diagram

FeedAttempt

FeedAttempt is a process where a voter inserts a MarkedBallot into a PCOS in an attempt to create a CommittedBallot.

NoOverVoteNoUnderVote

NoOverVoteNoUnderVote is an indication from the PCOS device that the Voter has made neither UnderVotes or OverVotes on their MarkedBallot.

UnderVoteAndOverVote

UnderVoteAndOverVote is an indication from the PCOS device that the Voter has made both UnderVotes and OverVotes on their MarkedBallot.

UnderVoteButNoOverVote

UnderVoteButNoOverVote is an indication from the PCOS device that the voter has made UnderVotes but not OverVotes on their MarkedBallot.

ReviseBallot

The Voter decides whether or not to correct their MarkedBallot for UnderVotes or OverVotes detected by a PCOS device.

OverVoteButNoUnderVote

OverVoteButNoUnderVote is an indication from the PCOS device that the Voter has not made UnderVotes but has made OverVotes on their MarkedBallot.

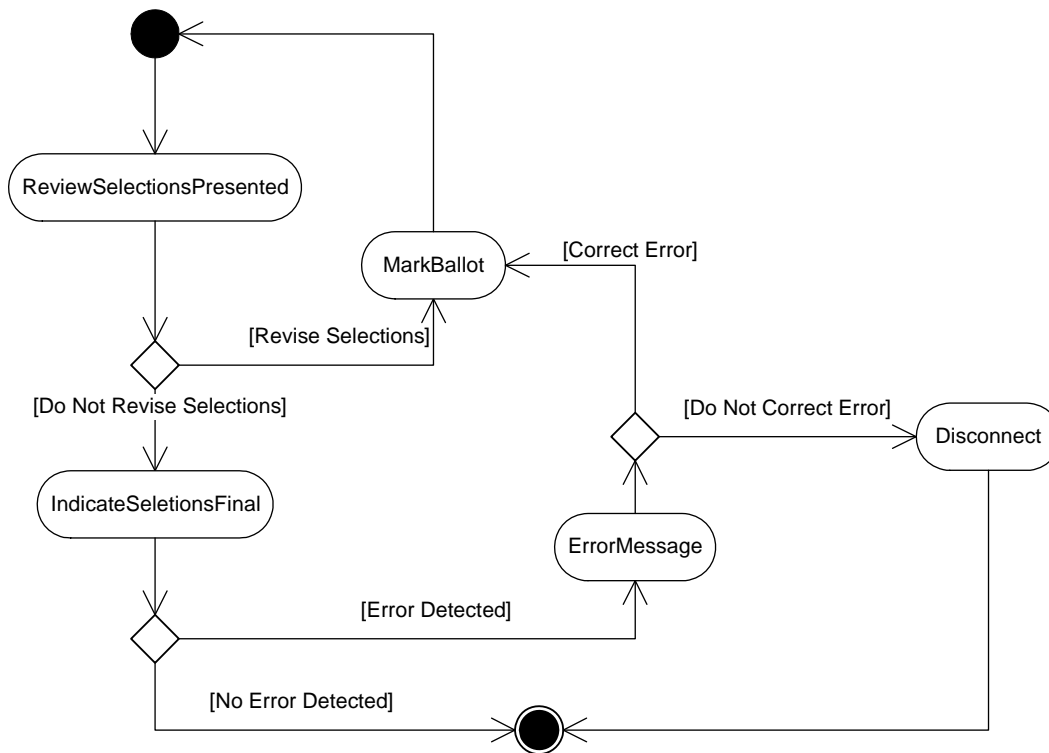
VoterWishesToOverride

VoterWishesToOverride is a decision made by the voter as to whether they would like to override an error on a MarkedBallot, generally due to the existence of one or more OverVotes, and have their MarkedBallot accepted as is by the PCOS device

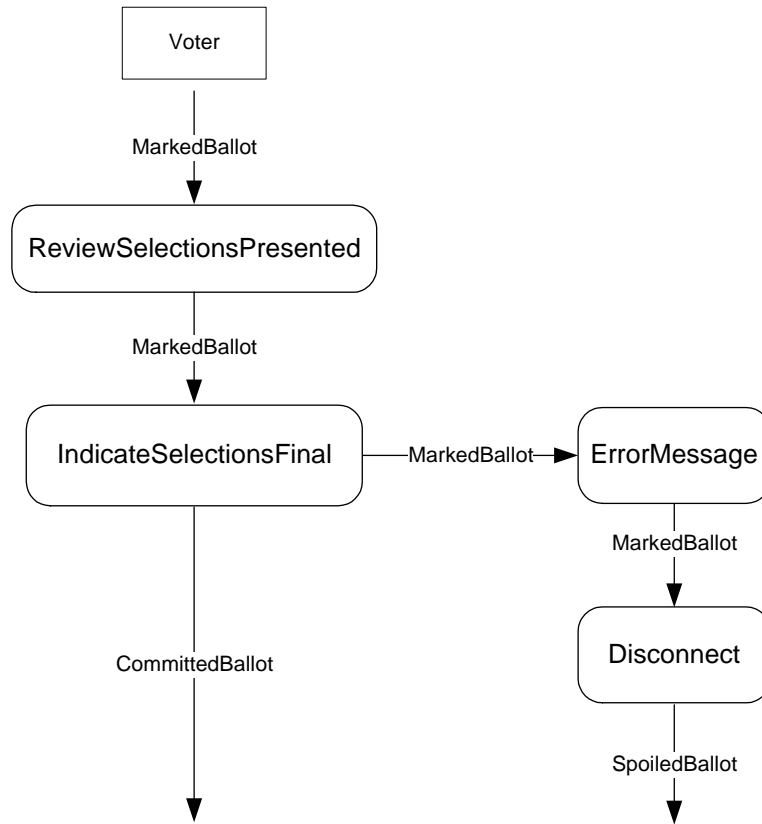
PerformOverride

PerformOverride is a process where a PollWorker configures a PCOS device to allow a MarkedBallot which includes OverVotes and possibly UnderVotes, in the case where UnderVotes are flagged by the PCOS, to become accepted and become both a CommittedBallot and AcceptedBallot.

KeypadOrVoiceSelection



3-28 Keypad or Voice Selection Activity Diagram



3-29 Keypad or Voice Selection Data Flow Diagram

ReviewSelectionsPresented

ReviewSelectionsPresented is a process where the Voter is presented with their ContestChoices for review when using VoteByPhone.

IndicateSelectionsFinal

IndicateSelectionsFinal is a process where the Voter indicates their final ContestChoice selections using keypad or voice when using VoteByPhone.

ErrorMessage

ErrorMessage is a process when using a VoteByPhone system where the system indicates to the Voter the specific error or errors which were detected in the Voter's MarkedBallot.

Disconnect

Disconnect is a process where a Voter, using a VoteByPhone system, chooses to disconnect from the system and abandon their MarkedBallot.

AcceptFinal

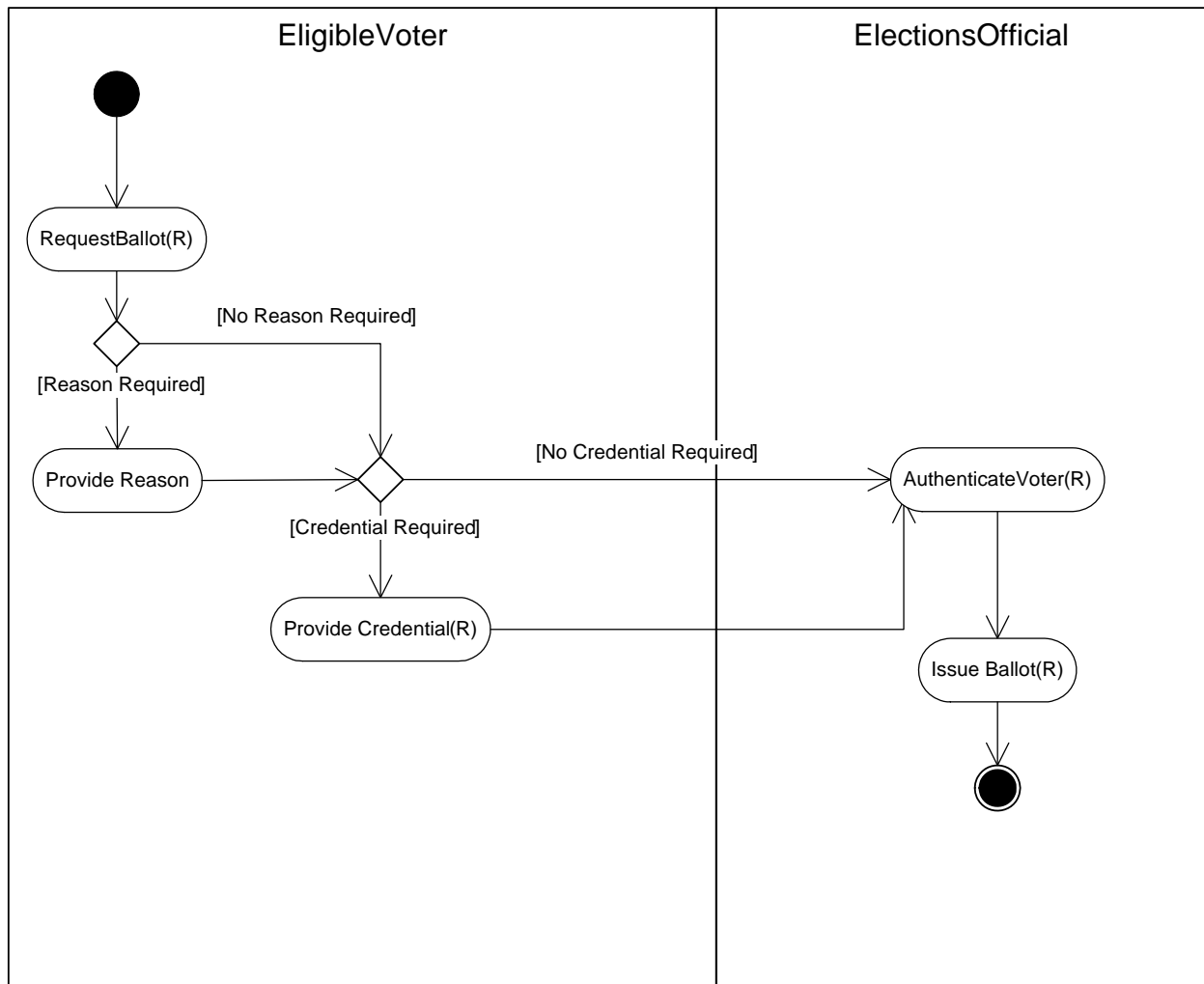
AcceptFinal refers to the CommittedBallot's transfer of control from the voter to the VotingSystem. This transfer's mechanics differ relative to the system. A CommittedBallot becomes an AcceptedBallot when:

- PBHC: The MarkedBallot is inserted into the ballot box
- CCOS: The MarkedBallot is inserted into the ballot box
- ProvisionalBallot: The ProvisionalBallot is handed to the SeniorPW

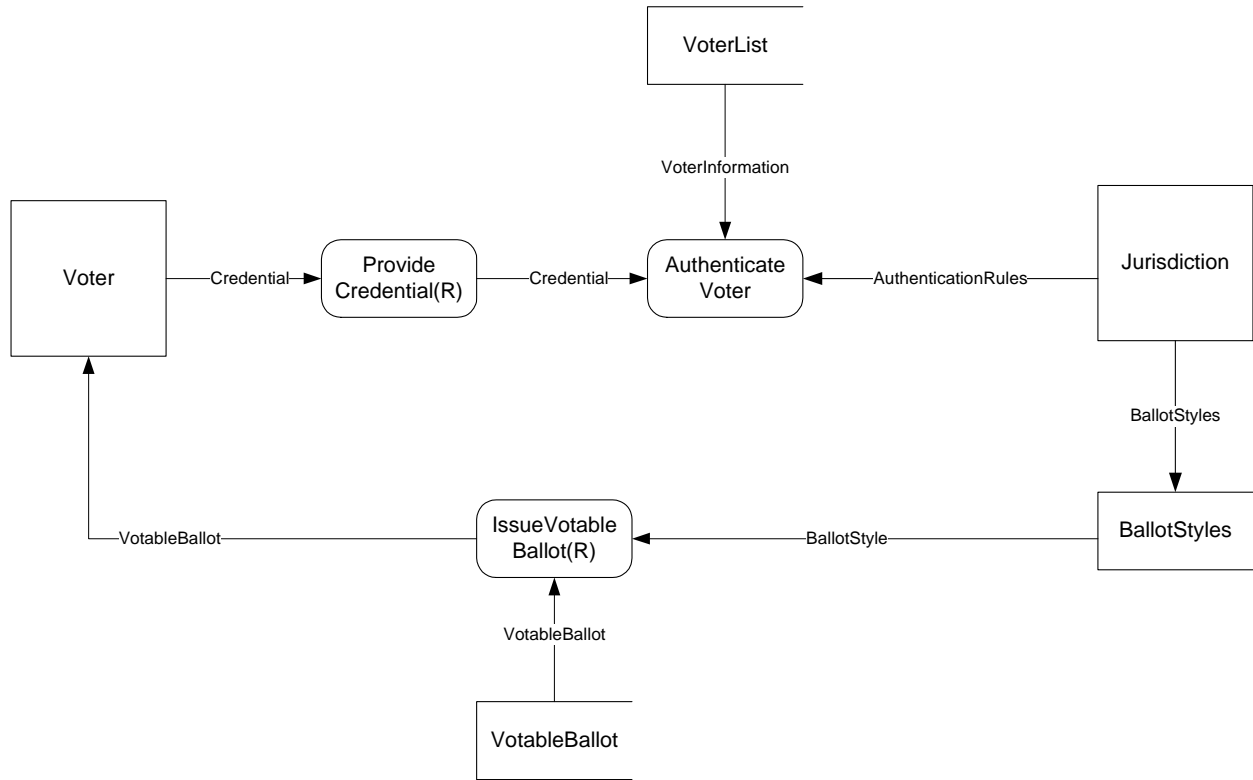
Remote

Some of the processes for remote voting are essentially the same as those for polling place voting (e.g., MarkBallot). The following diagrams represent processes that are either unique to remote voting or differ substantially from their polling place counterparts.

VoterCheckIn(R)

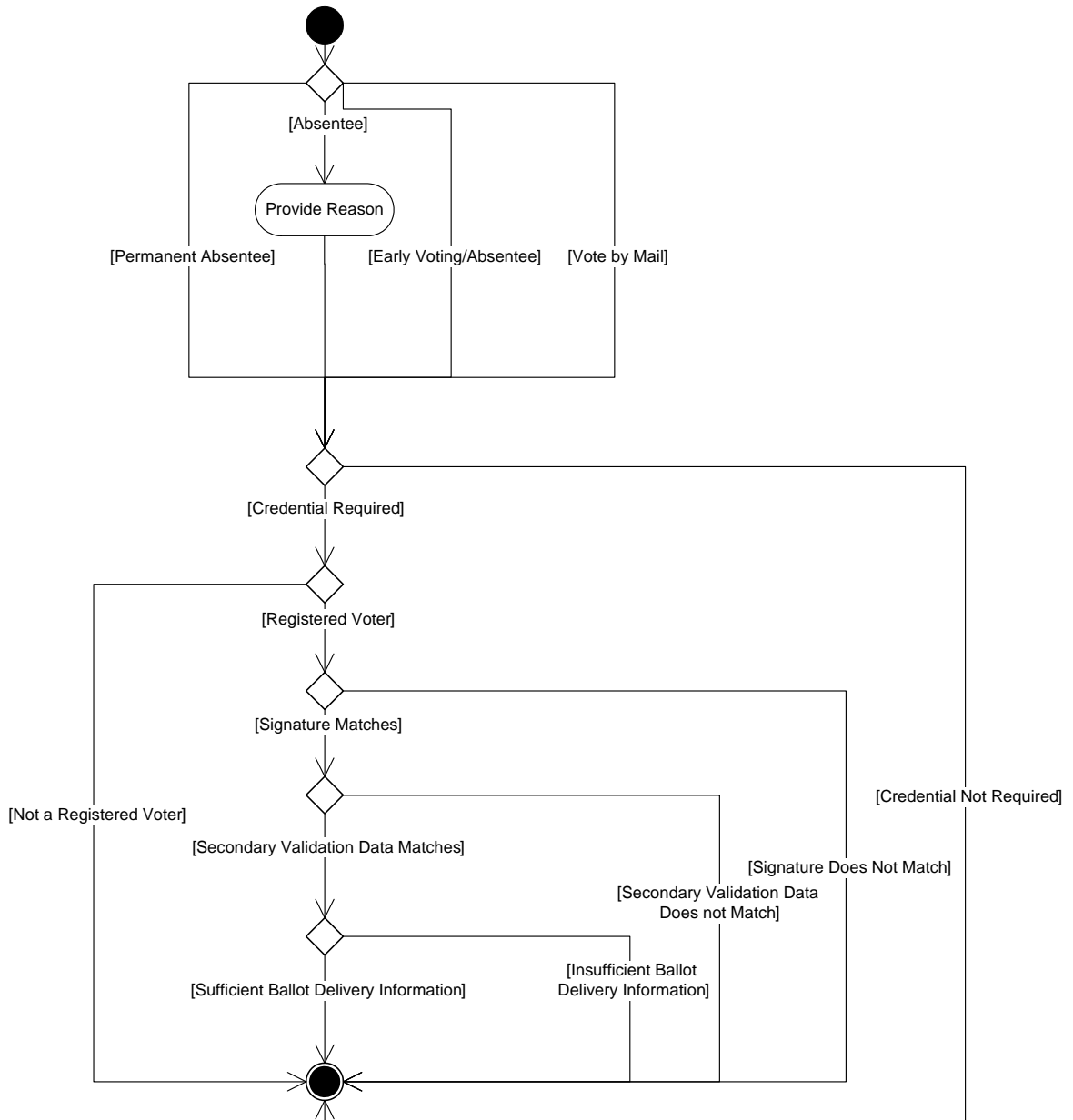


3-30 Voter Check In (Remote) Activity Diagram



3-31 Voter Check In (Remote) Data Flow Diagram

ProvideCredential(R)



If the Voter is able to Register and Request an AbsenteeBallot at the same time, they would leave this process to go to a Registration process and return to this process as a RegisteredVoter.

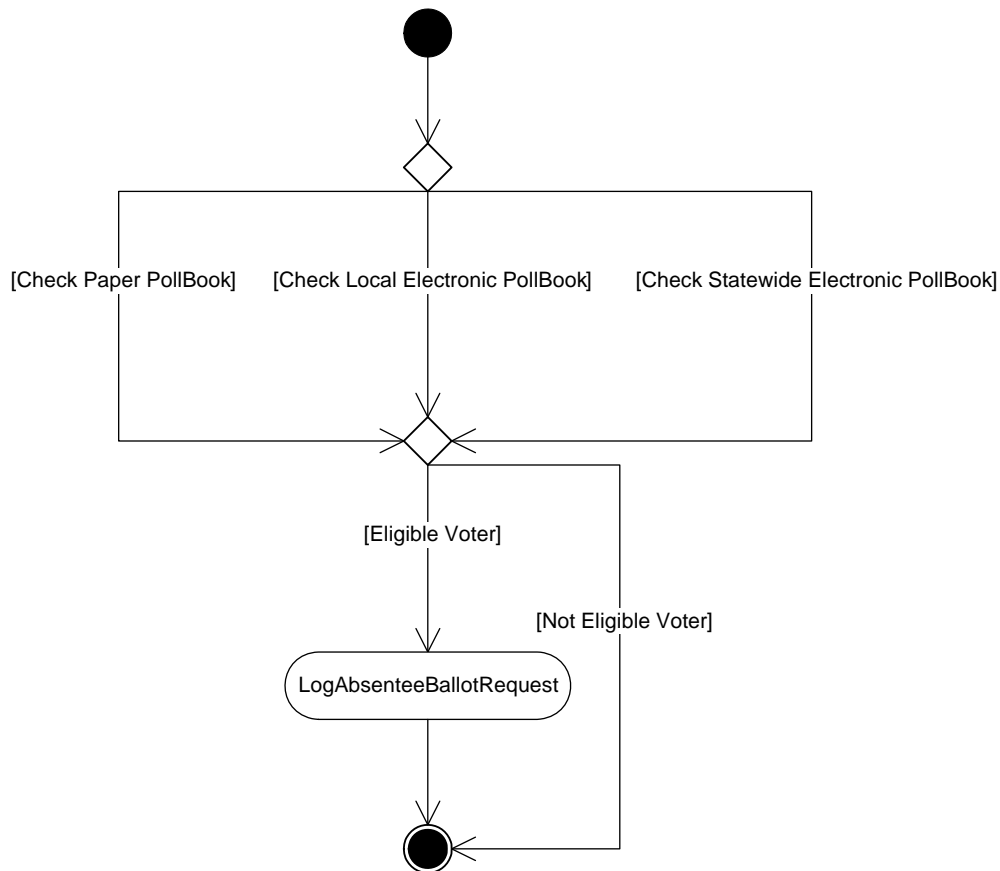
3-32 Provide Credential (Remote) Activity Diagram

- **Permanent Absentee** – usually, but not always, reserved for the elderly and/or those voters with disabilities. These voters automatically receive a ballot in the mail for every election. Some state laws provide for periodic review of the “permanent” status, specifically if the voter does not cast a ballot after several elections. Not all states have the concept of permanent absentee.

- Absentee (Voter must provide a reason or excuse) - requires voters to certify that they meet certain criteria, i.e. absent from the jurisdiction on Election Day, temporarily ill or disabled, etc. Some states require that the application to request a ballot must be notarized.
- Early Voting/Absentee (Voter does not have to provide a reason or excuse) - based on state law, voters may submit a request to vote by mail. In some states the request is valid for one or more years. In other states, an application must be completed and submitted for each election.
- Vote by Mail – all votes are cast by mail. Currently, Oregon is the only vote by mail state; however, several states allow all-mail ballot voting options for ballot initiatives. Additionally, some states (at least California) have the concept that if a large enough percentage of registered voters in a precinct apply for permanent absentee status, then the polling place is abolished and the precinct becomes effectively vote by mail.

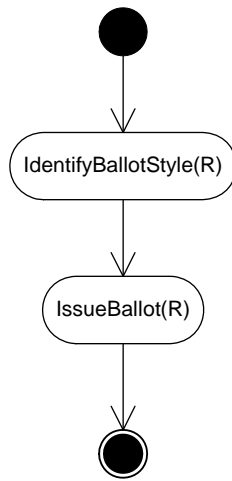
Source: EAC Absentee Voting and Vote by Mail Final

AuthenticateVoter(R)



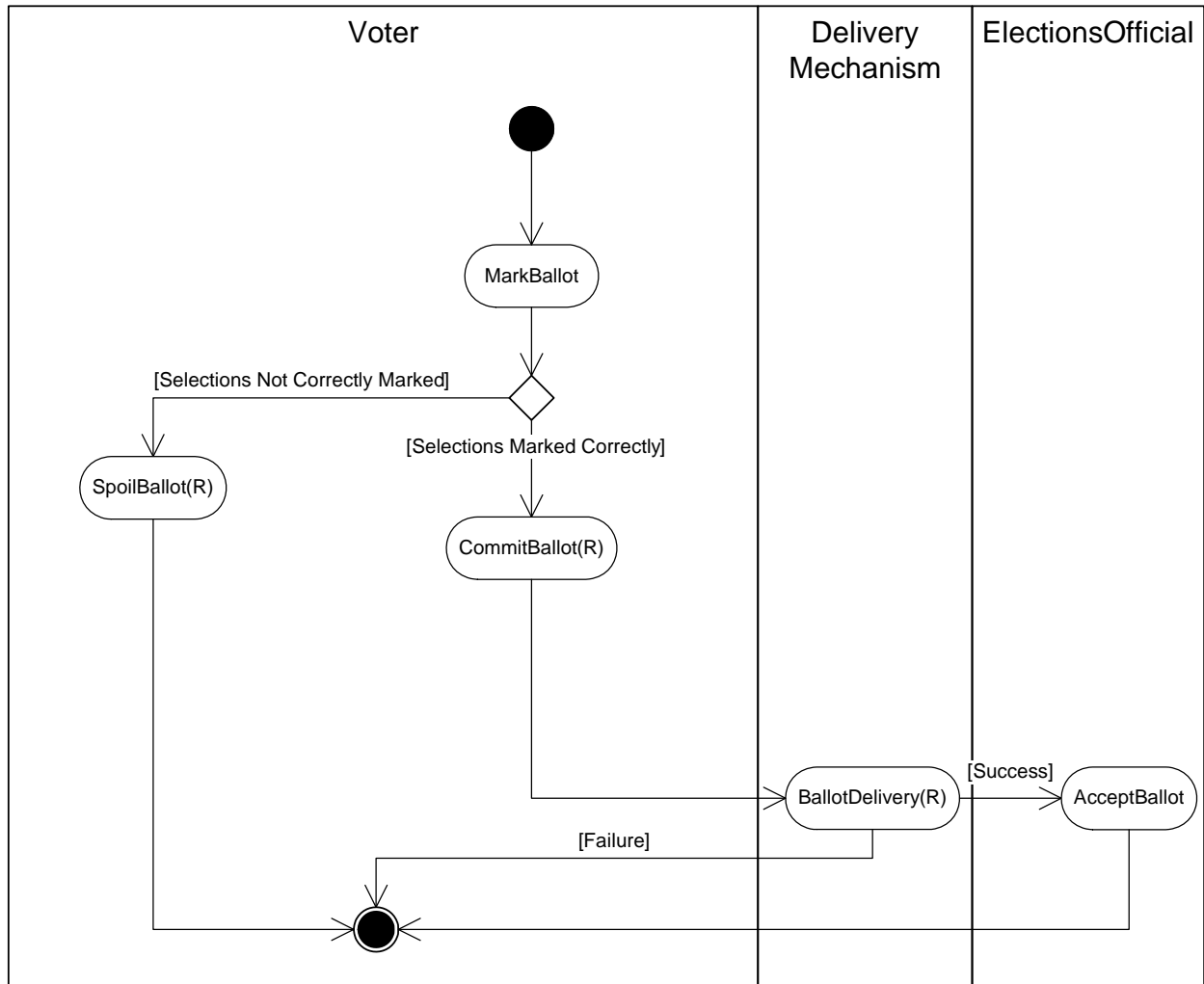
3-33 Authenticate Voter (Remote) Activity Diagram

IssueBallot(R)

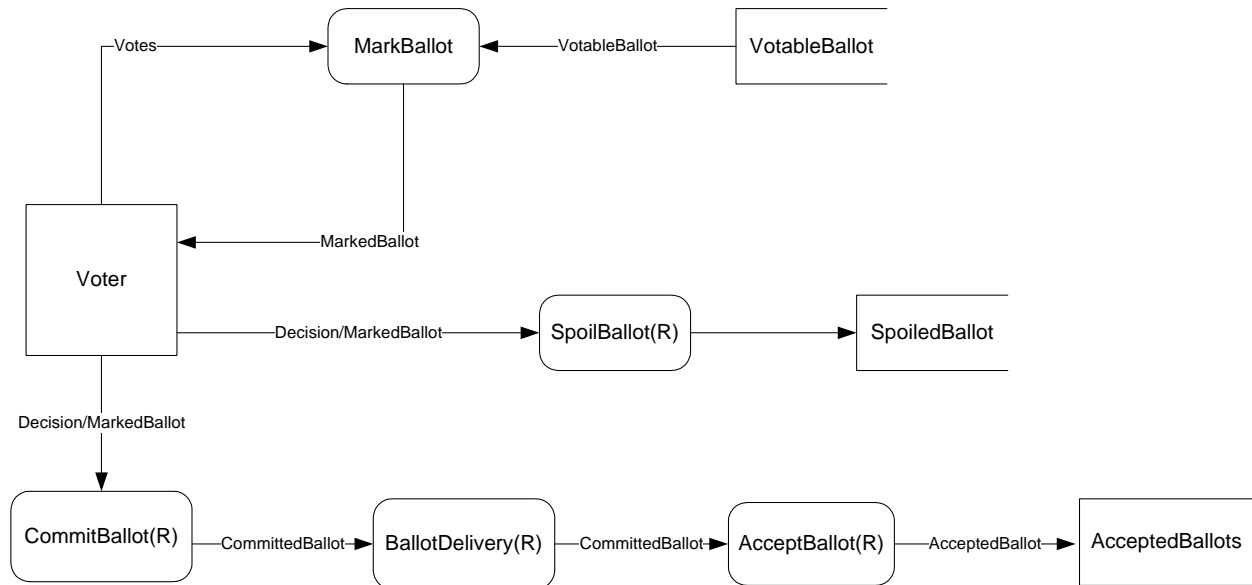


3-34 Issue Ballot Remote Activity Diagram

OneVote(R)



3-35 One Voter (Remote) Activity Diagram



3-36 One Voter (Remote) Data Flow Diagram

MarkBallot

The MarkBallot process for Remote is essentially the same as the process for PollingPlace.

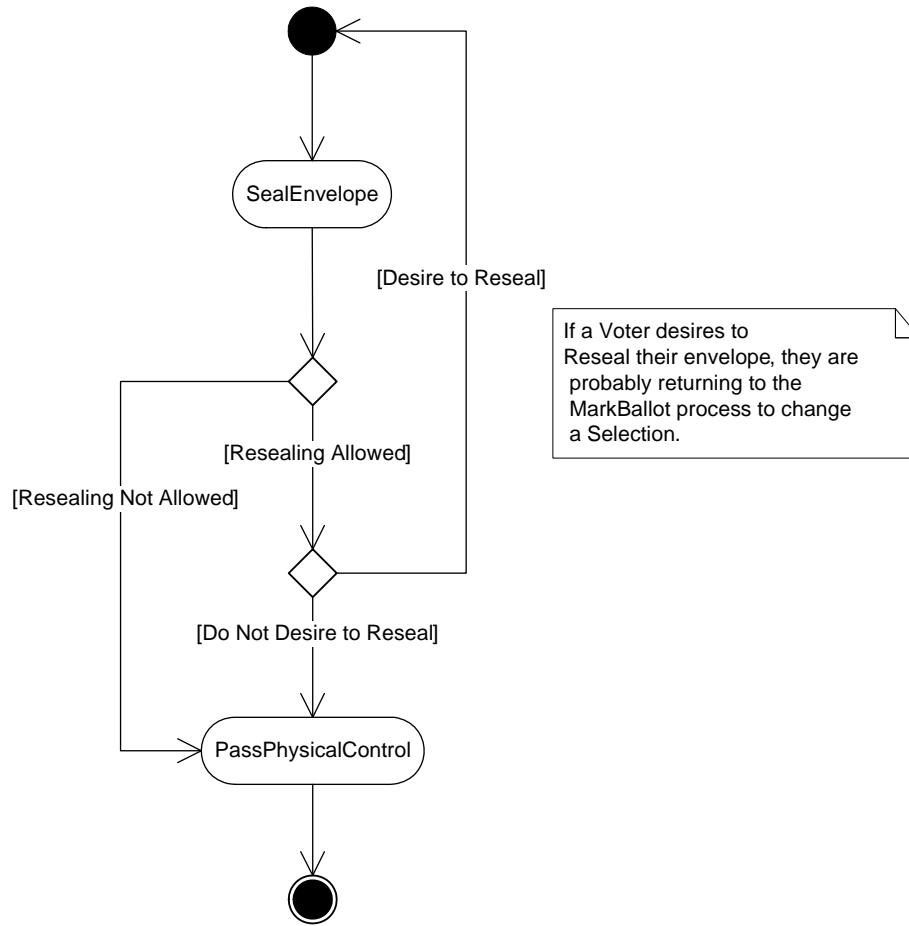
CommitBallot(R)

When a Voter finishes making their selections, they must take some positive action to commit those selections as final and to transfer control of these final choices. In some cases, the commitment and transfer are simultaneous (e.g., pressing the key designated to "vote" button for VoteByPhone) while other times commitment occurs before the control transfer is complete (e.g., sealing the envelope for VoteByMail).

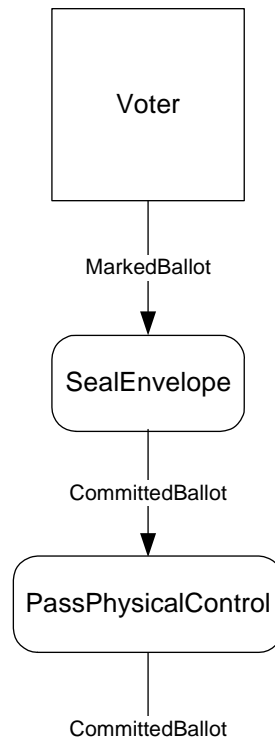
The commit process is fundamentally different for paper and electronic MarkedBallots and between PollingPlace and Remote.

PhysicalHandoff

A Voter may commit a MarkedBallot by physically transferring control to a person or mechanism from which they cannot recapture control. The two most common such handoffs are (1) Placing a VoteByMail ballot in a public mail box or handing it to a postal official at the post office and (2) Handing a completed ProvisionalBallot to the SeniorPW.



3-37 Physical Handoff Activity Diagram



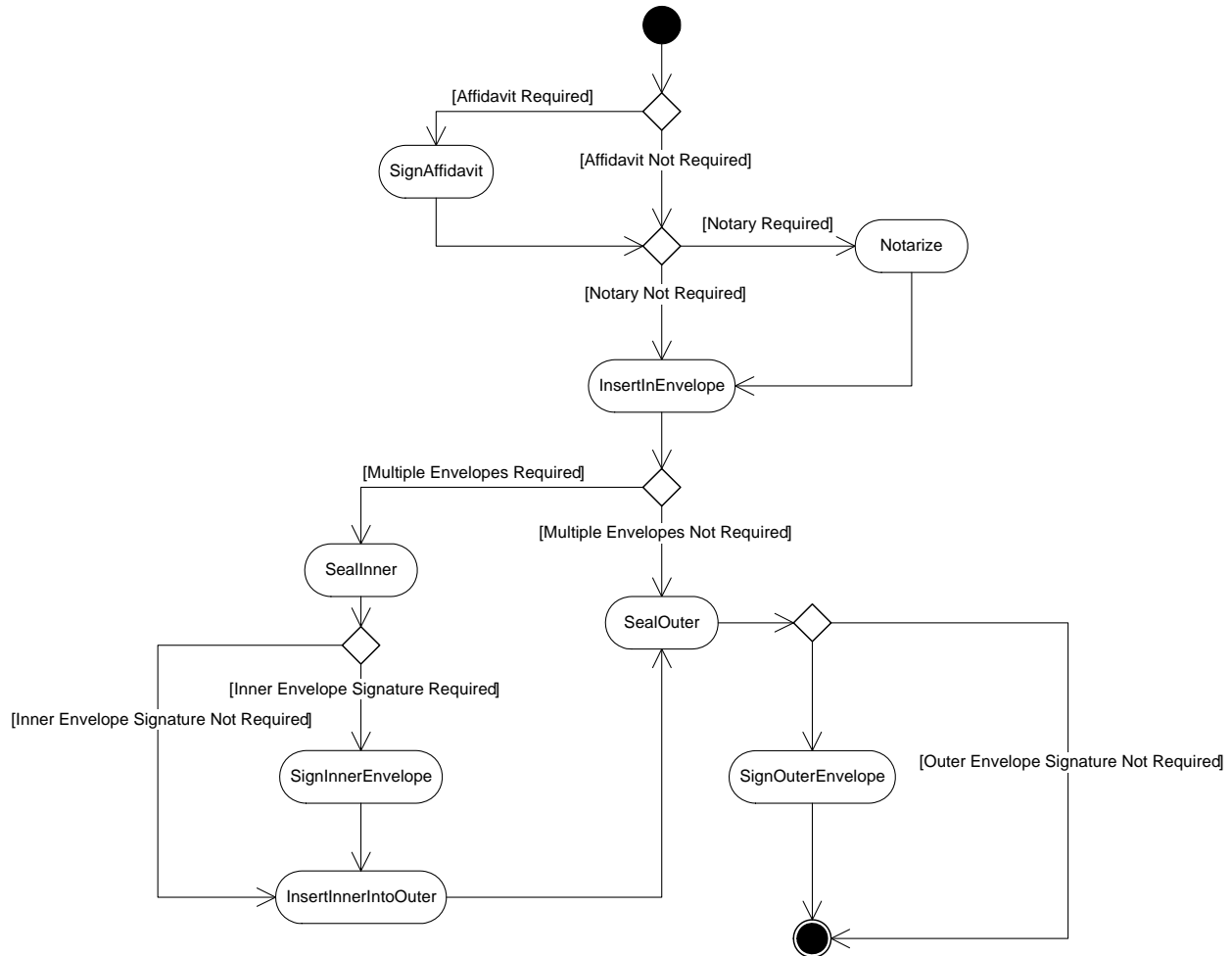
3-38 Physical Handoff Data Flow Diagram

SealEnvelope

There are several complexities to the SealEnvelope task. For example, some Jurisdictions use two envelopes, an inner envelope for privacy and an outer envelope that contains the destination and return addresses.

Of those Jurisdictions that use an inner envelope, they may require a signature across the seal as a tamper-protection mechanism, so reopening/resealing the inner envelope would invalidate the MarkedBallot it contains. If a Jurisdiction does not allow the envelope to be reopened and resealed before mailing then the MarkedBallot becomes a CommittedBallot upon initially being sealed.

Other Jurisdictions, (e.g., Maryland) do not use an outer envelope, but rather use some other form of removable voter signature sheet. This provides some properties of an outer envelope.



3-39 Seal Envelope Activity Diagram

AffidavitRequired

Some states, though not all, require RemoteVoters to sign an affidavit attesting to the information that they are providing regarding their voting eligibility as a part of their remote voting process.

SignAffidavit

SignAffidavit is a self-descriptive term where the voter signs the affidavit that is required by their state for RemoteVoters.

InsertIntoEnvelope

This seemingly pedantic, self-descriptive action is included to amplify the complexity of some remote voting processes. In some states, RemoteVoters are required to employ nested envelopes for privacy and authentication reasons. Failure to follow complex directions causes some remote ballots to be rejected.

MultipleEnvelopesRequired

Some, but not all, states require Voters to employ two or more envelopes for their RemoteBallot.

SealInner

SealInner is the process of the Voter sealing the envelope that contains only the RemoteBallot.

SealOuter

SealOuter is the process of the Voter sealing the envelope that contains an envelope that contains the RemoteBallot.

SignInner

SignInner is the process of the Voter signing the envelope that contains only the RemoteBallot.

SignOuter

SignOuter is the process of determining if the Voter must sign the envelope that contains the envelope that contains the RemoteBallot.

InsertIntoOuter

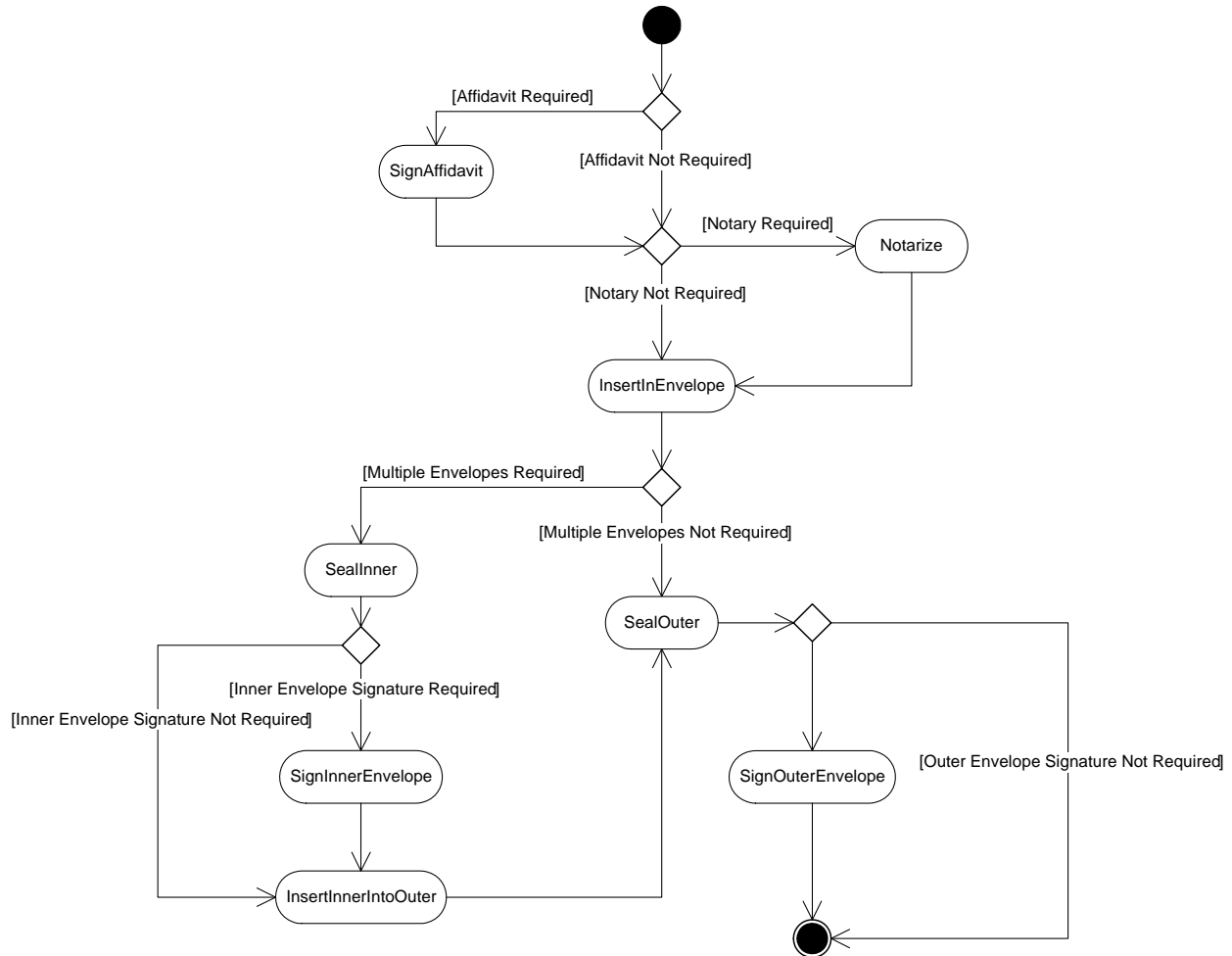
InsertIntoOuter is the process where a Voter inserts the envelope containing the RemoteBallot into an outer envelope.

Resealing

In some states, but not all, envelopes containing a RemoteBallot may be disqualified if it is reopened after it is sealed by the RemoteVoter. This process determines if it is permissible for a RemoteVoter to reopen an envelope that contains a RemoteBallot after it is sealed without disqualifying the RemoteBallot that it contains.

PassPhysicalControl

Once the RemoteBallot is properly prepared for transport to the Jurisdiction, it must be passed to the proper transfer service, e.g., the U. S. postal service, for delivery.



3-40 Seal Envelope Activity Diagram

HCISelection

The process for committing a Voter’s final selections is essentially the same as it is in a PollingPlace.

KeypadOrVoiceSelection

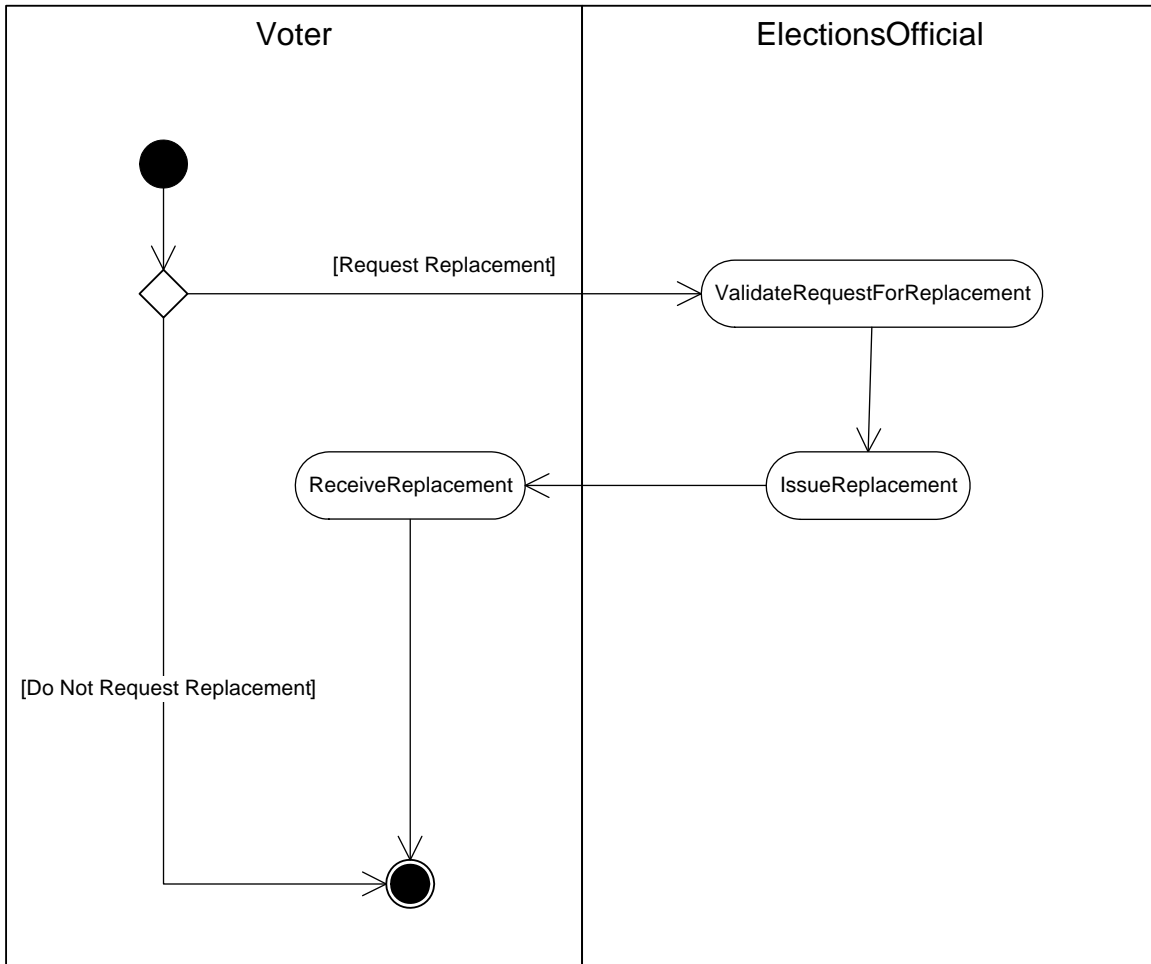
The process for committing a Voter’s final selections for VoteByPhone is essentially the same as it is in a PollingPlace.

SpoilBallot(R)

When a RemoteVoter makes a mistake when marking their VotableBallot that may invalidate one or more of their selections, they may request a replacement ballot. Historically, due to time limitations in the process of:

1. Getting the replacement ballot request to the controlling election official,
2. Appropriately processing the replacement ballot request at the election office, and
3. Returning the replacement ballot to the RemoteVoter

Traditionally, it has not been feasible for RemoteVoters voting by mail to receive a replacement ballot in time to allow the replacement ballot to be marked and returned by the legal deadline. This timeframe may be extended and complicated if the original ballot must be returned with the replacement ballot request.



3-41 Spoil Ballot (Remote) Activity Diagram

AbandonBallot(R)

This is a trivial activity - the Voter just throws the MarkedBallot away.

BallotDelivery(R)

Delivery of AcceptedBallots and other election artifacts to the Point Of Initial Accumulation (POIA), usually a county elections office.

For VBM systems, CommittedBallots are routinely sent through the US postal system, though commercial carriers such as FedEx or UPS may also be used. For overseas voters, ballots may pass through international mail systems.

For Remote collection centers, artifacts may be delivered via courier.

BallotImages may be transmitted via telephone or the Internet.

AcceptBallot(R)

AcceptBallot captures the notion final transfer of control of a MarkedBallot/CommittedBallot from the Voter to the voting system.

For VBM, the CommittedBallot is accepted or rejected during AbsenteeBallot processing, or during Canvass. If the former, the CommittedBallot becomes an AcceptedBallot, otherwise it becomes a RejectedBallot.

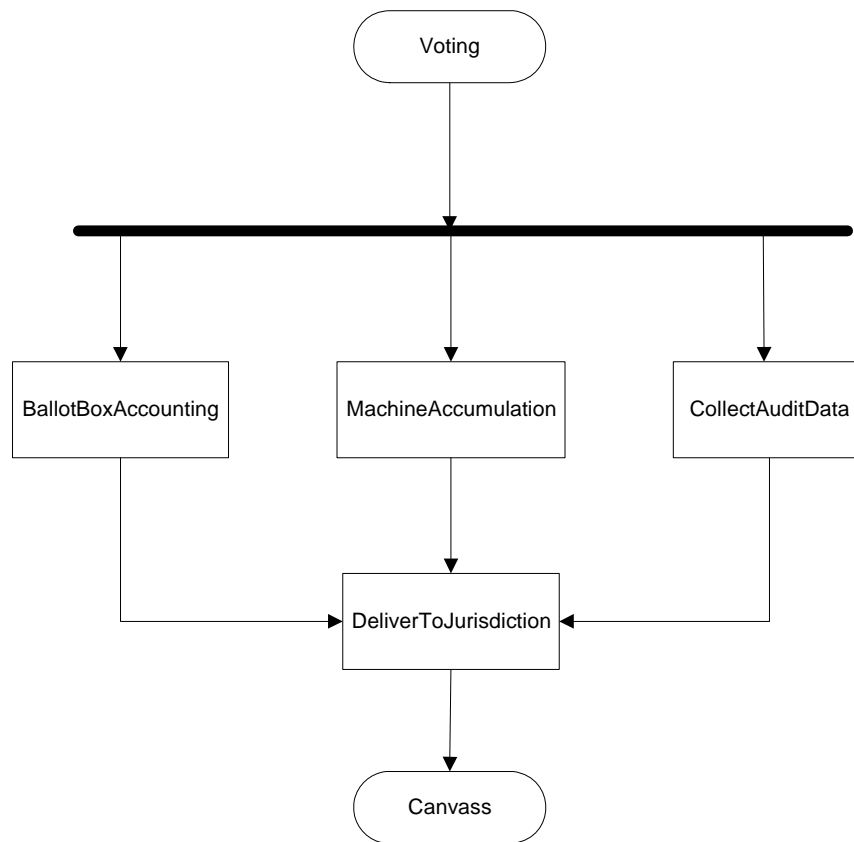
AcceptDelayed

AcceptDelayed refers to the Voter's attempt to transfer control to their MarkedBallot from the Voter to the VotingSystem, but acceptance by the VotingSystem does not occur immediately or interactively. Under AcceptDelayed, a CommittedBallot becomes an AcceptedBallot when:

- The mailed VBM CommittedBallot is accepted at Canvass.
- The hand carried VBM CommittedBallot is received by the ElectionsOfficial.

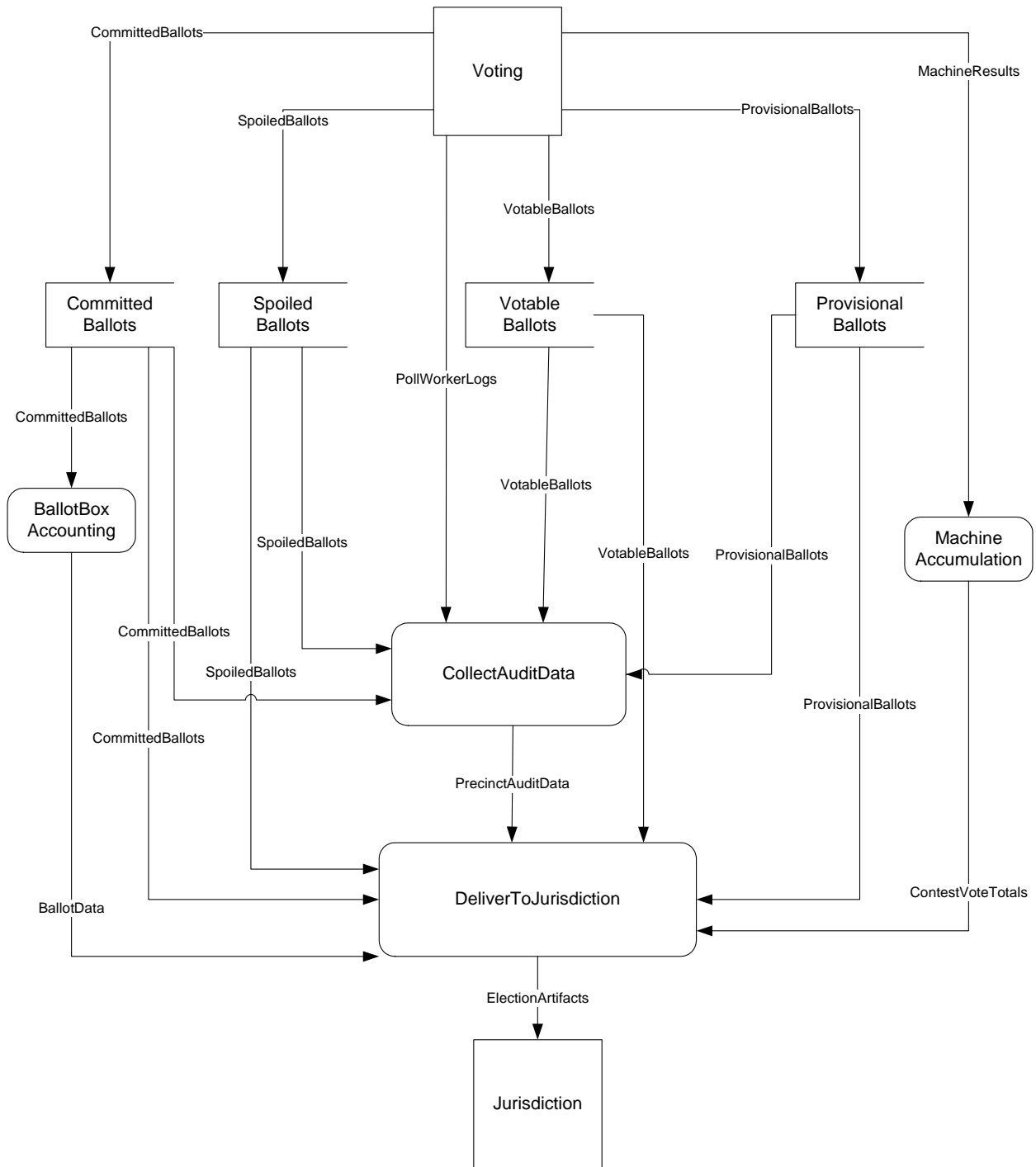
If a VBM CommittedBallot is rejected during Canvass it becomes a SpoiledBallot.

3.3 PrecinctCloseout



3-42 Precinct Closeout Flow Chart⁵

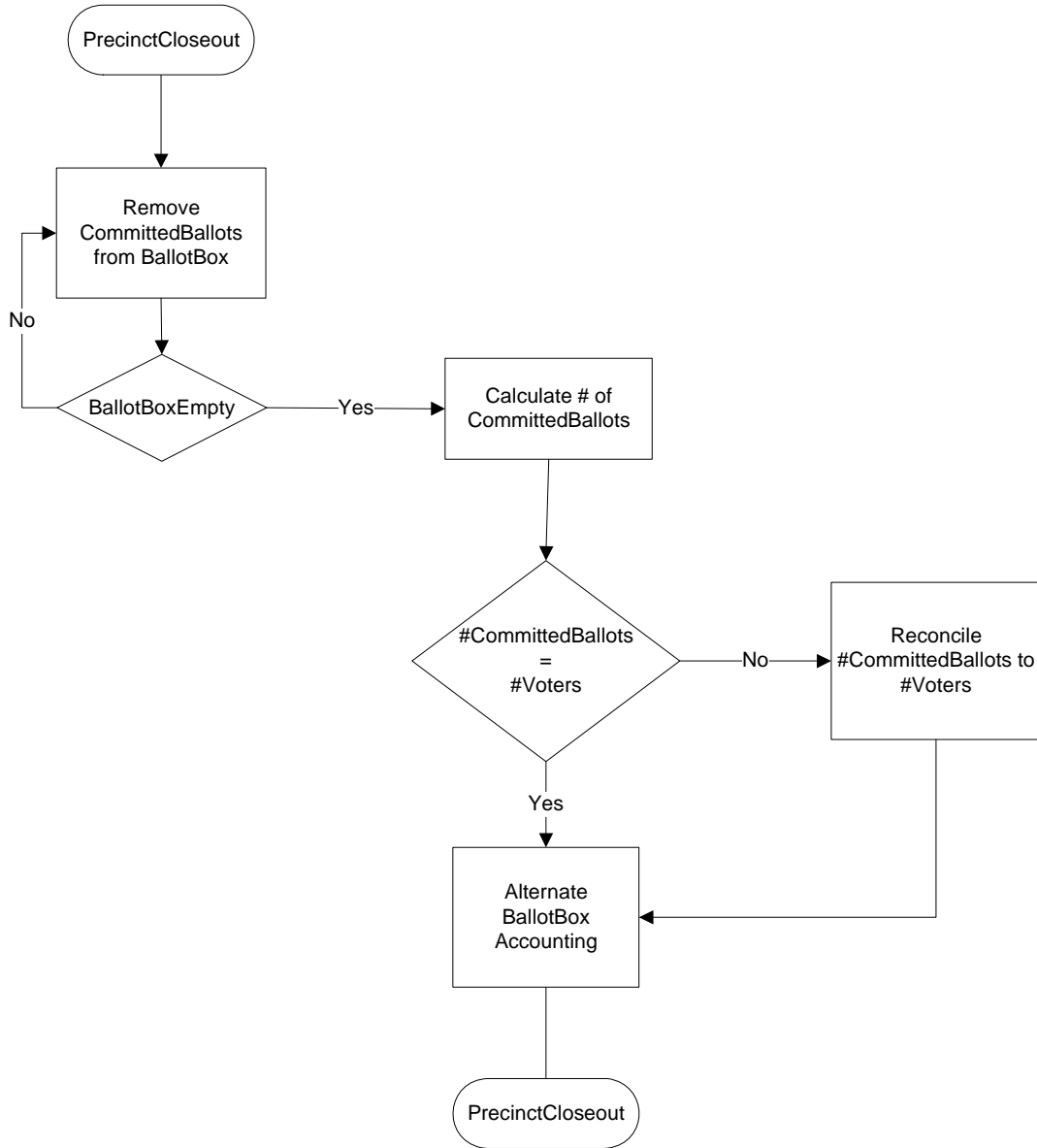
⁵ A Key to Model Symbols is located in Section 5



3-43 Precinct Closeout Data Flow Diagram

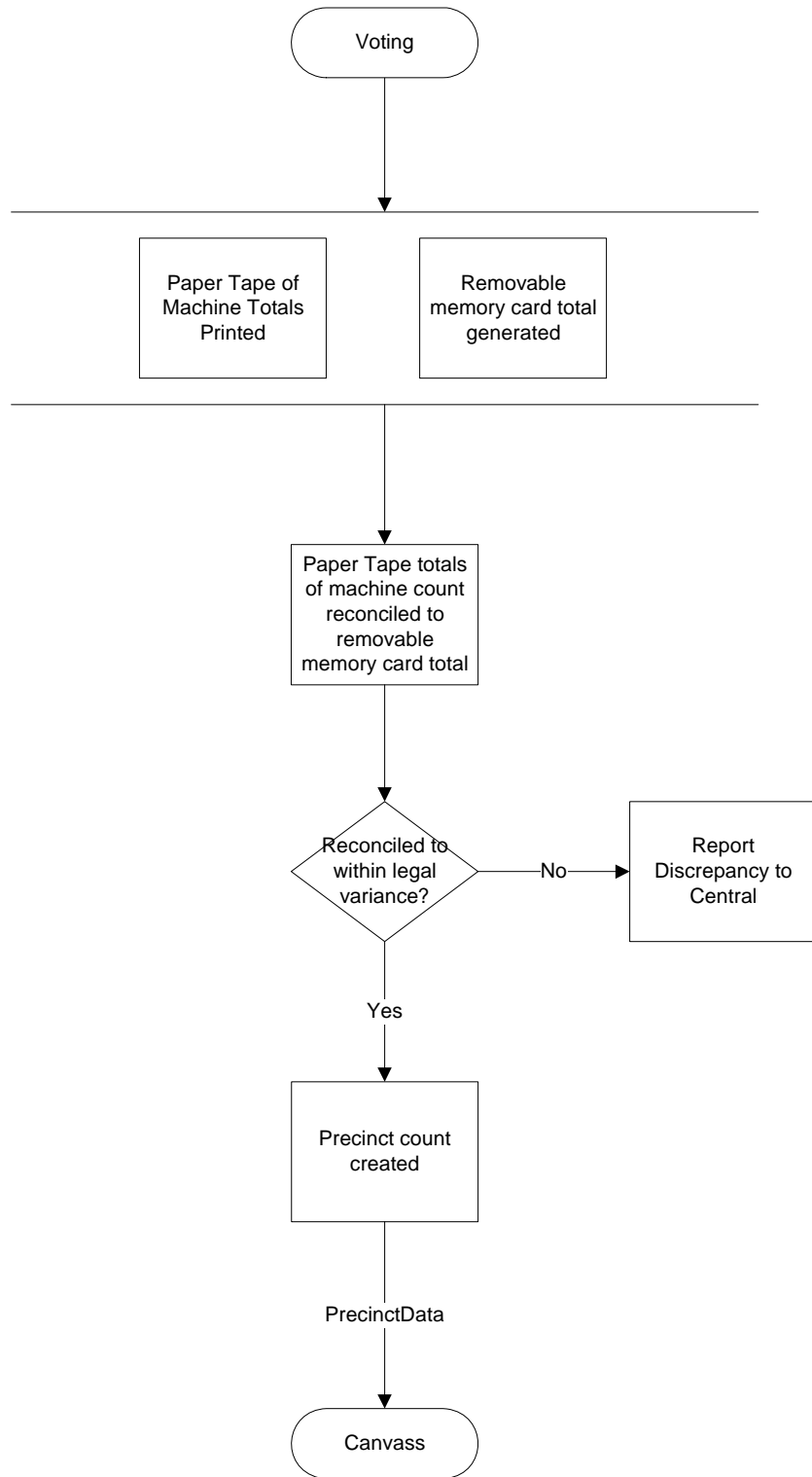
BallotBoxAccounting

BallotBoxAccounting describes the procedures for emptying a physical BallotBox and determining the number of ballots it contains.



3-44 Ballot Box Accounting Flow Chart

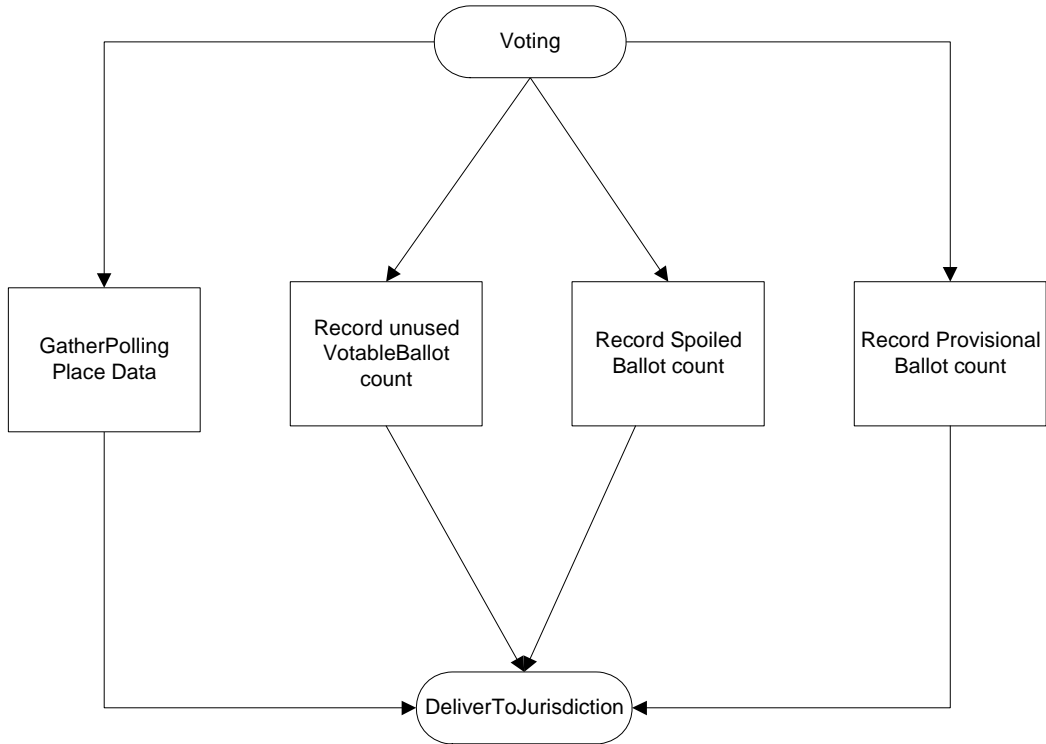
MachineAccumulation



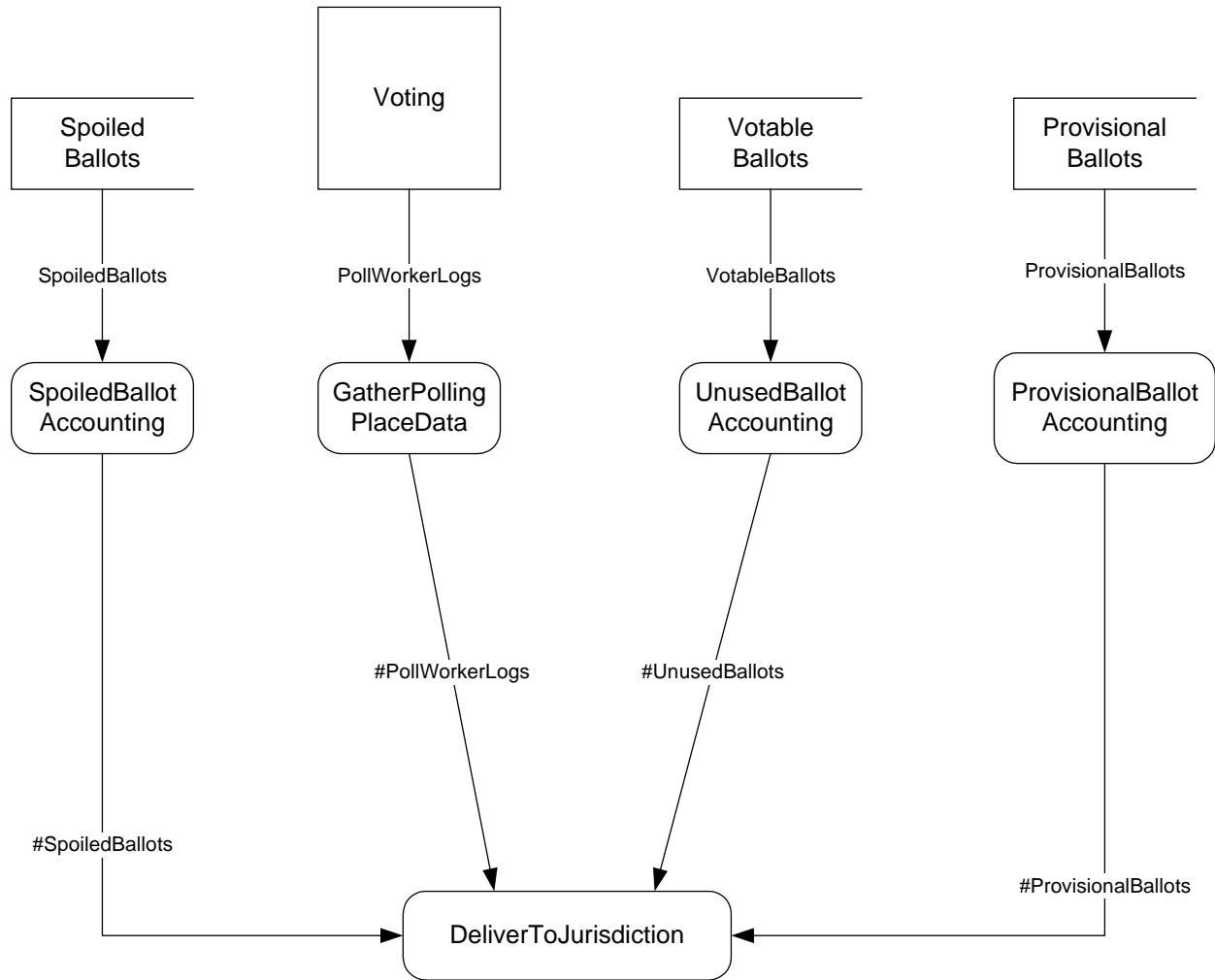
3-45 Machine Accumulation Flow Chart

CollectAuditData

CollectAuditData is the process for gathering data about the election process that can be used to validate the ContestVoteTotals.



3-46 Collect Audit Data Flow Chart



3-47 Collect Audit Data Data Flow Diagram

SpoiledBallotAccounting

SpoiledBallotAccounting refers to the processes that calculate the number of SpoiledBallots and reconcile that number to any associated SpoiledBallot records kept in the PollingPlace.

ProvisionalBallotAccounting

ProvisionalBallotAccounting refers to the processes that calculate the number of ProvisionalBallots and reconcile that number to any associated ProvisionalBallot records kept in the PollingPlace.

UnusedBallotAccounting

UnusedBallotAccounting refers to the processes that calculate the number of unused VotableBallots in the PollingPlace.

GatherPollingPlaceData

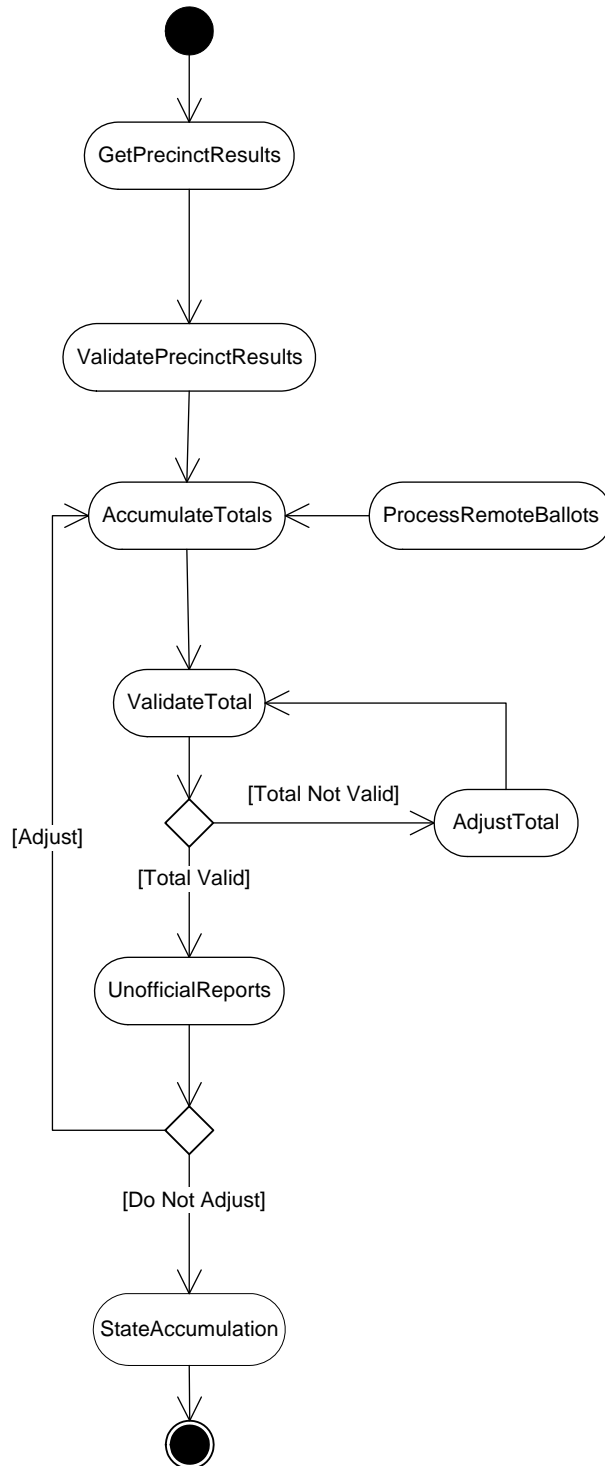
GatherPollingPlaceData refers to the processes that identify, collect, document, and package ElectionArtifacts in the PollingPlace.

DeliverToJurisdiction

DeliverToJurisdiction captures the processes that deliver ElectionArtifacts from PollingPlaces to their appropriate jurisdiction. This includes BallotDelivery.

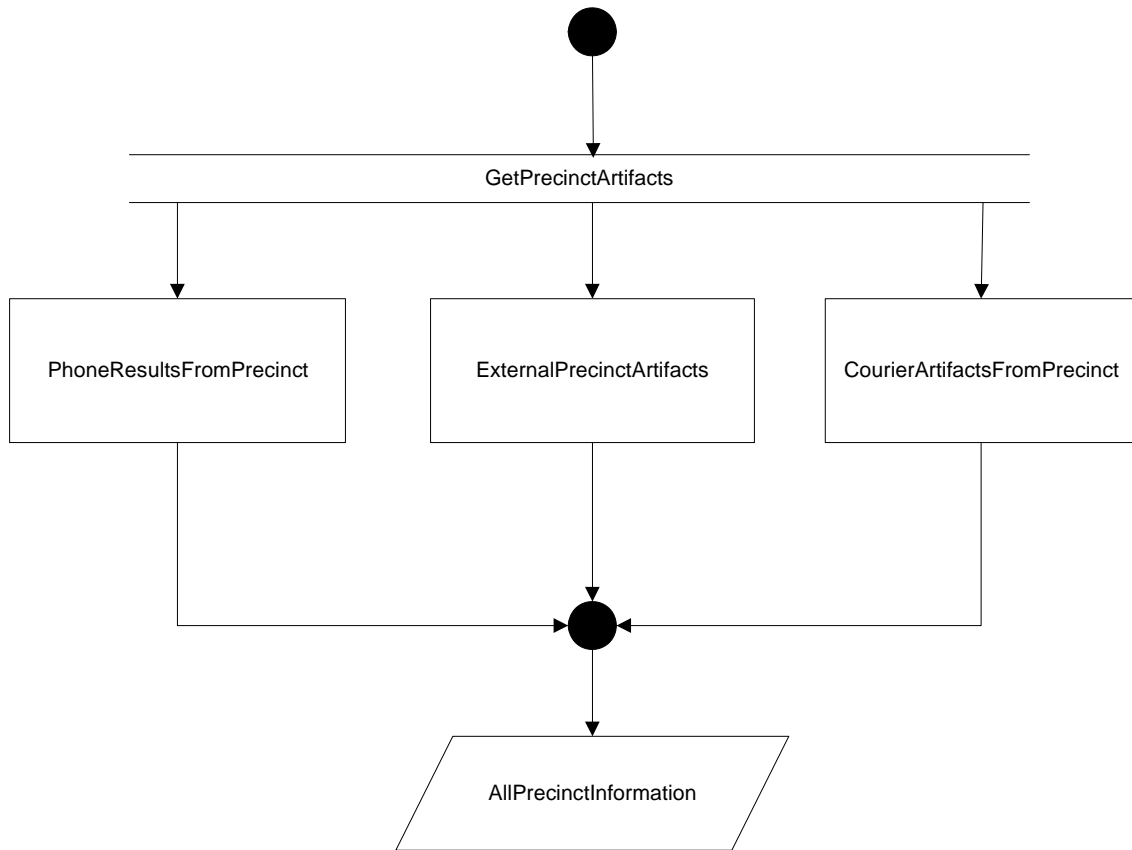
3.4 Canvass

The compilation of election returns and validation of the outcome that forms the basis for political subdivisions to them to ReportResults. "Canvass" is routinely conducted at the local jurisdiction level.



3-48 Canvass Activity Diagram

GetPrecinctResults



3-49 Get Precinct Results Flow Chart

PhoneResultsFromPrecinct

In many Jurisdictions, Precincts transmit preliminary totals to the Jurisdiction via telephone. These may include totals for:

- Voters
- Votes in each Contest
- ProvisionalBallots
- SpoiledBallots
- Etc.

This data may be used by the Jurisdiction for validating results during Canvass or during any subsequent audit.

CourierResultsFromPrecinct

PollingPlace procedures routinely involve transporting election Artifacts to the Jurisdiction. These Artifacts may include totals for:

- PollBooks used as Voter sign in
- PollBooks used as PollWorker logs

- Paper and/or electronic forms of:
- AcceptedBallots
- ProvisionalBallots
- SpoiledBallots
- Etc.

This data used by the Jurisdiction to establish the official election result during Canvass and during any subsequent audit.

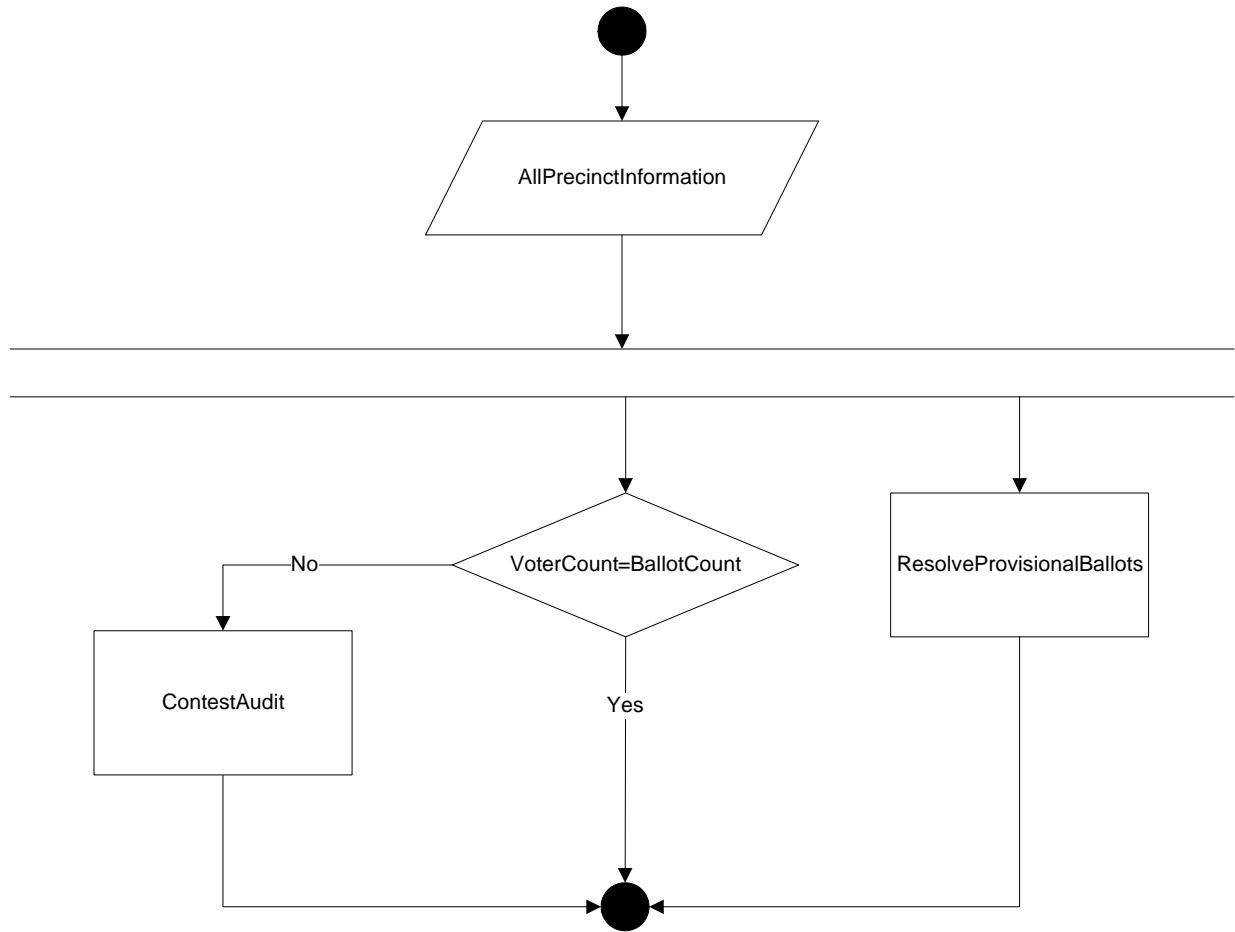
ExternalPrecinctArtifacts

There are materials and information that are relevant to the canvass process that are never physically at the PollingPlace, but are created by, or delivered directly from the voters to, the county elections central. These may include:

- AbsenteeBallots
- Early voting results
- Updated voter information
- Regulations and other documentation

ValidatePrecinctResults

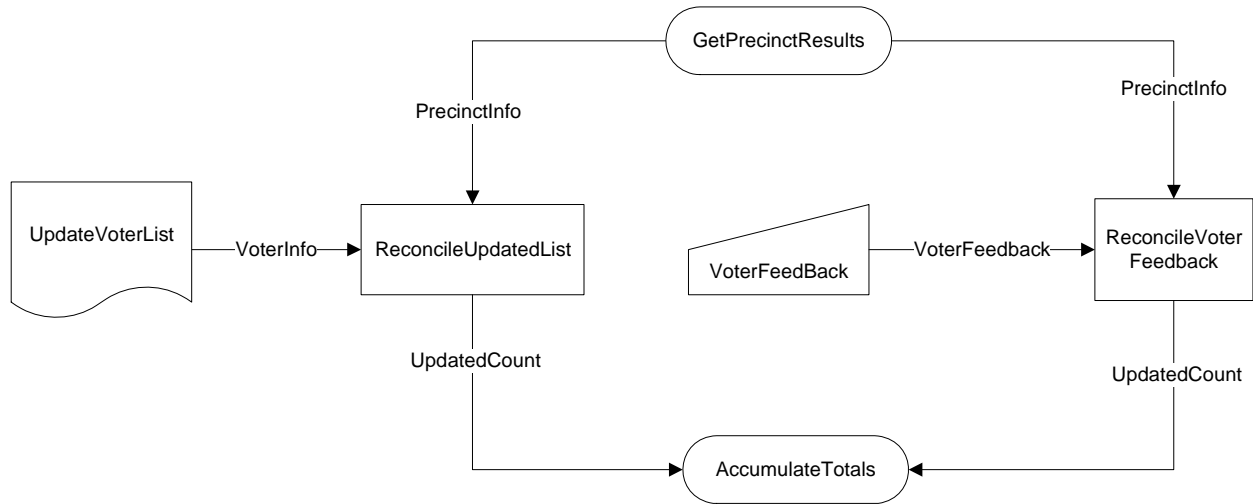
- Decisions beyond the capability or resources of the PollingPlace (e.g., resolving ProvisionalBallots)
- Ensure that PollingPlace procedures were properly followed
- Ensure that no changes occurred during BallotDelivery



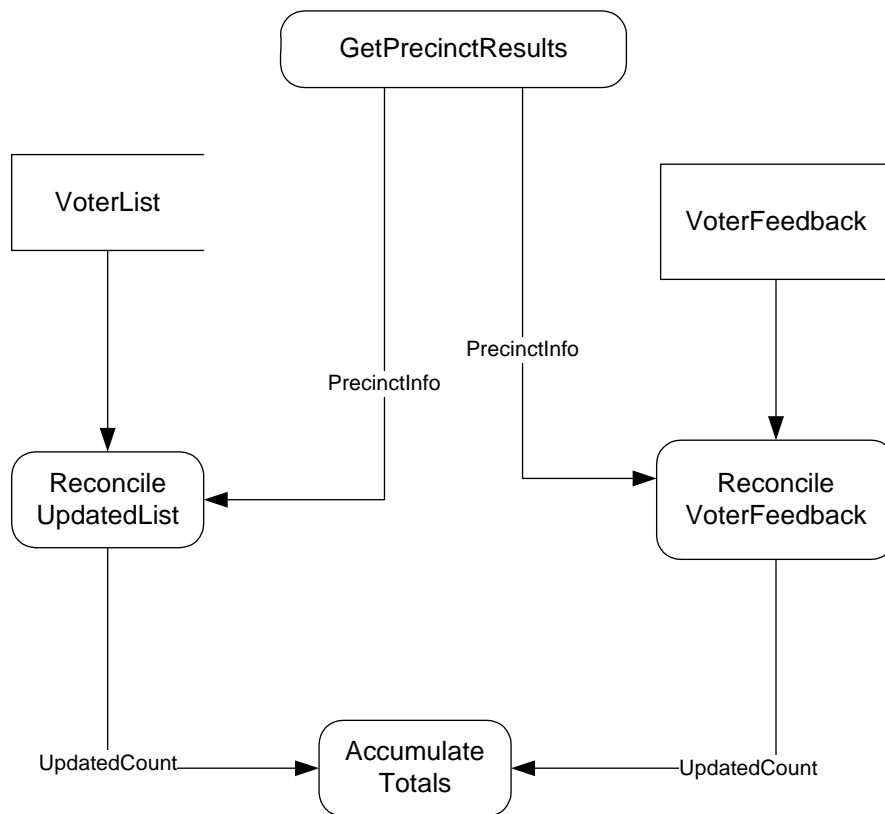
3-50 Validate Precinct Results Flow Chart

ResolveProvisionalBallots

In most cases, Voters are responsible for resolving challenges to their eligibility so that their ProvisionalBallot may be accepted, though Jurisdictions may attempt to reconcile some issues by updating Voter lists without Voter input.



3-51 Resolve Provisional Ballots Flow Chart



3-52 Resolve Provisional Ballots Data Flow Diagram

ContestAudit

ContestAudit conducts an ElectionAudit on a specific contest. The ContestAudit may examine all or any ContestArtifacts.

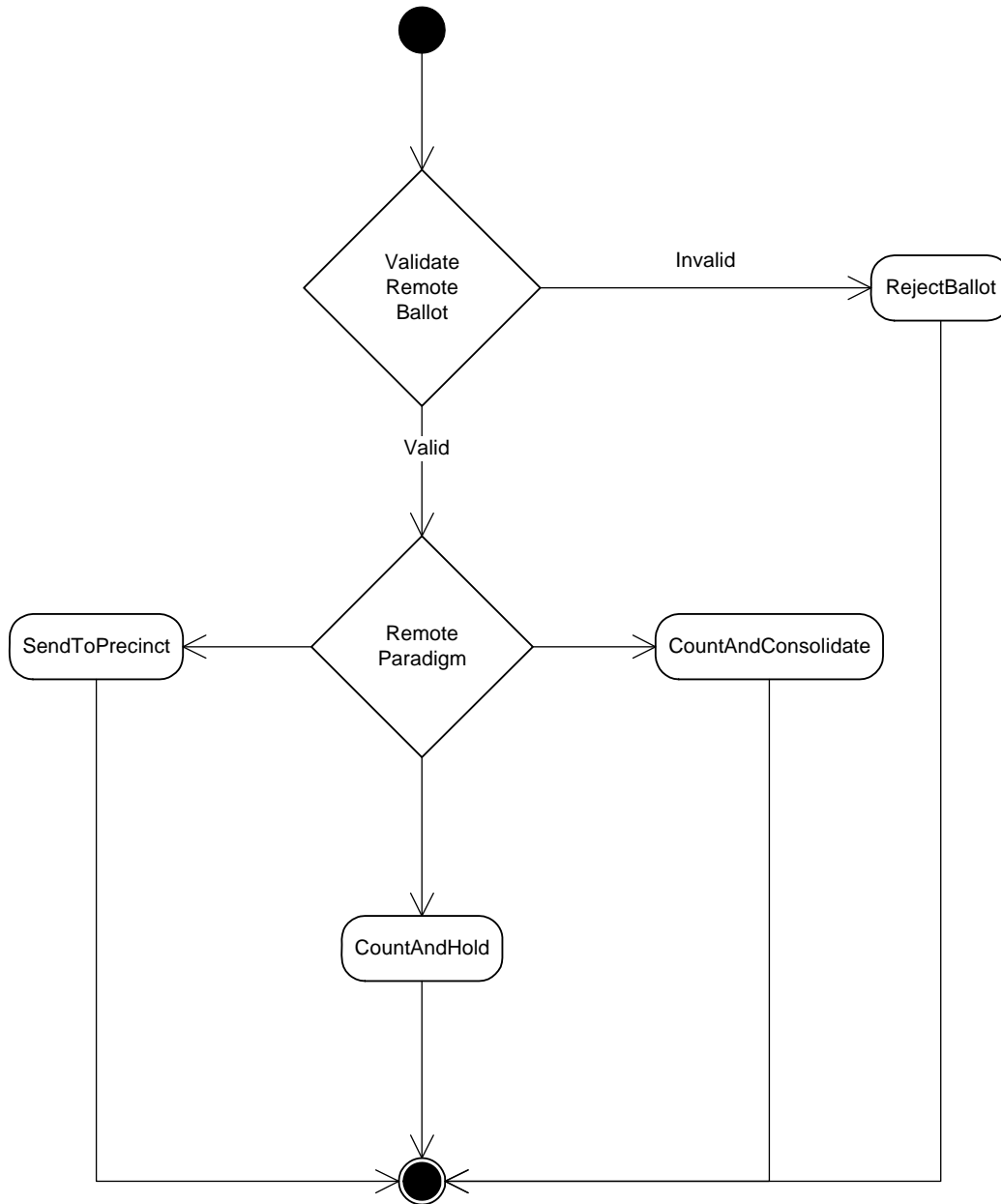
ProcessRemoteBallots

In all cases that we are aware of, remote ballots are validated at the local Jurisdiction. There are three paradigms that states use for counting RemoteBallots.

At the PollingPlace. After they are accepted and removed from their outer envelopes, they are transported to their proper PollingPlace to be counted along with election day AcceptedBallots.

At the local Jurisdiction, where they are incorporated into their Precinct of residence during Canvass.

At the local Jurisdiction, where they are incorporated into a special Precinct designated for RemoteBallots.



3-53 Process Remote Ballots Activity Diagram

AccumulateTotal

For both UnofficialResults and OfficialResults the local Jurisdiction accumulates Precinct ContestVoteTotals, including RemoteBallots and accepted ProvisionalBallots, in each Contest, and, where required, accumulates the Precinct totals for the Jurisdiction.

ValidateTotals

The ValidateTotals process utilizes controls to ensure that the derived ContestVoteTotals are:

- Mathematically accurate
- Consistent with PollingPlace Voter counts
- Consistent with VoterList counts
- Etc.

AdjustTotal

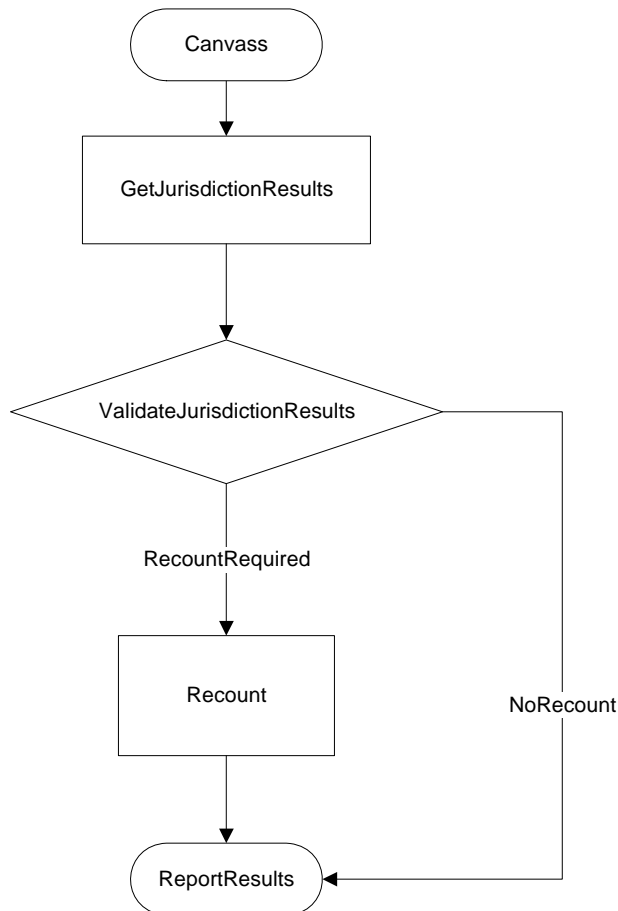
AdjustTotal represents the process to adjust the errant ContestVoteTotal when an AccumulationError is detected.

ReportResults

ReportResults is the process that states and jurisdictions follow to produce and release OfficialResults and UnofficialResults that reveal ContestVoteTotals.

3.5 StateAccumulation

The compilation of election returns and validation of the outcome that forms the basis for states to ReportResults.



3-54 State Accumulation Flow Chart

GetJurisdictionResults

GetJurisdictionResults refers to the processes that states employ to gather OfficialResults from jurisdictions. Results may be attained by a combination of Official correspondence sent via:

- USPS
- Commercial carrier
- Courier
- Fax
- Email attachment
- Web application

ValidateJurisdictionResults

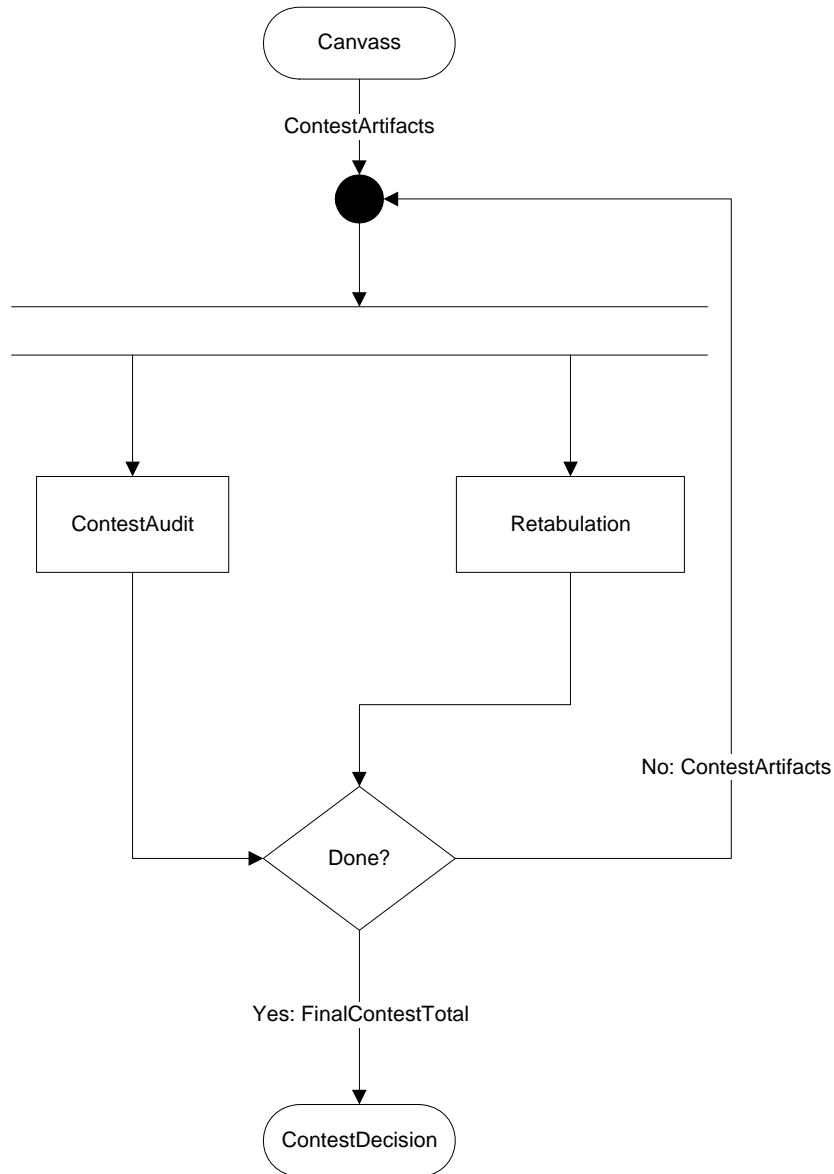
ValidateJurisdictionResults refers to the processes that states take to access the accuracy and completeness of OfficialResults received from jurisdictions for a given election.

AdjustTotal

AdjustTotal represents the process to adjust the errant ContestVoteTotal when an AccumulationError is detected.

Recount

In its pure form, a Recount is a retabulation of (original) Votes on AcceptedBallots in a particular Contest to confirm, or correct, the OfficialResult of the Canvass. The requirement to conduct a recount is determined by each state, with most states requiring a recount of Contests based on a difference threshold.



3-55 Recount Flow Chart

ContestAudit

ContestAudit conducts an ElectionAudit on a specific Contest. The ContestAudit may examine all or any ContestArtifacts.

CountAll

The retabulation portion of the recount involves three steps:

1. Identify the legal AcceptedBallots of record
2. Count all of the AcceptedBallots and
3. Accumulate the ContestVoteTotals

There are two manners of counting used in recounts:

1. MachineRecount and
2. HandRecount

ReportResults

ReportResults is the process that states and jurisdictions follow to produce and release OfficialResults and UnofficialResults that reveal ContestVoteTotals.

3.6 PostCertificationAudit

A PostCertificationAudit is an ElectionAudit that is designed to allow ElectionsOfficials to assess the effectiveness and efficiency of the procedures in a just-completed election.

4 Glossary of Key Terms

AbandonedBallot

A MarkedBallot that was not Committed by the Voter.

AbsenteeVoting

See RemoteVoting

AcceptedBallot

A CommittedBallot that:

- Is in the possession of ElectionsOfficials and
- Has successfully negotiated all filtering processes prior to Canvass and has retained its status as a legal ballot

Accumulation

Collecting and synthesizing totals of AcceptedBallots. This distinguishes Accumulation where totals from several VotingMachines, precincts, etc. are combined, from a MachineCount or HandCount, where each ballot is analyzed and its contents are added to each candidate's ContestVoteTotal.

AccumulationError

Those Election errors that occur as totals are collected, synthesized, and reported.

Artifact

A physical or electronic item or record.

See also ContestArtifacts.

Audit

See: ElectionAudit or ContestAudit

Ballot

An official physical or electronic representation of all Contests in an Election. Ballots present Contests and capture Voter selections. Ideally, Ballots are designed to clearly delineate the available selections for each Contest and to accurately capture the Voter's intended selections.

In addition to the Contests, Ballots routinely contain BallotInstructions and other information as well as forms or structures intended to help Voters express their preferences.

To view a diagram that depicts a ballot's transformation through the voting process, see Ballot State Transition Diagram (Figure 2-1).

To view a Venn diagram that captures overlapping properties of ballots, see BallotVennDiagram (Figure 2-2).

BallotAccounting

Identifies the status of every Ballot created for the Election, usually by PollingPlace.

At the end of the VotingPeriod, the number of Ballots distributed to a PollingPlace should equal the sum of remaining VotableBallots, the AcceptedBallots, ProvisionalBallots and the SpoiledBallots.

BallotBox

An official container for holding AcceptedBallots.

BallotConfiguration

A set of Contests in which Voters of a particular group (e.g., PoliticalParty and/or election district) are entitled to Vote.

BallotCreationMachine

A machine that produces physical or electronic ballots for an election.

BallotDelivery

Delivery of AcceptedBallots and to the Point Of Initial Accumulation (POIA), usually a county elections office. For PCOS PollingPlaces, the paper ballots themselves are delivered via courier, while preliminary results may be delivered soon after the polls close via telephone voice, computer transfer, or fax.

BallotFormat

Reflects presentation rules that are appropriate to the particular voting technology (physical, digital image, audio, etc.) such as background colors, headings, lines, instructions, text size, etc. on Ballots.

BallotImage

Electronic record of all Votes cast by a single Voter. The key connotation of this term is that it represents a marked, electronic ballot. BallotImages may be temporary or persistent. BallotMarkingDevices create temporary BallotImages in order to produce a physical Ballot for a Voter, while Direct Recording Electronic voting systems produce temporary BallotImages during VoterInteraction and then produce a persistent BallotImage for each CommittedBallot on the machine. BallotImage is the counterpart to PhysicalBallot.

BallotInstructions

Information provided to the Voter during the voting session that describes the procedure for executing a Ballot. Such material may (but need not) appear directly on the Ballot.

BallotMarkingDevice (BMD)

A voting machine that conducts VoterInteraction and generates a persistent physical MarkedBallot based on that interaction.

BallotPreparation

Creation of the VotableBallots to be used in an Election by selecting the specific Contests to be represented and applying the BallotFormat and related instructions for each distinct VotableBallot. BallotPreparation also includes preparing and testing election-specific software containing these selections.

BallotPresentation

Process of conveying the Ballot information (e.g., Contests and BallotInstructions) to the Voter. For paper ballots, the Voter must read the Ballot on a static page. On a Direct Recording Electronic, the Voter may change the presentation, e.g. by zooming or paging. Audio Ballots are presented through earphones.

BallotQuestion

An item on a VotableBallot that asks a question (e.g., Yes/No question).

BallotStyle

A conceptual representation of a VotableBallot. A concrete presentation of a particular BallotConfiguration. A given BallotConfiguration may be realized by multiple BallotStyles which may differ in the language used, the ordering of Contests and ContestChoices, etc.

BallotToken

A credential that binds a voter to a BallotStyle.

In many polling places during the VoterCheckIn process, voter authentication is managed separately from ballot management. In PollingPlaces that support more than one BallotStyle, once a voter is authenticated, they are sometimes given a credential that identifies their correct BallotStyle to PollWorkers that issue their VotableBallot.

BMD

See BallotMarkingDevice

Candidate

A person whose name appears as a Contest option on a Ballot in an Election.

Canvass

The compilation of election returns and validation of the outcome that forms the basis for political subdivisions to them to ReportResults. "Canvass" is routinely conducted at the local jurisdiction level.

CastBallot

The term "cast" has many connotations and has attained some legal distinctions that make its use ambiguous. Thus, we do not use this term in our models. *See also:* CommittedBallot and AcceptedBallot

CCOS

See CentralCountOpticalScan

CentralCountOpticalScan (CCOS)

A VotingSystem that employs marks sense technology to Scan and Count CommittedBallots recorded on PhysicalBallots at a central location. CommittedBallots are placed in a BallotBox at the PollingPlace and are transported or transmitted to the central location.

Certification

A CertifyingOfficial's act of designating (usually by signature) the final ContestVoteTotal for a jurisdiction or state.

CertifyingOfficial

The individual with legal authority to determine final ContestVoteTotals for that jurisdiction or state.

ClosedPrimary

PrimaryElection in which Voters receive a Ballot listing only those Candidates running for office in the PoliticalParty with which the Voter is affiliated. In some jurisdictions, NonpartisanContests and referendums, propositions, and/or questions may be included. In some cases, PoliticalParties may allow Unaffiliated Voters to Vote in their party's PrimaryElection.

Source: U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines

CommittedBallot

A physical or electronic MarkedBallot that contains the selections of a Voter in an Election, which are final and irreversible with respect to the Voter. A CommittedBallot that is a BallotImage may contain only Votes, while a CommittedBallot that is a PhysicalBallot usually contains all Contests but reflects each Vote with a predefined LegalMark.

Contest

Decision to be made within an Election, which may be a Contest for office or a referendum, proposition and/or question. A single Ballot may contain one or more Contests.

ContestArtifacts

ContestArtifacts represents all physical and electronic information captured for a specific contest in an election.

ContestArtifacts may include: ballots, BallotPreparation data and artifacts, relevant PollBooks, PhysicalVoteRecords, PollWorker logs, VotingMachine audit logs, voter feedback, VotingMachines themselves, etc.

Source: U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines

ContestAudit

ContestAudit conducts an ElectionAudit on a specific Contest. The ContestAudit may examine all or any ContestArtifacts.

ContestChoice

A value with which a vote in a given Contest is associated (e.g., a Candidate, the values Yes and No).

Source: U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines

ContestDecision

Translates the ContestVoteTotals into the Voters' preference(s) in the Contest.

ContestError

In the macro, ContestError occurs when a ContestVoteTotal does not precisely reflect the IdealContestTotals.

ContestError in the micro (i.e., in terms of individual errors) is the accumulation of VoteErrors and AccumulationErrors relative to a given contest.

ContestFault

Occurs when uncorrectable ContestError impacts a ContestVoteTotal in a way that (1) the ContestDecision is different from the IdealDecision or (2) the ContestVoteTotal alone cannot determine if the ContestDecision is or is not equal to the IdealDecision.

ContestSuccess

Occurs when the ContestVoteTotal is sufficiently close to the IdealContestTotal that the ContestDecision is equal to the IdealDecision.

ContestVoteTotal

The ContestVoteTotal is the reported total of the number of voters that chose an option in a given contest.

Controls

Controls are non-functional processes [1] that are put in place to ensure that functional processes operate correctly and that the fundamental system properties are preserved by the functional processes. For VotingSystems, controls include processes such as:

- Establishing chains of custody for election materials
- Conducting ElectionAudits
- BallotAccounting
- etc.

Judicial or elections official oversight for controls implementation may be legislatively mandated.

Count

There are many words used to describe the process of summing the votes for each candidate. We use the word "count" to reflect accessing each ballot to incorporate each vote into the appropriate ContestVoteTotal. This is distinguished from a machine count, where each ballot is analyzed and its contents are added to candidate totals. It is also distinguished from accumulation or aggregation, where totals from several sources are combined, for example where MachineCounts are accumulated at a PollingPlace.

CountyAccumulation

The Accumulation of Votes for all Contests for a County.

CountedBallot

A CommittedBallot that has at least one contest whose vote is included in the ContestVoteTotal.

CreateElectronicBallotStyle

Designing every BallotStyle electronically based on the applicable Contests and policies on Rotation as well as BallotInstructions and other formatting issues. The resulting electronic BallotStyles are used on electronic VotingMachines.

DirectRecordingElectronic (DRE)

A VotingMachine that conducts VoterInteraction, VoteCommitment, and VoteCapture; Counts each Vote; and generates a persistent BallotImage based on VoterInteraction.

District

See VotingDistrict

DRE

See DirectRecordingElectronic

DuplicatedBallot

An instance of an AcceptedBallot that is created by elections officials to facilitate further processing, e.g. to create a mark-sense ballot from an AcceptedBallot that was damaged or otherwise cannot be read by an optical scanner. DuplicateBallots require exceptional handling procedures to ensure that:

1. Each DuplicateBallot is included in the official count and
2. The DuplicatedBallot, of which any DuplicateBallot is a duplicate, is NOT included in the official count and
3. Ballot counts are carefully recorded to ensure that accurate numbers are available for any subsequent ElectionAudit.

Election

A series of processes that present options to voters, capture their selections, and accumulate those selections. The accumulations are used to decide voter-preferred options in contests.

ElectionArtifact

See ContestArtifacts

ElectionAudit

A process or set of processes that analyze data and processes in an election to identify ContestErrors or to validate ContestVoteTotals.

ElectionDefinition

Definition of the Contests that will appear on the Ballot for a specific Election.

ElectionDatabase

Data file or set of files that contain geographic information about political subdivisions and boundaries, all Contests to be included in an Election, and the allowed selections for each Contest.

ElectionError

In the macro, an ElectionError occurs when a ContestVoteTotal does not precisely reflect the IdealContestTotal.

ElectionError in the micro (i.e. in terms of individual errors) is the accumulation of VoteErrors and AggregationErrors.

ElectionsOfficial

A person associated with administering and conducting Elections, including permanent government personnel and temporary PollWorkers.

ElectionSpecificProgramming(ESP)

The data (and sometimes code, too) that is inserted into the device to provide information about how to represent a DirectRecordingElectronic or BallotMarkingDevice VotableBallot or parse a PrecinctCountOpticalScan or CentralCountOpticalScan CommittedBallot.

EligibleVoter

An LegalVoter who has registered to vote meeting all federal and state requirements and can therefore receive a VotableBallot. It is possible for an individual to be qualified to vote but not be an EligibleVoter. This can occur if the individual registers to vote after the deadline for a specific election. In this case, the person will be a QualifiedVoter but not an EligibleVoter for that election.

A QualifiedVoter and an EligibleVoter can both return to LegalVoter status if the voter moves and is no longer registered to vote in their new location.

ESP

See ElectionSpecificProgramming

FederalElection

An election that will decide at least one contest for a federal office.

GeneralElection

A regularly scheduled Election in which Voters, regardless of PoliticalParty affiliation, are permitted to Vote in Contests.

HandCount

The final Vote Count for each Contest for a given subdivision (e.g., Precinct) where a machine is not used to Count the Votes. The counterpart to HandCount is MachineCount.

HandCountedPaperBallots (HCPB)

A VotingSystem where PhysicalBallots are used for VotableBallots and machines are not used to Accumulate ContestVoteTotals.

HandRecount

Hands-on, human assessment of each ballot to retabulate the ContestVoteTotal.

An important distinction of HandRecounts is that stray and other non-LegalMarks on the HandRecounted ballots may be identified and acted upon during the HandRecount process.

HCPB

See HandCountedPaperBallots

IdealContestTotal

The ideal, or perfect, ContestVoteTotal. That is, the IdealContestTotal in a Contest is the accurate Count or Accumulation of each Voter's selection in that Contest. This is distinguished from the ContestVoteTotal in that the ContestVoteTotal may include ContestErrors, while the IdealContestTotal are perfect or ideal, without error.

It is important to note that the while accomplishing the ideal IdealContestTotal is the goal of every Election, the ideal is rarely (if ever) accomplished in practice and is impossible to identify in non-trivial cases.

IdealDecision

The IdealDecision in a contest translates the IdealContestTotal for a Contest into the Voter's preference(s) in the Contest.

InternetVoting

A VotingSystem that utilizes the Internet to deliver a VotableBallot to a RemoteVoter who completes the VoteCapture process and Commits their Votes by returning the CommittedBallot via the Internet.

Jurisdiction

The lowest level organization that has statutorial, electoral responsibilities as a jurisdiction. A jurisdiction also usually is the lowest government level that employs full time ElectionsOfficials.

LegalMark

The defined sign for Voters to place on physical Ballots to indicate their selection for each Contest or for a BallotMarkingDevice to generate based on its interaction with the Voter.

LegalVoter

An individual who meets the federal age and citizenship requirements and any additional requirements define by their state of residence and who is not disqualified by any other criteria (e.g., felon).

LogicAndAccuracyTesting

Election testing that:

1. Verifies that all voting devices are properly prepared for an election and collect data that verify equipment readiness;
2. Verifies the correct installation and interface of all system equipment;
3. Verifies that hardware and software function correctly; and
4. Segregates test data from actual voting data, either procedurally or by hardware/software features.

MachineCount

The final Vote Count for each Contest on a given Accumulating VotingMachine. The counterpart to MachineCount is HandCount.

MachineRecount

Utilizing the mechanical or electronic counting method to retabulate the ContestVoteTotal.

MarkedBallot

A VotableBallot, physical or electronic, that has been presented to a voter during VoterInteraction; that is, a VotableBallot becomes a MarkedBallot when it is presented to the voter before it is actually marked.

MockElections

One way to analyze VotingMachine behavior is to exercise them under circumstances that simulate the relevant election. These simulations are sometimes called MockElections. MockElections may be scripted events that compare the scripted outcome against those reported by the machines during the MockElection. MockElections may use machines that were used in the relevant election or machines that were prepared but not used.

See also: ParallelTest

NonpartisanOffice

Elected office for which Candidates run without PoliticalParty affiliation.

NotSignedInVoter

An EligibleVoter who has not signed in at the PollingPlace for the current Election. The counterpart to NotSignedInVoter is SignedInVoter.

A NotSignedInVoter, once they have signed in for the current election at the polling place, becomes a SignedInVoter

OfficialResult

The OfficialResult is the final ContestVoteTotal for a Contest in an Election. It is determined by the CertifiedResult that is signed by the senior ElectionsOfficial of the Jurisdiction or state, usually several days after election day.

See also: UnofficialResult

OpenPrimary

PrimaryElection in which all Voters can participate, regardless of their PoliticalParty affiliation. Some states require Voters to publicly declare their choice of PoliticalParty Ballot at the PollingPlace, after which the PollWorker provides or activates the appropriate VotableBallot. Other states allow Voters to select their PoliticalParty Ballot within the privacy of the voting booth.

Source: U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines

OpticalScanner

A device that utilizes light reflection technology to interpret and Count Votes made by LegalMarks on physical, usually paper, VotableBallots. The devices produce an electronic MachineCount and may produce a paper Count and/or persistent BallotImages for each Ballot. Ballots interpreted by OpticalScanners are routinely called Mark Sense Ballots.

OverVote

A condition that occurs when a Voter selects more than the maximum allowable selections in any Contest on a CommittedBallot.

ParallelTest

Tests that randomly select some VotingMachines from a jurisdiction and conduct a MockElection on ElectionDay. The purpose of ParallelTests is to determine if any of the jurisdiction's VotingMachines have been infected with malicious software.

PartisanOffice

An elected office for which Candidates run as representatives of a PoliticalParty.

PCOS

See PrecinctCountOpticalScan

Person

The superclass of Voters, LegalVoters, EligibleVoters, QualifiedVoters, ElectionsOfficials, Candidates, and all other people that may be involved in elections.

PhysicalBallot

Physical record of all Votes cast by a single Voter. The key connotation of this term is that it represents a marked Ballot. BallotMarkingDevices create temporary BallotImages in order to produce a PhysicalBallot for a Voter. PhysicalBallot is the counterpart to BallotImage.

PhysicalVoteRecord

A non-electronic rendering of all selections made by a voter in an election.

POIA

See PointOfInitialAccumulation

PointOfInitialAccumulation(POIA)

The physical location where ballot counts are accumulated. In most cases, this will be the county elections office, but may also be a regional accumulation site.

PoliticalParty

An organization that nominates or selects a candidate for election to office whose name appears on the VotableBallot as the candidate of the organization.

Adapted from the Election Code of Federal Regulations

PollBook

VoterList containing only information relative to a specific Precinct or PollingPlace.

PollBookGeneration

A process definition for the generation of a VoterList containing only information relative to a specific Precinct or PollingPlace.

PollingPlace

Facility to which Voters are assigned to receive a VotableBallot, conduct their VoterInteraction, and make their VoteCommitment. There are several types of polling places utilized in elections, including:

- Election Day Precinct-Specific Polling Place – Each voting precinct is assigned to a unique polling place.
- Election Day Consolidated Precinct Polling Place – Two or more voting precincts are assigned to a unique polling place. This is often based on several factors, including the number of voters in each precinct, size/location of the polling place facilities and the expected voter turnout for each polling place.
- Election Day Vote Center (jurisdiction-wide) – Several polling place/vote centers strategically located throughout the jurisdiction where any voter in the entire jurisdiction can vote on Election Day.
- Election Day Vote Center (regional) – Several polling place/vote centers strategically located by region where any voter within a specific region can vote on Election Day.
- Early Voting Vote Center (jurisdiction-wide) – Several early voting vote centers strategically located throughout the jurisdiction where any voter in the entire jurisdiction can vote during the designated early voting time period.
- Early Voting Vote Center (regional) – Various early voting vote centers strategically located by region where any voter within a specific region can vote during the designated early voting time period.

PollWorker

Person who prepares the Precinct by setting up voting equipment, greets Voters, verifies registrations and provides Voters with appropriate Ballots. At the end of the day, PollWorkers close the Precinct and prepare election materials for delivery or actually deliver the material to the Elections office.

Precinct

Administrative, electoral geographic division in which Voters cast Ballots at the same PollingPlace. A Precinct may contain more than one VotingDistrict and thus a PollingPlace that is assigned to a single Precinct may manage a separate BallotStyle for each VotingDistrict contained therein.

PrecinctAccumulation

Accumulation of all MachineCounts and HandCounts from a given Precinct.

PrecinctCountOpticalScan (PCOS)

A VotingSystem that employs marks sense technology to Scan and Count CommittedBallots recorded on PhysicalBallots at a Precinct-based PollingPlace. A distinctive feature of a PrecinctCountOpticalScan (PCOS) device is that it can be programmed to identify and reject UnderVotes and Overvotes on ballots that it scans.

PrecinctDefinition

Election administration division corresponding to a continuous geographic area that forms basis for determining Voter eligibility relative to a given Contests.

PrimaryElection

An Election held to determine which Candidate will represent a PoliticalParty for a given office in the GeneralElection.

Source: U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines

ProvisionalBallot

A CommittedBallot that was committed by a Voter whose Eligibility is disputed by an ElectionsOfficial or another person who is qualified to dispute a Voter's Eligibility.

QualifiedVoter

QualifiedVoter is a type of LegalVoter who has registered to vote but did not register in time to be an EligibleVoter for a specific election. A QualifiedVoter and an EligibleVoter can both return to LegalVoter status if the voter moves and is no longer registered to vote in their new location.

Receipt

A record of a transaction that binds the details of the transaction to the entity that holds the receipt.

Recount

In its pure form, a Recount is a retabulation of (original) Votes on AcceptedBallots in a particular Contest to confirm, or correct, the OfficialResult of the Canvass. The requirement to conduct a recount is determined by each state, with most states requiring a recount of Contests based on a difference threshold.

RegistrationDatabase

Collection of all registered Voter's data that is used to create PollBooks.

Registration

See VoterRegistration

RejectedBallot

A RejectedBallot is a MarkedBallot whose votes are not included in the ContestVoteTotals, without replacement to the voter.

RemoteBallot

Ballot that is used for RemoteVoting.

RemoteVoter

A voter that receives, marks, in most cases commits their ballot at other than their designated PollingPlace.

RemoteVoting

Voting that occurs at a location other than an official PollingPlace.

RemovableMedia

A form of computer memory that may be removed from one computer or VotingMachine and subsequently inserted and read into another computer or VotingMachine.

Rotation

Generally, Ballots are represented as lists, with lists of Candidates or questions contained within lists of Contests. Some studies show that list representations can inject bias, by favoring the first Candidate in a list, or by emphasizing the first Contest over subsequent Contests. To avoid this potential bias, some states/jurisdictions require that Candidate order be rotated, creating many versions of each BallotStyle. There are many algorithms for accomplishing Candidate rotation, but their goal is to mitigate list order bias. Contest rotation is usually dictated by law, usually involving precedence based on federal, state, and local policies.

RunoffElection

SpecialElection whose purpose is to select a winner following a PrimaryElection or a GeneralElection, in which no Candidate in a Contest received the required minimum percentage of the ContestVoteTotal necessary to determine the ContestDecision.

SeniorPW

The PollWorker in a PollingPlace who is generally responsible for:

- Managing and overseeing PollingPlace operation
- Providing advanced technical guidance to other PollWorkers
- Resolving voter conflicts
- Spoiling and reissuing ballots
- Etc.

The SeniorPW is referred to by various names throughout the country, including Precinct: Judge, Clerk, Chair, Coordinator, etc.

SignedInVoter

An EligibleVoter who has signed in at the PollingPlace for the current Election. The counterpart to SignedInVoter is NotSignedInVoter.

SpecialElection

An election that is held outside the normal election scheduling process, e.g. to fill an office that has become vacant between regularly scheduled elections.

SpoiledBallot

A MarkedBallot that whose votes will not be included in the ContestVoteTotalss, but for which a replacement VotableBallot is provided to the voter that spoiled the ballot.

State

Each State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, and any territory or possession of the United States.

Source: Federal Code of Elections

Tabulation

See Accumulation

Token

Physical device or digital representation given to an EligibleVoter to aid in authentication and provide access to the VotingSystem or their appropriate VotableBallot. A Token can be used to activate an electronic Ballot and may

contain the information needed to determine the correct BallotStyle. Tokens are very commonly used when the PollWorker at the PollBook does not hand out VotableBallots.

Source: U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines

UnderVote

A condition that occurs when a voter marks less than the maximum allowable selections on any contest on a CommittedBallot.

UnofficialResults

Results other than OfficialResults. While UnofficialResults may be released by competent authority, they are unofficial in the sense that they are preliminary and are generally expected to change. Often, they do not include all ballots that are known to be counted, e.g. absentee ballots are sometimes added after UnofficialResults are released.

VBM

See VoteByMail

VBP

See VoteByPhone

VotableBallot

An instance of a BallotStyle that incorporates rotation rules and BallotFormat to form a physical, electronic, audio, etc. ballot that a voter can mark or otherwise use to indicate their selections. Every distinct, legitimate ballot used in an election is termed a VotableBallot.

Since VotableBallots become MarkedBallots when they are issued to a voter, VotableBallots remaining at the end of the VotingPeriod are UnusedBallots.

Vote

A selected candidate or issue in a contest on a ballot. Indication by a Voter of support for a particular Contest choice on a VotableBallot.

VoteByMail (VBM)

A VotingSystem that utilizes the postal service to deliver a Physical VotableBallot a remote Voter who completes the VoteCapture process and Commits their Votes by returning the MarkedBallot.

VoteByPhone (VBP)

A VotingSystem that utilizes the the telephone system to deliver a VotableBallot a remote Voter and Captures the Votes.

VoteCapture

The process of transitioning a VotableBallot from a "pre-vote" or "vote in process" to CommittedBallot. VoteCapture is the voting system action that is triggered by a Voter's VoteCommitment act. For a PhysicalBallot, VoteCapture may entail the MarkedBallot falling into a BallotBox or being fed into an OpticalScanner. For Direct Recording Electronic, it reflects transfer from temporary storage to a final, persistent storage format.

VoteCommitment

A Voter commits their selections by taking a clearly identifiable action that finalizes their Votes. For PhysicalBallots, the Voter may insert their MarkedBallot in an OpticalScanner or BallotBox. For a Direct Recording Electronic, the Voter may touch or press a "vote" button that transfers their selections from temporary storage to a final, persistent storage format and ends the voting session. A VoteByMail Voter inserts their Ballot into the mail system to commit their Votes.

VoteTabulatingMachine

A device that Counts Votes.

Voter

A person that votes in an election. Only EligibleVoters can vote in any election. A voter is an individual who has been issued a VotableBallot.

VoterConfidence

Effective democratic government demands that citizens can have deserved trust that their Elections are conducted according to law, that their Votes count, that all citizens have reasonable opportunity to vote free of coercion, and that no one can vote more than once. The term VoterConfidence is used to capture this notion of trust in the electoral process. There are no perfect Elections and every ElectionError or mishap offers an opportunity to negatively impact VoterConfidence.

VoterInteraction

This is the phase of the voting process where the Voter interprets a VotableBallot, reasons about their Contest choices, and takes action to reflect their selections. For PhysicalBallots, the interaction may be reading, marking, and reviewing the VotableBallot.

VoterList

This self-descriptive term contains all necessary information on prospective voters needed to properly issue (or to refuse to issue) their correct VotableBallot).

VoterRegistration

The process of creating VoterLists. This involves requiring voters to provide information before the election that can be used to: (a) Determine their eligibility to vote (b) Authenticate them at the polling place and (c) Identify their voting district or otherwise select their proper VotableBallot.

VoterVerifiedPaperAuditTrail (VVPAT)

A VotingSystem that supports voter-verification through voter-verifiable paper records (VVPR).

Source: U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines

VoteError

All errors that affect one Vote in one Contest are VoteErrors.

VotingDistrict

The smallest administrative, electoral geographic division and is the basis for determining which contests the LegalVoters residing in that VotingDistrict are eligible to vote. The smallest geographic area where all resident voters receive the same VotableBallot.

There may be more than one VotingDistrict in a precinct.

VotingMachine

An electronic or mechanical device that creates or processes VotableBallots during the voting process.

VotingSystem

Equipment (including hardware, firmware, and software), materials, and documentation used to define elections and BallotStyles, configure voting equipment, identify and validate voting equipment configurations, perform logic and accuracy tests, activate ballots, capture votes, count votes, reconcile ballots needing special treatment, generate reports, transmit election data, archive election data, and audit elections.

Note: Much of this definition is taken from Source the U.S. Election Assistance Commission's Technical Guidelines Development Committee (TGDC) Recommended Guidelines. This definition closely maps to HAVA's definition. In some cases the team felt the need to extend the HAVA definition to more closely map to voting systems today.

VVPAT

See Voter VerifiedPaperAuditTrail

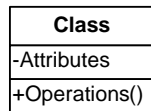
WriteInBallot

An instance of a MarkedBallot that includes at least one contest in which the voter made a write-in selection. Write-in selections generally cannot be interpreted by an optical scanner.

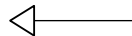
5 Key to Model Symbols

5.1 Domain Models

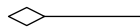
Domain Models



The class is the basic building block for a domain model. It identifies the type of object (e.g., Special Election) and lists its attributes and any operations.



Generalization identifies when one class is a “kind of” another class (e.g., Special Election is a kind of Election). The arrow points to the superclass from one or more subclasses.



Aggregation identifies when one class is composed of (“has a”) another class (parts) (e.g., Election has a Contest). The arrow points from the parts to the whole.



Association indicates a relationship exists between classes (e.g., a Precinct produces a Precinct Accumulation).

1 *

Multiplicity is used on each end Generalization, Aggregation, and Association relationship lines to indicate how many classes are connected across an instance of an Association or Aggregation (e.g., there are one or many Political Parties in a Primary Election).



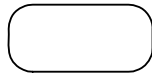
Notes provide addition information or clarification.

5.2 State Transition Diagrams

State Transition Diagrams



Initial state (starting point)



State indicates that an object that has satisfied a condition, is waiting for an event, or is performing an action (e.g., MarkedBallot)



Transition indicates that an object is moving from one state to another (e.g., a MarkedBallot can transition – by Spoil – to a Spoiled Ballot)



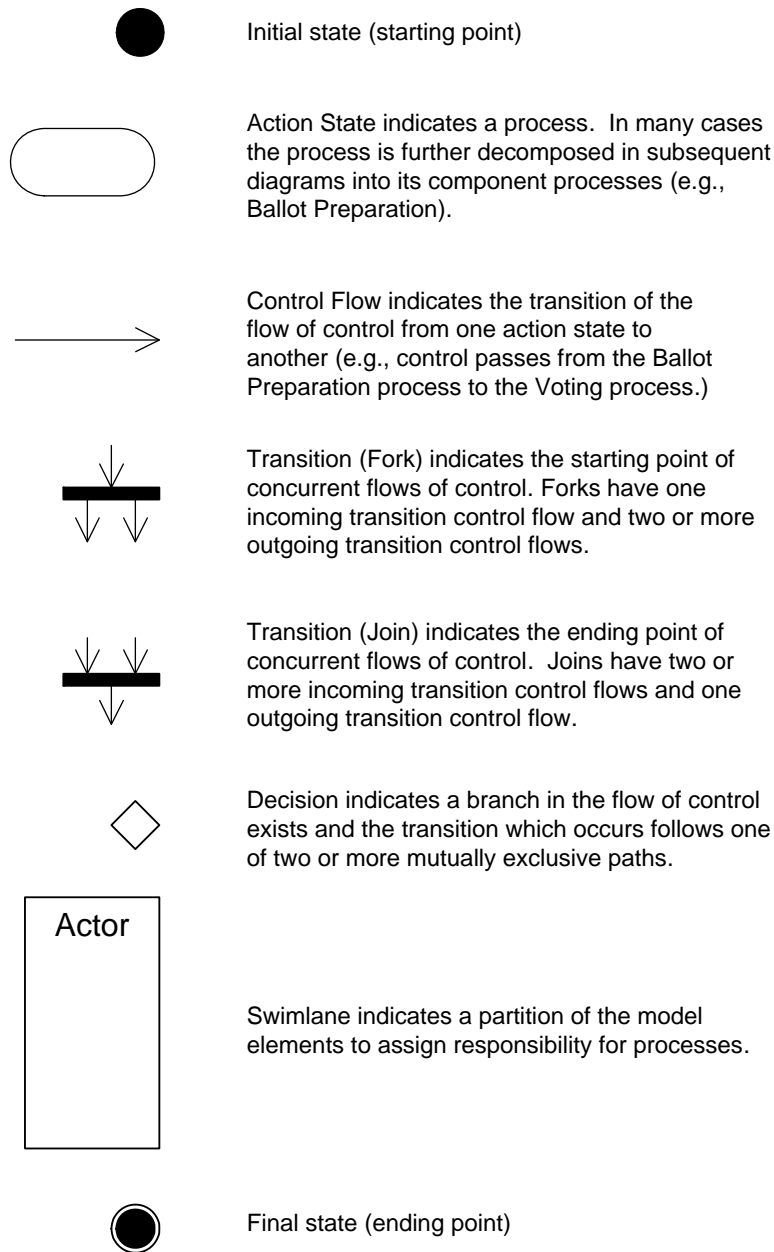
Transition indicates that an object is moving from one state to the same state (e.g., a DRE in Administrative Mode with Election Specific Programming can transition – by Administrative Action – to a DRE in Administrative Mode with Election Specific Programming)



Final state (ending point)

5.3 Activity Diagrams

Activity Diagrams

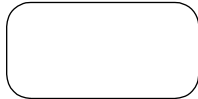


5.4 Data Flow Diagrams

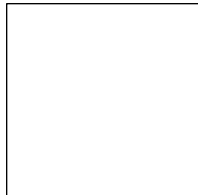
Data Flow Diagrams



Data Store indicates a repository for information which was output from a process.



Process indicates an activity that transforms data from one form to another.

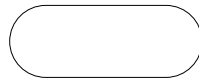


Interface (aka Source or Sink) indicates an external source and/or consumer of data which is outside the system.



Data Flow indicates the flow of data from (1) interfaces to or from processes or (2) processes to or from data stores. Data Flows are labeled with the name of the data.

5.5 Flow Charts



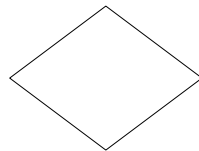
Terminator indicates the beginning and ending points of the process.



Process indicates an action.



Control Flow indicates the transition of the flow of control from one process to another.



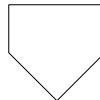
Decision indicates a branch in the flow of control exists and the transition which occurs follows one of two or more mutually exclusive paths.



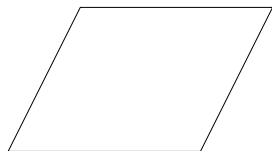
Connectors indicate a jump from one point in the process flow to another point



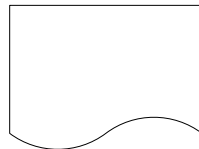
Parallel Mode indicates the synchronization of two or more parallel operations.



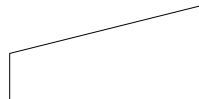
Off Page Connector indicates the process is continued on another page.



Data indicates inputs to and outputs from a process.



Document



Manual Input