Software Requirements Specification

for

Voting System

Revision History

Name	Date	Reason for changes	Version
Voting System	Oct. 7, 2019	Initial draft	0.1
Voting System	Oct. 21, 2019	Error fixed	0.2

1. Introduction

1.1 Purpose

This document presents the software requirements specification for Voting System (VS) (vision 0.1). It includes the whole system and subsystem's purpose, features, interfaces, functions, and constraints on operations with corresponding reactions of the system.

1.2 Document Conventions

This document follows the IEEE standard: IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications. IEEE Computer Society, 1998. Higher-level requirements are assumed to be inherited by detailed requirements. VS is the short for Voting System in the following content.

1.3 Intended Audience and Reading Suggestions

This document is intended for developers, project managers, marketing staff, users, testers, and documentation writers of VS.
Chapter 2: Overall description, describes the overview of the product, including product perspective, functions, constraints, and assumptions.
Chapter 3: External Interface Requirements, describes the logical characteristics of each interface between the software product and the users/ hardware/ other software components.
Chapter 4: System Features, describes organizing the functional requirements for the product by system features, the major services provided by the product.
Chapter 5: Other Nonfunctional Requirements, describe the product's requirements on performance, safety, security, quality, business.
We recommend the readers to read the chapter 2 first, chapter 3 & 4 is mainly for developers and testers, users should also read chapter 5.

1.4 Product Scope

VS is for assisting the various stakeholders with the voting, nominating, generating and sharing voting results for closed/open party votings. It aims to effectively setting voting format, collect candidates data, accepting votes, generating and sharing voting results. Voters can upload their votes to the system and the candidates with the highest votes (opened party voting) or the party with the highest votes (closed party voting) will win the voting.

This system is designed to support parties/independent candidates and election officials manage the nominated candidates, also supports voters to submit their votes, party/candidates preference. We build a database between voters, parties, and election officials. The voting results can also be generated to reports and be shared via social media.

1.5 References

IEEE. IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications. IEEE Computer Society, 1998.

2. Overall Description

2.1 Product Perspective

Voting System (VS) is designed to help parties to submit election candidates and administrators to generate the election results. It consists of various functions, such as candidate registration, election summarization, and election result announcement.

2.2 Product Functions

VS is designed for party administrators, independent candidates, voters, and election administrators. There are distinctive functions for these three types of users.

Independent candidates:
- Party register: Organizations register themselves as an independent candidate in the system.

Party administrator:
- Party register: Organizations register themselves as a party candidate in the system.

Voter:
- Voter submit ballot: Voters vote for the candidates and submit ballots online.

Election administrator (officials):
- Administrator set voting format: The administrator sets the voting format for the voting.
- Administrator announce winner: The administrator displays the winner on the screen.
- Administrator display statistics result: The administrator displays the election statistics on the screen, including type of election, the winner, number of seats, the number of ballots cast, and the number of votes received by each candidate and party.
- Administrator summarize audit files: The administrator summarizes and displays the election trends on the screen, including number of seats, the number of ballots cast, and the number of votes received by each candidate and party over time.
- Shared with media personnel: The results of the election could be shared with media personnel.

2.3 User Classes and Characteristics

- Party administrators and independent candidates can use VS to themselves as a party or individual candidates.
- Voters can use VS to submit ballots online for their candidates.
- Election administrators can use VS to manage elections, such as generating election results and announcing election results.

2.4 Operating Environment

Operating system
- Linux

Library
- Java Runtime Environment (JRE)

2.5 Design and Implementation Constraints

This application runs on Linux operating system and requires Java Runtime Environment (JRE).

2.6 User Documentation

2.7 Assumptions and Dependencies

The client should have internet access and install Java Runtime Environment (JRE).

3. External Interface Requirements

3.1 User Interfaces

The system has a command-line interface (CLI), where the user interacts with the system in the form of successive lines of text. When the system asks the user for input, the prompt text should be concise and clear so that the user can easily follow the instructions. When the system is running in process and can not respond to user input, it should show the progress or current state of the system. After finishing the election process, the system should display necessary information to the screen. The system should also inform the user when it generates a file.

3.2 Hardware Interfaces

The system is able to operate on desktop computers in UMN CSELabs (see https://cseit.umn.edu/computer-classrooms). Internet connection is required so that the file of ballots can be sent to the computer. The audit file generated by the system will be stored on the same computer.

3.3 Software Interfaces

The system is command-line based. The user will initiate the system and interact with it using a terminal interface provided by the operating system.
The system is developed in Java, and only relies on Java standard libraries. Java Runtime Environment (JRE) is required by the system to perform. It is the user's responsibility to install JRE prior to using the system.

3.4 Communication Interfaces

The system uses Java application programming interface (API) to handle inputs and outputs, including reading from command-line, reading from text files, displaying to command-line and writing text files.

4. System Features

4.1 Deal With Tie

Name	Deal With Tie
ID	VS_001
Description	If there is ever a tie, flip a coin. Randomly select the winner in a fair coin toss.
Actors	System administrators.
Organizational Benefits	Deal with the Tie conditions.
Frequency of Use	Less than the number of seats of final winners.
Triggers	When there is a tie at the end of the voting.
Preconditions	The Voting has finished.
Postconditions	A winner is generated.
Main Course	1. System pops up "There is a tie situation. Do you want to flip the coin?" (AC1)(EX1) 2. The user flip the coin in the system. 3. The system declared the result (winner).
Alternate Courses	AC1 User decides not to flip now. 1. User input "quit", return to the main menu.
Exceptions	EX1 User does not input yes/no/quit 1. The system pops up "wrong command, please input again 2. The system return to main step1.

4.2 Party Puts Up Candidates

Name	Party Puts Up Candidates

ID	VS_002
Description	Parties submit their candidates.
Actors	Party Administrator.
Organizational Benefits	Identify the candidates of the voting.
Frequency of Use	At least one for each party.
Triggers	User input submit_candidate in the command line.
Preconditions	The party has not submitted candidates. The voting has not begun.
Postconditions	The candidates of the party have been updated to the system database.
Main Course	1. The user input "submit_candidate" in the command line. (AC1) (EX1) 2. The system show an example of file. 3. The user uploads the candidates file. (AC1)(AC2) (EX2) 4. The system pops out a confirmation. 5. The system return to the main page.

Alternate Courses	AC1 User decides not to register now.
	    1. User input "quit", return to main page.
	AC2 The file's format is wrong.
	    1. The system pops up "Please check your file's format.
	    2. Return to main step 2.

Exceptions	EX1 The party has already submitted the candidates.
	    1. The system pops up "You've already submitted the candidates".
	    2. Return to the main page.
	EX2 The file's format is wrong.
	    1. The system pops up "The file's format is wrong"
	    2. The system show a sample format.
	    3. Return to main course step2.

4.3 Voter Submit Ballot

Name	Voter Submit Ballot
ID	VS_003
Description	Voters vote for the candidates and submit ballots online.
Actors	Voter

Organizational Benefits	Voting system gets the ballots for the voting.
Frequency of Use	At most once for each voter per voting.
Triggers	The voter runs command line of submitting a ballot.
Preconditions	A ballot file is generated by the voter.
Postconditions	Voting system copies the ballot file and saves it to the corresponding location.
Main Course	1. User inputs "submit_ballot [ballot file]" in the command line. (AC1) . 2. System pops out a confirmation notification. 3. User input "yes/y" (AC2). 4. System pops a successful uploading notification. (EX1). 5. System returns to the main page.

Alternate Courses	AC1 User decides not to submit now.
	    1. User inputs "quit" to return to the main page.
	AC2 User decides not to submit the ballot file.
	    1. User inputs "no/n" to return to the main page.

Exceptions	EX1 The ballot file is already submitted.
	    1. System pops out failure notification "You have already uploaded your ballot".
	    2. System returns to the main page.

4.4 Administrator Set Voting Format

Name	Administrator Set Voting Format
ID	VS_004
Description	The administrator sets the voting format for the voting.
Actors	Administrator
Organizational Benefits	The voting system gets information of the voting and gets the information to read corresponding texture in each ballot file.
Frequency of Use	At least once per voting. Can change or reset multiple times.
Triggers	The administrator runs command line of setting voting format.
Preconditions	Classes are being offered by instructors. Campers are being placed into the classes.
Postconditions	A format file is generated in the voting directory.
Main Course	1. User inputs "set_format [voting directory]" in the command line. (AC1) 2. System outputs format choices. 3. User inputs corresponding format number. (AC1) (EX1) 4. System generates a format file in the voting directory. 5. System pops a successful setting notification. 6. System returns to the main page.
Alternate Courses	AC1 User decides not to set now. 1. User inputs "quit". 2. System returns to the main page.
Exceptions	EX1. User input illegal format number. 1. System outputs illegal input warning. 2. System continues with main course step 2.

4.5 Administrator Announce Winner

Name	Administrator Announce Winner
ID	VS_005
Description	The administrator displays the winner on the screen
Actors	Election Administrator (officials).
Organizational Benefits	Announce the winner of the election to everyone
Frequency of Use	Once per election
Triggers	User input winner in the command line.
Preconditions	The voting has finished. The administrator has processed all voters' ballots.
Postconditions	The name of the election winner will be printed on the screen.
Main Course	1. User inputs "winner" in the command line. (AC1)(EX1). 2. System pops out a confirmation notification. 3. User input "yes/y" (AC2). 4. System calculates the ballots and selects the winner. (AC3). 5. System prints the name of the winner on the screen.

Alternate Courses	AC1 User decides not to submit now.
	    1. User inputs "quit" to return to the main page.
	AC2 User decides not to select the winner.
	    1. User inputs "no/n" to return to the main page.
	AC3 Two candidates have the same number of votes.
	    1. System asks the user to toss a coin and input the winner.

Exceptions	EX1 User enters illegal input
	    1. System pops out failure notification "Your input is illegal".
	    2. System returns to the main page.

4.6 Administrator Display Statistics Result

Name	Administrator Display Statistics Result
ID	VS_006
Description	The administrator displays the election statistics on the screen, including type of election, the winner, number of seats, the number of ballots cast, and the number of votes received by each candidate and party.
Actors	Election Administrator (officials).
Organizational Benefits	Announce the election statistics to everyone
Frequency of Use	Once per election
Triggers	User input "display statistics" in the command line.
Preconditions	The voting has finished. The administrator has processed all voters' ballots.
Postconditions	The election statistics will be printed on the screen.
Main Course	1. User inputs "display statistics" in the command line. (AC1)(EX1). 2. System pops out a confirmation notification. 3. User input "yes/y" (AC2). 4. System generates the election statistics (AC3). 5. System prints the election statistics on the screen.

Alternate Courses	AC1 User decides not to submit now.
	    1. User inputs "quit" to return to the main page.
	AC2 User decides not to select the winner.
	    1. User inputs "no/n" to return to the main page.
	AC3 Two candidates have the same number of votes.
	    1. System asks the user to toss a coin and input the winner.

Exceptions	EX1 User enters illegal input
	    1. System pops out failure notification "Your input is illegal".
	    2. System returns to the main page.

4.7 Administrator Summarize Audit Files

Name	Administrator Summarize Audit Files
ID	VS_007
Description	The administrator summarizes and displays the election trends on the screen, including number of seats, the number of ballots cast, and the number of votes received by each candidate and party over time.
Actors	Election Administrator (officials).
Organizational Benefits	Show the summary of audit files to everyone.
Frequency of Use	Once per election
Triggers	User input "summary" in the command line.
Preconditions	The voting has finished. The administrator has processed all voters' ballots.
Postconditions	The summary of the audit file will be printed on the screen.
Main Course	1. User inputs "summary" in the command line. (AC1)(EX1). 2. System pops out a confirmation notification. 3. User input "yes/y" (AC2). 4. System generates the summary. 5. System prints the summary of audit files on the screen.
Alternate Courses	AC1 User decides not to submit now. 　　1. User inputs "quit" to return to the main page. AC2 User decides not to select the winner. 　　1. User inputs "no/n" to return to the main page.
Exceptions	EX1 User enters illegal input 　　1. System pops out failure notification "Your input is illegal". 　　2. System returns to the main page.

4.8 Shared With Media personnel

Name	Shared With Media personnel
ID	CRSS_008
Description	The results of the election could be shared with media personnel.

Actors	Election Administrator (officials).
Organizational Benefits	Attract people collaborate and participate in the voting. Ensure the representativeness of the results.
Frequency of Use	The result will be shared on Twitter everyday.
Triggers	The administrator input share in the command line.
Preconditions	The voting has begun. The administrator has logged in.
Postconditions	Statistics of current data are posted to twitter.
Main Course	1. The user input share in the command line 2. The system asked the user to input twitter name (AC1) 3. The system asked the user to input the password (AC1) (EX1) 4. The system asked the user to verify the content to be posted (AC1) 5. Posted confirmed (AC1) (EX2) 6. Return to the main page.
Alternate Courses	AC1 User decides not to register now. 1. User input "quit", return to main course step 1.

Exceptions	EX1. User name and user password does not match.
	    1. System pops up "wrong twitter name or password"
	    2. Return to the main course step 2.
	
	EX2. System fails on posting.
	    1. System pops up "Post failed, error XXX…"
	    2. System redirects the user to the main course step 4.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

5.1.1 Response Time

System should be able to respond to the operations of all users quickly, which means it should show different data or tables and respond to editing in time. In case of multiple users operating at the same time, the system should be able to respond to all of them smoothly.

5.1.2 Processing Speed

System needs high processing speed. It needs to finish statistics of one voting with more than 10,000 ballots in 5 minutes.

5.2 Safety Requirements

5.2.1 Operating Environment

Submitting ballots and communication with media personnels are done in an online environment. The other operations are done offline.

5.3 Security Requirements

5.3.1 User Permission Requirement

Only the authorized administrator can access the ballot data. The voters need to be verified before voting and once submit the ballot, they cannot change their ballots. The party users need to register and be verified to set the candidates. Once the candidates are set, the party users cannot access the voting data.

5.4 Software Quality Attributes

5.4.1 Architecture

The whole system is divided into backend database and frontend interface.

5.5 Business Rules

No business rules for the voting system.

Appendix

1. Example File Generated for Open Party List voting:

```
OPL
3
9
6
[Pike,D]
[Foster,D]
[Deutsch,R]
[Borg,R]
[Jones,R]
[Smith,I]
1,,,,,
1,,,,,
,1,,,,
,,,,1,
,,,,,1
,,,1,,
,,,1,,
1,,,,,
,1,,,,
```

2. Example File Generated for Closed Party List voting:

CPL
4
[D,R,G,I]
7
100
16
[Pike,D,1]
[Foster,D,2]
[Floyd,D,3]
[Jones,D,4]
[Mallory,D,5]
[Deutsch,R,1]
[Wong,R,2]
[Walters,R,3]
[Keller,R,4]
[Borg,R,5]
[Jones,G,1]
[Smith,G,2]
[Lewis,G,3]
[Smith,G,4]
[Li,G,5]
[Perez,I,1]
1,,,
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