Software Development Plan (SDP)

CMSC 447 Group 4

Project Vesta

1 Scope **3**
1.1 Identification 3
1.2 System overview 3
1.3 Document overview 3
2 Referenced documents **3**
3 Overview of required work **3**
4 Plans for performing general software development activities **4**
4.1 Software development process 4
4.2 General plans for software development 4
4.2.1 Software development methods 4
4.2.2 Standards for software products 5
4.2.3 Reusable software products 5
4.2.3.1 Incorporating reusable software products 5
4.2.3.2 Developing reusable software products 5
5 Plans for performing detailed software development activities **5**
5.1 Project planning and oversight 5
5.2 Establishing a software development environment 5
5.3 Software implementation and unit testing 6
5.3.1 Software implementation 6
5.3.2 Performing unit testing 6
5.4 System qualification testing 6
5.4.1 Testing on the target computer system 6
5.4.2 Revision and retesting 6
5.4.3 Analyzing and recording system qualification test results 6
5.5 Preparing for software use 6
5.5.1 Preparing the executable software 6
5.5.2 Preparing version descriptions for user sites 7
5.6 Software product evaluation 7
5.7 Software quality assurance 7

1 Scope

1.1 Identification

This document refers to the software package known as Vesta.

1.2 System overview

Vesta is a web based application that will be utilized by an average internet user. This web application is intended to allow users to acquire potential living locations based on abstract specifications regarding the area. To garner said information, the user will specify quality of life attributes desired within a defined radius. These characters may include meteorological data (i.e. average temperature, average weather conditions), geographical information, etc. The application will compare the inputted information to specified open source databases to determine the locations that fit the criteria. Once the locations have been determined by the software on the back-end, they will be displayed to the user.

1.3 Document overview

This document will specify the process and design choices in which Vesta will be engineered, tested, and delivered to the customer.

2 Referenced documents

None at this time.

3 Overview of required work

The following requirements are specified for the software package:

I. The application shall allow the user to input a search query through the web interface. (Input State)
   A. The application should allow the user to input meteorological search information.
      1. The application should allow the user to select a range of temperatures.
      2. The application should allow the user to select prefered weather conditions.
         a. The user should be able to specify the number of clear days per year.
         b. The user should be able to specify the total amount of inches of rain per year.
         c. The user should be able to specify the total amount of inches of snow per year.
         d. The user should be able to specify the average percentage of humidity in the morning.
         e. The user should be able to specify the average percentage of humidity in the afternoon.

B. The application should allow the user to input a range of property values.
C. The application should allow the user to select a range of population sizes.
D. The application should allow the user to search for political parties.
    1. The user should be able to select if the county was Blue for the most recent presidential election.
    2. The user should be able to select if the county was Red for the most recent presidential election.

II. The application shall output the most optimal cities for the user to live based on inputted data.
III. The application should return a set of results within 60 seconds. (Calculation State) (Results State)
IV. The application should display a set of results for 95% of queries. (Calculation State) (Results State)

The software package will be documented using documents including but not limited to:

- Software Development Plan
- Software Requirements Specifications
- Software Design Description
- Software Test Description
- Software Test Report
- Software User Manual

4 Plans for performing general software development activities

4.1 Software development process

The software development process used to create the software package will be a combination of Agile and Waterfall development processes.

4.2 General plans for software development

4.2.1 Software development methods

In order to create the software package, we will use the following tools, services, and systems:

- Python3.6
    - Server backend to handle input from web application
- Apache2
    - Web server to host our web application
- Git
    - Version control, management, and collaboration
- GroupMe
    - Team member communication
- Google Documents
    - Storing and collaboratively working on documentation
- Amazon Web Services
    - Hosting a virtual machine in order to run our web application
- Filezilla

- SFTP access to the server, and transferring files

4.2.2 Standards for software products

Code will be formatted using the following standards:

- Python : Pep 8 -- Style Guide for Python Code
  - https://www.python.org/dev/peps/pep-0008/
- JavaScript : Code Conventions for the Javascript Programming Language
  - http://javascript.crockford.com/code.html

4.2.3 Reusable software products

4.2.3.1 Incorporating reusable software products

Vesta will utilize the following free databases and their APIs:

- Google Maps
  - https://developers.google.com/maps/
- Simple Maps
  - https://simplemaps.com/data/us-cities
- Github
  - https://github.com/tonmcg/County_Level_Election_Results_12-16
- Census API
  - https://www.census.gov/data/developers/data-sets/popest-popproj/popest.html
  - https://www.census.gov/data/developers/data-sets/acs-1year.html
- Zillow
  - http://files.zillowstatic.com/research/public/City/City_Zhvi_AllHomes.csv
- Current Results
  - https://www.currentresults.com/Weather/US/weather-averages-index.php
  - https://www.currentresults.com/Weather/US/average-state-weather.php
  - https://www.currentresults.com/Weather/US/average-city-weather.php

4.2.3.2 Developing reusable software products

Vesta will not develop any reusable software products.

5 Plans for performing detailed software development activities

5.1 Project planning and oversight

All planning, including design, development, testing, and installation, will be done collectively as a group. Oversight and guidance will be provided by professor Cain and our sponsor, Dr. Nicholas.

5.2 Establishing a software development environment

The software package will be developed and tested on a combination of Linux and Windows machines, and a combination of Integrated Development Environments including but not limited to: Sublime Text, Visual Studio Code, vim, emacs, PyCharm, and Atom.

5.3 Software implementation and unit testing

This paragraph shall be divided into the following subparagraphs to describe the approach to be followed for software implementation and unit testing. The planning in each subparagraph shall cover all contractual clauses regarding the identified topic.

5.3.1 Software implementation

The software package will be implemented on an Amazon Web Services Lightsail instance running Ubuntu LTS 16.06, with the following hardware specifications:

- 512 megabytes of DDR4 RAM
- 2 Virtual CPUs (Recent Intel i3 or equivalent)
- 10GB of solid state storage space

The software package will be implemented using the following software technologies:

- Python3.6
- Apache2
- Bitnami Web Hosting Solution

5.3.2 Performing unit testing

The software package will be unit tested as each requirement is completed with a goal of 75% code coverage. Unit testing will be done by each team member on their own code, and occasional cross-testing between team members should take place in order to minimize bugs and broken code.

All user input will come from an interactive website. As a result, all code that interacts with user input will be tested by hand to verify that it works correctly.

All backend code will be tested by unit tests written specifically to test the functionality of each code unit written.

5.4 System qualification testing

5.4.1 Testing on the target computer system

Multiple use-cases will be developed to ensure integrity of input and results.

5.4.2 Revision and retesting

Regression testing will be implemented as a dedicated action item subsequent to each added feature, database, and query to the software package.

5.4.3 Analyzing and recording system qualification test results

All test results will saved and catalogued according to date and test script version onto github to allow for change history tracking. This will help mitigate intermittent code issues and assist in regression testing.

5.5 Preparing for software use

5.5.1 Preparing the executable software

In order to deploy the software package, these steps must be followed:

1. Launch an Amazon Web Services Lightsail instance with the hardware specifications provided in section 3.5.1
2. Copy the files in the directory “website” into the /home/bitnami/htdocs/ directory of

the server
3. Install Python3.6 with “sudo apt-get install python3.6”
4. Install flask with “sudo pip3 install flask”
5. Navigate to the htdocs directory, and start the python backend with “python3.6 -m flask run --host=0.0.0.0”
6. The software package is now deployed. A user may access it on the internet using the static IP of the AWS Lightsail instance (This may require additional configuration)

5.5.2 Preparing version descriptions for user sites

Users will visit target url of web application, and be able to interface with the software package through it.

5.6 Software product evaluation

The software package will be evaluated by the customer, Dr. Nicholas, the users, and the professor of the CMSC447 course.

5.7 Software quality assurance

Testing and use of the software package is a routine element of the development process. All developers will develop use cases to ensure functionality. Using the previously specified standards above, clean and maintainable code will be ensured for easy maintenance and addition of new features.