



Bilkent University

Department of Computer Engineering

CS 453 - Application Lifecycle Management

Phase I Report

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Phase I Report

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1. Introduction

A bug tracking process will be investigated in the project. That is managed by the help of the bug tracking tools. Those tools conceptually help software teams to find, record and track bugs in their software. Bugs may lead to improper work of the developed software. So bugs should be detected and solved before the delivery of the final software. Bug tracking is generally a part of the testing process of software. The problem in the bug tracking concept is the hardness of changing any part of the project to fix the bug after its implementation finished. This problem was solved with the help of Agile methods which offer the development team to fix bugs during the project's implementation. If we get Scrum as an example, the team tracks bugs at the end of each sprint.

All the bug tracking tools work in the same sense. First, bugs should be detected. There are two alternative ways for detection. Either the bugs may be detected by the customer involvement, that is, bugs are reported by the customer or the development team detects the bugs. Then, bugs should be reported to the development team as they can notice how to fix it. With the help of a bug tracking tool, developers solve the problem by conducting all operations necessary. That should be repeated for all bugs. After solving all of them, the product should be tested repeatedly until making sure that the product works properly. Finally, all the data related to bugs should be added in order not to experience the same problem in the future.

Software teams aim to deliver their product to the customer without any problem by using bug tracking tools. In this project, our team will investigate the working system of Bugzilla which is one of those bug tracking tools.

In the bug tracking life cycle, a new bug from the user or product with the unconfirmed state is created as a bug in the system. After a bug is created, it will be assigned to a developer to solve it. If the developer is finished with the bug, QA should verify that the bug has been solved. If it is verified, the bug will be closed. Otherwise, the bug will be classified as unconfirmed and reopened to solve it again. That means QA was not satisfied with the solution. If the bug is reopened, it is assigned to a developer again and repeats all the processes explained until the bug is closed. Finally, the bug solved will be added to the bug list in order not for developers to face the same problem in the project again.

2. Assessment Criteria

Below will be the ideal set of functionalities for the Issue Tracking from two perspectives such as application and issues.

2.1. General Criteria for the Application

These are the main criteria and set of functionalities about the application itself.

2.1.1 Usability

Creating, closing, updating issues should be simple and user-friendly for both developers and other users. This also means that the tool should be well documented on how to use it as it might be used by users who are not developers (in some open source projects, clients can also submit issues).

2.1.2. Integrability

The tool should be integrable with other tools such as code review, communication, and version control. This would ensure that the development team would be synchronized as well if two people on the same teamwork on the same issue and code. It should also be integrated into database engines such as Oracle or MySQL, and preferably it should have automated sanity checks for inconsistencies within the database (such as duplicate bugs).

2.1.3. Security

Some companies or users may want to keep their information on what features they are working on safe if it is an open-source project. If the users want to be anonymous and do not want to share their information, the application should ensure that the information about the users safe.

2.1.4. Multi-Platform Compatibility

The tool should be accessible from different devices since the developers or the users might not have computers available at all times. For instance, for an open-source mobile application, the users should not be expected to have a computer to report a bug and they should be able to report a bug from their mobile phone.

2.1.5. Ease of Setup

The tool should be easy to set up in order to prevent the developers waste time during the initial integration of the tool to the project.

2.1.6. Reliability

The tool should be able to safely store the data, like user information and issue information. It should not crash frequently as it might cause severe problems for the integration with the other programs.

2.2. Criteria for the Issues

These are the main criteria and set of functionalities about the issues.

2.2.1. Issue Type

Since there might be several types of issues for a project such as a bug or an improvement to a problematic part, the tool should support several types of issues.

2.2.2. Status and Resolution

Status is the state of the reported issue like open or close and the resolution is how the issue is currently handled. An issue's resolution could be marked as fixed, cannot duplicate, will not be fixed, duplicate issue, invalid or will be resolved later.

2.2.3. Description

Gives information about how the issue can be duplicated and how it can affect other functionalities of the software.

2.2.4. Assignee and The Reporter Information

The issue should be properly assigned to a person either automatically by the system or manually by an admin or other developers, in order to avoid the confusion and the reporter information could be found if additional information is needed from the reporter.

2.2.5 Priority & Severity

The information about the severity and the priority should be visible to all users. Priority would represent how urgent an issue should be resolved whereas severity

would be how much an issue would affect the overall project. Generally, if the severity is high, the urgency should also be high. Priority should be labeled by hand or could be understood by the voting from the users so that the important problems for the users can be seen by the developers.

2.2.6. Labeling and Searching

The labeling of an issue should be possible so that it can be searched within the tool by the users. Custom labeling for each project should also be available so that searching would be easier.

2.2.7. Dates

Dates on the updates of the issue such as when it is created or when it is updated so that other people working on the issue can find additional information about the issue and they can be synchronized.

2.2.8. Platform, OS and Version of the Product

Gives information about which OS, OS version and product version the bug had found so that only people who have those specifications can work on the issue.

2.2.9. Dependencies

Shows information if the current issue has dependencies with the other issues, if it can be solved before the other issues are solved, etc.

2.2.10. Alert Tracking

The developers or users can be informed by email or in-app notification automatically depending on their preferences so that if there is any update on the issue, they can be informed directly.

2.2.11. Worklog and History

Worklog is the job done on the issue so far and the history shows who performed on which issues and what is the status of the issues.

3. Use Cases of Bugzilla

3.1. Use Case Diagram for Bugzilla

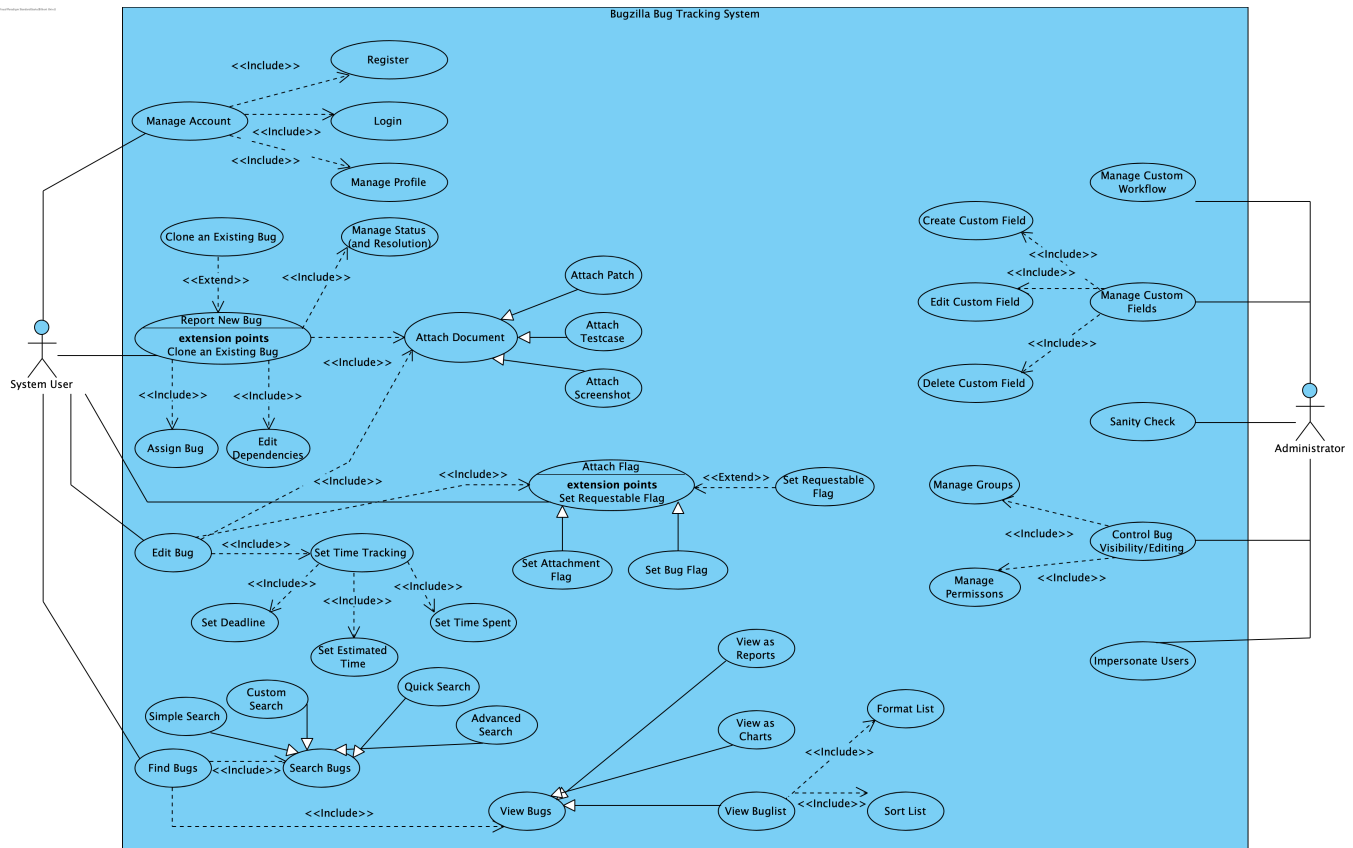


Figure 1: The Use Case Diagram for Bugzilla.

3.2. Scenarios

3.2.1. Scenario 1

Use Case: User creates a bug report

Primary Actor: System User

Entry Conditions:

- The user needs to be already registered to the application.
- User needs to be logged in.
- The user needs to have the required permissions assigned by an administrator.

Exit Conditions:

- The user submits the bug report.
- The user sets the bug status as closed/done.

Main Flow of Events:

1. The user clicks the **New** link available in the header or footer of pages, or the **File a Bug** link on the home page.
2. The user selects the product in which they found a bug.
3. The user specifies the component (part of the product which is affected by the bug they discovered; if they have no idea, they select General if such a component exists).
4. The user selects the version of the program they were using.
5. The user selects the operating system and platform the program is running on.
6. The user selects the severity of the bug.
7. The user provides a short but descriptive summary of the bug they found.
8. In the Description, users give a detailed list of steps to reproduce the problem they encountered.
9. The user assigns the bug to a developer.
10. The User attaches a document (test case, patch, or screenshot of the problem).
11. User makes product-specific requests such as requesting a review for the patch they just attached or requesting their bug to block the next release of the product.
12. Users review and validate their bug reports.
13. Users submit their bug report by clicking the **Submit Bug** button to add their report to the database.

Alternative Flow of Events:

1. The user goes to the bug that they want to clone.
 - a. Then clicks on the “**Clone This Bug**” link on the footer of the bug page
- 3.,4.,5.,6.,7.,8. The User can change the values and/or text if needed.
9. The user may not have the authorization to assign
 - a. The system presents an error to the user.

3.2.2. Scenario 2

Use Case: User edits a bug report

Primary Actor: System User

Entry Conditions:

- The user needs to be already registered to the application.

- User needs to be logged in.
- The User needs to have the required permissions assigned by an administrator for seeing and editing features like time tracking, etc.
- The bug report selected by the user needs to exist.

Exit Conditions:

- The user finishes editing the bug report and saves changes.

Main Flow of Events:

1. The user selects a bug report to edit.
2. The user chooses from the available fields such as Status, Alias, Assignee, etc.
3. The user clicks on the edit hyperlink of a particular field, that field will display as editable and the user edits the field accordingly.
4. After the editing is done, the user clicks on the Save Changes button, which is on the top right-hand corner of the page as shown in the screenshot below.

Alternative Flow of Events:

2. During the editing of the bug report:
 - a. The user may upload an attachment to the selected bug report such as relevant files to bugs - patches, screenshots, test cases, debugging aids or logs, or anything else binary or too large to fit into a comment
 - b. The user may set a flag by selecting either + or - from the drop-down menu next to the name of the flag in the **Flags** list.
 - c. The user may see deadlines and estimated times to fix bugs and can provide time spent on these bugs.

3.2.3. Scenario 3

Use Case: Find/trace/locate an existing logged bug

Primary Actor: System User

Entry Conditions:

- The user needs to be already registered to the application.
- User needs to be logged in.

Exit Conditions:

- The user selects a bug id to access its details.

Main Flow of Events:

1. The user clicks on the Browse hyperlink on the header of the home page.

2. The user browses the bug according to the category.
3. After selecting a category a new window shows the components which are sub-sections of a product. A product can have multiple components listed.
4. The user selects from one of the components.
5. This will open another window. All the Bugs created under a particular category will be listed over here. From that Bug-list, the user clicks on the Bug# ID to see more details about that bug.

3.2.4. Scenario 4

Use Case: User searches for finding a specific bug

Primary Actor: System User

Entry Conditions:

- The user needs to be already registered to the application.
- User needs to be logged in.

Exit Conditions:

- The user finds the wanted bug report.

Main Flow of Events:

1. The user clicks on the **Search** hyperlink in the header of the homepage.
2. The user clicks on the **Simple Search** section as shown in the following screenshot.
3. The user chooses the **Status** of the bug from the list to filter. Then, chooses the **Product** from the list and enters some keywords related to the bug.
4. Then clicks on the **Search** button.
5. The result will be as shown as a list.
6. At the bottom of the search page, there are various options for display options.
7. The user customizes these settings for their preference.
8. The user chooses the wanted bug for display.

Alternative Flow of Events:

2. The user clicks on the Advanced Search tab.
 - a. The user selects the required option from the **Summary** field. Then, they enter the keyword to identify or filter out the bugs.
 - b. The next step is to select the category of Bug from the Classification box.

- c. Then, choose the **Product** under which the Bug is created
- d. In the Component box, the user selects a suitable component.
- e. In the Status box, the user clicks on a suitable status.
- f. In the Resolution box, the user chooses a suitable resolution,
- g. Then the user clicks on the **Search** button after entering all the fields based on the requirement of the filter.
- h. Advanced Search will detect the bug and the result will be displayed.

3.2.5. Scenario 5

Use Case: User generates graphical/tabular reports

Primary Actor: System User

Entry Conditions:

- The user needs to be already registered to the application.
- User needs to be logged in.

Exit Conditions:

- The user generates and displays a graphical or tabular report.

Main Flow of Events:

1. To begin with, the user clicks on the **Reports** link at the header of the homepage.
2. The user clicks on the **Graphical Reports** hyperlink, which is listed under the **Current State** section.
3. Now, the user will set various options to present reports graphically.
4. Afterward, they click on **Generate Report** to display a Bar chart, where the Severity of a bug is the vertical axis, while the Component “Widget Gears” is the horizontal axis.
5. The result of the above-mentioned line graph will be presented to the user.

Alternative Flow of Events:

2. The user clicks on the **Tabular Reports** in the **Current State** section.
 - a. The user selects Vertical, Horizontal axis along with Multiple tables (if required) and provides details in the other fields.
 - b. After selecting all the fields, they click on **Generate Report**. Based on the deadlines, it generates multiple tables.

- c. By clicking on the CSV hyperlink below the table, it converts the report into a CSV file.
- d. Similarly, a Line Graph can be created for Complete Vs Deadline.

4. Scenario Walkthrough

This scenario walkthrough consists of initially searching for bugs that cloning a bug report then modifying its information such as time tracking, attachments. Afterward, it shows generating a visual report for these metrics.

4.1. Searching for a Task Set

1. Click on the search hyperlink on the header of the homepage. You will get two tabs, Simple Search and Advanced Search, click on the Advanced Search tab.

Figure 2 shows the Bugzilla Advanced Search interface. The top navigation bar includes links for 'Browse', 'Advanced Search', 'New Bug', and 'My Dashboard'. The main search area has a 'Summary' dropdown set to 'contains all of the strings' and a 'Search' button. Below this are five filter sections: 'Classification' (with options like Client Software, Developer Infrastructure, Components, Server Software, Other, Graveyard), 'Product' (with options like addons.mozilla.org, Air Mozilla, Bugzilla, bugzilla.mozilla.org, Calendar, Chat Core, Cloud Services, Community Building, Conduit), 'Component' (with options like aboutdebugging, aboutlogins, aboutmemory, Accessibility, Accessibility Tools, Account Help, Account manager, Account wizard, ach / Acholi), 'Status' (with options like UNCONFIRMED, NEW, ASSIGNED, REOPENED, RESOLVED, VERIFIED, CLOSED), and 'Resolution' (with options like FIXED, INVALID, WONTFIX, INACTIVE, DUPLICATE, WORKSFORME, INCOMPLETE, SUPPORT). Below these filters are four sections for narrowing results: 'Detailed Bug Information' (narrow results by the following fields: Comments, URL, Whiteboard, Keywords, Bug Numbers, Version, Target Milestone, Type, Severity, Priority, Hardware, OS), 'Search By People' (narrow results to a role (i.e. Assignee, Reporter, Commenter, etc.) a person has on a bug), 'Search By Change History' (narrow results to how fields have changed during a specific time period), and 'Custom Search' (Didn't find what you're looking for above? This area allows for ANDs, ORs, and other more complex searches). The 'Search By People' section has three columns of checkboxes for roles: 'Any of: the Bug Assignee', 'the Reporter', 'the QA Contact', 'a CC list member', 'a Commenter', 'a Mentor'. The 'Search By Change History' section has a dropdown for 'Sort results by: Reuse same sort as last time'. The 'Custom Search' section has a text input for complex searches. At the bottom, there is a checkbox for 'and remember these as my default search options'.

Figure 2: Step 1 shows selecting advanced search.

2. Select the required option from the Summary field. Then, you can enter the keyword to identify or filter out the bugs. You can also select the category of Bug from the Classification box.

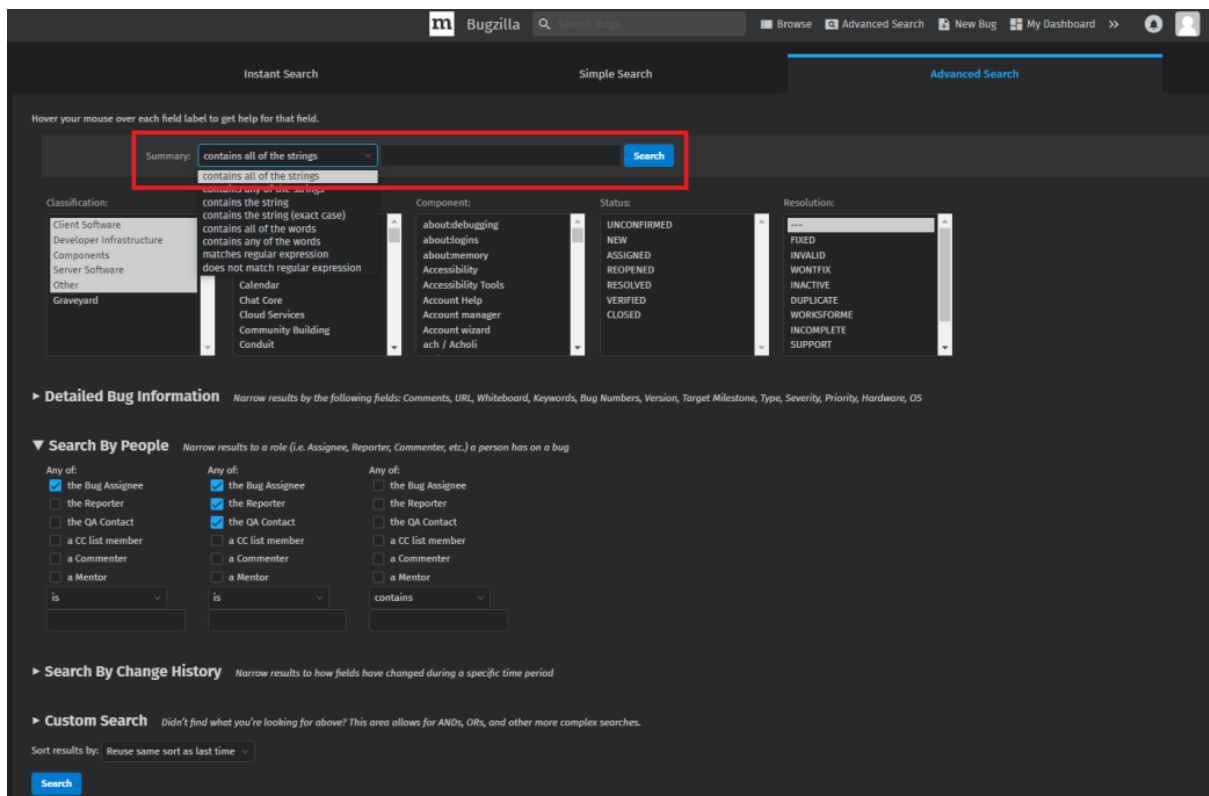


Figure 3: Selecting fields from the interface.

4. Click on the Search Button after entering all the fields based on the requirement of the filter. This would list all the bugs with the specified criteria.

Resolution: FIXED														
Classification: Client Software, Developer Infrastructure, Components, Server Software, Other, Graveyard														
Product: Firefox														
San Apr 12 2020 06:10:42 PDT														
This result was limited to 500 bugs. See all search results for this query.														
ID	Type	Summary	Comp	Assignee	Status	Resolution	Updated	Y	Priority	Closed	Depends on	Duplicates	Flags	Keywords
1461268	bug	The "Firefox.exe - Application Error" dialog is popped up when Compatibility mode is on	Launcher Process	tkuchig@mozilla.com	VERI	FIXE	04/04/20		P1	2020-03-03 03:05:33	firefox+4			11
1460755	bug	Increase margin of tab list menu when triggered by touch	Tabbed Browser	mstremm@mozilla.com	VERI	FIXE	02/06/20		P2	2020-04-09 21:46:30	firefox+4	qz-verify+		8
1540427	bug	Don't save persistent certificate exceptions in private browsing windows	Security	ava-qadi@gmail.com	VERI	FIXE	10/06/19		P2	2019-04-09 16:26:08	firefox+4	firefox+2		16
1442466	bug	Make certificate exceptions on the new cert error pages permanent by default	Security	johanna@mozilla.com	RESO	FIXE	10/06/19		P1	2019-01-24 03:52:16	firefox+4	firefox+2		27
1427840	bug	Intermittent browser/base/content/test/performance/browser_subclose_grow.js [unexpected changed rect: (x1625, y2654, x2574, y3038), window width: 510]	General	andrew.swan@gmail.com	RESO	FIXE	10/03/19		P3	2020-04-11 21:53:49	needinfo	intermittent-failure, regression		23
1427669	bug	Remove browser toolbar update! gfx	Address Bar	daw-kmo@mozilla.com	RESO	FIXE	Set 08/20		P1	2020-04-09 10:00:37				12
1395203	bug	Add bindings for implementing Sync engines in Rust	Sync	lina@mozilla.com	RESO	FIXE	Set 06/20		P1	2020-04-10 03:01:40	firefox+4	firefox+2		18
1428924	bug	default-browser-agent.exe fails with missing VCRUNTIME140.dll on uninstall	Installer	mhowett@mozilla.com	RESO	FIXE	Set 02/20		P1	2020-04-11 09:18:11				7
1422243	bug	"Bookmark pages" context menu item from Library - History doesn't work	Bookmarks & History	standard@mozilla.com	RESO	FIXE	Set 02/20		P2	2020-04-07 21:53:10				9
1428428	bug	Pinna Windows asan tier-3 TestDbusListNoOpEntryPoint 1 Value of 3046	Launcher Process	tkuchig@mozilla.com	RESO	FIXE	Set 02/20		P3	2020-04-11 09:37:57	intermittent-failure			6
1428442	bug	Update vendored rasgite to 0.22.0	Sync	tschow@mozilla.com	RESO	FIXE	Set 02/20		--	2020-04-11 09:37:53				4

Figure 4: Search results interface.

5. It is also possible to click on a bug from the list in order to see more detailed information about it. You can vote, clone follow or edit the bug from this page.

4.2 Creating a New Bug

1. From any page, click to the new bug button. It will redirect you to the page given below.

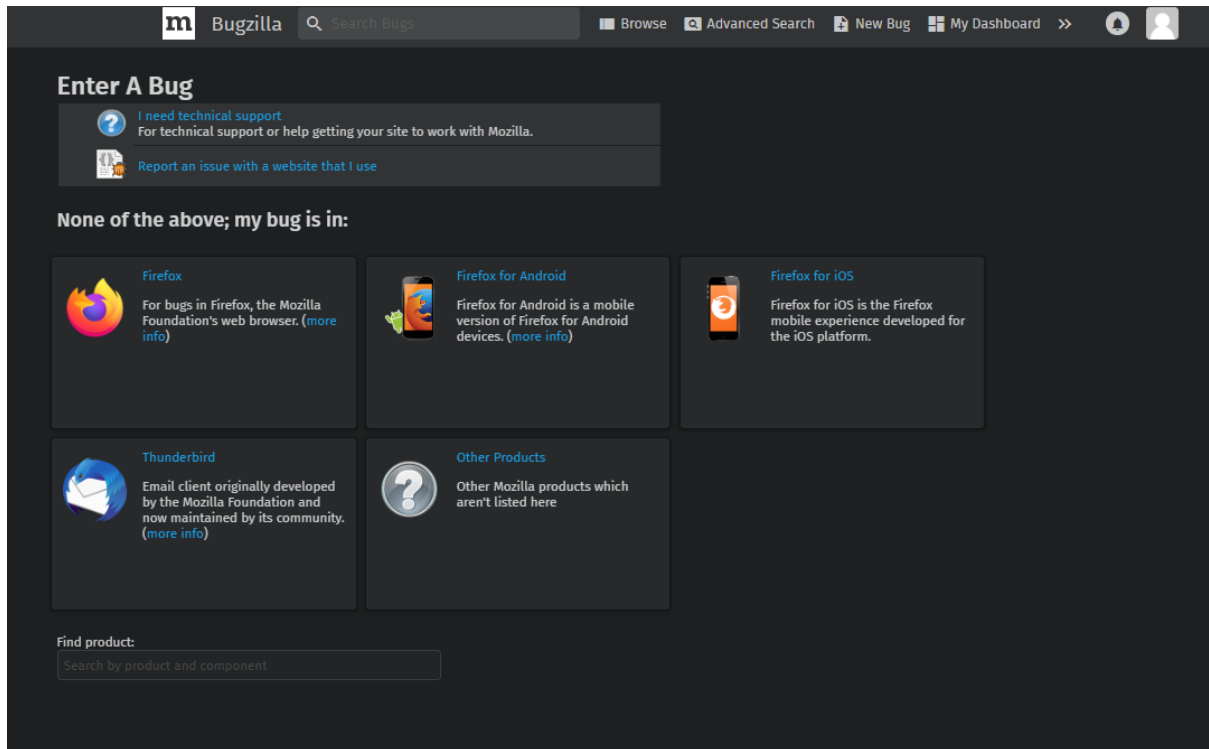


Figure 5: Bug creation main interface.

2. Specify the product which you have problems with. That page would redirect you to a simple search page given below.

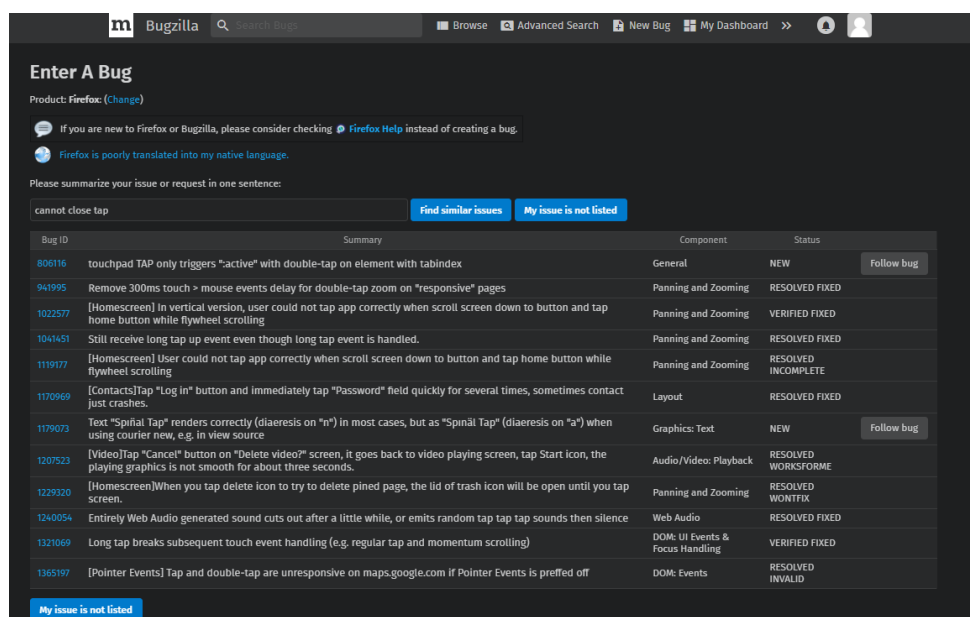
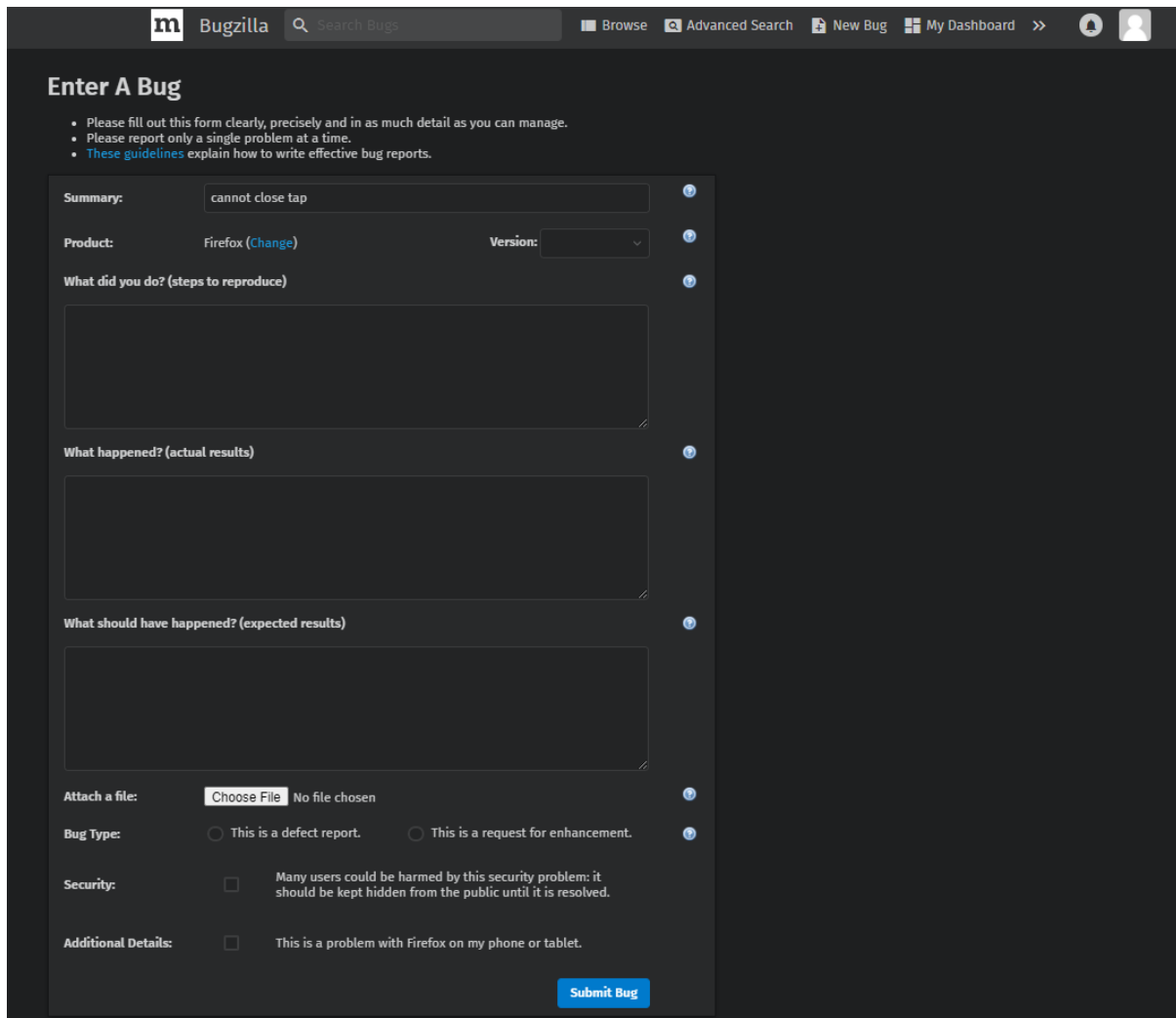


Figure 6: Searching for existing bugs.

3. Search the bug from the search bar, if a similar bug is listed, you can follow it, if not press my issue is not listed button. It will redirect you to the Enter a Bug page.



The screenshot shows the Bugzilla 'Enter A Bug' interface. At the top, there is a navigation bar with the Bugzilla logo, a search bar, and links for 'Browse', 'Advanced Search', 'New Bug', and 'My Dashboard'. Below the navigation bar, the title 'Enter A Bug' is displayed. A list of instructions follows: 'Please fill out this form clearly, precisely and in as much detail as you can manage.', 'Please report only a single problem at a time.', and 'These guidelines explain how to write effective bug reports.' The form itself consists of several sections: 'Summary:' with a text input field containing 'cannot close tap'; 'Product:' with a dropdown menu showing 'Firefox (Change)'; 'Version:' with a dropdown menu; 'What did you do? (steps to reproduce)' with a large text area; 'What happened? (actual results)' with a large text area; 'What should have happened? (expected results)' with a large text area; 'Attach a file:' with a 'Choose File' button and 'No file chosen' text; 'Bug Type:' with two radio buttons: 'This is a defect report.' (selected) and 'This is a request for enhancement.'; 'Security:' with a checkbox and a note: 'Many users could be harmed by this security problem: it should be kept hidden from the public until it is resolved.'; and 'Additional Details:' with a checkbox and a note: 'This is a problem with Firefox on my phone or tablet.' At the bottom right of the form is a blue 'Submit Bug' button.

Figure 7: Bug report generation interface.

4. From this page you can enter a new bug by specifying the necessary information as given from the screenshot below. When it is done, press the submit bug button.

4.3 Cloning an existing task

1. Go to the bug that the user wants to clone. Then click on the Create a new bug ... as a clone of this bug link from the context menu as shown in the screenshot below.

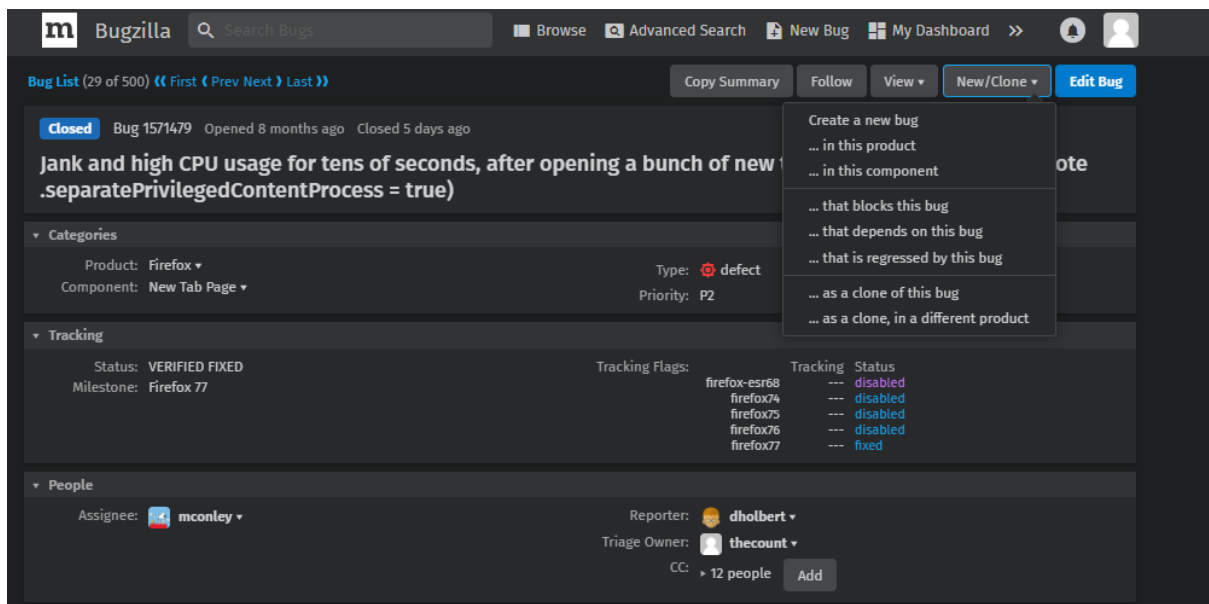


Figure 8: Cloning an existing task.

2. After clicking on clone the bug link, the page will navigate the user to the Enter Bug page with information automatically filled about the selected bug page. Once on the selection page, the user has to select the component of the product.

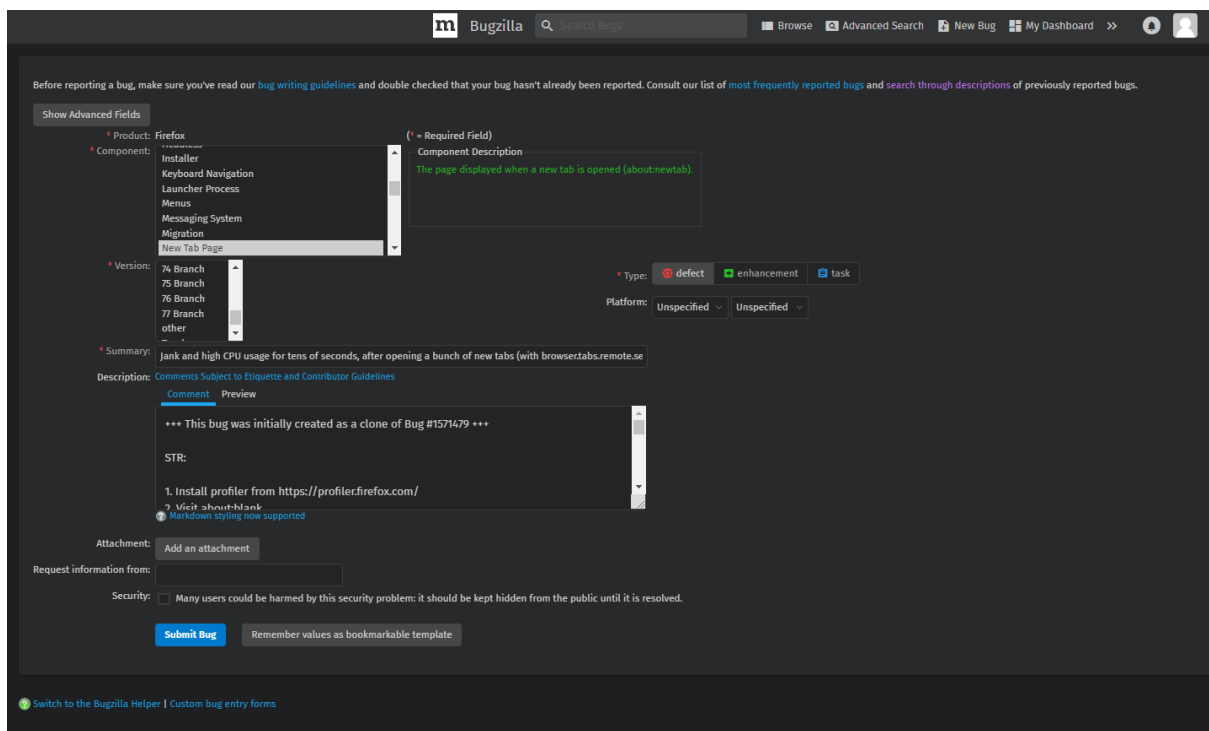


Figure 9: Fields of the bug report.

3. From this page, the reporter can edit the bug as they want.

4.4. Generating Tabular Data

1. Click the arrow next to the My Dashboard button and click the reports button.

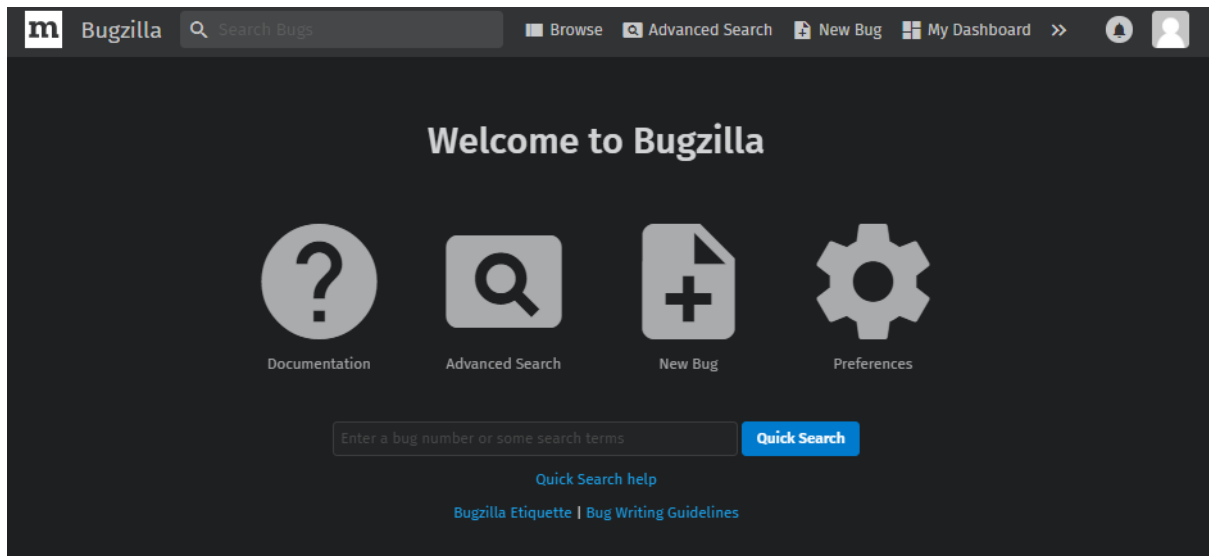


Figure 10: Bugzilla welcome screen.

2. Click on the Graphical Reports hyperlink, which is listed under the Current State section as shown in the following screenshot.

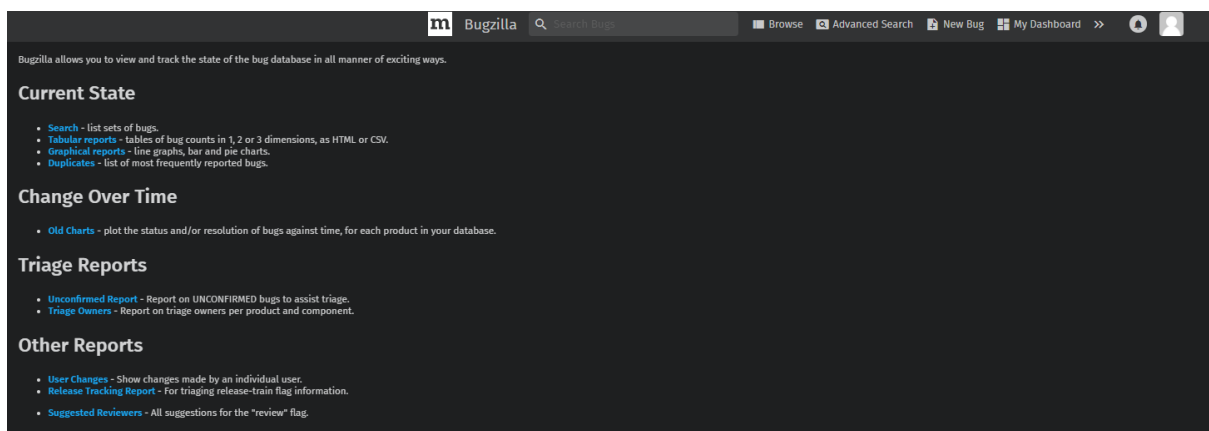


Figure 11: Reports interface.

3. Now, set various options to present reports graphically.

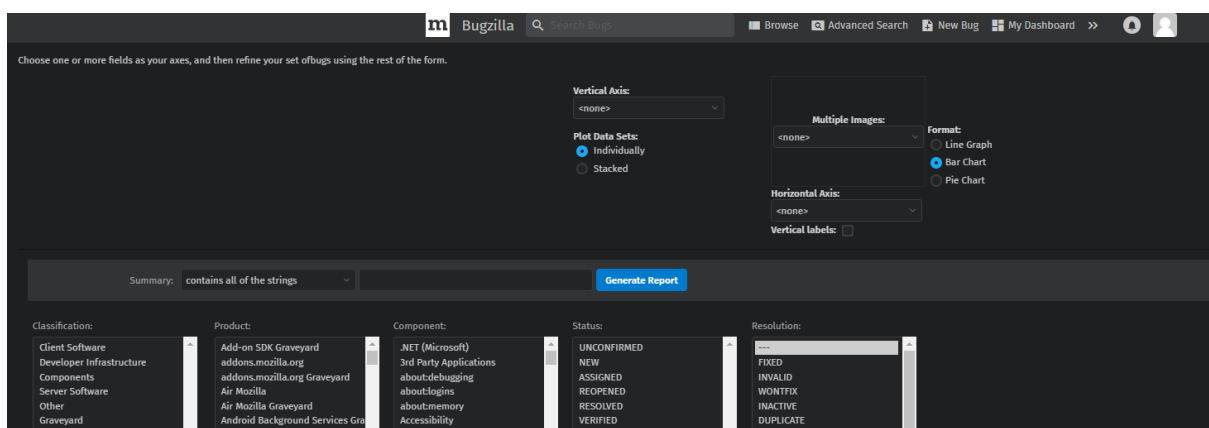


Figure 12: Report options and settings selection.

4. Click on Generate Report to display a Bar chart, where the Severity of a bug is the vertical axis, while the priority is the horizontal axis.

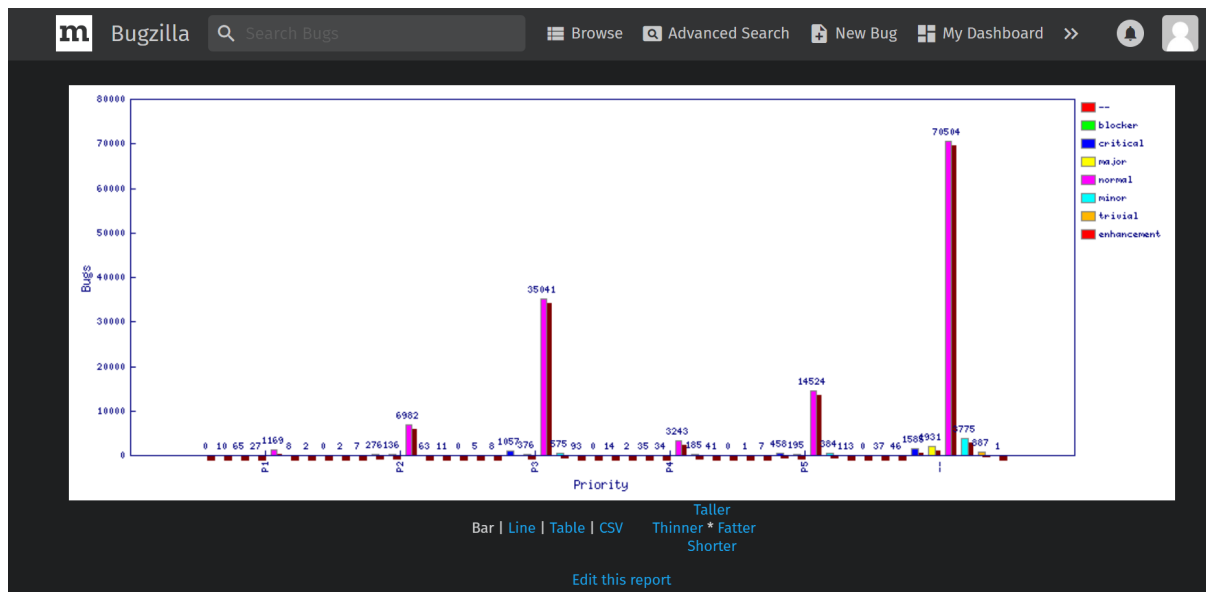


Figure 13: Generated report result as bar chart.

5. Integration Diagram for IT

Below is the integration diagram which shows how bug tracking fits into the application lifecycle management.

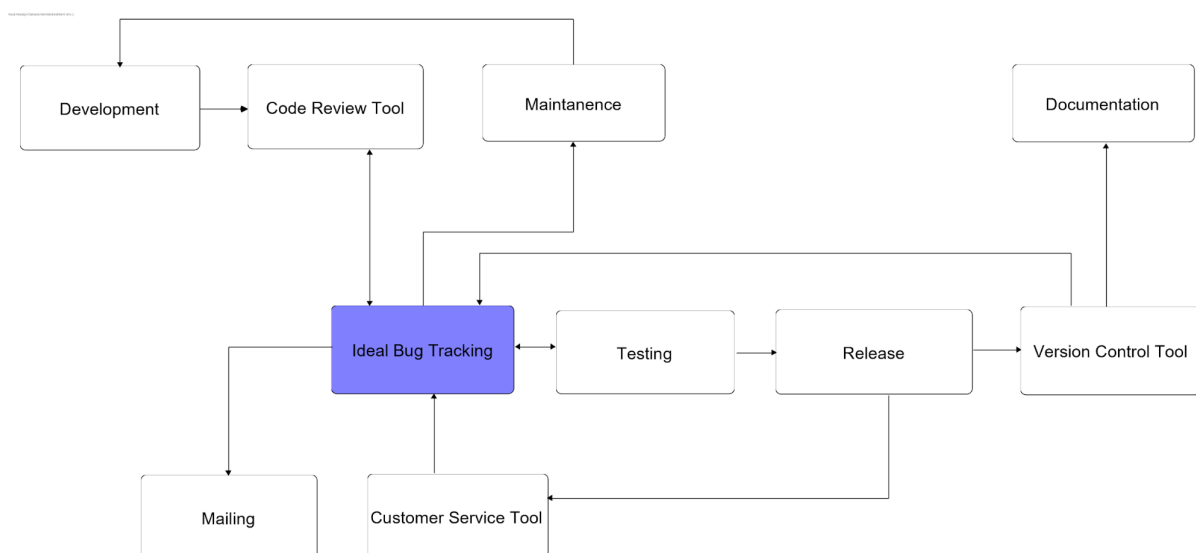


Figure 14: Integration Diagram for IT.

The lifecycle starts from the development phase. After developers complete their parts, they submit them to an ideal code review tool. After the code is reviewed, the issues should be reported to the ideal bug tracking tool. This tool should be able to mail to related individuals. When an issue is resolved, it would go back to the

maintenance and development phases again and repeat the cycle until there are no issues. After testing is completed, any issues found would be recorded on the ideal bug tracking tool. After the release, any issues found by the customers will be reported to the ideal bug tracking tool. The ideal bug tracking tool should prevent committing a code to version control tool if there is an issue within the code. After the version control, all of them should be documented.

6. Activity Diagram for IT

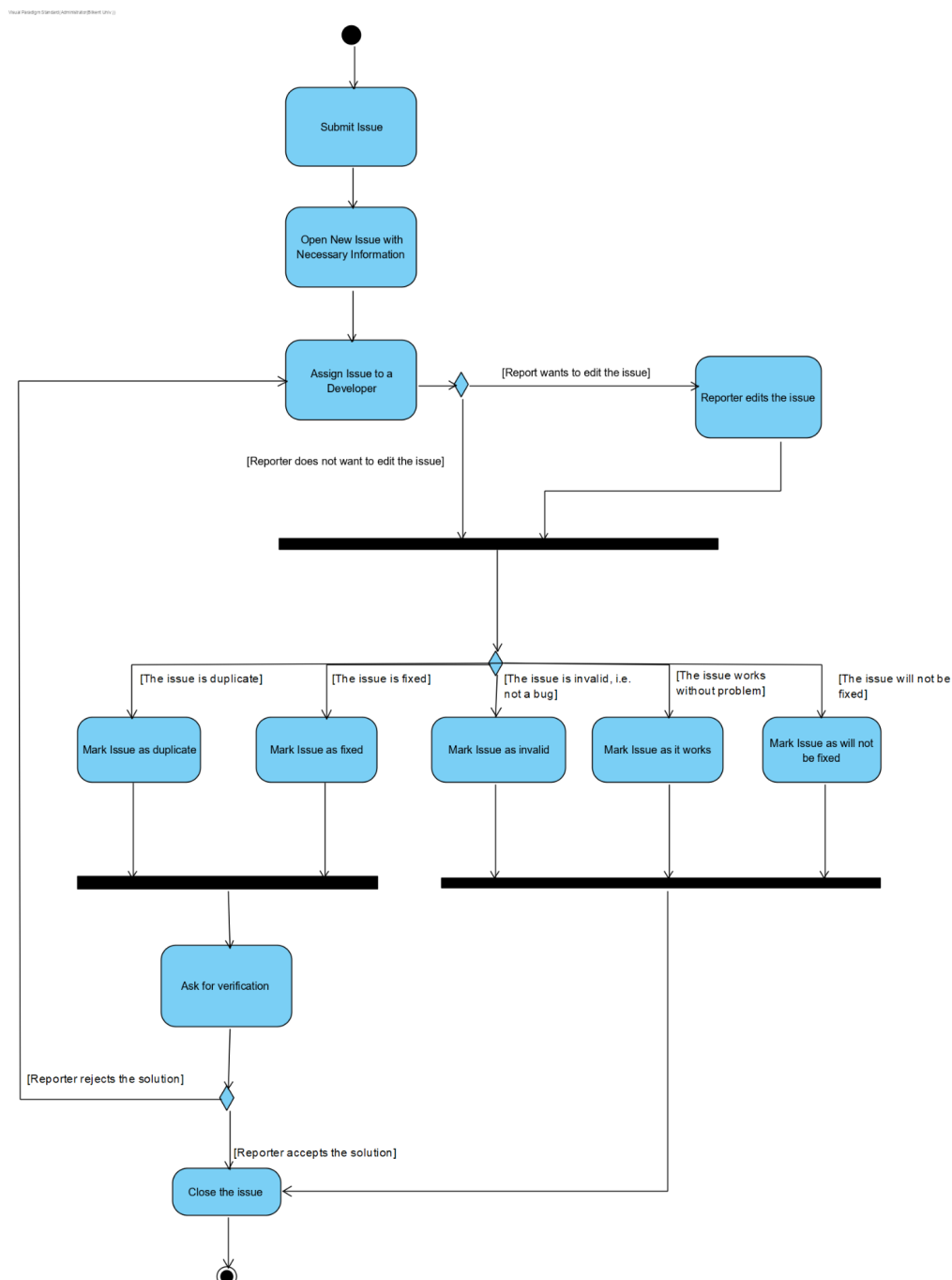


Figure 15: Activity Diagram for IT.

7. Integration Diagram for Bugzilla

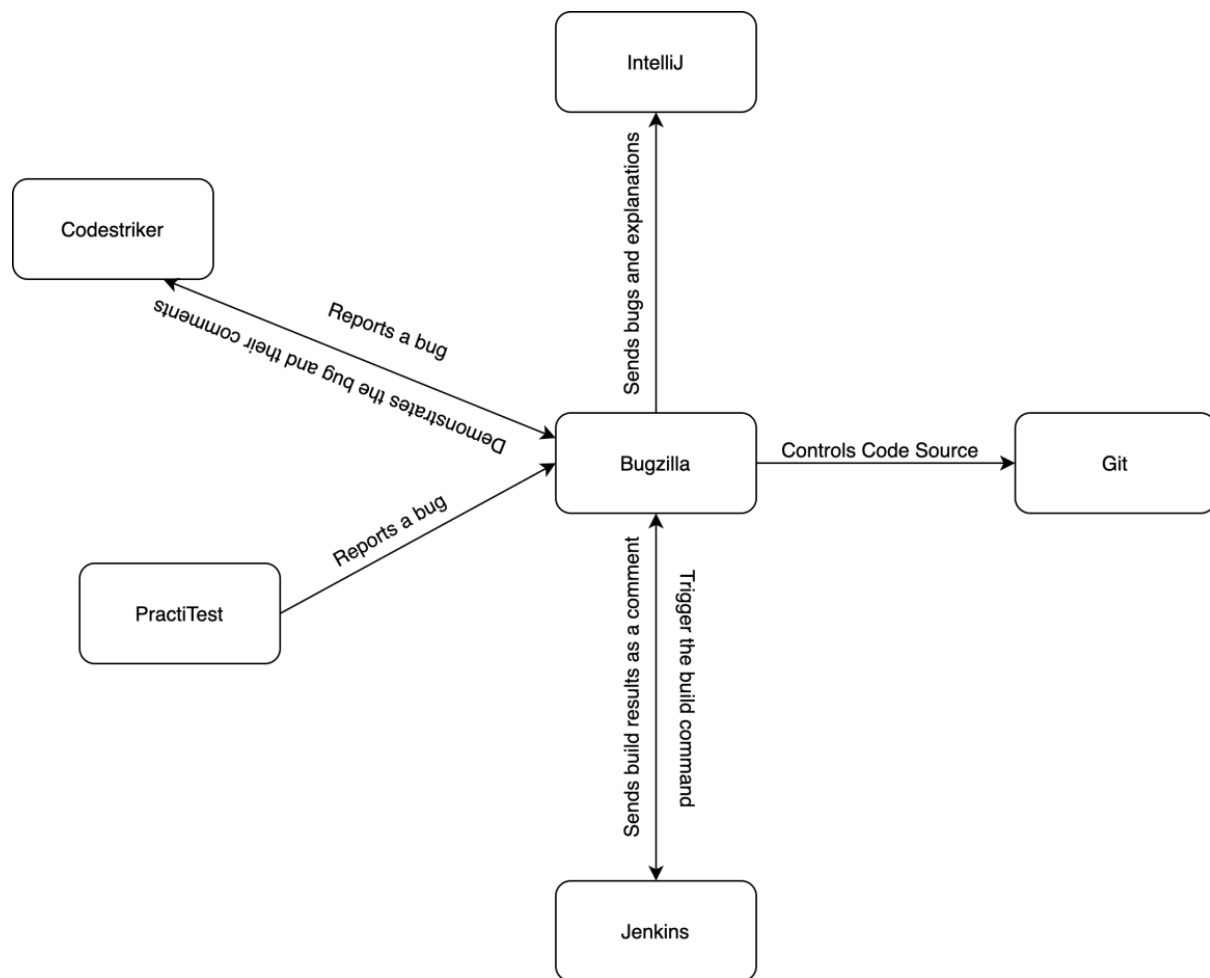


Figure 16: Integration Diagram for Bugzilla.

7.1 Jenkins

When a bug is resolved with Bugzilla, the solved bug's build can be automatically triggered to Jenkins with this integration. Also, the build results of Jenkins can be added as a comment of the bug in Bugzilla. It can be said that they integrate bi-directionally. Jenkins and Bugzilla integration can be managed by using ops hub.

7.2 Git

Git can be integrated with Bugzilla to make easier source code management. Before committing anything, users can check the bug status of the code. Also, it supports multiple bug references in commit messages and, allowing and rejecting any commits with Bugzilla. The integration can be managed by GitZilla.

7.3 PractiTest

PractiTest is a test management solution and provides to organize tests, runs, and requirements. PractiTest allows users to open a new bug form in Bugzilla with all the steps and actual results of the test run in a pre-entered way. The integration can be managed by one of the PractiTest plug-ins.

7.4 Deskzilla

It is a desktop application that allows you to use Bugzilla with a rich interface. There are features that facilitate planning and managing projects, like nested queries, by-field distributions, arranging bugs in a hierarchy, query counters that immediately show the number of bugs satisfying a query. For Agile development, Deskzilla can be used to maintain backlog order by using a custom field to hold order value. The integration can be managed by the ALM Works Deskzilla application itself.

7.5 IntelliJ

The integration allows users to monitor issues and loads Bugzilla bugs into IntelliJ through Deskzilla. It also "is able to detect Java stack traces in an issue and apply IntelliJ's "Analyze Stack trace" action to them". The integration can be managed by a plug-in which is called tracking.

7.6 Codestriker

The integration allows you to read a bug record, and how it has been resolved, Codestriker can add in a link to the code review topic, which shows the actual code which fixed the bug. The integration can be managed by manipulating the configuration file of Codestriker.

8. Data Samples

The data provided below is obtained from <https://bugzilla.mozilla.org/> by specifying the search to columns to the features described below. Since the website contains all of the issues for every Mozilla product, we also specified the product to Mozilla Firefox in order to get this data.

Bug ID	Type	Summary	Component	Assignee	Status	Resolution	Priority	Severity	Opened	Updated	Closed	Depends on	Duplicates	Keywords	Number of	Reporter	Votes	Flags
1427651	defect	Animated pngs can cause migraines and seizures	Preferences	nobody	RESOLVED	WORKSFORME	--	normal	02-01-18 15:24	02-01-18 19:18	03-01-18 03:05			access	3	erwinm	0	
1427572	enhancem	Contradictory statement in 'about:config' page	Preferences	nobody	RESOLVED	DUPLICATE	--	normal	01-01-18 19:48	03-01-18 09:01	03-01-18 17:01				2	kaarticsiva	0	
1427834	defect	Missing context menu option "view background image" on hyperlinks	Menus	nobody	RESOLVED	DUPLICATE	--	normal	03-01-18 11:24	03-01-18 14:06	03-01-18 22:06				4	nielsl	0	
1427982	enhancem	[Enhancement] Add a clear field content Button (URL, Search, other input	Address Bar	nobody	RESOLVED	DUPLICATE	--	normal	04-01-18 00:42	04-01-18 01:58	04-01-18 09:58				2	murznn	0	
1429202	defect	[UX] Address bar shows remote results before local ones (even tho they lo	Address Bar	nobody	RESOLVED	DUPLICATE	--	normal	09-01-18 12:21	10-01-18 02:37	10-01-18 10:37				2	alex94puc	0	
1429355	defect	Bookmarks Toolbar should be seen on Customize page and automatically c	Toolbars and Customizatio	nobody	RESOLVED	DUPLICATE	--	normal	10-01-18 03:30	10-01-18 07:08	10-01-18 15:08				6	oana.botis	0	
1428965	defect	Disable the Remove Selected cookies button if no cookie selected	Preferences	nobody	NEW	---	P5	normal	08-01-18 20:45	11-01-18 10:27					1	magicp.jp	0	
1429659	defect	The "Use Current Page" button is not disabled when no current page	Preferences	nobody	NEW	---	P5	normal	10-01-18 18:45	11-01-18 14:59					3	magicp.jp	0	
1429895	defect	No search suggestion for division calculation in the address bar	Address Bar	nobody	RESOLVED	DUPLICATE	--	normal	11-01-18 12:27	11-01-18 19:15	12-01-18 03:15				2	didaio	0	
1428606	defect	Connection is not secure page turn green after reloading the page	Security	nobody	RESOLVED	WORKSFORME	--	normal	06-01-18 22:17	12-01-18 02:22	12-01-18 10:22	1424917			6	magicp.jp	0	
1429456	enhancem	Use "in" instead of "as" in "Open links in / as tabs instead of new windows'	Preferences	gijskruitbo	RESOLVED	FIXED	P5	trivial	10-01-18 08:23	12-01-18 07:53	11-01-18 09:47	1424970			6	gijskruitbo	0	
1429716	enhancem	Stop resetting border properties for the translation info bar's buttons and	Theme	ashish150x	RESOLVED	FIXED	P3	normal	11-01-18 01:58	12-01-18 14:08	12-01-18 22:08	1334429, 1423453	good-first-		24	dao+bmo	0	
1430128	enhancem	Remove remnants of the iconsize attribute	Toolbars and Customizatio	dao+bmo	RESOLVED	FIXED	--	normal	12-01-18 07:03	12-01-18 14:09	12-01-18 22:09	1428938			5	dao+bmo	0	
1429364	defect	The "Save Link as" context menu option do not work in the "Firefox Notes'	General	pastith	VERIFIED	FIXED	P2	normal	10-01-18 04:29	15-01-18 07:37	12-01-18 22:08				14	mcoman	0	
1429334	defect	Missing title for New tabs after restarting Firefox	New Tab Page	nobody	RESOLVED	DUPLICATE	--	normal	10-01-18 02:00	16-01-18 12:10	16-01-18 20:10				2	mihai.bold	0	
1430485	defect	about:addons displayed for only half a second	General	nobody	RESOLVED	INVALID	--	normal	14-01-18 11:46	16-01-18 14:09	16-01-18 22:09				2	ruedin	0	
1430953	enhancem	Feature request: File -> New Private Tab	Private Browsing	nobody	RESOLVED	DUPLICATE	--	normal	16-01-18 18:23	16-01-18 20:29	17-01-18 04:29				2	public	0	
1430507	defect	Context menu Open Link In New Window does not work on svg element	Menus	gijskruitbo	RESOLVED	FIXED	--	normal	14-01-18 17:33	17-01-18 01:55	17-01-18 09:55	1429709	1225052		12	david.new	0	
1431006	defect	Pop-up menus not showing without a navigation bar	Toolbars and Customizatio	nobody	RESOLVED	WONTFIX	--	normal	16-01-18 23:29	17-01-18 06:00	17-01-18 14:00				3	buch1-1	0	
1431098	enhancem	New tab created with element full screened does not receive address bar	Untriaged	nobody	RESOLVED	INCOMPLETE	--	normal	17-01-18 06:38	17-01-18 11:43	17-01-18 19:43				1	fahimazulf	0	
1431318	enhancem	Show fragment in brackets in bookmark title when bookmarked	Bookmarks & History	nobody	UNCONFIRM	---	P5	normal	18-01-18 00:48	18-01-18 04:50					3	combettav	0	
1431317	enhancem	Firefox Sync doesn't sync search engines in "One-Click Search Engines" in "	Sync	nobody	RESOLVED	DUPLICATE	--	normal	18-01-18 00:43	18-01-18 07:05	18-01-18 15:05				2	combettav	0	
1430357	defect	Error: createFromField requires a password or username field in a docume	Preferences	nobody	NEW	---	P3	normal	12-01-18 22:25	18-01-18 10:38					2	magicp.jp	0	
1430396	defect	TypeError: event.target is undefined when check on/off "Allow Nightly to	Preferences	myk	RESOLVED	FIXED	--	normal	13-01-18 05:47	19-01-18 02:13	19-01-18 10:13				12	magicp.jp	0	
1431888	enhancem	Open the Library in a tab rather than in a window	Bookmarks & History	nobody	RESOLVED	DUPLICATE	--	normal	19-01-18 18:19	19-01-18 20:22	20-01-18 04:22				2	public	0	
1430848	defect	Add an option to move add-ons to the Overflow Menu automatically	Toolbars and Customizatio	nobody	VERIFIED	WONTFIX	--	normal	16-01-18 10:25	22-01-18 08:09	18-01-18 21:37				9	public	1	
1431958	defect	"Unknown label for categorical histogram" is logged when click "Update P	Preferences	nobody	NEW	---	P4	normal	20-01-18 18:44	22-01-18 13:29					1	magicp.jp	0	
1431959	defect	"Unknown label for categorical histogram" is logged when go to about:pr	Preferences	nobody	NEW	---	P4	normal	20-01-18 19:11	22-01-18 13:30					1	magicp.jp	0	
1432408	defect	History: not possible to sort by date.	Bookmarks & History	nobody	RESOLVED	DUPLICATE	--	normal	23-01-18 00:29	23-01-18 01:12	23-01-18 09:12				2	3rlendhl	0	
1432062	enhancem	Require dangling commas via eslint for the migration component	Migration	samreadin	RESOLVED	FIXED	P4	normal	21-01-18 13:21	23-01-18 02:06	23-01-18 10:06				4	MattN+bn	0	
1432161	defect	Yandex.Maps API doesn't work with tracking protection enabled	Protections UI	nobody	RESOLVED	DUPLICATE	--	normal	22-01-18 06:18	23-01-18 15:35	23-01-18 23:35				2	arinasmr	0	
1432729	enhancem	Reword "Import and Backup" to "Restore and Backup" in Library" (Ctrl+S)	Bookmarks & History	nobody	RESOLVED	WONTFIX	--	trivial	24-01-18 00:24	24-01-18 00:48	24-01-18 08:48				2	combettav	0	
1432734	enhancem	Reword Import to Restore in Library/Import and Backup	Bookmarks & History	nobody	RESOLVED	WONTFIX	--	trivial	24-01-18 00:32	24-01-18 01:02	24-01-18 09:02				3	combettav	0	
1432735	enhancem	Reword Export to Backup in Library/Import and Backup	Bookmarks & History	nobody	RESOLVED	WONTFIX	--	trivial	24-01-18 00:34	24-01-18 01:03	24-01-18 09:03				2	combettav	0	
1432723	enhancem	Make sidebar(Ctrl+H/B)black when using preinstalled Dark Theme	Theme	nobody	RESOLVED	DUPLICATE	--	normal	24-01-18 00:12	24-01-18 06:22	24-01-18 14:22				2	combettav	0	
1432722	enhancem	Make hamburger option black when using preinstalled Dark Theme	Theme	nobody	RESOLVED	DUPLICATE	--	normal	24-01-18 00:10	24-01-18 06:22	24-01-18 14:22				2	combettav	0	
1432772	defect	Korean search autocomplete issue	Search	nobody	RESOLVED	DUPLICATE	--	normal	24-01-18 05:21	24-01-18 06:36	24-01-18 14:36				2	pdj5096	0	
1430467	defect	autorefresh notification bar disappears when moving the tab to a differen	Tabbed Browser	nobody	NEW	---	P3	normal	14-01-18 07:06	24-01-18 07:56					1	combettav	0	
1432533	enhancem	Avoid file.exists() -> read file antipattern in migrator code	Migration	nobody	NEW	---	P3	normal	23-01-18 09:26	24-01-18 23:45		862127	perf		1	dothayer	0	

Figure 17: Data sample for the issues in Mozilla Firefox from Bugzilla.

8.1 Description of the Categories

- **Bug ID:** ID of the issue.
- **Type:** Type of the issue like a defect, enhancement task.
- **Summary:** Summary of the issue.
- **Component:** Which component of the software is affected by the bug.
- **Assignee:** Assignee of the issue.
- **Status:** Current status of the issue.
- **Resolution:** Resolution of the issue.
- **Updated:** Last update date of the issue.
- **Priority:** Priority of the issue.
- **Closed:** Closing date of the issue.
- **Depends On:** Other issues that the current bug depends on.
- **Duplicates:** Duplicates of the current issue if there is any.
- **Flags:** Custom tags.
- **Keywords:** Keywords that define the issue.
- **Number of Comments:** Number of comments on the issue. This would express the popularity of the issue.
- **The number of CC's:** Number of CC in the issue. This would express the popularity of the issue.
- **Opened:** Opening date of the issue.
- **Reporter:** Reporter of the issue.
- **Severity:** How much will it affect the software
- **Votes:** Shows how much other users are affected by the same issue.

9. Process Smells

Smell Category	Description
No Priority Set	Priority has not been set so there are several unresolved issues with high severity due to not having priorities like an issue from 2008.
No Traceability	No linking between some commits and issues has been created.
No Assignee	No assignee has been set for an issue so it has not been resolved even if it is really old like a bug from 2005. Also, some issues are solved but have no assignee.
Unsolved Bugs	Bugs that are not solved at all even if it is really old like a bug from 2002.
Zombie Tasks	Bugs are not marked as solved even if they have been solved.
Undefined/Unclear Tasks	Descriptions for the issues are not sufficient. Some given links are not related to the issue. Some documents that are shared via docs do not provide permission to look.
Works for Some	Issues that are solved only for some portion of the users which means some of the issues are ignored for some users.
No Due Date Set	Due date has not been set.
No Duplicate Reference	Some issues that are marked as duplicate are not referenced to the original issue.

10. References

- [1] “JIRA - Issue Types,” Tutorialspoint. [Online]. Available: https://www.tutorialspoint.com/jira/jira_issue_types.htm. [Accessed: 02-Apr-2020].

- [2] “Bugzilla:Addons.” Bugzilla:Addons - MozillaWiki, wiki.mozilla.org/Bugzilla:Addons. <https://www.bugzilla.org/docs/2.16/html/how.html> [Accessed: 02-Apr-2020].