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COMPARATIVE ANALYSIS OF BUG TRACKING TOOLS

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Received on 10-10-2016

Accepted on: 20-11-2016

Abstract

Bug tracking tools help stake holders involved in software projects to detect bugs, resolve them and then ensure to have contingency and preventive measures so that detected bugs are not repeated in the future projects. The present generation of software developed, are enormous and extensive in size inorder to meet customer requirements and hence presence of bugs is impossible to avoid. Hence it is very important to know the functionalities and features of different bug trackers namely the open source ones so that compatible and relevant tools can be chosen efficiently for bug tracking purposes. The paper provides description of ten popular bug tracking tools and the major features of these tools are discussed in details yet concise manner. A comparative matrix is presented which helps to compare the tools, analyse them and find a tool which supports majority of the functionalities expected from an ideal bug tracking tool.

Keywords: Bug tracking, issue tracking, open source, web application, features.

Introduction

We are all aware of the popular saying “To err is Human”. The major objective of software developers is to know what error has been made, resolve it and then learn lessons from the same as part of continuous process improvement. Software configuration applications provide a wide spectrum of tools and methodologies that helps to manage the various stages of software life cycle. These applications help in bug tracking process, configuration and version control and other release management activities. When the number of bugs are miniscule the requirements of a specific bug tracking tool is extremely non- existent. But, when the number of bugs becomes high the requirements of bug tracking tools evolve especially for large software development projects (12). Bug Tracking Toolis software that is designed to help in tracking of bugs in software programs. Software products have become extremely large, and complex to meet diversified user requirements (11). The maintenance activity in a software development life cycle

*Sweta Bhattacharya*et al. /International Journal of Pharmacy & Technology* uses a major part of cost investment related to software development cost. Hence bug tracking is of immense importance as part of software maintenance (11). There exist various defects finding tool, such as those used by most open source programs and software. Open source software development has great necessity of bug tracking systems because the development team members are spread all across the world. In such scenarios, bug trackers help developers to track problem reports but also aids in software configuration management (12). Bug tracking systems have multiple benefits and hence have become progressively popular among software development organization. Some of the important benefits of bug tracking systems are mentioned below (13):

- Detection of application based bugs
- Increases transparency of the development process
- Enhances tracking of bugs and the resolutions
- Helps in management of bugs for future releases
- Aids in planning of releases
- Manages the scheduling of resources
- Prioritization of the bugs for decisions on SLA
- Tracks status of bugs
- Helps in sharing and consolidation of information to aid software configuration
- Improves software productivity by enhancing quality of software

Bugzilla

The tool Bugzilla was developed when the open source Web browser project Mozilla required a tool for bug tracking (1). It was used as an in house tool to aid the bug tracking of Mozilla. The tool was initially coded using Perl which later on went through series of improvements by the open source programmer community. Bugzilla emerged as an extremely popular tool being used by Apache, Open Office, Linux and also private organizations like NASA and IBM who develop mission critical systems. Bugzilla allows users to input new bugs, edit and track existing ones. The Product, Component, Version, Status and Report fields allows users to track bugs. On the contrary, Summary, Whiteboard, Severity, Attachments and the Dependency features allows user to fix the bugs. The tool also allows users to search information using filters and also through Bugzilla reports which presents detailed information related to the status of the bugs and its impact on the application through graphical representation. It is a web application supported by MySQL and HTML pages are used for user interaction. Bugzilla is presently one of the most popular

defect tracking systems which covers majority of the features expected from an efficient bug tracking system. The

main functionalities of the tool include:

- Basic and advanced search capability. The advanced search system allows customized search based on time, priority and various other specifications
- Email notifications faculty helps to track any changes made in Bugzilla
- The bug search results can be downloaded in various formats. The bug lists are available in Atom and the searches can be subscribed to be sent as feed available in iCalendar format
- The automatic duplicate bug detection system searches for similar bugs in the system as soon as the name of a bug is typed in the tool for filing a summary of bug. The search results can be saved and rerun using simple click option
- Ability to create and modify an existing bug through email
- Time tracking system to track bug resolution time
- Ability to view all Bugzilla users, assign bugs, request users work on a bug and also watch/help activities of other developer users when on vacation or leave
- Capability to install bugs of one Bugzilla installation to another one and also across multiple versions of the tool (14)

Bugzilla is a tool which is constantly and consistently developed and tested for further enhancement and continuous improvement. Due to this development strategy the tool has been adopted by leading technologies in the world. The major advantages of Bugzilla are mentioned below:

- Efficient tracking of bugs and changes in the code
- Review of new developed or updated code patches
- Ability to reduce downtime
- Helps in increasing productivity
- Enhances customer satisfaction
- Ensures accountability
- Improves communication
- Reduces cost and increases product quality(14)

Eventum

Eventum is PHP based software established by the MYSQL software development team. The main purpose of the tool is issue tracking and it supports multiple features. The system is easy to understand and user friendly. The MYSQL team makes use of this software internally for producing reliable outputs. It can be used by many departments in the organization as per their requirement. In case of support related departments it helps in tracking the incoming technical queries(6, 9, 20). Similarly in software development area it helps in tracking the bugs. The main features of the tool include:

- Visitors can sign in with new Eventum accounts.
- Multiple projects can be used with the same instance of Event num.
- Creates, Modifies and Deletes custom issue resolutions.
- Redundancy is avoided by means of tracking duplicate.
- E-mail is integrated to ensure hassle free working on issues.
- The information pertaining to the filename, developer and revision are well maintained with the help of CVS module.
- The schedule maintenance made easy with the aid of time tracking tools

Fossil

Fossil is created by D. Richard Hipp that runs on cross-platform server. It possesses a built-in web interface. It works in distributed environment and does not require centralized server, but to ease the collaboration one can be used. SQLite database is used for storing content which is open-source. "Ticket" is a special name given to denote a bug-report. The ticket change artefact holds a timestamp, a ticket id and one or more name/value pairs. It is light weight and easy to operate on a low resource device. It works in two modes namely autosync and manual-merge (7, 21). The major features of Fossil are:

- Bug tracking integrated with wiki
- Simple networking and self-contained
- Robust and Reliable

Mantis

Mantis is a free, easily downloadable open source web based bug tracking software (2). Mantis was developed in late 2000 and can be used by diverse software development projects. The major features of Mantis include:

- Ability to send email notifications related to updates, comments and resolutions to the users, developers and administrators
- Control of access of the users at project level
- Ability to customize the tool through extensive plugin library to meet user requirements
- Provides support to various mobile platforms like – Windows, Android and iPhone
- Ability to manually inform on the relationship of a bug with the other while reporting
- Has a Customized field option, full text search, Filters, Built-in reporting facility.

Mantis code is written in PHP scripting language with the back end support of MySQL, MS SQL, PostgreSQL databases and also webservers. The tool is compatible with all major OS namely Windows, Linux, Mac OS, OS/2 and many others. The tool provides supports to multiple projects per instance. The sponsorship support of the tool allows placing sponsorship for specific issues and developers can track such sponsorships and payments. Another major advantage of the tool is its capability to save attachments in database, webserver and can also be backed up to an FTP account. The reports generated from the tool can be exported to Microsoft excel, Microsoft word or csv. The documentation of tool is extremely easy to understand and comprehend and thus helps developers in bug tracking aiding change management and enhancements of new versions(15).

OTRS (Open Technology Real Services)

OTRS service is flexible net based system that provides help desk software, IT service management software and process management module that helps in automation which obviously decreases the errors that occur in process and maximizes the efficiency of the service. Firm implementation and easy procedure involved in customization makes the system highly transparent and efficiency is optimized. OTRS provides versatile service starting from evaluation, conceptual design, installation and configuration, training, migration, review and optimization, customization and with strong professional support. Each service provided ensures that higher rate of user acceptance and satisfaction is provided to the end user. It is used worldwide by the companies and available in 37 languages. The profound trouble shooting and reliable software update are also achievable. Feature provided by the OTRS is awesome (4, 5, 19). The major features supported by OTRS are:

- Remote Control access
- Asset Management
- Customer Survey

- Reporting
- Billing and invoicing
- Service Level Agreement
- Knowledge Base
- Multi-site Support
- Ticket Management

Red-mine: Red-Mine is a cross-platform and cross-database oriented flexible project management open source web application (3). The main features of Red-mine are mentioned below:

- Red-mine has the ability to manage multiple projects using one instance. Each of the users who use the Red-mine application can have different roles and the projects they are part of can also be private or public. The modules of the project can be enabled or disabled at the various levels of the project. Red-mine supports all these variabilities.
- Red-mine allows user to define their roles in a project and access permissions at various project levels can be provided in one click
- The tool has a web based administration interface that helps users define statuses, issue types and provides a flexible issue tracking system
- Gantt chart and calendar can be created based on start date and deadlines of the various issues
- The tools has the capability of creating simple reports to view and track time based on activities and issues.
- The tool can also be customized as per the user needs based on issues, time – entry.
- Messages can be shared and posted for ease of communication and development.
- Repository browsers help to view, change and search contents which are attached to each of the projects.
- The project status update, activities, issue changes related information can be available through atom feeds.

Apart from all the above mentioned features, the tool allows users to register online supporting multi lingual users. The Red-mine is developed and maintained by community volunteers and users are free to provide their innovative ideas for the upgradation and improvement of the tool (17).

Request Tracker: Request Tracker (RT) is a ticket-tracking system written in Perl programming language which helps in coordinating tasks and manage user request. It is an open source tool was developed in 1996 by Jesse Vincent and distributed under the GNU public license.

The Request Tracker for Incident Response was developed in cooperation with JANET-CERT which caters to the need of CERT teams. The tool runs on Apache and lighttpd web servers and data is stored in MySQL, PostgreSQL, Oracle and SQLite.

Request Tracker has various interfaces for creating and updating tickets. The web interface provides login access to users and guest users and allows users to add custom fields and data to the issue tickets. The email system provides auto responses and attachments when emails are sent. The emails are also stored in the tool corresponding to each ticket and the tool can distinguish between public and private replies to emails (4, 18).

The Bug Genie: The bug Genie developed by Daniel Andre Eikeland and Philip Kent. It is an open source web based issue tracking system written in PHP language. It provides multi-lingual support and shows all the subversions (8, 9). Roadmap gets displayed automatically and the tool is highly user friendly. The features of the tools are:

- Project management is done in efficient way by providing separate spaces for storing issues, files and wikis. Transition from one area to other for tracking is easy.
- Timeline exhibits the entire project history.
- Issues tracing is customized that makes it bug tracking better.
- Integrated with Wiki.
- Workflow can be adjusted based on the team or company. Workflow browser and editor help in this process of visualization.
- RSS support
- E-mail commands are supported that makes smooth workflow

Trac

Trac is an open source project used for issue tracking in software development projects. The system provides interfaces various version control systems like Subversion and Git helping in improved reporting capability. Trac has a built-in powerful wiki rendering engine and helps in providing issue descriptions. The tool helps in providing links and references between bugs, tasks, changesets, files and wiki pages. The timeline feature displays all current and previous projects events handled making tracking of the project activities easier. On the other hand, the roadmap feature helps in setting milestones to be achieved in future (2). The major features of the tool include:

- Works as a light weight project management and is easy to be used

- The tools has flexibility with various types of projects and can be customized through plugins or user written coding
- Tracks resolution of bugs, issues, feature requests using a ticketing system.
- Ability to assign severity to the tickets and then filtering of the same
- Tracking of changes in the project by providing timeline
- Code highlighting and file comparison facility
- Access to anonymous users to view status of projects, tickets and milestones although registration is required for making changes through “permission system”
- Has Documentation-server which helps in communication, user and resource management.
- Has a customizable template and extensible plugin facility which helps users to customize the tool as per needs

Hence Trac provides an independent approach to the developers without contradicting or interfering much with the developmental strategy and policy of the software project teams(16).

Web Issues

Web Issues is developed by the Web Issues Team and it is an open source tool utilised for tracking issue with the collaboration of team members in a multi-platform area. The process of storing, sharing and tracking is made with the help of using attributes, depiction and file inclusions. User can install it very easily and can customize as per their requirement. It possesses two parts - one MYSQL-PHP based server to store the data and a client to connect with the server as desktop application. Operating systems supported are Linux and Windows(9, 10).

The Web Issues features are:

- Configurable filtering criteria help to filter issues by getting public and personal views.
- E-mail notification makes optimize the system.
- Documentation made easy through creating PDF documents by printing from client.

Comparative Analysis of the Bug – Tracking Tools

In the analysis we have described the features of ten open source bug tracking tools. The matrix created in shown in Table 1. which helps us to perform a comparative analysis of the features supported by each of these tools based on which an ideal bug tracking tool could be proposed which would have coverage of maximum number of features.

Table 1: Comparative Matrix of the Bug Tracking Tools.

Bug tracking tool	Advance search	Excellent security	Time tracking	E-mail Notification	Multi lingual support	Custom field & custom workflow	Track duplicate issue	RSS support	Real time services	Integrated wiki & chat	Multiple database support
Bugzilla	✓	✓	✓	✓	✓	✓	✓			✓	✓
Eventum			✓	✓		✓	✓	✓	✓		
Fossil										✓	
Mantis	✓		✓	✓	✓	✓		✓		✓	✓
OTRS				✓					✓		
Redmine			✓	✓	✓	✓					✓
Request tracker			✓	✓	✓						
The Bug-Genie	✓		✓	✓	✓	✓		✓		✓	
Trac			✓	✓			✓			✓	
WebIssues		✓		✓			✓				

Conclusion

It is evident from the table presented above that maximum numbers of the features are being supported by “BugZilla” except two i.e RSS and Real Time Support. Hence if these features get added, or a new tool is introduced supporting RSS and Real Time Support, it will become an ideal one for bug tracking related activities. Bugzilla stands out as a standard open- source tracking since the product is of optimum quality and supports all possible activities that are essential for bug tracking.

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