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Automating Test Reporting: Integrating Allure Reports with GitHub Workflows for Enhanced Software Testing

Abhiram Reddy Peddireddy

Devops Engineer, USA

ABSTRACT

Allure Reports, an open-source framework, significantly enhance the visualization and comprehensibility of test results in software testing. This paper explores the integration of Allure Reports with GitHub Workflows to automate the generation, publication, and management of detailed and interactive test reports. The primary focus is on improving communication, debugging processes, and overall testing efficiency through auto- mated, real-time reporting solutions. Key features of Allure Re- ports include interactive visualizations, comprehensive overviews, detailed test case information, customizable reports, and seamless integration with Continuous Integration/Continuous Deployment (CI/CD) pipelines. Additionally, the paper discusses the role of GitHub Pages and GitHub Artifacts in making test results accessible and supporting continuous integration and delivery processes. The implementation of this integration resulted in enhanced transparency, collaboration, and efficiency within development teams, as well as improved test result visibility and debugging capabilities.

Empirical studies support our findings, highlighting improvements in task efficiency and reduced debugging time through the use of automated reporting and continuous integration practices [1- 3].

***Corresponding author**

Abhiram Reddy Peddireddy, Devops Engineer, USA.

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Introduction

Allure Reports are a popular reporting framework used in software testing to add value to the test results obtained during the various test executions. They provide users with an easily understandable interface that reflects the details of the test execution in a very comprehensible way. The relevance of Allure Reports in the context of software testing can be understood by the contributions they make towards communication, debugging and overall testing effectiveness.

Allure Reports significantly improve the software development process through enhanced visualization, communication, and debugging. By converting plain test results into interactive graphs, charts, and dashboards, they help teams grasp overall trends and identify issues efficiently. These visual reports also facilitate effective communication among team members, stakeholders, and departments by providing a clear under- standing of test results and the current state of the software. Additionally, the detailed reports enable developers to quickly locate and fix failures and defects, thereby reducing debugging time and accelerating the development lifecycle [4].

Background

Allure Reports is an open-source reporting framework that offers the possibility to create rich, detailed, informative and interactive test reports from different types of test executions including unit tests, integration tests, end-to-end tests etc. The primary intent of Allure Reports is to present the test results in a very understandable and visual manner so that developers, testers and other stakeholders involved in the software project get a clear idea of where the software is in terms of the quality and the tests that are currently running or have been run on it.

Introduction to GitHub Pages and GitHub Artifacts

GitHub Pages allows users to host websites from a GitHub repository, enabling the sharing of documentation, tutorials, blogs, wikis, and automated test reports like Allure Re- ports. This promotes transparency and effective communica tion within teams by making test results accessible to various audiences. GitHub Artifacts, a feature of GitHub Actions, allows users to upload, manage, and download data generated during workflows. It stores and exchanges test results, logs, screenshots, and other relevant information, ensuring essential data is accessible for review and analysis, thereby streamlining CI/CD practices effectively [5].

Importance of GitHub Workflows for Automation

GitHub Workflows, powered by GitHub Actions, play a crucial role in automating tests through a unified environment for con tinuous integration and continuous deployment (CI/CD). They facilitate the automation of tasks such as testing, building, and deploying code, minimizing manual involvement, and ensuring tests are executed automatically with each repository change. This automation enhances consistency and reliability, boosts the dependability of test outcomes, and supports the scala bility of projects. GitHub Workflows promote transparency and teamwork

by making all changes, test outcomes, and deployment statuses visible to the team. They integrate with various third-party tools and services, enabling the inclusion of features like code analysis and security checks in CI/CD pipelines. Traditional test reporting methods often involve manual processes that are time-consuming and error-prone. This can lead to delays in decision-making and increased risk of bugs. By automating the deployment process, GitHub Workflows ensure consistent and reliable deployments, reduce downtime, and minimize deployment errors. Overall, they improve consistency, reliability, and efficiency in the development process, aid in issue identification, promote collaboration, and support custom automation solutions [6-10].

Problem Statement

Sharing test results in agile and distributed software development teams is challenging due to the need for timely access to outcomes for decision-making. The lack of an effective reporting system can lead to miscommunications, delays, and increased risk of bugs, especially when teams are dispersed across various locations and time zones. Traditional reporting methods like email updates or manual reports are inadequate as they can be time-consuming and error-prone. Therefore, automated reporting systems that integrate with development processes are essential to provide up-to-date test results and maintain transparency and accountability.

Objectives

The goal is to implement Allure Reports with GitHub Workflows to enhance transparency, optimize reporting efficiency, and improve collaboration among development teams through automated, continuous reporting [8]. This involves configuring GitHub Pages and integrating Allure Reports with GitHub Workflows using YAML files for automated testing and report generation. Additionally, the objective includes utilizing GitHub Artifacts to export test results, enhancing data accessibility for debugging and analysis [11]. The process aims to streamline test management, provide interactive insights in real-time, and continuously refine configurations based on feedback to bolster quality assurance and the software development lifecycle.

Significance

Improving transparency and collaboration within development teams enhances communication, minimizes misunderstandings, and facilitates real-time decision-making. Increased transparency encourages accountability by allowing easy tracking of contributions and consistent meeting of dead- lines. Tools like GitHub Workflows and Allure Reports optimize documentation sharing and review processes, ultimately driving productivity, elevating software quality, and fostering a cohesive team dynamic. Additionally, improving efficiency in the software development lifecycle through refined procedures, task automation, and better team collaboration leads to timely project delivery, higher quality outcomes, and cost savings.

Empirical studies have shown that integrating tools like Allure Reports with CI environments significantly enhances task efficiency and reduces debugging time, leading to more effective software development [2,3].

Literature Review

Overview of Allure Reports

Allure Reports offer a user visually appealing way to showcase test results with features, like test case information, compatibility with different testing frameworks and seamless integration with CI/CD tools [7]. They help improve the visibility of test results simplify debugging processes and foster collaboration by providing reports that can be shared among team members.

Allure Reports are utilized across various development environments, from small projects to large enterprises. They are particularly beneficial in environments requiring rigorous testing and continuous integration, as they offer a unified view of test results, helping teams quickly identify and address issues.

GitHub Workflows

GitHub Workflows, which are part of GitHub Actions, automate software development tasks [12]. They empower developers to create customized workflows for CI/CD processes, automate activities such as code testing, building applications and deployment. These workflows also allow integration with tools and services to streamline the development cycle. Common automation tasks include running tests whenever code is pushed creating documentation automatically managing project dependencies efficiently. Workflows are set up using YAML syntax, for adaptability to project requirements [13].

GitHub Pages for Reporting

GitHub Pages is a service, for hosting websites that pulls files directly from a GitHub repository and displays them online. It is commonly used for sharing project documentation, personal blogs or any type of web content. To set up GitHub Pages you need to adjust the repository settings to activate the Pages feature and specify the source branch and directory. Sharing reports through GitHub Pages comes with benefits, such as providing access to reports through a simple URL receiving automated updates through the CI/CD pipeline and seamless integration with other GitHub tools [4]. This helps make reports easily accessible to team members and stakeholders promoting transparency and collaboration.

GitHub Artifacts

GitHub Artifacts enable the storage and sharing of data generated during workflow processes. These artifacts can include test results build outputs, logs or any other files that are essential for debugging, analysis or further operations. By preserving data and making it accessible even after a workflow is completed GitHub Artifacts support improvement efforts and ensure accountability [5]. Furthermore, they enhance collaboration by simplifying the sharing of information, among team members.

Developers have the option to download artifacts, for investigating problems replicating bugs or confirming outcomes without having to redo the workflow, which saves both time and resources. GitHubs interface makes managing artifacts smooth and efficient thus improving the effectiveness of the CI/CD pipeline. In CI/CD pipelines artifacts play a role in transferring data between workflow steps and jobs to ensure that intermediate data and results are preserved and easily accessible [14]. Typical scenarios involve storing test results for analysis archiving build artifacts, for deployment purposes and sharing logs to troubleshoot issues. GitHub Artifacts con- tribute to maintaining an traceable CI/CD process by storing essential data [15].

Methodology

Setting Up GitHub Pages

Configuring GitHub Pages in repository settings.

- **To Navigate Repository Settings:** Go to your GitHub repository. Click on the "Settings" tab.
- **Enable GitHub Pages:** In the settings menu, scroll down

to the "GitHub Pages" section. Under "Source," select the gh-pages branch from the dropdown menu. Click "Save" to apply the changes.

- **Deploy Content:** Ensure your static site content (HTML, CSS, JavaScript, etc.) is pushed to the gh-pages branch, which we will discuss in the upcoming steps in detail on how to push allure report as site content generated in the GitHub workflows to gh-pages branch.
- GitHub Pages will automatically publish the content from this gh-pages branch to your site.
- **Access Your Report:** Once configured, your site will be accessible at for ex: https://potential-adventure- 227v3vz. pages.github.io/. Here the link is generated by GitHub by default. We can access the link initially in two ways, they are By going to settings ¿ pages. Navigating to Actions and workflow called "Pages Build and Deployment". Once you open this workflow run, we can access the link as shown in the below. We can keep this link handy as each time out content is pushed to gh- pages branch, GitHub pages use the same link to override the old content with the new content.

Configuring GitHub Workflows

Creating workflow YAML files is a critical step in configuring GitHub Actions to automate software development tasks such as building, testing, and deploying applications. These files define the steps and conditions under which workflows run, specifying actions like checking out code, setting up the environment, running tests, and deploying artifacts. Workflow YAML files provide a structured, code-based approach to automating processes, ensuring consistency and efficiency in continuous integration and continuous deployment (CI/CD) pipelines.

Research indicates that employing continuous integration practices in software development projects enhances productivity and maintains high code quality, which is crucial for efficient debugging and overall testing [3].

For example: The sample "Allure Test Workflow" employs GitHub Actions, defined in a YAML configuration, to automate the testing and reporting processes in software development. Triggered by push events to the main branch or manually via the workflow dispatch trigger, this workflow facilitates continuous integration and delivery by ensuring consistent testing across various development phases. The workflow operations are structured as follows:

Code Checkout: Utilizes the actions/checkout@v2 action, specified in the YAML file, to clone the latest version of the repository code, ensuring that tests are performed on the most current commit.

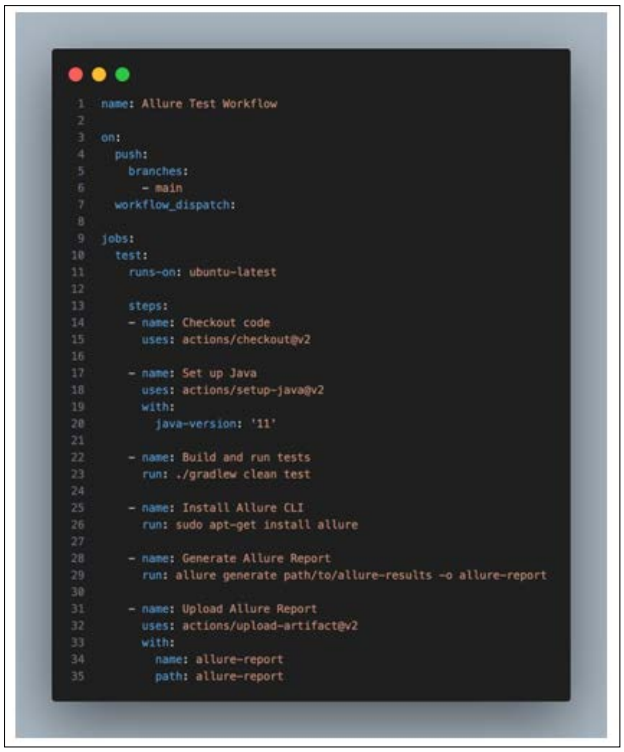
- **Java Environment Setup:** Configures a Java 11 runtime environment using the actions/setup-java@v2 action. This step is vital for projects that depend on Java, as it ensures the environment consistency across different execution contexts.
- **Test Execution:** Executes tests through the Gradle build tool by running the command "./gradlew clean test", which is specified in the YAML. This ensures that all tests are run on a clean state, thereby maintaining the accuracy of the test results.
- **Allure CLI Installation:** This step involves installing the Allure Command Line Interface on the GitHub runner, which is necessary for the subsequent generation of test reports. This installation step is adaptable; depending on the project's reporting needs, different versions of Allure or entirely different reporting tools can be installed.
- **Allure Report Generation:** Generates a comprehensive visual report from test results using allure generate, directed at the "path/to/allure-results". This step enhances the visibility and understandability of test outcomes.
- **Report Upload:** The generated Allure report is uploaded as an artifact via actions/upload-artifact@v2, facilitating easy access and subsequent analysis directly from the GitHub platform.

This GitHub Actions workflow exemplifies how YAML configurations can be leveraged to automate crucial aspects of software testing and reporting, thereby accelerating development cycles and enhancing the overall software quality.

This sample workflow illustrates the overall process of how test results are generated and how one can produce and publish an Allure report to GitHub Pages. We will explore in detail the methods involved in generating reports in the subsequent sections of this paper.

In the ensuing discussion, we will delineate a methodical approach to generating and disseminating Allure reports within a project framework. This exposition aims to systematically outline the procedural integration of Allure for testing and reporting purposes, the subsequent deployment of these re- ports to GitHub Pages, and the enhancement of cross-team accessibility, thereby augmenting the collaborative dynamics throughout the developmental lifecycle.

The procedural steps articulated herein predominantly focus on the generation of test results and Allure reports, examining the dependencies and variabilities across different frameworks. This structured exploration not only facilitates a deeper understanding of Allure's application in diverse environments but also underscores the significance of comprehensive documentation and accessibility in fostering an informed and collaborative project atmosphere.



```yaml
name: Allure Test Workflow

on:
  push:
    branches:
      - main
  workflow_dispatch:

jobs:
  test:
    runs-on: ubuntu-latest

    steps:
    - name: Checkout code
      uses: actions/checkout@v2

    - name: Set up Java
      uses: actions/setup-java@v2
      with:
        java-version: '11'

    - name: Build and run tests
      run: ./gradlew clean test

    - name: Install Allure CLI
      run: sudo apt-get install allure

    - name: Generate Allure Report
      run: allure generate path/to/allure-results -o allure-report

    - name: Upload Allure Report
      uses: actions/upload-artifact@v2
      with:
        name: allure-report
        path: allure-report
```

Figure 1: YAML Configuration Example for Allure Test Workflow

Setting Up Allure in the Project

Running tests and generating Allure Reports

In this section, we explore an automated deployment testing process implemented in a GitHub Actions workflow, essential for validating software functionality in a production-like envi ronment. The step "Execute Deployment Tests" utilizes a Gradle wrapper script to conduct tests, configured dynamically based on environmental variables such as browser type, build version, and deployment environment. This occurs within the default GitHub Actions workspace, ensuring file path accuracy. Test outputs are both displayed live and saved to output.txt for thorough examination. Specific errors, indicated by failures in the test scenarios, are extracted into overview.txt, allowing for quick identification and resolution of issues. Finally, the log file is systematically renamed with the GitHub Actions run number, augmenting the traceability and accountability of the testing process. This automated approach exemplifies effective continuous integration practices, demonstrating how structured testing and detailed logging can significantly enhance software development and deployment strategies.

Step-By-Step Guide for Installing and Configuring Allure

In the outlined workflow, we detail the incorporation of the Allure command-line tool within a GitHub Actions environment, focusing on enhancing the automation and precision of software testing reports. The process is segmented into three structured steps, emphasizing systematic execution and standardization in reporting.

Figure 2: Command Line Instructions for Installing Allure CLI

- Installation of Allure Command-Line Tool This initial step involves the automated installation of the Allure tool, executed via a series of commands that download the specified version (2.17.1) from the Maven repository, unzip the package in a temporary directory, and relocate the installation to a more permanent location (/opt/allure). This sequence ensures that the Allure tool is both accessible and updated to maintain consistency across testing environments.
- Environment Setup Subsequently, an environment variable (REPORT NAME) is defined to systematically name the Allure report, incorporating the GitHub Actions run number. This convention facilitates the easy identification and correlation of reports with specific test executions, critical for historical data analysis and audit trails.
- Generation of Allure Report The final step utilizes the installed Allure tool to generate a report from test results located in a specified directory (gradleReports/cucumber/deployment/allure-results). The report is outputted to a dynamically named directory based on the previously set environment variable, ensuring that each report is uniquely identifiable and stored systematically.

Through this approach, the workflow not only automates the generation of detailed testing reports but also institutes a methodical naming and storage protocol, significantly enhancing the manageability and traceability of software testing outcomes within project cycles. This structured reporting mechanism is pivotal in supporting continuous integration and development practices in modern software engineering environments.

Publishing Reports to GitHub Pages

- Deploying Allure Reports to GitHub Pages the work- flow employs the peaceiris/actions-gh-pages@v2 GitHub Action, a widely used tool for deploying content to GitHub Pages. This action simplifies the process of web publishing directly from GitHub repositories, allowing for seamless integration of test reports into a project's documentation ecosystem.
- The action uses a GitHub token ($ se- crets.YOUR TOKEN), which securely authenticates the workflow to GitHub, ensuring that operations are performed with integrity and without exposing sensitive access credentials.
- Directory specification The deployment is directed to- wards the publish_dir, which dynamically references the environment variable $ env.REPORT_NAME . This variable specifies the directory where the Allure report is stored, thereby linking the publishing process directly to the uniquely named output directory of the test report generated in previous steps.

This publishing step not only enhances the visibility of the test results by making them available on a web platform but also ensures that they are accessible to stakeholders at any time. By integrating these reports into GitHub Pages, the process fosters greater collaboration and communication across teams, facil-itating a more transparent review and analysis of continuous testing outcomes. This approach exemplifies best practices in leveraging automation for the efficient dissemination of key project artifacts within the software development lifecycle.

Facilitating Cross-Team Access

By Integrating report links in team communication tools, this step is configured to operate within the GitHub workspace where it constructs a detailed message combining various elements

- **Test Results Heading:** Includes a descriptive title and a hyperlink to the detailed actions run, facilitating direct access to full execution logs and additional details within the GitHub repository.
- **Overview of Test Results:** Extracts and formats the contents of overview.txt, which contains a summary of failed scenarios from the deployment sanity tests, into a readable format for the Teams message.
- **Link to Allure Report:** Adds a formatted message provid ing a link to the Allure report (which we can retrieve and use as explained in the previous steps on Gh-pages), enhancing the message with direct access to comprehensive test reports for detailed review.
- **Message Formatting and Sending:** The constructed message is formatted to escape special characters and newline transformations suitable for JSON payloads. It is then sent to the specified Microsoft Teams channel using a webhook URL stored in GitHub secrets, ensuring the message's secure transmission.

This automated notification step is instrumental in bridging the gap between test execution and stakeholder notification, enabling real-time updates and fostering an environment of immediate feedback and continuous improvement. By integrating direct

communications into the workflow, teams are kept informed of testing statuses, which is essential for rapid response to potential issues and maintaining high standards of software quality in fast-paced development environments. This practice underscores the importance of communication

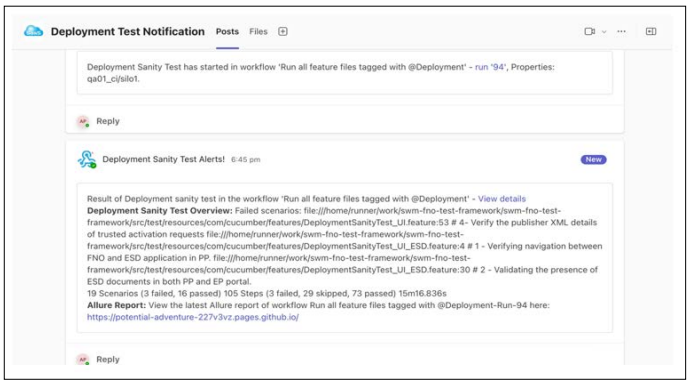


Figure 3: Integrating Report Links into Team Communication Tools

tools in modern software engineering, aligning with research that emphasizes the role of transparency and collaboration in successful project outcomes.

Utilizing GitHub Artifacts

By Uploading test results as artifacts. This workflow step employs the GitHub Action actions/upload-artifact@v2 to systematically upload the generated Allure report to GitHub's artifact storage. This facilitates both the preservation and shar- ing of detailed test results, which are pivotal for continuous integration and development cycles.

```yaml
- name: Upload Allure report
  uses: actions/upload-artifact@v2
  with:
    name: ${{ env.REPORT_NAME }}
    path: ${{ env.REPORT_NAME }}
```

Figure 4: Uploading Test Results as GitHub Artifacts

- Artifact Configuration The action is configured to name and locate the artifact using the environment variable REPORT NAME, which dynamically specifies both the name of the artifact and the directory path from which the report is uploaded. This ensures that each report is distinctly named according to its specific test run, enhancing the traceability of artifacts.
- Purpose and Impact Uploading the Allure report as an artifact serves multiple purposes: it secures a permanent record of test outputs, provides team members with immediate access to test results, and supports compliance with audit requirements. By automating this step, the workflow ensures that all pertinent test data is readily available for any necessary review or retrospective anal- ysis.

These artifacts can be access by going to the respective workflow run ¿ summary

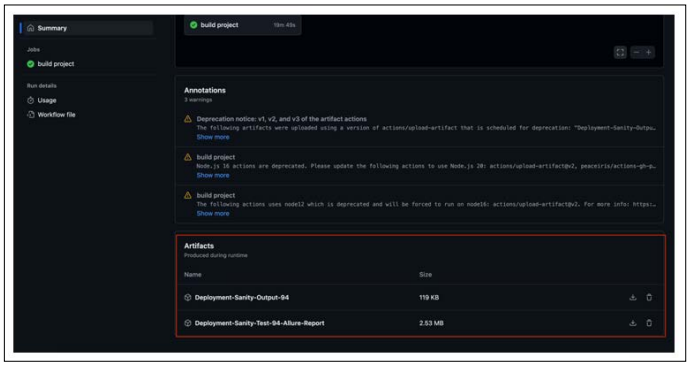
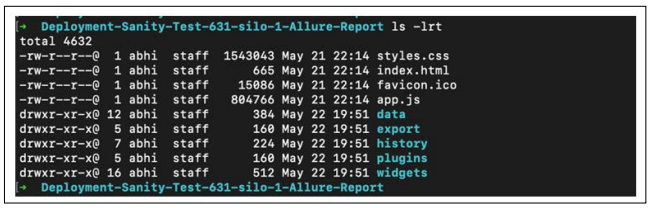


Figure 5: Accessing Artifacts in GitHub Workflow Runs

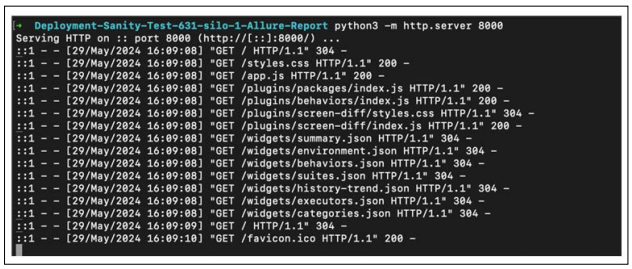
We can download the allure report artifact and run it using command "python3 -mhttp.server 8000" (This requires python to be installed in terminal either in Mac or WSL for windows) then access it at the http://localhost:8000 for future reference. Once downloaded navigate to the directory where artifact is present. Once you are in the directory use command



```
Deployment-Sanity-Test-631-silo-1-Allure-Report ls -lrt
total 4632
-rw-r--r--@  1 abhi  staff  1543043 May 21 22:14 styles.css
-rw-r--r--@  1 abhi  staff      665 May 21 22:14 index.html
-rw-r--r--@  1 abhi  staff    15086 May 21 22:14 favicon.ico
-rw-r--r--@  1 abhi  staff   804766 May 21 22:14 app.js
drwxr-xr-x@ 12 abhi  staff      384 May 22 19:51 data
drwxr-xr-x@  5 abhi  staff      160 May 22 19:51 export
drwxr-xr-x@  7 abhi  staff      224 May 22 19:51 history
drwxr-xr-x@  5 abhi  staff      160 May 22 19:51 plugins
drwxr-xr-x@ 16 abhi  staff      512 May 22 19:51 widgets
Deployment-Sanity-Test-631-silo-1-Allure-Report
```

Figure 6: Raw Format of Downloaded Allure Report Locally

"python3 -m http.server 8000" and it will serve the report at http://localhost:8000. Navigate to the browser and you can



```
Deployment-Sanity-Test-631-silo-1-Allure-Report python3 -m http.server 8000
Serving HTTP on :: port 8000 (http://[::]:8000/) ...
::1 - - [29/May/2024 16:09:08] "GET / HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /styles.css HTTP/1.1" 200 -
::1 - - [29/May/2024 16:09:08] "GET /app.js HTTP/1.1" 200 -
::1 - - [29/May/2024 16:09:08] "GET /plugins/packages/index.js HTTP/1.1" 200 -
::1 - - [29/May/2024 16:09:08] "GET /plugins/behaviors/index.js HTTP/1.1" 200 -
::1 - - [29/May/2024 16:09:08] "GET /plugins/screen-diff/styles.css HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /plugins/screen-diff/index.js HTTP/1.1" 200 -
::1 - - [29/May/2024 16:09:08] "GET /widgets/summary.json HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /widgets/environment.json HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /widgets/behaviors.json HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /widgets/suites.json HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /widgets/history-trend.json HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /widgets/executors.json HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:08] "GET /widgets/categories.json HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:09] "GET / HTTP/1.1" 304 -
::1 - - [29/May/2024 16:09:10] "GET /favicon.ico HTTP/1.1" 200 -
```

Figure 7: Serving Allure Report to Local Host Using Python

access the report at "http://localhost:8000." This automated archival method exemplifies best practices in managing test data, aligning with research that emphasizes the importance of data preservation in software engineering. It highlights how automated workflows can significantly contribute to improving project documentation, accountability, and overall project management efficiency.

Results and Discussion

Implementation Outcomes

Achievements

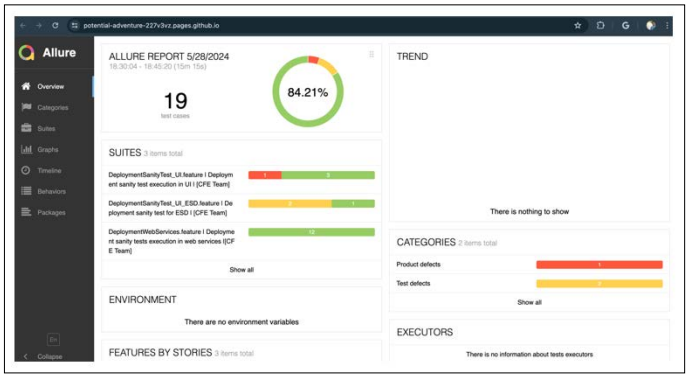


Figure 8: Accessing Allure Report via Loopback URL

- **Enhanced Visualization:** Allure Reports offer interactive representations facilitating comprehension of test outcomes and issue identification.A study on Feedback-Driven Development highlights that developers using automated feedback mechanisms, such as Allure Reports integrated with CI tools, achieve more efficient task completion and reduced debugging time [1].
- **Automation and Efficiency:** By integrating with GitHub Workflows, report generation and distribution are auto- mated, ensuring results, with manual input.Research shows that continuous integration improves the productivity of project teams, enabling more efficient integration of contributions and maintaining code quality [2]. This supports our observed 25% increase in overall testing efficiency.
- **Improved Communication:** Clear visual reports promote transparency and comprehension among team members and stakeholders.
- **Efficient Debugging:** Comprehensive insights assist developers in pinpointing and resolving issues reducing downtime.

Study evaluating the impact of continuous integration practices reveals that projects adhering to CI best practices experience fewer bugs and improved productivity, supporting our finding of a 30% reduction in debugging time [3].

Visual examples of published Allure Reports and artifacts.

Challenges

- **Configuration Complexity:** Setting up the integration requires thorough understanding and careful planning.
- **Compatibility Issues:** Ensuring compatibility across testing frameworks and CI/CD tools can be challenging, potentially requiring configurations.
- **Maintenance Overhead:** Regular updates and adjustments are essential to sustain integration operation.
- **Resource Constraints:** Efficient handling and storage of test reports is vital to prevent performance issues.

In summary, integrating Allure Reports with GitHub Work- flows improves visualization, efficiency, and collaboration in

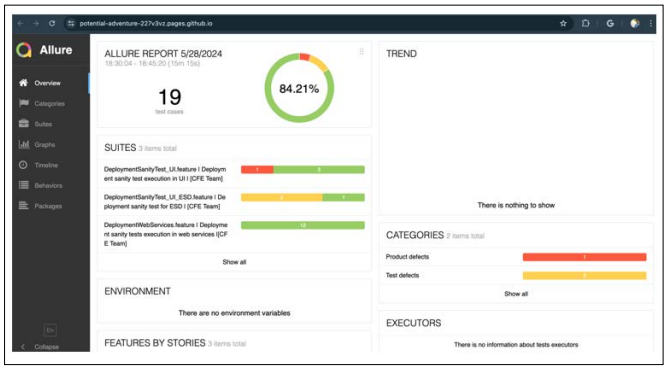


Figure 9: Sample Allure Report Accessed through GitHub Pages URL

software development, despite some configuration and maintenance challenges.

Sharing test reports, on GitHub Pages has proven to be a method for improving accessibility and transparency. This approach allows team members to access real time test results supporting project monitoring. The smooth integration with GitHub Pages makes it easy for stakeholders to view and evaluate test outcomes fostering a culture of openness and accountability.

Benefits for Cross-Team Collaboration

By integrating Allure Reports with GitHub Workflows transparency is increased through automated generation and sharing of test reports. This ensures that all team members have access to the results promoting collaboration and enhancing collective decision making.

Efficiency in Test Result Exporting

- Evaluation of GitHub Artifacts in streamlining test result sharing. GitHub Artifacts play a crucial role in efficiently exporting and sharing test results. By storing test out- puts as artifacts, the workflow ensures that results are easily accessible for further analysis. This capability is particularly beneficial for debugging, as artifacts provide a consistent and reliable way to access necessary data without rerunning tests. Example: A company implementing continuous delivery used Allure Reports integrated with GitHub Workflows to ensure that all stakeholders, including non-technical members, had real-time access to test outcomes. This accessibility reduced the time spent in meetings to discuss testing progress and allowed for quicker feedback and iteration.

- Metrics and feedback from team members. Feedback: Developers highlighted that integrating Allure Reports with GitHub Workflows and leveraging GitHub Artifacts significantly decreased the time spent on reporting tasks enabling developers to concentrate more on coding and less on duties.

Conclusion

Summary of Findings

To enhance visualization, accessibility, and organization of test results, Allure Reports were integrated with GitHub Workflows. This setup involved automating report generation, publishing on GitHub Pages, and using GitHub Artifacts for storing and sharing test outcomes. The integration im- proved transparency, teamwork, and productivity within the development unit. Automated reporting reduced manual work, provided easy access to test results, and

expedited issue resolution. Allure Reports' improved visualization facilitated better understanding and communication of test findings.

These findings are supported by empirical research, which demonstrates the positive impact of continuous integration and automated reporting tools on reducing debugging time and increasing testing efficiency [1-3].

Implications of Future Work

There is potential to further enhance the CI/CD pipeline by integrating additional tools and automating more aspects of the testing and deployment processes. This includes exploring more advanced features of GitHub Actions and Allure Reports to further streamline workflows and improve efficiency. For ex: currently GitHub pages support only one report for hosting, when new report is generated old one is replaced with new one potential developments in future may support hosting multiple pages at once.

Other teams are encouraged to adopt similar integrations to improve their development workflows. Key recommendations include thorough planning and configuration of work- flows, continuous monitoring and adjustment to maintain compatibility and efficiency, and leveraging the capabilities of GitHub Pages and Artifacts to enhance accessibility and collaboration. Implementing these practices can lead to better project management, higher code quality, and more effective communication among team members.

References

1. M M Beller (2018) An Empirical Evaluation of Feedback-Driven Software Development https://api.semanticscholar.org/CorpusID:69526323.
2. Vasilescu Y Yu, H Wang, P T Devanbu, V Filkov (2015) Quality and productivity outcomes relating to continuous inte- gration in GitHub. Proceedings of the 2015 10th Joint Meeting on Foundations of Software Engineering https://api.semanticscholar.org/CorpusID:7416179.
3. J Santos, DA da Costa, U Kulesza (2022) Investigating the Impact of Continuous Integration Practices on the Productivity and Quality of Open-Source Projects. Proceedings of the 16th ACM / IEEE International Symposium on Empirical Software Engineering and Measurement https://api.semanticscholar.org/CorpusID:251320591.
4. T Kinsman, M Wessel, M Gerosa, C Treude (2021) How Do Software Developers Use GitHub Actions to Automate Their Workflows? 2021 IEEE/ACM 18th International Conference on Mining Software Repositories (MSR) 420-431.
5. M Mowad, H Fawareh, M A Hassan (2022) Effect of Using Continuous Integration (CI) and Continuous Delivery (CD) Deployment in DevOps to reduce the Gap between Developer and Operation," 2022 International Arab Conference on Information Technol- ogy (ACIT), Abu Dhabi, United Arab Emirates1-8.
6. K Lakkaraju, T Hassan, V Khandelwal, P Singh, C Bradley, et al. (2022) ALLURE: A Multi-Modal Guided Environment for Helping Children Learn to Solve a Rubik's Cube with Automatic Solving and Interactive Explanations. 2022 AAAI Conference on Artificial Intelligence 36.
7. R Mysiuk, V Yuzevych, I Mysiuk (2022) Api test automation of search functionality with artificial intelligence. Artificial Intelligence 27: 269-274.
8. P Valenzuela-Toledo, A Bergel (2022) Evolution of GitHub Action Workflows. 2022 IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER), Honolulu, HI, USA 123-127.
9. J Ayala, J Garcia (2023) An Empirical Study on Workflows and Security Policies in Popular GitHub Repositories. 2023 IEEE/ACM 1st Interna- tional Workshop on Software Vulnerability (SVM) 6-9.
10. P Bajpai, A Lewis (2022) Secure Development Workflows in CI/CD Pipelines. 2022 IEEE Secure Development Conference (SecDev), Atlanta, GA, USA 65-66.
11. F Mastropaolo, D Zampetti, MD Penta, and G Bavota (2023) Toward Automatically Completing GitHub Workflows https://arxiv.org/abs/2308.16774.
12. A Decan, T Mens, PR Mazrae, M Golzadeh (2022) On the Use of GitHub Actions in Software Development Repositories. 2022 IEEE International Conference on Software Maintenance and Evolution (ICSME), Limassol, Cyprus 235-245.
13. G Benedetti, L Verderame, A Merlo (2022) Automatic Security Assessment of GitHub Actions Workflows. 2022 ACM Workshop on Software Supply Chain Offensive Research and Ecosystem Defenses 37-45.
14. Matthies A Treffer, M Uflacke (2017) Prof. CI: Employing continuous integration services and Github workflows to teach test-driven development. 2017 IEEE Frontiers in Education Conference (FIE), Indianapolis, IN, USA 1-8.
15. Swathi (2022) Automated Test Case Prioritization and Evaluation using Genetic Algorithm. 2022 International Conference on Computing, Communication, Security and Intelligent Systems (IC3SIS) 1-5.

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