**Software Requirements Specification**

**for**

**Voting System**

**Version 0.1 approved**

**Prepared by Team 11**

**University of Minnesota Twin Cities**

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**Revision History**

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| --- | --- | --- | --- |
| **Name** | **Date** | **Reason For Changes** | **Version** |
| **Team 11** | 01-31-2021 | Creation of document. Began filling in core ideas and dividing up tasks among teammates. | 0.1 |
|  |  |  |  |

# Introduction

## Team Members

* + 1. Ryan Mower: mower023
    2. Emma Spindler: spind038
    3. Hoai Bui: bui00015
    4. Eric Palmer: palme885

## Purpose

The purpose of this document is to provide a detailed description of the voting system. It will explain the purpose and features implemented by the voting system. In addition, it will display interfaces

## Document Conventions

*<Describe any standards or typographical conventions that were followed when writing this SRS, such as fonts or highlighting that have special significance. For example, state whether priorities for higher-level requirements are assumed to be inherited by detailed requirements, or whether every requirement statement is to have its own priority.>*

## Intended Audience and Reading Suggestions

*<Describe the different types of reader that the document is intended for, such as developers, project managers, marketing staff, users, testers, and documentation writers. Describe what the rest of this SRS contains and how it is organized. Suggest a sequence for reading the document, beginning with the overview sections and proceeding through the sections that are most pertinent to each reader type.>*

## Product Scope

*<Provide a short description of the software being specified and its purpose, including relevant benefits, objectives, and goals. Relate the software to corporate goals or business strategies. If a separate vision and scope document is available, refer to it rather than duplicating its contents here.>*

## References

*<List any other documents or Web addresses to which this SRS refers. These may include user interface style guides, contracts, standards, system requirements specifications, use case documents, or a vision and scope document. Provide enough information so that the reader could access a copy of each reference, including title, author, version number, date, and source or location.>*

# Overall Description

## Product Perspective

*<Describe the context and origin of the product being specified in this SRS. For example, state whether this product is a follow-on member of a product family, a replacement for certain existing systems, or a new, self-contained product. If the SRS defines a component of a larger system, relate the requirements of the larger system to the functionality of this software and identify interfaces between the two. A simple diagram that shows the major components of the overall system, subsystem interconnections, and external interfaces can be helpful.>*

## Product Functions

*<Summarize the major functions the product must perform or must let the user perform. Details will be provided in Section 3, so only a high level summary (such as a bullet list) is needed here. Organize the functions to make them understandable to any reader of the SRS. A picture of the major groups of related requirements and how they relate, such as a top level data flow diagram or object class diagram, is often effective.>*

## User Classes and Characteristics

*<Identify the various user classes that you anticipate will use this product. User classes may be differentiated based on frequency of use, subset of product functions used, technical expertise, security or privilege levels, educational level, or experience. Describe the pertinent characteristics of each user class. Certain requirements may pertain only to certain user classes. Distinguish the most important user classes for this product from those who are less important to satisfy.>*

## Operating Environment

*<Describe the environment in which the software will operate, including the hardware platform, operating system and versions, and any other software components or applications with which it must peacefully coexist.>*

The voting system program is being developed on several different operating systems including Windows 10, Ubuntu 20.04 LTS, Macintosh Catalina. However, the target machine is running a Linux Ubuntu 16.04 LTS or more recent version. Additional requirements for the target machine is that it has at least 16 GB of random access memory and 1 GB of disk space for the outputted logfile. If the voting system algorithm is distributed, it should also run on Windows 10 and Macintosh as well.

## Design and Implementation Constraints

*<Describe any items or issues that will limit the options available to the developers. These might include: corporate or regulatory policies; hardware limitations (timing requirements, memory requirements); interfaces to other applications; specific technologies, tools, and databases to be used; parallel operations; language requirements; communications protocols; security considerations; design conventions or programming standards (for example, if the customer’s organization will be responsible for maintaining the delivered software).>*

## User Documentation

*<List the user documentation components (such as user manuals, on-line help, and tutorials) that will be delivered along with the software. Identify any known user documentation delivery formats or standards.>*

## Assumptions and Dependencies

*<List any assumed factors (as opposed to known facts) that could affect the requirements stated in the SRS. These could include third-party or commercial components that you plan to use, issues around the development or operating environment, or constraints. The project could be affected if these assumptions are incorrect, are not shared, or change. Also identify any dependencies the project has on external factors, such as software components that you intend to reuse from another project, unless they are already documented elsewhere (for example, in the vision and scope document or the project plan).>*

# External Interface Requirements

## User Interfaces

*<Describe the logical characteristics of each interface between the software product and the users. This may include sample screen images, any GUI standards or product family style guides that are to be followed, screen layout constraints, standard buttons and functions (e.g., help) that will appear on every screen, keyboard shortcuts, error message display standards, and so on. Define the software components for which a user interface is needed. Details of the user interface design should be documented in a separate user interface specification.>*

## Hardware Interfaces

*<Describe the logical and physical characteristics of each interface between the software product and the hardware components of the system. This may include the supported device types, the nature of the data and control interactions between the software and the hardware, and communication protocols to be used.>*

## Software Interfaces

*<Describe the connections between this product and other specific software components (name and version), including databases, operating systems, tools, libraries, and integrated commercial components. Identify the data items or messages coming into the system and going out and describe the purpose of each. Describe the services needed and the nature of communications. Refer to documents that describe detailed application programming interface protocols. Identify data that will be shared across software components. If the data sharing mechanism must be implemented in a specific way (for example, use of a global data area in a multitasking operating system), specify this as an implementation constraint.>*

## Communications Interfaces

*<Describe the requirements associated with any communications functions required by this product, including e-mail, web browser, network server communications protocols, electronic forms, and so on. Define any pertinent message formatting. Identify any communication standards that will be used, such as FTP or HTTP. Specify any communication security or encryption issues, data transfer rates, and synchronization mechanisms.>*

# System Features

*<This template illustrates organizing the functional requirements for the product by system features, the major services provided by the product. You may prefer to organize this section by use case, mode of operation, user class, object class, functional hierarchy, or combinations of these, whatever makes the most logical sense for your product.>*

## System Feature 1

*<Don’t really say “System Feature 1.” State the feature name in just a few words.>*

4.1.1 Description and Priority

*<Provide a short description of the feature and indicate whether it is of High, Medium, or Low priority. You could also include specific priority component ratings, such as benefit, penalty, cost, and risk (each rated on a relative scale from a low of 1 to a high of 9).>*

4.1.2 Stimulus/Response Sequences

*<List the sequences of user actions and system responses that stimulate the behavior defined for this feature. These will correspond to the dialog elements associated with use cases.>*

4.1.3 Functional Requirements

*<Itemize the detailed functional requirements associated with this feature. These are the software capabilities that must be present in order for the user to carry out the services provided by the feature, or to execute the use case. Include how the product should respond to anticipated error conditions or invalid inputs. Requirements should be concise, complete, unambiguous, verifiable, and necessary. Use “TBD” as a placeholder to indicate when necessary information is not yet available.>*

*<Each requirement should be uniquely identified with a sequence number or a meaningful tag of some kind.>*

REQ-1:

REQ-2:

## System Feature 2 (and so on)

# Other Nonfunctional Requirements

## Performance Requirements

*<If there are performance requirements for the product under various circumstances, state them here and explain their rationale, to help the developers understand the intent and make suitable design choices. Specify the timing relationships for real time systems. Make such requirements as specific as possible. You may need to state performance requirements for individual functional requirements or features.>*

The voting system is tasked with collecting votes for many users, ranging up to 100,000. Being such a large number, the voting system must be able to process and successfully terminate in 8 minutes or less. Another requirement is that the election CSV file is located within the same directory as the executable for the voting system’s algorithm. The executable is required to be one file that contains the entire program. In addition, the target machine must have at least 150 MB of RAM (assuming 1 KB of RAM per ballot and 50 MB for extra overhead) and 1 GB of disk space for the outputted report. It is also important to note that the voting system does not need a network connection for successful execution.

## Safety Requirements

*<Specify those requirements that are concerned with possible loss, damage, or harm that could result from the use of the product. Define any safeguards or actions that must be taken, as well as actions that must be prevented. Refer to any external policies or regulations that state safety issues that affect the product’s design or use. Define any safety certifications that must be satisfied.>*

There are no special safety requirements for the voting system because the program is only reading from a data file, not writing to it. Therefore, the ballot csv file should remain unmodified throughout the program’s execution.

## Security Requirements

*<Specify any requirements regarding security or privacy issues surrounding use of the product or protection of the data used or created by the product. Define any user identity authentication requirements. Refer to any external policies or regulations containing security issues that affect the product. Define any security or privacy certifications that must be satisfied.>*

No authentication is necessary upon program execution because the program operates only on provided data, it does not contain any. Additionally, ensuring one vote per person is handled at voting centers, making provided data accurate. There are no other security requirements for the voting system.

## Software Quality Attributes

*<Specify any additional quality characteristics for the product that will be important to either the customers or the developers. Some to consider are: adaptability, availability, correctness, flexibility, interoperability, maintainability, portability, reliability, reusability, robustness, testability, and usability. Write these to be specific, quantitative, and verifiable when possible. At the least, clarify the relative preferences for various attributes, such as ease of use over ease of learning.>*

A completely deterministic voting algorithm is required to ensure the correct candidates are elected every execution, unless there is a tie. In the case of a tie, a random coin flip will then select a winner out of the candidates competing in a runoff. Additionally, the program should be able to handle multiple executions with unique voters and candidates. This is because the voting system is designed to be run several times throughout the year at normal election times and special elections. Teaching new users how to start the program on a desired ballot file should take less than one minute. Results outputted by the program should be clear and easy to read. In the case of the terminal output, users should be able to see who won the election for each type of election within 10 seconds. Users should be able to interpret the audit file in less than 30 seconds.

## Business Rules

*<List any operating principles about the product, such as which individuals or roles can perform which functions under specific circumstances. These are not functional requirements in themselves, but they may imply certain functional requirements to enforce the rules.>*

Election periods are when the voting system will be utilized. To use the system, election officials and testers will be the primary actors. They should receive a ballot comma separated file which contains all of the results from the election. This file is assumed to have no mistakes or miscounts. The actors will then run the voting system program by passing the ballot csv file’s name as a parameter.

# Other Requirements

*<Define any other requirements not covered elsewhere in the SRS. This might include database requirements, internationalization requirements, legal requirements, reuse objectives for the project, and so on. Add any new sections that are pertinent to the project.>*

Runtime of the voting system loads all ballots into memory so a database or any other means of storage is not necessary. However, voting progression must be recorded throughout program execution. To accomplish this, an audit file must be created and updated. The audit file should display constant progression towards the generated results. Due to the constant progression tracking, replaying an audit file should allow the election to replicate itself. The audit file should include the type of voting system, the number of candidates, candidates, number of ballots, the order in which the ballots were received, all the calculations and how many votes each candidate had, and the winners of the election. In addition to the audit file is to output the results to the screen upon successful termination. This includes the winners of the election, number of candidates, number of ballots, the type of election and other information displaying how the election progressed. An additional requirement is that the voting system program is one executable file to provide an easy form of execution.

* Your audit file is a strict requirement and an auditing should be able to follow the order of the ballots being assigned to the candidates. You should show the order of removal of candidates in IR and what ballots were redistributed. The file should show all of the step
* You will need to produce an audit file with the election information at the time (e.g. Type of Voting, Number of Candidates, Candidates, Number of Ballots, calculations, how many vote a candidate had, etc), you should list the winner(s), and you should show how the election progressed so that the audit could replicate the election itself. You should show the how got what ballot and its order of being received if applicable
* You should display to the screen the winner(s) and information about the election(e.g. type of election, number of seats).You do not need to show an audit of the votes but showing the number of ballots cast, the winners and the stats for everyone such as number of votes received is needed.

**Appendix A: Glossary**

*<Define all the terms necessary to properly interpret the SRS, including acronyms and abbreviations. You may wish to build a separate glossary that spans multiple projects or the entire organization, and just include terms specific to a single project in each SRS.>*

* **Ballot file** - The ballot file is the comma separated file that contains user’s votes. This file will then be passed to the voting system algorithm to calculate the results of the election.
* **CSV** - Comma separated file. This is a file that contains data that is delimited by a comma.
* **Target Machine** - The computer in which the voting system will be run on. Our target machine are the college of science and engineering computers. These computers are running Ubuntu 16.04 LTS or earlier.

**Appendix B: Analysis Models**

*<Optionally, include any pertinent analysis models, such as data flow diagrams, class diagrams, state-transition diagrams, or entity-relationship diagrams*.>

**Appendix C: To Be Determined List**

*<Collect a numbered list of the TBD (to be determined) references that remain in the SRS so they can be tracked to closure.>*