System Test Plan Document for Validation and Verification System

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1. Objectives

1.1 Purpose of the Software Test Plan

The primary purpose of this Software Test Plan (STP) is to outline the comprehensive testing approach, methodologies, and strategies to ensure the reliable and effective validation of the software under consideration. This document serves as a guide for the testing team, providing a roadmap for the testing phases and activities throughout the software development life cycle.

1.2 Scope of Testing

The scope of testing encompasses all functional and non-functional aspects of the software. This includes validating the intended functionality, assessing performance, ensuring security, and verifying compatibility with different environments. The testing scope extends from unit testing to system integration testing, covering both manual and automated testing processes.

1.3 Overall Testing Objectives

The overarching objectives of the testing process are:

- To Validate Functionality: Ensure that the software functions according to the specified requirements and meets the end-users' expectations.
- To Verify Reliability: Confirm the stability and reliability of the software by testing concurrency features.
- To Assess Performance: Evaluate the software's performance in terms of responsiveness and resource utilization.
- To Ensure Security: Verify the effectiveness of security measures, protecting against unauthorized access and potential vulnerabilities.

1.4 Test Deliverables

The testing process will produce the following key deliverables:

- Test cases and scenarios (present document)
- Test scripts for automated testing
- Test logs and reports
- Defect reports and resolution documentation

1.5 Testing Schedule

A detailed schedule outlining the timelines for each testing phase, including milestones and dependencies, is provided in the Test Schedule section (Section 6).

1.6. Definitions and Acronyms

This section contains definitions of terms, acronyms, and abbreviations that may be used throughout the System Test Plan. These definitions are included to assist the reader in understanding the content of this document more effectively.

Table 1: Abbreviations and Acronyms

Term	Description
V&V	Verification and Validation
SRD	Software Requirement Document
SDD	Software Design Document
STP	System Test Plan
API	Application Programming Interface
Creator User	Can upload SRD, SDD, and STP documents and use it to enter requirements, design and test plans into the V&V tool.
Reviewer User	Can review requirements, design and test plans and provide feedback.
Administrator User	Can add, delete and modify user roles.

2. Document References

The documents listed in Table 2 are essential for understanding the requirements and design specifications of the V&V tool. These documents provide comprehensive details and should be referenced for the testing process.

Table 2. Document References

Document Title	Document Link
System Requirements Document (SRD)	SRD for V&V tool
System Design Document (SDD)	SDD for V&V tool

3. System Summary

3.1. Overview

The Validation and Verification (V&V) Tool is a comprehensive software suite designed to enhance the efficiency and effectiveness of software development projects. It serves as a centralized platform for managing and tracking software development artifacts including Software Requirement Documents (SRD), Software Design Documents (SDD), and Software Test Plans (STP). Its primary objective is to facilitate thorough validation and verification of software projects, ensuring compliance with defined standards and requirements.

3.2. Key Features

- Document Management: Facilitates the creation, editing, and review of SRD, SDD, and STP documents. Incorporates version control and a collaborative commenting system.
- Role-Based Access Control (RBAC): Supports distinct user roles like Administrator, Creator, and Reviewer, each with specific permissions and access levels to different system functionalities.
- Authentication and Security: Implements robust user authentication mechanisms, including two-factor authentication, and ensures secure handling of sensitive data.
- Commenting and Flagging: Allows users to add comments to documents and flag sections for further attention or action, fostering an interactive review process.
- Report Generation: Generates comprehensive reports based on the artifacts, encapsulating key metrics and evaluations, such as the 4C's (Completeness, Correctness, Consistency, Clarity).
- User Notification System: Delivers timely notifications to users regarding document reviews, approval status changes, and other relevant updates.
- Concurrent Editing: Manages simultaneous document edits by multiple users, with conflict resolution mechanisms to ensure data integrity.

3.3. System Architecture

The V&V Tool is built on a multi-tier architecture, comprising a user-friendly front-end interface, a powerful back-end server, and a robust database. The system is designed for high scalability and reliability, with API integrations that facilitate smooth interactions with external systems and databases.

3.4. Technical Environment

Database System: Utilizes a NoSQL database for flexible and efficient data management.

3.5. User Roles and Permissions

- <u>Administrator:</u> Manages user roles, oversees document lifecycle, and has full access to all system functionalities.
- <u>Creator:</u> Responsible for creating and editing SRD, SDD, and STP documents. Can submit documents for review and track their status.
- <u>Reviewer:</u> Reviews documents, adds comments, flags sections, and approves or rejects artifacts. Can escalate documents for higher-level review.

Security Features

Two Factor Authentication for Login functionality to provide increased security.

4. Test Plan Environment

4.1. Introduction

This section outlines the test environment setup required for the Validation and Verification (V&V) tool's System Test Plan. It provides an outline of the hardware, software and network necessary to conduct a comprehensive testing process.

4.2. Hardware Requirements

- Test Server: Quad-core processor, 16GB RAM, 1TB SSD storage.
- Test Client Machines: Dual-core processor, 8GB RAM, 256GB SSD storage, with varying operating systems (Windows 10, macOS Mojave, Linux Ubuntu 18.04).
- Networking Equipment: Gigabit Ethernet connection with a configured firewall to simulate production network conditions.

4.3. Software Requirements

- Operating Systems: Windows 10, macOS Mojave, Linux Ubuntu 18.04.
- Database: PostgreSQL 12.x with test databases pre-populated with test data.
- Test Management Tools: JIRA for defect tracking, TestRail for test case management.

4.4. Network Configuration

- LAN setup mimicking the production environment with bandwidth limitations set for performance testing.
- VPN access for remote testing capabilities.

5. Major Test Specifications

This section covers the list of all the test scenarios and the accompanying specific test cases that need to be performed during the testing cycle of the project.

➢ Functional Test Scenarios and Cases

The cases presented in this section intend to test the behavior of the functional components of the present software project.

5.1. Test Scenario - Login Workflow

Verifies the complete login process, including UI interactions and backend authentication.

5.1.1. Test Case Name: Valid Credentials Login Attempt

Description: This test examines the process of logging into the V&V tool using valid user credentials. The test will include the following -
● Components to be tested - Authentication Subsystem in Authentication Layer.
● Whether the log-in screen is displayed to the user on running the application or not.
● Whether the user is granted access to the application and the main user interface if the entered username and password are valid and match.

Testing Procedure:
● Run the application and initialize the V&V tool to launch the login page.
● In the respective fields, add the username and password of a valid user in the database, press the login button. The behaviour of the system is then observed to check if the session is initialised and the user is redirected to the main user interface.

Expected Result:
● Upon launching the application, the V&V tool is initialized and the user is able to observe the user login page.
● The system will display a login successful message and redirect the user to the main interface page.

Prepared By: Harshita Chadha

5.1.2. Test Case Name: Invalid Credentials Login Attempt

Description: This test examines the process of logging into the V&V tool using invalid user credentials. The test will include the following -
● Components to be tested - Authentication Subsystem in Authentication Layer.
● Whether the log-in screen is displayed to the user on running the application or not.

● Whether the user is denied access to the application and an error message displayed.

Testing Procedure:
● Run the application and initialize the V&V tool to launch the login page.
● In the respective fields, add the username and password of a valid user in the database, press the login button. The behaviour of the system is then observed to check if the error in login message is displayed.

Expected Result:
● Upon launching the application, the V&V tool is initialized and the user is able to observe the user login page.
● The system will display a login unsuccessful error message and redirect the user to the main initial login page.

Prepared By: Harshita Chadha

5.1.3. Test Case Name: Empty Field Login Attempt

Description: This test examines the process of logging into the V&V tool using without user credentials. The test will include the following -
● Components to be tested - Authentication Subsystem in Authentication Layer.
● Whether the log-in screen is displayed to the user on running the application or not.
● Whether the user is denied access to the application and an error message displayed.

Testing Procedure:
● Run the application and initialize the V&V tool to launch the login page.
● In the respective fields, do not enter any username and password and press the login button. The behaviour of the system is then observed to check if the no input provided message is displayed.

Expected Result:
● Upon launching the application, the V&V tool is initialized and the user is able to observe the user login page.
● The system will display a no input error message and redirect the user to the main initial login page.

Prepared By: Harshita Chadha

5.2. Test Scenario - Logout and Session Clearance

Ensures that logging out clears session data and user states as expected.

5.2.1. Test Case Name: Logout Session Termination

Description: This test ensures that on choosing the logout option, a user is successfully logged out of the V&V tool's interface and the logout function terminates the user session correctly. The test will include the following -
● Components to be tested - Authentication Subsystem in Authentication Layer.
● Whether the confirmation of logout option is displayed to the user when the logout option is chosen.
● Whether a user is successfully able to logout from the V&V tool application.

Testing Procedure:
● While an instance of the V&V tool application is running, navigate to the logout option located in the top right corner of the interface and click on it.
● In the logout pop-up, select cancel logout option.
● In the logout pop-up, select confirm logout option.

Expected Result:
● Clicking on the logout option should prompt a pop-up dialog to appear that asks the user to confirm the action or cancel it.
● When the cancel logout option is selected in the confirmation pop-up, the pop-up should disappear and the user should be redirected to the last view of the V&V tool application they were on before initiating the logout operation.
● When the confirm logout option is selected from the confirmation pop-up dialog, the user session should be terminated and the application interface should be redirected to the logout successful page.

Prepared By: Harshita Chadha

5.3. Test Scenario - User Role Switching

Tests the functionality to switch between different user role views and permissions.

5.3.1. Test Case Name: Load Admin View

Description: This test verifies the user interface correctly loads the admin view when an admin user logs in. The test will include the following -
● Components to be tested - View Switch Subsystem in Interface Layer.
● Whether the login action leads to the correct main user interface view based on the type of user being logged in.

Testing Procedure:
● While an instance of the V&V tool application is running, navigate to the login option and enter an admin type user's credentials.

Expected Result:
- When the user is logged in, the main user interface should display the admin view of the application and the view type dialog box in the interface window is displaying the type of view as "Administrator".

Prepared By: Harshita Chadha

5.3.2. Test Case Name: Load Reviewer View

Description: This test verifies the user interface correctly loads the reviewer view when an admin user logs in. The test will include the following -
- Components to be tested - View Switch Subsystem in Interface Layer.
- Whether the login action leads to the correct main user interface view based on the type of user being logged in.

Testing Procedure:
- While an instance of the V&V tool application is running, navigate to the login option and enter a reviewer type user's credentials.

Expected Result:
- When the user is logged in, the main user interface should display the reviewer view of the application and the view type dialog box in the interface window is displaying the type of view as "Reviewer".

Prepared By: Harshita Chadha

5.3.3. Test Case Name: Load Creator View

Description: This test verifies the user interface correctly loads the creator view when an admin user logs in. The test will include the following -
- Components to be tested - View Switch Subsystem in Interface Layer.
- Whether the login action leads to the correct main user interface view based on the type of user being logged in.

Testing Procedure:
- While an instance of the V&V tool application is running, navigate to the login option and enter a creator type user's credentials.

Expected Result:
- When the user is logged in, the main user interface should display the creator view of the application and the view type dialog box in the interface window is displaying the type of view as "Creator".

Prepared By: Harshita Chadha

5.3.4. Test Case Name: Switching Between Views

Description: This test ensures that the system allows users to switch between different role-based views according to their permissions. The test will include the following -
- Components to be tested - View Switch Subsystem in Interface Layer.
- Whether the login action for a user with multiple roles leads to the correct main user interface view where the interface view type can be changes from the view type menu.
- Whether, based on the type of current view, role specific functions can be successfully perform,ed by a user with multiple user roles assigned.

Testing Procedure:
- While an instance of the V&V tool application is running, navigate to the login option and enter the credentials for a user with multiple user roles assigned.
- From the view type menu, navigate to other types of user views.
- Switch to the creator type view from the view type menu and select the create new document option.
- Switch to the reviewer type view from the view type menu, select and open any test document in the pending requests tab. Select any part of the content of the doc and select the add comment option from the menu in the displayed document's view.
- Switch to the administrator type view from the view type menu. Use the user actions menu in the view to click in the create new user option.

Expected Result:
- When the user is logged in, the main user interface should display any one of the views which the user has access to based on role-type permissions.
- The view type menu should list all the other views that the user has access to. Clicking on any particular option in this menu should cause the main interface view to change to the selected type.
- A pop-up prompting the user to enter document details such as type of document, name of the project manager, name of the document, etc appears. After adding these details and selecting the confirm and create document option, the user should be lead back to the main creator view interface where this new document should appear under the editing documents tab.
- A pop-up should appear, askling the user to enter the comments. Pressing enter, should comment into the central database of the V&V tool and the comments added should also appear in the reviewer comments tab.
- A new window should open that prompts the user to enter the new users details. Upon pressing the save and confoirma and add user option, a pop-up saying user added is

displayed. When the 'X' is pressed on this window, the user is redirected to the main admin view of the V&V tool's application.

Prepared By: Harshita Chadha

5.4. Test Scenario - Document Creation Workflow

Confirms the workflow for creating a new document types in the V&V tool.

5.4.1. Test Case Name: Creation Of an SRD Type Document in Creator View

Description: This test ensures that the system allows creator type users to create an SRD type document that is suitably saved and can be accessed from the creator view's main user interface. The test will include the following -
● Components to be tested - Document Editor and Viewer Subsystem in Interface Layer
● Whether the user can create an SRD type document..
● Whether the created document is visible and accessible via the main interface creator view of the V&V tool.

Testing Procedure:
● In the creator view of the V&V tool, click on the create new document option in the editing documents pane.
● Enter the details of the document such as the name of the document, the project manager, and select the type of document as type SRD. Select the create document option in the pop-up.
● Navigate to the main creator type view of the application and look for the created document uner the editing documents pane.

Expected Result:
● Clicking on the create new document option should open a pop-up prompting the user to enter details about the new document to be created.
● Entering the details and pressing the create document option should display a document creation successful message and the user should be redirected to the created document view to add details.
● In the main creator view of the V&V tool, the new created document should be displayed under the editing documents pane and an "SRD" type identifier should be displayed next to the name indicating the type of document for ease of reference.

Prepared By: Harshita Chadha

5.4.2. Test Case Name: Creation Of an SDD Type Document in Creator View

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Description: This test ensures that the system allows creator type users to create an SDD type document that is suitably saved and can be accessed from the creator view's main user interface. The test will include the following -
- Components to be tested - Document Editor and Viewer Subsystem in Interface Layer
- Whether the user can create an SDD type document.
- Whether the created document is visible and accessible via the main interface creator view of the V&V tool.

Testing Procedure:
- In the creator view of the V&V tool, click on the create new document option in the editing documents pane.
- Enter the details of the document such as the name of the document, the project manager, and select the type of document as type SDD. Select the create document option in the pop-up.
- Navigate to the main creator type view of the application and look for the created document under the editing documents pane.

Expected Result:
- Clicking on the create new document option should open a pop-up prompting the user to enter details about the new document to be created.
- Entering the details and pressing the create document option should display a document creation successful message and the user should be redirected to the created document view to add details.
- In the main creator view of the V&V tool, the new created document should be displayed under the editing documents pane and an "SDD" type identifier should be displayed next to the name indicating the type of document for ease of reference.

Prepared By: Harshita Chadha

5.4.3. Test Case Name: Creation Of an STP Type Document in Creator View

Description: This test ensures that the system allows creator type users to create an STP type document that is suitably saved and can be accessed from the creator view's main user interface. The test will include the following -
- Components to be tested - Document Editor and Viewer Subsystem in Interface Layer
- Whether the user can create an STP type document.
- Whether the created document is visible and accessible via the main interface creator view of the V&V tool.

Testing Procedure:
- In the creator view of the V&V tool, click on the create new document option in the editing documents pane.

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- Enter the details of the document such as the name of the document, the project manager, and select the type of document as type STP. Select the create document option in the pop-up.
- Navigate to the main creator type view of the application and look for the created document under the editing documents pane.

Expected Result:
- Clicking on the create new document option should open a pop-up prompting the user to enter details about the new document to be created.
- Entering the details and pressing the create document option should display a document creation successful message and the user should be redirected to the created document view to add details.
- In the main creator view of the V&V tool, the new created document should be displayed under the editing documents pane and an "STP" type identifier should be displayed next to the name indicating the type of document for ease of reference.

Prepared By: Harshita Chadha

5.5. Test Scenario - Document Edit And Save

Ensures that editing and saving changes for all types of documents in the V&V tool work correctly.

5.5.1. Test Case Name: Editing and Saving of Documents

Description: This test ensures that users, especially creators and reviewers, can successfully edit and save documents in the V&V tool. The test will include the following -
- Components to be tested - Document Editor and Viewer Subsystem in Interface Layer
- Whether the user can access a document they have created.
- Whether the user can make edits to the document they have created or have been granted access to by the creator.
- Whether the edits user makes are auto-saved and reproducible or manually saved and reproducible.

Testing Procedure:
- In the creator view of the V&V tool, click on an already existing document that the current user is the creator of in the editing documents pane.
- In the creator view of the V&V tool, click on an already existing document that the current user is a contributor of in the editing documents pane.
- Inside the document that the user is a creator of, make an edit such as modifying or adding text, then wait for 10 minutes, exit the document and the open the document again.

- Inside the document that the user is a contributor to, make an edit such as modifying or adding text, then wait for 10 minutes, exit the document and the open the document again.
- Inside the document that the user is a creator of, make an edit such as modifying or adding text, then click on the save option, exit the document and the open the document again.
- Inside the document that the user is a contributor to, make an edit such as modifying or adding text, then click on the save option, exit the document and the open the document again.

Expected Result:
- The user should be able to access the document and should be redirected to a new page displaying the document clicked on.
- The user should be able to access the document and should be redirected to a new page displaying the document clicked on.
- The changes made should persist and be visible due to the auto-save capability of the system.
- The changes made should persist and be visible due to the auto-save capability of the system.
- The changes made should persist and be visible.
- The changes made should persist and be visible.

Prepared By: Harshita Chadha

5.6. Test Scenario - Commenting and flagging

Tests the ability for users to add, edit, and save comments in the different types documents in the V&V tool.

5.6.1. Test Case Name: Reviewer Comments Workflow

Description: This test ensures that reviewers can add comments to a document in the V&V tool. The test will include the following -
- Components to be tested - Document Review and Commenting Subsystem in Logical Layer.
- Whether the reviewer user can add a comment to the document they are a reviewer for.
- Whether the reviewer user can make edits to the comments they have added to a document.
- Whether the reviewer user can reply to a comment chain.

Testing Procedure:

- In the reviewer view of the V&V tool, open any document in the pending requests pane. Following this, select any part of the open document and use the add comment option in the top menu to add a test comment, click the save button in the comment pop-up box
- Observe the reviewer comments pane within the document for the created comment.
- Click on the created comment and select the edit comment option. Make any changes to the test comment and click on save.
- Click on the created comment and select the delete comment option.
- Click on a comment not created by the present user.
- Click on the reply option at the bottom of any already existing comment in the document. In the pop-up that opens, add a test reply comment and click on save. Observe the respective creator/reviewer pane where the original comment was to see if the reply has been saved.

Expected Result:
- The user should be able to access the document. Selecting text and clicking on the add comment option should open a pop-up with an empty text field and a save and cancel button. Adding text and clicking on the save button should close the popup and add the comment to the reviewer comment pane. Clicking on cancel closes the pop-up without any changes to the reviewer comments pane.
- The newly created comment should be added to the reviewer comments pane.
- Clicking on the created comment by the reviewer user, two buttons, edit or delete should appear. Clicking on the edit button opens a popup with an editable text field with the original text should appear along with two buttons - save changes and cancel changes. After making the required changes to the comment, clicking on the save changes option saves the edits and these are also observable by clicking on the edited comment in the reviewer comments pane. Clicking on the cancel changes button preserves the original comment and no changes are made.
- Clicking on the created comment and selecting the delete option leads to a pop-up asking user to confirm comment deletion. In the pop-up if the confirm deletion option is selected, the comment is deleted and should not be visible in the reviewer comments pane. If the cancel option is selected instead, then the pop-up closes and the comment is preserved.
- Clicking on a comment not created by the user, only the reply option should be visible. No edit or delete option should be available.
- When the reply option is selected at the bottom of a comment, a pop-up with an empty text field and a save and cancel button should open. Adding text and clicking on the save button should close the popup and add the comment to the existing comment chain where the new comment was added. Clicking on cancel closes the pop-up without any changes.

Prepared By: Harshita Chadha

5.6.2. Test Case Name: Creator Comments Workflow

Description: This test ensures that creators can add comments to a document in the V&V tool. The test will include the following -
● Components to be tested - Document Review and Commenting Subsystem in Logical Layer.
● Whether the creator user can add a comment to the document they are a reviewer for.
● Whether the creator user can make edits to the comments they have added to a document.
● Whether the creator user can reply to a comment chain.

Testing Procedure:
● In the creator view of the V&V tool, open any document in the pending requests pane. Following this, select any part of the open document and use the add comment option in the top menu to add a test comment, click the save button in the comment pop-up box
● Observe the creator comments pane within the document for the created comment.
● Click on the created comment and select the edit comment option. Make any changes to the test comment and click on save.
● Click on the created comment and select the delete comment option.
● Click on a comment not created by the present user.
● Click on the reply option at the bottom of any already existing comment in the document. In the pop-up that opens, add a test reply comment and click on save. Observe the respective creator/reviewer pane where the original comment was to see if the reply has been saved.

Expected Result:
● The user should be able to access the document. Selecting text and clicking on the add comment option should open a pop-up with an empty text field and a save and cancel button. Adding text and clicking on the save button should close the popup and add the comment to the creator comment pane. Clicking on cancel closes the pop-up without any changes to the creator comments pane.
● The newly created comment should be added to the creator comments pane.
● Clicking on the created comment by the creator user, two buttons, edit or delete should appear. Clicking on the edit button opens a popup with an editable text field with the original text should appear along with two buttons - save changes and cancel changes. After making the required changes to the comment, clicking on the save changes option saves the edits and these are also observable by clicking on the edited comment in the creator comments pane. Clicking on the cancel changes button preserves the original comment and no changes are made.
● Clicking on the created comment and selecting the delete option leads to a pop-up asking user to confirm comment deletion. In the pop-up if the confirm deletion option is selected, the comment is deleted and should not be visible in the creator comments pane.

If the cancel option is selected instead, then the pop-up closes and the comment is preserved.

- Clicking on a comment not created by the user, only the reply option should be visible. No edit or delete option should be available.
- When the reply option is selected at the bottom of a comment, a pop-up with an empty text field and a save and cancel button should open. Adding text and clicking on the save button should close the popup and add the comment to the existing comment chain where the new comment was added. Clicking on cancel closes the pop-up without any changes.

Prepared By: Harshita Chadha

5.6.3. Test Case Name: Reviewer Flagging Capability

Description: This test ensures that reviewers can flag specific sections or issues within a document in the V&V tool. The test will include the following -
- Components to be tested - Document Review and Commenting Subsystem in Logical Layer.
- Whether a reviewer user can flag a section of the document and view the flags added after saving.
- Whether all the users - creator and reviewer added to a document can view the added flags.

Testing Procedure:
- In the reviewer view of the V&V tool, click on an already existing document in the review requests pane. In the document that pops open, select any section and click on the add flag option in the menu. In the pop-up that opens, add flag details and click save.
- Click on the created flag in the document and select the edit option.
- Click on the created flag in the document and select the delete option.
- In the creator view of the V&V tool, click on the document in which the flag in steps 1 and 2 above was added and observe the flags that appear.

Expected Result:
- The selected document should open up. Selecting text and clicking on the add flag option should open a popup which contains options for adding text comment, flag title and selecting the flag category from amongst these five - Critical, Non-critical, Weakness, Missing, and Clarification. Adding these details and clicking save should close the pop-up and a flag should appear near the originally selected text.
- Clicking on this flag should result in a pop-up that displays the contents of the flag and two options - delete and edit. Selecting the edit option, makes the fields of the flag editable. Changed can be made to the created flag. Pressing save option at the end of editing preserves the changes made. Pressing the cancel option at the end of editing rejected the changes made.

- Clicking on this flag should result in a pop-up that displays the contents of the flag and two options - delete and edit. Selecting the delete option closes the pop-up and the flag is deleted and disappears from its original position in the document.
- In the creator view, the added flags in the reviewer view should be visible in the document. Clicking on the flag, opens a pop-up with flag details. No edit or delete option should be visible here.

Prepared By: Harshita Chadha

5.7. Test Scenario - Report Generation
Confirm that reports generated from the Software artifacts data are accurate and contain all necessary information.

5.7.1 Test case: Accurate Report Generation from Software Artifacts

Description: This test case verifies the integrity and accuracy of the generated report against the entries of the software artifacts within the V&V tool.
- After populating the database with artifacts and assigning the 4C values (Completeness, Correctness, Consistency, Clarity), the system should compile a report that accurately reflects these entries and their respective evaluations.
- The test ensures that each artifact's details and the 4C attributes are correctly aggregated and represented in the final report, demonstrating the system's capability to track and document the validation and verification status effectively.
- Components to be tested: Report Generation Module

Testing Procedure:
- Log into the V&V tool with a user account that has permissions to generate reports (e.g., Creator role).
- Navigate to the reporting section of the V&V tool interface.
- Select a predefined set of software artifacts to include in the report, ensuring a diverse range that covers all 4C evaluation metrics.
- Initiate the report generation process and monitor the system's response and processing time.
- Once the report is generated, review its content for accuracy, ensuring that each included artifact is represented with its corresponding 4C evaluations.
- Perform a manual verification by cross-referencing the generated report data with the actual entries in the software artifact database.
- Document any discrepancies or anomalies encountered during the cross-referencing process.

Expected Results:
- The report should accurately encapsulate all selected software artifacts, including their 4C evaluation metrics.
- The content of the report should be a true representation of the data stored within the software artifact database, without any omissions or inaccuracies.
- The format of the report should align with the predefined template, showcasing the data in a clear and organized manner.
- The process of generating the report should be smooth, without system errors or delays that exceed the expected time frame for report compilation.

Prepared By: Boomika Karuppaiah

5.8. Test Scenario - Approval Escalation Flow

Verify the V&V tool's functionality for escalating a document through the approval chain, covering both approval and rejection scenarios.

5.8.1. Test Case Name: Document Approval Escalation Process

Description: This test case focuses on verifying the smooth progression of a document through the approval chain once it is approved by the initial reviewer.
- The process involves tracking the document as it is escalated to higher authority levels for further approvals.
- The test aims to ensure that the V&V tool's workflow for document approval is functioning as designed, facilitating a seamless transition from one approval stage to the next while keeping all relevant parties informed through system notifications.
- Components to be Tested: Document Approval Workflow, User Notification System.

Testing Procedure:
- Log in as a reviewer with permissions to approve documents.
- Select a document ready for review.
- Approve the document and observe the escalation process.
- Check for system notifications and updates to the document's status.
- Log in as an administrator and verify receipt of the escalated document for final approval.
- Document each step in the approval process for accuracy and timeliness.

Expected Results:
- The document, once approved by the reviewer, should automatically escalate to the next level of approval.
- System notifications and status updates should accurately reflect the document's progress through the approval chain.
- Administrators should receive the document for final approval without any delay or error.

Prepared By: Boomika Karuppaiah

5.8.2 Test Case Name: Document Rejection and Feedback Process

Description: This test case examines the V&V tool's handling of document rejection scenarios. It specifically tests the system's ability to communicate the rejection decision back to the document creator, along with detailed feedback from the reviewer.
- The focus is on ensuring that the rejection process is clear, the feedback mechanism is effective, and the document's status is updated accurately in the system.
- This test is crucial for understanding how the tool manages the feedback loop, enabling document creators to receive, understand, and act upon the feedback provided by reviewers.
- Components to be Tested: Document Review Interface, Notification System

Testing Procedure:
- Log in as a reviewer and select a document from the review queue.
- Evaluate the document and choose to reject it, providing detailed feedback.
- Observe the system's handling of the rejection, including updates to document status and notifications to the creator.
- As a document creator, receive the rejection notification and access the feedback provided.
- Verify the feedback's clarity and its accessibility for making necessary changes.

Expected Results:
- Upon rejection, the document's status should be updated accurately, and a notification sent to the creator.
- The feedback provided by the reviewer should be clearly communicated to the document creator.
- The system should facilitate an easy process for the creator to access and act upon the feedback.

Prepared By: Boomika Karuppaiah

5.9. Test Scenario - Role Management
Ensure that the V&V tool effectively manages user roles, allowing an admin to add, remove, and update roles with corresponding changes in user permissions.

5.9.1 Test Case Name: Role Addition by Admin

Description: This test case aims to validate the functionality for an admin to add a new role to a user's profile.

- It assesses whether the role addition is executed correctly within the system and whether it results in the appropriate update of user permissions.
- Components to be Tested: Admin Interface

Testing Procedure:
- Log in as an administrator to the V&V tool.
- Navigate to the user management section.
- Select a user and add a new role to their profile.
- Verify the successful addition of the role and assess the updated user permissions corresponding to the new role.
- Check the system's role management logs for accuracy and consistency of the operation.

Expected Results:
- The system should allow the admin to add the new role without errors.
- The user's permissions should reflect the newly assigned role immediately.
- The role management logs should accurately document the addition of the role.

Prepared by: Boomika Karuppaiah

5.9.2 Test Case Name: Role Removal by Admin

Description: This test case checks the system's capability to allow an admin to remove an existing role from a user's profile. It focuses on ensuring that the removal process is smooth and results in the correct adjustment of user permissions.
- Components to be Tested: Admin Interface

Testing Procedure:
- Log in as an administrator.
- Access the user management interface.
- Select a user with multiple roles and remove one of their existing roles.
- Observe changes in user permissions to ensure the role removal is reflected accurately.
- Review role management logs to confirm the accuracy of the removal process.

Expected Results:
- The admin should be able to remove the role without any system errors.
- The user's permissions should be updated to exclude the permissions associated with the removed role.
- Role management logs should clearly record the role removal action.

Prepared by: Boomika Karuppaiah

5.9.3 Test Case Name: Role Updation by Admin

Description: This test case examines the ability of an admin to update or modify the roles assigned to a user, ensuring that any changes made are correctly reflected in the system, both in terms of user permissions and system logging.
- Components to be Tested: Admin Interface

Testing Procedure:
- Log into the V&V tool as an administrator.
- Go to the user management area and select a user for role updation.
- Modify the roles assigned to the user (e.g., change from reviewer to creator).
- Check for the immediate reflection of these changes in user permissions.
- Confirm the accuracy and consistency of these changes in the system logs.

Expected Results:
- The system should allow role modification without errors or delays.
- The user's permissions should immediately reflect the updated roles.
- The role management logs should accurately document the updation process.

Prepared by: Boomika Karuppaiah

5.10.   Test Scenario - Data Integrity Check
   This scenario tests the V&V tool's capability to maintain data integrity, especially in terms of linking between documents, and handling concurrent edits by multiple users.

5.10.1 Test Case Name: Linkage Addition and Removal Verification

Description: This test assesses whether the system accurately records the addition and removal of links between documents in the database. It checks if the data integrity is maintained during these operations.

Components to be Tested: Document Linking Feature

Testing Procedure:
- Log in as a Creator user.
- Create links between various documents (e.g., SRD linked to SDD).
- Remove some of the previously created links.
- Verify in the database that all additions and removals of links are accurately reflected.
- Check for any inconsistencies or data integrity issues.

Expected Results:
- The database should accurately show all the newly created links and the removal of existing links without any discrepancies.
- There should be no data integrity issues post link addition or removal operations.

Prepared by: Boomika Karuppaiah

5.10.2 Test Case Name: Forward Linkage Integrity Check

Description: This test verifies the accuracy and integrity of forward linkages (e.g., from SRD to SDD) to ensure they correctly point to the relevant linked documents.
- Components to be Tested: Document Linking Feature

Testing Procedure:
- Identify a set of documents with forward linkages.
- Review each forward link to ensure it accurately points to the correct document.
- Check for any broken or incorrect links.
- Cross-reference with the database for consistency in link records.

Expected Results:
- All forward links should correctly point to the intended documents.
- The database should have a consistent record of these linkages without any errors.

Prepared by: Boomika Karuppaiah

5.10.3 Test Case Name: Backward Linkage Integrity Check

Description: This test focuses on the accuracy and integrity of backward linkages (e.g., from SDD back to SRD), ensuring that they properly reference the originating documents.
- Components to be Tested: Document Linking Feature

Testing Procedure:
- Select documents with backward linkages.
- Assess each backward link for accuracy in referencing the originating document.
- Investigate any linkages that do not correctly reference the source documents.
- Validate against the database for record accuracy and consistency.

Expected Results:
- Backward linkages should accurately reflect the source or originating documents.
- The database should align with these linkages, showing no discrepancies in the records.

Prepared by: Boomika Karuppaiah

5.10.4 Test Case Name: Concurrent Document Editing Handling

Description: This test case evaluates the system's ability to manage concurrent edits on a document by multiple users, focusing on conflict resolution and data integrity.
- Components to be Tested: Concurrency, Conflict Resolution

Testing Procedure:
- Arrange for multiple users to edit the same document simultaneously.
- Monitor the system's handling of concurrent edits and any arising conflicts.
- Assess the conflict resolution mechanism for effectiveness.
- Check the final document version for data consistency and integrity.

Expected Results:
- The system should handle concurrent edits smoothly, providing real-time updates to all users.
- Conflict resolution should be effective, with a clear mechanism for resolving edit conflicts.
- The final version of the document should be free of data inconsistencies and maintain integrity post multiple edits.

Prepared by: Boomika Karuppaiah

5.11. Test Scenario - Notification System

This scenario evaluates the effectiveness of the V&V tool's notification system in generating and displaying various notifications, including approval requests, comment alerts, and administrative notifications for different user roles.

5.11.1 Test Case Name: Creator Notification Functionality

Description: This test case assesses the notification system's capability to alert creators about relevant activities like feedback on their documents, approval status changes, or other pertinent updates.
- Components to be Tested: Notification System, Creator User Interface

Testing Procedure:
- Log in as a creator within the V&V tool.
- Submit a document for review and wait for feedback or approval status change.
- Monitor the notification system for alerts regarding the submitted document.
- Engage with the notifications to ensure they lead to the relevant sections or details within the tool.
- Verify the timeliness and accuracy of the notifications received.

Expected Results:
- Creators should receive timely notifications about the status of their submitted documents, including any comments or feedback.
- Notifications should accurately reflect the current status or changes related to the creator's activities.
- Interacting with the notifications should lead the creator to the relevant document or section for further action or review.

Prepared by: Boomika Karuppaiah

5.11.2 Test Case Name: Reviewer Notification Functionality

Description: This test focuses on the notification system's ability to keep reviewers informed about new documents assigned for review, updates on previously reviewed documents, or escalations needing their attention.
- Components to be Tested: Notification System, Reviewer User Interface

Testing Procedure:
- Log in as a reviewer.
- Receive and act on notifications related to new document reviews or updates on previously reviewed documents.
- Check the notifications for accuracy and ensure they link to the appropriate documents or actions.
- Assess the system's responsiveness and reliability in delivering these notifications.

Expected Results:
- Reviewers should receive prompt and accurate notifications for new review assignments and updates on past reviews.
- Notifications should provide clear information and direct the reviewer to the relevant documents or actions.
- The notification system should consistently deliver these alerts without failure or significant delay.

Prepared by: Boomika Karuppaiah

5.11.3 Test Case Name: Admin Notification Functionality

Description: This test evaluates the effectiveness of the notification system in informing administrators about high-level activities and decisions required on their part, such as final document approvals, system alerts, or user management updates.
- Components to be Tested: Notification System, Admin User Interface

Testing Procedure:

- Log in as an administrator.
- Engage with notifications related to final approval requests, system maintenance alerts, or user management tasks.
- Verify the accuracy and relevance of the notifications received.
- Test the efficiency of the notification system in terms of speed and reliability.

Expected Results:
- Administrators should receive accurate and relevant notifications regarding final approval requests, system alerts, and user management activities.
- Notifications should be timely and direct the administrator to the necessary actions or sections within the V&V tool.
- The system should ensure the reliability and consistency of notification delivery, maintaining administrative awareness and responsiveness.

Prepared by: Boomika Karuppaiah

➢ Non-Functional Test Scenarios and Cases

The cases presented in this section intend to test the behavior of the non-functional components of the present software project.

5.1 Test Scenario: User Interface Responsiveness

This test evaluates the responsiveness and performance of the V&V tool's user interface under normal operating conditions, focusing on load times, interaction latency, and general usability.

5.1.1. Test Case Name: UI Responsiveness and Performance Check

Description: This test case involves assessing the V&V tool's user interface for its response time and overall performance. It checks how quickly different elements of the interface react to user inputs under typical usage scenarios.
- Components to be Tested: User Interface, Performance Metrics

Testing Procedure:
- Access various components of the V&V tool, such as the document creation section, review panel, and report generation module.
- Measure the time taken for each component to load and become interactive.
- Perform standard operations like document editing, commenting, and navigating between different UI sections.
- Monitor and record any lag, unresponsiveness, or performance hiccups.
- Use performance measurement tools to gather data on UI responsiveness metrics.

Expected Results:
- The UI should load components and respond to user interactions promptly, without significant delay.
- Standard operations should execute smoothly, demonstrating the tool's capability to handle typical user activities efficiently.
- Performance metrics should be within acceptable thresholds, indicating a responsive and user-friendly interface.

Prepared by: Boomika Karuppaiah

5.2 Test Scenario: Database Integration

To verify the seamless integration and interaction between the V&V tool's application components and its backend database, particularly focusing on data retrieval and storage accuracy.

5.2.1. Test Case Name: Database Integration and Data Flow Verification

Description: This test case examines the integration of the V&V tool's application components with its backend database. It assesses the accuracy and efficiency of data storage and retrieval processes.
- Components to be Tested: Database Management System, API

Testing Procedure:
- Perform various data-intensive operations within the tool, such as creating and updating documents, adding comments, and generating reports.
- Verify that these operations accurately reflect in the database in real-time.
- Check for any data loss, corruption, or inconsistency during the data transfer process.
- Use database logging and monitoring tools to observe data flow and integration points.
- Conduct stress tests to assess the robustness of the database integration under high load conditions.

Expected Results:
- Data generated or modified in the application should be accurately and promptly reflected in the database.
- The database should show no signs of data loss, corruption, or inconsistency.
- Integration points between the application and the database should handle data transfers smoothly, even under stress conditions.

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6. Test Schedule Plan

The Test Schedule Plan for the Verification and Validation (V&V) tool outlines a comprehensive timeline and sequencing of testing activities, guiding the execution of the testing phases. Table 3 shows the Test Schedule Plan for the V&V tool.

Table 3. Test Schedule

Type	Scenario	Test Case	Start Date	End Date
Functional	Login Workflow	Valid Credentials Login Attempt	TBD	TBD
		Invalid Credentials Login Attempt	TBD	TBD
		Empty Field Login Attempt	TBD	TBD
	Logout and Session Clearance	Logout Session Termination	TBD	TBD
	User Role Switching	Load Admin View	TBD	TBD
		Load Reviewer View	TBD	TBD
		Load Creator View	TBD	TBD
		Switching Between Views	TBD	TBD
	Document Creation Workflow	Creation Of an SRD Type Document in Creator View	TBD	TBD

Functional		Creation Of an SDD Type Document in Creator View	TBD	TBD
		Creation Of an STP Type Document in Creator View	TBD	TBD
	Document Edit And Save	Editing and Saving of Documents	TBD	TBD
	Commenting and flagging	Reviewer Comments Workflow	TBD	TBD
		Creator Comments Workflow	TBD	TBD
		Reviewer Flagging Capability	TBD	TBD
	Report Generation	Accurate Report Generation from Software Artifacts	TBD	TBD
	Approval Escalation Flow	Document Approval Escalation Process	TBD	TBD
		Document Rejection and Feedback Process	TBD	TBD
	Role Management	Role Addition by Admin	TBD	TBD
		Role Removal by Admin	TBD	TBD
		Role Updation by Admin	TBD	TBD

Functional	Data Integrity Check	Linkage Addition and Removal Verification	TBD	TBD
		Forward Linkage Integrity Check	TBD	TBD
		Backward Linkage Integrity Check	TBD	TBD
		Concurrent Document Editing Handling	TBD	TBD
	Notification System	Creator Notification Functionality	TBD	TBD
		Reviewer Notification Functionality	TBD	TBD
		Admin Notification Functionality	TBD	TBD
Non-Functional	User Interface Responsiveness	UI Responsiveness and Performance Check	TBD	TBD
	Database Integration	Database Integration and Data Flow Verification	TBD	TBD

7. Summary of Results

This section will be filled with test reports upon the completion of system testing.