Software Testing Plan and Test Procedures
For the
Semantic Web Crawler
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Prepared for:
National University
Prepared by:
Michael Bastos
Davendra Patel
Manuel Covarrubias Jr.

Approvals

Title	Printed Name	Signature	Date
Client Representative	Dr. Appel		
Project Manager	Manuel Covarrubias Jr.		
Project Leader	Davendra Patel		
Project Engineer	Michael Bastos		

Revision Changes

The revision change record shall contain the revision number, date of revision, engineering change order (ECO) number, description of what was modified, added or deleted, and the individuals name responsible for the change.

Revision Change Record

Revision Number	Date	Engineering Change Order (ECO)	Description	Approved

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1.0 Introduction

1.1 Identification

This document is the Software Test Plan (STP) for the Semantic Web Crawler (SWC) software development project. This section of the STP shall summarize the background of the software project and the scope and goals of the test plan. This STP applies to the SWC Computer Software Component Item (CSCI) and all of the Computer Software Components (CSC) of the SWC software development project.

1.2 Objectives

The SWC STP shall support the following objectives:

- To detail the required activities in preparing for and conducting the specified tests that is stated in the subsequent sections.
- To communicate to all responsible parties the tasks that they are to perform and the schedule that is to be followed in performing the tasks.
- To describe the sources of information that was used to prepare the SWC Test Plan.
- To describe the test devices and environment that are needed to conduct the system test.

1.3 Background

The SWC software product scans or ‘crawls’ through pages on the Internet to create an index of the data that it is looking for. The Semantic Web Crawler program shall allow the client to give the application a web address and/or some specific variables to quickly and easily crawl hundreds of pages of a website in a matter of minutes, parsing and saving only what data is valuable to the client and saving it in either a database or Comma Separated Value (CSV) in an Excel spreadsheet format. With proper caching this process can be repeated hundreds of thousands of times with hundreds of websites in various ways allowing the client to better narrow down the type of data they wish to pull from the website without necessarily impacting the crawled site’s overall performance or bandwidth. The SWC program shall be programmed for long term usage so that the core would require very little maintenance down the road, and that any changes should be made to the User Interface (UI) which is built separately. The SWC program shall provide the client relevant data from websites the client predefines. The primary purpose of the SWC is to collect data so that when the client points it at a website, it shall provide the client relevant and immediate information in either Excel or CSV formats pulled directly from that website.

1.4 Scope

The tests to be performed on the SWC system shall verify that the functionality of the software shall meet the requirements set forth in the Software Requirements Specification (SRS) and detailed in the Software Design Document (SDD). Each potential path of execution shall be followed by the testers, verifying that the system responds correctly to both valid and invalid interactions.

1.5 Reference Documents

1.5.1 Specifications

In regards to the SWC STP, the documents that support the SWC system are the SWC SRS and the SWC SDD.

Bastos, M., Covarrubias, M., Patel, D., Semantic Web Crawler Software Requirements Specification
Document April 2012

Bastos, M., Covarrubias, M., Patel, D., Semantic Web Crawler Software Design Description May
2012

1.5.2 Standards

The section titled Software Quality Assurance (SQA) of the *SWC Software Management Plan (SPMP)* outlines the SQA functions that are involved in verifying that the final SWC Software Product is free of all observable defects.

Bastos, M., Covarrubias, M., Patel, D., Semantic Web Crawler Software Project Management Project Document March 2012

1.5.3 Drawings

No drawings outside of the SWC STP document apply to this project.

1.5.4 Other Publications

Other publications that apply to the SWC STP document are the *SWC Operational Concept Document, Project Engineering: A Practitioner's Approach,* and *Software Architecture in Practice*.

Bastos, M., Covarrubias, M., Patel, D., Semantic Web Crawler Operational Concept Document March 2012

Pressman, Roger S., Project Engineering: A Practitioner's Approach, Seventh Edition, McGraw Hill, 2010.

Bass, Clements, Kazman, Software Architecture in Practice, 2nd Ed., April 2003

1.5.5 Glossary

1.5.5.1 Definitions

Bandwidth	Refers to the amount of data that can be sent through a network or modem connection
Hyper Text Markup Language	The language in which pages on the World Wide Web are written

1.5.5.2 Abbreviations and Acronyms

CSC	Computer Software Component
CSCI	Computer Software Component Item
CSV	Comma Separated Value
DNS	Domain Name Service
DSL	Digital Subscriber Line
ECO	Engineering Change Order
GB	Gigabyte
GHz	Gigahertz
GUI	Graphical User Interface
HTML	Hyper Text Markup Language
IP	Internet Protocol
ISP	Internet Service Provider
N/A	Not Applicable
OS	Operating System
PC	Personal Computer
QA	Quality Assurance
RAM	Random Access Memory
SDD	Software Design Document
SPMP	Software Management Plan
SQA	Software Quality Assurance
SRS	Software Requirements Specification
SWC	Semantic Web Crawler
STP	Software Test Plan
UI	User Interface

1.6 Testing Plan Overview

The remainder of this STP document describes the overall test objectives, the test cases themselves, and supporting information. This document also describes the overview of the test plan requirements, environmental needs, responsibilities, staffing and training needs, the testing schedule, and a list of the risks and contingencies involved in the test plan. The intended audience for this STP consists of:

- The SWC Program Testing Manager
- The SWC Program System Development Team
- Senior Management
- The current customer

The organization of the SWC STP is as follows:

Section 2.0 Test Objectives describes the testing philosophy and qualification requirements for the SWC program.

Section 3.0 Build Integration is not included in this document as this is the first build of the SWC program.

Section 4.0 Test Cases describes the trace ability of the test cases to the SRS, details the test cases, the features to be tested, the features not to be tested, and the approach to testing and pass/fail criteria.

Section 5.0 Test Requirements specifies suspend criteria and resume requirements, deliverable test documents, and test tasking.

Section 6.0 Environmental Needs specifies the necessary and desired properties of the test environment.

Section 7.0 Responsibilities identifies the groups responsible for the various aspects of the testing program.

Section 8.0 Staffing and Training Needs specifies the test staffing needs by skill level and training options for providing the necessary skills.

Section 9.0 Schedule specifies the test milestones and item transmittal events.

Section 10.0 Risks and Contingencies identifies the high-risk assumptions of the test plan and the mitigation techniques to be implemented.

2.0 Test Objectives

2.1 General Philosophy

The general philosophy of the Semantic Web Crawler STP is one of ensuring functional software testing to evaluate, identify, and minimize errors and bugs. The methodology to be employed in conducting the tests will closely follow the guidelines of the User Manual. The project and testing criteria will be weighed against the budget and time constraints in order for a timely completion of the software product.

2.2 General Qualification Requirements

This section describes the types and levels of qualification used for the test cases specified in this plan.

The qualification types include:

- **Not Applicable** (N/A) - The section contains overview, title only, or other non-requirement material that will not be tested.
- **Inspection** - A qualification method that is carried out by visual inspection.
- **Analysis** - A qualification method that is carried out by mathematical evaluation, the use of models or simulation and similar analytic procedures.
- **Demonstration** - A qualification method that is carried out by operation of the SWC (or some part of it) and relies on observable functional operations that do not require the use of elaborate instrumentation or special test equipment.
- **Test** - A qualification method that is carried out by operation of the SWC software (or some part of it) and relies on the collection, and subsequent examination, of data.

The qualification levels include:

- **Unit Level** - Qualification methods employed during the coding and unit testing activity on the lowest elements of the SWC program.
- **SWC Integration Level** - Qualification methods employed during integration and testing activity on aggregates of units within SWC program.
- **CSCI Level** – Qualification methods employed during the Software Performance activity on the fully implemented SWC program.
- **Subsystem Level** - Qualification methods employed during the subsystem testing activity.
- **Configuration Level** - Qualification methods employed during the configuration testing activity.
- **System Integration Level** - Qualification methods employed during the system integration testing activity.
- **System Level** - Qualification methods employed during the system testing activity.
- **System Installation Level** - Qualification methods employed during the system installation testing activity.

3.0 Build Integration

Build Integration does not apply to this program as currently there is only one build envisioned.

4.0 Test Cases

4.1 SRS Cross Reference Table

4.1 SRS Cross Reference Table				
SRS Requirements Description	**SRS Paragraph**	**Qualification Method**	**Qualification Level**	**Test Case Name**
User Registration	3.4.1	Demonstration	System	Invalid User Invalid Password System Administrator Login
User Login	3.4.2	Demonstration	System	User Profile Maintenance System Administration Database Operations GUI (Graphical User Interface) Management
User Activity Selection	3.4.3	Demonstration	System	Edit Profile Change Password
System Administration	3.4.5	Demonstration	System	Create User Modify User Delete User
Database Management	3.4.6	Demonstration	System	Database Entry Database Deletion Queries
Web Crawler GUI	3.4.7	Demonstration	System	Web Crawler GUI

4.2 Test Case Identification

4.2 Test Case Identification			
Test Case Name	**Objective**	**Execution**	**Anticipated Result**
Invalid User	This test case verifies that the system rejects a user name, which is not entered in the system.	At the Login page, type "jondoe" for the user name and "1234AbcD" for the password. Click *Submit* button.	The system should display an error window indicating that the user has entered an incorrect Login.
Invalid Password	This test case verifies that the system rejects a	At the Login page, type "dpatel" for the user name and "1234AbcD" for the password.	The system should display an error window indicating that

4.2 Test Case Identification			
Test Case Name	**Objective**	**Execution**	**Anticipated Result**
	Login by a valid user when the password is entered incorrectly.	Click *Submit* button.	the user has entered an incorrect Password.
System Administrator Login	This test case verifies a successful Login with a valid administrator user name and password.	At the login page, type “dpatel” for the user name and "f49Wu<kWl7f=PAN" for the password. Click *Submit* button.	The system should display the SWC System Administrator Main Menu.
User Profile Maintenance	This test case verifies the navigation GUI correctly access the subsequent GUI.	On the Administrator Activity Selection Menu select User Profile Maintenance.	The system should display the User Profile Maintenance Navigation GUI.
Edit Profile	This test case allows the user to edit their user profile.	On the User Profile Maintenance GUI, edit the desired information. Click *Submit* button. Error handling functions are exercised to demonstrate proper handling of invalid entries.	The system should display error messages when invalid data has been entered, and a confirmation page indicating that the user's profile has been changed when all data entries are correct.
Change Password	This test case allows the user to change their user password.	On the Change Password GUI, enter "dcba4321" for the new password and "dcba4321” as the confirmation. Click *Submit* button.	The system should display a confirmation page indicating that the user's password has been changed.
System Administration	This test case verifies the navigation GUI correctly access the subsequent GUI.	On the System Administrator Activity Selection GUI select System Administration and click *Submit*.	The system should display the System Administrator Navigation GUI
Create User	This test case verifies that the system correctly accepts data for a	On the Create New User GUI enter the data for a new user and Submit.	The system should error-check the data and return error messages for incorrect

4.2 Test Case Identification			
Test Case Name	**Objective**	**Execution**	**Anticipated Result**
	new user and stores it in the database.		data and transfer the data to the database when correct, returning a confirmation.
Modify User	This case verifies that the system will correctly store changes to a user's profile in the database.	On the Modify or Delete User GUI enter the User ID to be modified and Submit. When the current database data is presented, modify the user data and Submit.	The system should error check the data and return error messages for incorrect data and transfer the data to the database when correct, returning a confirmation that the user data has been changed.
Delete User	This test case verifies that the system will correctly delete a user profile from the system.	On the Modify or Delete User GUI enter the User ID to be modified deleted and Submit. When the current database data is presented, delete the file with the *Delete* button.	The system should clear the GUI display and display a confirmation message that the file has been deleted.
Database Operations	This test case verifies the navigation GUI will correctly access the cloud-based web server.	On the System Administrator Activity Selection Navigation GUI select Database Operations.	The system should display the opening page of the cloud-based database application with the SWC database selected.
GUI Management	This test case verifies the navigation GUI will correctly access the SWC program.	On the System Administrator Activity Selection Navigation GUI select GUI Management.	The system should display the opening page of the SWC GUI development application with the SWC GUI program selected.
Database Operations	This test case verifies the navigation GUI correctly accesses the database system.	On the System Administrator Activity Selection Navigation GUI select Database Operations.	The system should display the opening page of the database system application with the SWC database selected.
Web Crawler	This test case	On the System Administrator	The system should

4.2 Test Case Identification			
Test Case Name	**Objective**	**Execution**	**Anticipated Result**
GUI	verifies the Web Crawler GUI correctly access the subsequent SWC program.	Activity Selection Navigation GUI select Web Crawler GUI.	display the opening page of the Web Crawler GUI application with the SWC GUI program selected.

4.3 Features To Be Tested

4.3.1 Overall Features

The test cases included in this test plan will, by simple means of their execution, verify the following items:

- The web server and client are communicating correctly
- The system is producing valid Hyper Text Markup Language (HTML) for display to the user
- The system modules are communicating correctly with the database and each other

Ideally, three separate testers, logging onto a single server at the same time, would perform the test cases identified in Section 4.1. This would allow for testing of the system's performance under simultaneous usage.

4.3.2 System Administrator

The system administrator test cases will verify that all the functionality, which should be available to an administrative user of the system, does, in fact, function as specified in the Software Requirements Specification. The same user should perform all of the administrative test cases identified in Section 4.1 in the same testing session.

4.4 Approach

The overall approach to testing of the system should be adequately specified in the preceding sections of this document. In general, the procedures specified in the User's Manual will be utilized in execution of the specified test cases. This should ensure the User Manual is accurate and provide sufficient verification of the system's functionality from the user's point-of-view.

4.5 Item Pass/Fail Criteria

The test case identification table in Section 4.2 above identifies the actions and displays that the system is expected to produce in response to each user action. In those test cases, which present

multiple actions and responses, each response must meet the specified criteria for the entire test case to pass. If one aspect of the test fails, following correction, the entire test is to be redone to ensure full continuity of the function.

5.0 Test Requirements

5.1 Suspension Criteria and Resumption Requirements

During execution of the test plan, testing of the system shall only be suspended if the system fails consistently on more than one test case and/or if a repeatable internal server error is encountered.

If the errors are encountered in the System Administration section of the system, then all testing shall be suspended until the errors are corrected and the Lead Software Engineer has conducted a unit and integration-level testing of the affected modules. If the errors are encountered in the User section of the system, however, testing may continue in the areas that are not affected while the affected system modules are inspected and repaired.

Once the testing of any area has been suspended, the testing can be resumed again once the Lead Software Engineer has conducted a successful unit and integration-level testing of the affected modules. The testers must execute all test cases related to the affected area of the system and the cases not directly related to the failure.

5.2 Test Deliverables

Other documents that are part of the testing process and that shall be delivered are:

- The SWC Software Test Plan
- Test design specifications
- Test case specifications
- Test item transmittal reports
- Test logs
- Test incident reports
- Test summary reports
- Test input data and test output data

5.3 Testing Tasks

The preparation for testing the system involves the installation of the SWC program on to the host personal computer (PC). It shall be noted that no special skill is needed for this activity. The initial testing shall be accomplished through the use of the host PC as the web object. The testing of the system shall involve following the test cases specified above. It shall be noted that no special skill is needed for this activity. After the initial testing has been completed, the web server shall be presented to demonstrate the capability to accomplish the full range of tests through the SWC program.

6.0 Environmental Needs

The minimum testing environment for the system is:

- SWC program software
- SWC program User Manual
- SWC program Test Plan Specification
- 1 Gigahertz (GHz) processor, Pentium or equivalent
- Linux Operating System
- 2 GB (Gigabyte) of RAM (Random Access Memory)
- 5 GB of hard-disk space for storage
- Monitor
- Keyboard
- Pointing device
- Web connectivity between the client and server machines
- Access to the SWC program requires a full-time Internet connection (i.e. Digital Subscriber Line (DSL) or Cable service), to provide a gateway between the home and the Internet. To accomplish this, any one of the following connection configurations is required:
    - Static Internet Protocol (IP) Address. A static IP address is a dedicated IP address assigned to the Internet account by the Internet Service Provider (ISP).
    - Dynamic Domain Name Service (DNS) Service - Dynamic DNS is a service that allows the user to alias the assigned Dynamic IP address to a permanent hostname, allowing the computer to be more easily accessed from various locations on the Internet. This allows the user to access the SWC program via the web server over the Internet by entering the static host name instead of the currently assigned Dynamic IP address.

7.0 Responsibilities

The Testing Manager and the SWC Development Team are responsible for the test plan (managing and designing) and resolving any issues that arise during testing. All of the members of the SWC Development Team shall be responsible for preparing, executing, and witnessing the functions of the test plan. The SWC Development Team shall provide the environmental needs required to support the execution of the test plan.

8.0 Staffing and Training Needs

The SWC STP requires no significant staffing or specialized training. The members of the SWC Development Team shall complete all testing. It shall be assumed that the users of the SWC program shall have a sufficient amount of computer knowledge to open and use the Internet and follow the directions of the SWC User Manual, but have no specialized computer or programming skills.

9.0 Schedule

Table 9.1 shows the events/documents and their respective due dates involved in the SWC testing.

TABLE 9.1 SWC TESTING SCHEDULE

Date	Event
May 15, 2012	Initial SWC STP Delivered
May 15, 2012 to May 28, 2012	Testing by the SWC Development Team
May 30, 2012	Final Test Report

10.0 Risks and Contingencies

Table 10.1 Risk Factors, identifies the high-risk assumptions of the test plan. Generalized contingencies to deal with categories of risks are contained in the following paragraphs. Specific contingency plans will be developed to mitigate Risk Factors with a catastrophic impact and those that generate a risk value of five or greater.

10.1 Risk Factors Table

The Risk Factors Table identifies the high-risk assumptions of the test plan, the category or the risk factor, the probability that it may occur, the impact of its occurrence, a weight value of its impact and the product of the probability and value that represents the risk total. The risk total is used to determine which risk factors will have specific mitigation methods developed.

Table 10.1 Risks Factors

Risk Factor	Category	Prob*	Impact	Value	Risk Total
Delivery of Test Host PC and Operating System (OS) is delayed	Management	1	Significant	3	3
Host PC OS fails to meet basic requirements	Software	1	Catastrophic	4	4
Designated test OS fails to interface with SWC programs	Software	1	Catastrophic	4	4
SWC programs fail to interface with database on test machine	Software	1	Catastrophic	4	4
Client browsers fail to render SWC web pages	Software	1	Catastrophic	4	4
Host PC does not meet basic requirements	Hardware	1	Catastrophic	4	4
Designated host OS is unstable on host PC	Hardware	1	Significant	3	3
Unscrupulous hacker corrupts privileged database data	Security	1	Significant	3	3
Personnel leave/are removed from project	Management	1	Significant	3	3
Test team falls behind schedule	Management	3	Significant	3	9
Delayed delivery of test plan to testers	Management	2	Significant	3	6
Significant bugs found during testing process	Programming	2	Significant	3	6
Usability concerns expressed by testers	Programming	2	Significant	3	6

*Probability 1 is lowest and 5 is highest

10.2 Risk Tracking/Monitoring

All team members are responsible for monitoring the project's risk factors. Each development team member shall have the programming software and database application installed and running on one or more local machines to support software development. Any issues which represent a risk to the successful completion of the project are to be reported to the Project Engineer and will be discussed with the entire team as soon as practical.

10.3 General Contingency Plans

The Project Engineer is responsible for implementing contingency plans to mitigate any of the above risks. In general, the contingencies involved can be summarized as follows:

10.3.1 Software Risk Contingencies

Risks related to the software that underlies the system will be mitigated by either changing the program interfaces to the software or by changing the software systems used.

10.3.2 Hardware Risk Contingencies

Risks related to the hardware on which the system runs should be mitigated by the upgrading or changing of the hardware involved.

10.3.3 Customer Risk Contingencies

Risks related to the customer for the product may not be subject to mitigation. In the event of such an occurrence, the Project Engineer and the Customer Coordinator will meet with the customer to determine if there is any way in which the product can be altered to meet customer needs.

10.3.4 Security Risk Contingencies

Risks related to the security of the data stored in the system may be best mitigated by the enforcement of appropriate security policies on the customer's site. The SWC program provides basic access controls that should provide an acceptable level of basic security. Further, the test software and database will not contain any sensitive data.

10.3.5 Management Risk Contingencies

The Project Engineer in conjunction with senior management will address risks related to product or personnel management.

10.3.6 Programming Risk Contingencies

Risks related to programming will be mitigated through implementation of sound programming and design practices from the project's inception. All code will be well documented and built to conform to the customer's requirements as laid out in the SRS and SDD documents. Peer review will be emphasized as part of the overall testing program. All team members will unit-test their code and the Quality Assurance (QA) organization will report any programming errors it uncovers to the lead software engineer, who will coordinate with the other programmers to find and correct them.

10.4 Specific Risk Contingency Plans

Risk factors anticipated to have a catastrophic impact on the test plan or that generate a Risk Value of 5 or greater are given a specific mitigation. It is the responsibility of the Test Manager to implement the risk mitigation plan at the appropriate time.

10.4.1 Host PC Operating System

In the unlikely event that host PC operating system does not meet the basic requirements the Test Manager will immediately notify the Project Engineer that the test plan cannot be implemented. The Project Engineer is tasked with obtaining an operating system for the host PC that meets the basic requirements of the test program. As an interim measure the project development computer may be diverted to support testing on a shared basis.

10.4.2 Test Operating System

In the unlikely event that the test OS does not support the SWC test program the Test Manager will immediately notify the Project Engineer that the test plan cannot be implemented. The Project Engineer is tasked with obtaining an operating system for the test that does support the SWC test program. As an interim measure the project development computer may be diverted to support testing on a shared basis.

10.4.3 SWC Program to Database Interface

In the unlikely event that SWC Program and the Database are not compatible the Test Manager will immediately notify the Project Engineer and the Lead Programmer that the test plan cannot be implemented. The Lead Programmer is tasked with resolution of the problem and will either modify the SWC program to meet the requirements of the database or choose a different database program that supports the SWC requirements. As an interim measure the project development computer may be diverted to support testing on a shared basis.

10.4.4 Client Browsers

In the unlikely event that the browsers designated for use with the SWC program fail to render the SWC program web pages the Test Manager will immediately notify the Project Engineer and the Lead Programmer that the test plan cannot be implemented. The Lead Programmer is tasked with resolution of the problem and will take steps to modify the web pages so the designated browsers properly render them.

10.4.5 Host PC

In the unlikely event that host PC does not meet the basic requirements the Test Manager will immediately notify the Project Engineer that the test plan cannot be implemented. The Project Engineer is tasked with obtaining a host PC that meets the basic requirements of the test program. As an interim measure the project development computer may be diverted to support testing on a shared basis.

10.4.6 Test Team Behind Schedule

In the unlikely event that the test team falls behind schedule the Test Manager will immediately notify the Project Engineer. The project engineer will either obtain additional personnel to conduct testing or divert personnel from other tasks to conduct testing.

10.4.7 Test Plan Delayed

In the unlikely event that the test plan is delayed in arriving at the testers the Test Manager will immediately notify the Project Engineer and the Lead Programmer that the initiation of testing will be delayed. The Lead Programmer will walk the customer through the test plan.

10.4.8 Significant Bugs

In the event significant bugs are found during the testing process the Test Manager will immediately notify the Project Engineer and the Lead Programmer that the testing schedule is in jeopardy due to the number of bugs being generated during testing. This may have a direct impact on the scope of the project that can be delivered on time. The Lead Programmer will schedule extra time for the programmers to pursue the bugs. In the event this will have an impact on the scope of the project that can be delivered on schedule the Lead Engineer will negotiate with the customer as to whether the schedule can be modified or the project scope modified to meet the available tasks and resources.

10.4.9 Usability Concerns

In the event the testers express concerns with respect to the usability of the SWC program the Test Manager will immediately notify the Project Engineer and Lead Programmer. The Project Engineer, Lead Programmer, and Customer Coordinator will interface with the Test team to determine appropriate action.