InfoPulse Software System (IPSS)

v1.0

Software Testing Report

Author: Joshua Bonner

Contact: jbb5882@psu.edu

Master of Software Engineering

SWENG 894 (SUM 2024) – Capstone Experience

1. Introduction

1.1. Purpose

This document outlines a comprehensive testing strategy that leverages Test Case Specifications, User Acceptance Testing (UAT), and Unit Tests implemented with Pytest (for the backend implementation) and Vitest (for the frontend implementation). Each component of this approach plays a distinct role in the overall testing process, ensuring thorough validation of the IPSS functionalities.

1.2. Intended Audience

The intended audience for this document is project managers, developers, software quality assurance engineers, and stakeholders. Its use will ensure the quality of the software system and that it aligns with stakeholder expectations.

1.3. Testing Approach

This testing approach, combining Test Case Specifications, User Acceptance Testing, and Unit Tests with Pytest and Vitest, ensures comprehensive software validation from individual components to end-user requirements. By systematically executing these tests, we can deliver high-quality, reliable software that meets the needs and expectations of its users.

1.4. Test Key

Verified – **Test Case ID:** IPSS####

Unverified – **Test Case ID:** IPSS####

Failed – **Test Case ID:** IPSS####

---

2. Test Case Specifications with UAT

Test Case ID: IPSS001 (tested 08 JUN 2024)

Requirement Reference: SRS 3.1.1.1

"IPSS shall authenticate each user by providing authentication mechanisms to access the web application"

Jira Item #: IPSS-7

Test Case Title: Verify User Login Functionality

Test Description:

This test verifies that a user can successfully log in to the web application by providing their authentication credentials.

Preconditions:

- IPSS is currently running without errors
- The user has created an account with valid credentials
- The user is using a supported browser that is up-to-date

Test Steps:

1. Access the login page at its root directory from a browser
2. Click on the username input field and provide a valid username
3. Click on the password field and provide the username's associated password
4. Click the login button

Expected Results:

- ✓ User is verified and is redirected to their dashboard

Actual Results:

- ➢ The user is successfully verified upon providing valid credentials using the test user

---

Test Case ID: IPSS002 (tested on 08 JUN 2024)

Requirement Reference: SRS 3.1.1.2

"IPSS shall reject unauthenticated login attempts outright"

Jira Item #: IPSS-7

Test Case Title: Reject Unauthenticated Login Attempts

Test Description:

This test verifies that unauthenticated individuals cannot access the IPSS web application.

Preconditions:

- IPSS is currently running without errors
- The login page is accessible

Test Steps:

1. Access the login page at its root directory from a web browser
2. Click on the username input field and type in an invalid username or leave it blank
3. Click on the password input field and type in an invalid password or leave it blank
4. Click the login button

Expected Results:

- ✓ Authentication attempt is thwarted denying access to the IPSS web application
- ✓ A verbose error statement is provided within the page to inform the user of the unsuccessful attempt

Actual Results:

- ➢ Unverified credentials prohibit access to user dashboards
- ➢ Alert is presented informing that the login attempt was unsuccessful

---

Test Case ID: IPSS003 (tested 22 JUL 2024)

Requirement Reference: SRS 3.1.1.3

"IPSS shall provide a method to create a new user account"

Jira Item #: IPSS-12

Test Case Title: Create a User Account

Test Description:

This test verifies that a user account can be created

Preconditions:

- IPSS is currently running without errors
- The Create New User Account page is accessible

Test Steps:

1. Access the Create New User Account page
2. Provide account information in the provided fields
3. Click the submit button

Expected Results:

- ✓ A new user account is created
- ✓ A verbose statement is provided informing the user their account has successfully been created and can now be used to log in to the application

Actual Results:

- ➢ After navigating to the account creation page via the link provided on the login page, I was able to successfully create an account via the form provided
- ➢ Once the submit button was clicked, I was rerouted back to the login page and an alert presented itself to inform me that the account had been created

---

Test Case ID: IPSS004 (tested 03 AUG 2024)

Requirement Reference: SRS 3.1.1.4

"IPSS shall provide a mechanism to recover or reset the user's authentication credentials"

Jira Item #: IPSS-33

Test Case Title: Recover User Authentication Credentials

Test Description:

This test verifies that a user can recover their authentication credentials.

Preconditions:

- IPSS is currently running without errors
- The login page is accessible

Test Steps:

1. Access the login page at its root directory from a web browser
2. Click on the recover password link on the page
3. In the username field provide a valid username
4. After a valid username is provided, a security question will prompt for input, provide the correct answer to the security question

Expected Results:

- ✓ After completing the necessary steps without error, the user's password will be provided on the page

Actual Results:

- ➢ After navigating to the account recovery page, a user is successfully able to retrieve their password

---

Test Case ID: IPSS005 (tested 03 AUG 2024)

Requirement Reference: SRS 3.1.1.4

"IPSS shall provide a mechanism to recover or reset the user's authentication credentials"

Jira Item #: IPSS-33

Test Case Title: Reset User Authentication Credentials

Test Description:

This test verifies that a user can reset their authentication credentials.

Preconditions:

- IPSS is currently running without errors
- The login page is accessible

Test Steps:

1. Access the login page at its root directory from a web browser
2. Click on the reset password link on the page
3. In the username field provide a valid username
4. After a valid username is provided, a security question will prompt for input, provide the correct answer to the security question
5. In the newly provided input field, provide a new password

Expected Results:

- ✓ After completing the necessary steps without error, the user's password will be reset to the one provided
- ✓ A verbose statement is provided informing the user their password has been updated

Actual Results:

- ➢ After navigating to the account recovery page, a user is successfully able to retrieve their password

---

Test Case ID: IPSS006 (tested on 06 JUN 2024)

Requirement Reference: SRS 3.1.1.5

"IPSS shall store authentication credentials securely by encoding the user's sensitive information"

Jira Item #: IPSS-13

Test Case Title: Securely Store User Authentication Credentials

Test Description:

This test verifies that a user's credentials are encrypted while at rest in the User PostgreSQL Database Table.

Preconditions:

- Tester can access ipss_dev PostgreSQL Database Server through PgAdmin
- Tester can view the User Table

Test Steps:

1. Access the User Table within the database
2. Run a query to retrieve all the contents from the User table

Expected Results:

- ✓ The tester can verify that the password and answer to the security question fields for each user are not stored in plaintext

Actual Results:

- ➢ The user password is hashed before being inserted into the User record within the user database table
- ➢ The original password is not visibly recognizable within the database

---

Test Case ID: IPSS007 (tested on 15 JUN 2024)

Requirement Reference: SRS 3.1.2.8

"IPSS shall provide an application dashboard for the user"

Jira Item #: IPSS-8

Test Case Title: Access User Dashboard

Test Description:

This test verifies that a user can access their dashboard after successfully authenticating.

Preconditions:

- IPSS is currently running without errors
- The login page is accessible
- A valid user account exists

Test Steps:

1. In a web browser, navigate to the IPSS login page
2. Enter a valid username and password
3. Click the “Login” button
4. Verify no errors populate within the UI
5. Verify the user is redirected to their personal dashboard page by checking for the username at the top right of the application header

Expected Results:

- ✓ The user is redirected to the user dashboard page

Actual Results:

- ➢ After successfully authenticating, the user is redirected to the user dashboard page.

Test Case ID: IPSS008 (tested on 15 JUN 2024)

Requirement Reference: SRS 3.1.1.6

“IPSS shall allow the user to log out securely”

Jira Item #: IPSS-41

Test Case Title: Log Out From User Dashboard

Test Description:

This test verifies that a user can log out of their dashboard.

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard

Test Steps:

1. In the application header, click the “Logout” button which is denoted by the exit MDI icon
2. Verify that the user is redirected to the login page
3. Verify that the user information is removed from the browser’s local storage within the developer tools

Expected Results:

- ✓ The user is redirected to the login page

Actual Results:

- ➢ After the logout button is clicked on the user dashboard, the user is redirected to the login page
- ➢ User information is removed from the browser's local storage and Pinia state

---

Test Case ID: IPSS009 (tested on 19 JUN 2024)

Requirement Reference: SRS 3.1.2.10

“IPSS shall provide search tabs to organize all the articles returned in a search tab”

Jira Item #: IPSS-18

Test Case Title: View/Toggle Search Tabs On User Dashboard

Test Description:

This test verifies that a user can view separate search tabs within the user dashboard.

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard

Test Steps:

1. In the application header, conduct searches using the search bar
2. Verify, for each search conducted, that separate search tabs are viewable on the left-hand side of the user dashboard
3. Click each tab to toggle between the content that is presented in the form of article cards within the main area of the user dashboard
4. Verify the content is changed based on the topic searched

Expected Results:

- ✓ The user can view separate search tabs on the user dashboard
- ✓ The user can toggle between the active search tabs

Actual Results:

- ➢ After conducting basic searches, search tabs are populated on the left-hand side of the user dashboard
- ➢ Each search tab houses different sets of article cards based on the search criteria

---

Test Case ID: IPSS010 (tested on 20 JUN 2024)

Requirement Reference: SRS 3.1.2.11

"IPSS shall provide cards within the search tabs that house the content of an article"

Jira Item #: IPSS-19

Test Case Title: View Article Cards In Search Tabs

Test Description:

This test verifies that a user can view article cards within each search tab relating to the search topic.

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard
- The user has selected a search tab

Test Steps:

1. Using the search bar, conduct a search based on a topic or keyword
2. Verify article cards populate within the user dashboard based on the selected search tab's topic.
3. Verify that each article card contains a title, author, source, and date from the source

Expected Results:

- ✓ The user can view separate search tabs on the user dashboard
- ✓ The user can toggle between the active search tabs
- ✓ The user can see article cards based on the topic of the selected search tab
- ✓ Each article card contains the basic information about the source article

Actual Results:

- ➢ After conducting a basic search, article cards are populated within the search tabs to view content
- ➢ Each card has a title, author, date it was published, and an image from the source

---

Test Case ID: IPSS011 (tested 20 JUN 2024)

Requirement Reference: SRS 3.1.2.12

"IPSS shall provide a page to view the content of an article"

Jira Item #: IPSS-20

Test Case Title: View Article Contents

Test Description:

This test verifies that a user can view an article's contents.

Preconditions:

- IPSS is currently running without errors
- The user has conducted a search
- Article Cards are present on the user dashboard

Test Steps:

1. Click on an Article Card on the User Dashboard
2. Verify that the user is redirected to the Article page
3. Verify that the article's contents are displayed and can be read

Expected Results:

- ✓ The user can view an article page
- ✓ The article page contains all the content of the article including its author, published date, and description

Actual Results:

- ➢ After selecting an article card on the user dashboard, the user is redirected to its associated article page
- ➢ The content of the article is present and includes the author, published date, and description

---

Test Case ID: IPSS012 (tested 29 JUN 2024)

Requirement Reference: SRS 3.1.2.9

"IPSS shall provide a means to search for articles from the dashboard"

Jira Item #: IPSS-14

Test Case Title: Search for Articles

Test Description:

This test verifies that a user can search for articles based on search criteria provided in the search bar within the user dashboard.

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard
- The user has provided a topic or keyword in the search bar

Test Steps:

1. Conduct a search using the search bar with a topic name or keyword
2. Verify a search tab populates within the search tabs
3. Verify article cards populate on the user dashboard containing relevant information based on search criteria

Expected Results:

- ✓ A new search tab is created
- ✓ Article cards populate on the user dashboard with relevant information about the search criteria

Actual Results:

- ➢ After conducting a basic search based on a keyword or topic, a new tab is created
- ➢ The body of the web application contains article cards with basic information about the article
- ➢ The article cards can be clicked to access the article page which holds its content

---

Test Case ID: IPSS013 (tested 29 JUN 2024)

Requirement Reference: SRS 3.1.2.1

"IPSS shall provide the most recent articles by searched topic or keyword sorted by popularity"

Jira Item #: IPSS-14

Test Case Title: Articles Search Provides Recent Articles

Test Description:

This test verifies that the article content is relevant to the search criteria and is up to date

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard
- The user has provided a topic or keyword in the search bar

Test Steps:

1. Conduct a search using the search bar with a topic name or keyword
2. Verify the articles returned are relevant to the search criteria
3. Verify the articles are up to date or the most recent news

Expected Results:

- ✓ Article content is relevant to the search criteria
- ✓ Articles are no more than a day old

Actual Results:

- ➢ After conducting a basic search based on a topic or keyword, relevant articles are populated and are no more than a day old

---

Test Case ID: IPSS014 (tested 29 JUN 2024)

Requirement Reference: SRS 3.1.2.5

"IPSS shall reach out to NewsAPI data sources for articles relating to the search criteria provided by the user"

Jira Item #: IPSS-21

Test Case Title: Articles Searches From NewsAPI Source

Test Description:

This test verifies that the articles are served up from the NewsAPI source

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard
- The user has provided a topic or keyword in the search bar

Test Steps:

1. Conduct a search based on a particular keyword or topic
2. Verify the contents that are provided in the article cards/page contain content from NewsAPI

Expected Results:

✓ Article content is served up from NewsAPI sources

Actual Results:

➢ Verified that article content is initially served up by NewsAPI by reviewing endpoints written in the source

---

Test Case ID: IPSS015 (tested 20 JUL 2024)

Requirement Reference: SRS 3.1.2.2, SRS 3.1.2.4

"IPSS shall save user preferences to enable default search customization"

"IPSS shall organize searched articles based on user preferences"

Jira Item #: IPSS-22 & IPSS-23

Test Case Title: Default Search Customization

Test Description:

This test verifies that the user can configure the default search behavior and directly affects content returned by NewsAPI

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard
- The user has set their preferences via the preferences dialog box

Test Steps:

1. Conduct a search by providing a topic or keyword in the search bar provided
2. Verify that the article publish dates fall between the set dates within the user preferences
3. Verify that the articles are sorted based on the sort by property defined within the user preferences

Expected Results:

- ✓ Article content retrieved from NewsAPI contains relevant information based on user preferences

Actual Results:

- ➢ After verifying that the user search preferences have been set, a search was conducted on the topic "Bitcoin" and articles that were returned fell between the specified "to" and "from" dates
- ➢ Additionally, articles that are returned utilized the "sortBy" preference according to the criteria provided by NewsAPI

Test Case ID: IPSS016 (tested 06 JUL 2024)

Requirement Reference: SRS 3.1.2.3

"IPSS shall allow the user to save search criteria for later use"

Jira Item #: IPSS-17

Test Case Title: Persistence of Searched Articles

Test Description:

This test verifies that the articles returned by a search persisted through sessions

Preconditions:

- IPSS is currently running without errors
- The user is currently viewing their dashboard
- The user has conducted a search

Test Steps:

1. Close the browser application
2. Reopen a browser client and access the IPSS login page
3. Provide credentials for the user you were previously logged in as
4. Verify after successfully authenticating that the user dashboard populates with the same set of articles previously seen before closing the application

Expected Results:

✓ Article content persists through browser sessions

Actual Results:

➢ After completing the test steps, articles continue to persist through browser sessions

---

Test Case ID: IPSS017 (tested 22 JUL 2024)

Requirement Reference: SRS 3.1.3.1

"IPSS shall be compatible with major web browsers (e.g., Chrome, Firefox, Edge)"

Test Case Title: Web Browser Compatibility

Test Description:

This test verifies that the IPSS will function in different web browser clients

Preconditions:

- IPSS is currently running without errors

Test Steps:

1. Open a Google Chrome instance and navigate to where the application is being hosted
2. Verify the login page populates
3. Repeat steps 1-2 with Firefox and Edge

Expected Results:

- ✓ IPSS functions normally within different web browser clients

Actual Results:

- ➢ After completing the test steps, IPSS works as intended in various web browser clients

---

3. Source Code

- **Pytest Unit Tests:**
  - auth_test.py
  - search_test.py
  - user_test.py
- **Vitest Unit Tests:**
  - App.spec.ts
  - Article.spec.ts
  - Auth.spec.ts
  - Login.spec.ts
  - Search.spec.ts
  - User.spec.ts

---

4. Code Coverage Analysis

Below are two screenshots that show the console output for each test suite used. The first image is from the Vitest set of unit tests and shows a few things:

- ~70% statement and line coverage (assignments, calls)
- ~80% branch coverage (conditionals)
- 37% function coverage
  - There are quite a few boilerplate library calls that did not need to be tested as it would be redundant given these libraries are already tested thoroughly by the maintainers

Overall, this should provide enough evidence that the frontend source code performs as it should with little to no issues with logic or functionality.

The second image is from the Pytest set of unit tests with a total coverage of 82%. This should also inspire confidence that the backend implementation is executing as expected and relatively bugs-free.

Collectively, these unit tests validate the overall functionality of the software system, ensuring that the IPSS is prepared to handle all edge cases without issue.

```
 Test Files  4 passed (6)
      Tests  5 passed (7)
     Errors  2 errors
   Start at  15:16:36
   Duration  998ms (transform 369ms, setup 478ms, collect 687ms, tests 144ms, environment 2.05s, prepare 366ms)

 % Coverage report from v8
-----------------------|---------|----------|---------|---------|-------------------
File                   | % Stmts | % Branch | % Funcs | % Lines | Uncovered Line #s
-----------------------|---------|----------|---------|---------|-------------------
All files              |   68.97 |    78.57 |    37.5 |   68.97 |
 src                   |       0 |        0 |       0 |       0 |
  main.ts              |       0 |        0 |       0 |       0 | 1-33
 src/components/article |     100 |      100 |     100 |     100 |
  ArticleHelper.ts     |     100 |      100 |     100 |     100 |
 src/router            |   78.94 |       50 |      20 |   78.94 |
  index.ts             |   78.94 |       50 |      20 |   78.94 | 32-40,52-54
 src/services          |     100 |      100 |     100 |     100 |
  AuthService.ts       |     100 |      100 |     100 |     100 |
  SearchService.ts     |     100 |      100 |     100 |     100 |
 src/services/clients  |     100 |      100 |     100 |     100 |
  AuthClient.ts        |     100 |      100 |     100 |     100 |
  SearchClient.ts      |     100 |      100 |     100 |     100 |
 src/stores            |   70.47 |      100 |   28.57 |   70.47 |
  auth.ts              |   54.83 |      100 |       0 |   54.83 | 12-25
  search.ts            |   60.46 |      100 |       0 |   60.46 | 12-20,23-24,27-30,33-34
  user.ts              |     100 |      100 |     100 |     100 |
-----------------------|---------|----------|---------|---------|-------------------

============================== Coverage summary ==============================
Statements   : 68.97% ( 169/245 )
Branches     : 78.57% ( 11/14 )
Functions    : 37.5% ( 6/16 )
Lines        : 68.97% ( 169/245 )
==============================================================================
```

```
(infopulse_api) dev@machine ~/CourseWork/InfoPulse/infopulse_api  IPSS-28-sprint2-bug-hunt ± pytest
============================= test session starts ==============================
platform darwin -- Python 3.10.3, pytest-8.2.2, pluggy-1.5.0
rootdir: /Users/dev/CourseWork/InfoPulse/infopulse_api
plugins: anyio-4.4.0
collected 13 items

src/tests/auth_test.py ......                                            [ 46%]
src/tests/main_test.py .                                                 [ 53%]
src/tests/search_test.py ..                                              [ 69%]
src/tests/user_test.py ....                                              [100%]

============================== 13 passed in 2.45s ==============================
(infopulse_api) dev@machine ~/CourseWork/InfoPulse/infopulse_api  IPSS-28-sprint2-bug-hunt ± coverage report -m
Name                                                 Stmts   Miss  Cover   Missing
----------------------------------------------------------------------------------
src/app/main.py                                         26      7    73%   24-31
src/app/routers/auth_router.py                          45     16    64%   37-48, 54-56, 67
src/app/routers/search_router.py                        14      5    64%   14-18
src/app/routers/user_router.py                          26     13    50%   16-22, 27-32
src/common/data_handlers/search_handler.py              26      8    69%   33-40
src/common/data_handlers/user_handler.py                42     17    60%   33-42, 45-51
src/common/helpers/auth.py                              39      1    97%   52
src/common/helpers/db_client.py                         22      0   100%
src/common/helpers/search_helper.py                     12      0   100%
src/models/article.py                                   14      0   100%
src/models/search.py                                     7      0   100%
src/models/token.py                                      5      0   100%
src/models/user.py                                       9      0   100%
src/tests/auth_test.py                                  37      0   100%
src/tests/conftest.py                                    3      0   100%
src/tests/main_test.py                                   7      0   100%
src/tests/search_test.py                                 9      0   100%
src/tests/user_test.py                                  25      0   100%
----------------------------------------------------------------------------------
TOTAL                                                  368     67    82%
```

Traceability Matrix:

Requirement ID	Test Case ID	Test Date	User Story	Commit
SRS 3.1.1.1	IPSS001	08 JUN 2024	IPSS-7	IPSS-7-create-login
SRS 3.1.1.2	IPSS002	08 JUN 2024	IPSS-7	IPSS-7-create-login
SRS 3.1.1.3	IPSS003	22 JUL 2024	IPSS-12	IPSS-12-account-creation-functionality
SRS 3.1.1.4	IPSS004	03 JUL 2024	IPSS-33	IPSS-33-account-recovery
SRS 3.1.1.4	IPSS005	03 JUL 2024	IPSS-33	IPSS-33-account-recovery
SRS 3.1.1.5	IPSS006	08 JUN 2024	IPSS-13	IPSS-42-implement-authentication
SRS 3.1.1.6	IPSS008	15 JUN 2024	IPSS-41	IPSS-41-logout
SRS 3.1.2.1	IPSS013	29 JUN 2024	IPSS-15	IPSS-15-backend-article-routes
SRS 3.1.2.2	IPSS015	20 JUL 2024	IPSS-22 IPSS-23	IPSS-22-create-search-pref-component IPSS-23-store-user-preferences
SRS 3.1.2.3	IPSS016	06 JUL 2024	IPSS-17	IPSS-17-store-articles
SRS 3.1.2.4	IPSS015	20 JUL 2024	IPSS-22 IPSS-23	IPSS-22-create-search-pref-component IPSS-23-store-user-preferences
SRS 3.1.2.5	IPSS014	29 JUN 2024	IPSS-21	IPSS-21-serve-article-content
SRS 3.1.2.6	IPSS011	20 JUN 2024	IPSS-20	IPSS-20-article-page
SRS 3.1.2.7	OBE for v1.0	----------	----------	----------
SRS 3.1.2.8	IPSS007	15 JUN 2024	IPSS-8	IPSS-8-create-dashboard
SRS 3.1.2.9	IPSS012	29 JUN 2024	IPSS-14	IPSS-14-frontend-article-routes
SRS 3.1.2.10	IPSS009	19 JUN 2024	IPSS-18	IPSS-18-article-search-tabs
SRS 3.1.2.11	IPSS010	20 JUN 2024	IPSS-19	IPSS-19-article-cards
SRS 3.1.2.12	IPSS011	20 JUN 2024	IPSS-20	IPSS-20-article-page
SRS 3.1.3.1	IPSS017	22 JUL 2024	N/A	N/A