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Software Design and Construction 159.251

Software Configuration Management

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Daily issues in software development…

- Common scenarios:

  - Oops, I've just found a bug, should I ***report*** it or just ***ignore*** it?
    - **Reporting**: I've never seen something similar to this before, what ***is the type*** of this bug?
    - And where is it coming from? ***Is it the code I wrote***? Or is it coming from someone else's code?
  - This bug has been fixed before, why it has ***reappeared*** again?

Have you heard of these stories before?

- I cannot find the latest version of this program or document?
- **A *disaster*:** the latest version of the code was ***overwritten*** by an old version!!
  - I've lost all my latest changes – two days of work!!!
- Nobody knows **which version** of the program is final.
- Design document is **out of sync** with programs.
- I don't know if **all the changes that were suggested have been incorporated**.

What’s needed?

- ……a mechanism to handle these issues.
- Change is inevitable when software systems are built.
  - changes is a daily routine.
- Bugs are part of the development cycle- you first find (***detect***) and then try to ***fix*** them.
  - And it would be even better if you can ***predict*** them before they happen!
- Not only bugs, all ***issues*** should be managed and tracked.

What is *Software Configuration Management (SCM)*?

- Process of **identifying and linking** the components that make up the product
  - Examples: source code files, database files…etc

- *Configuration Management help in*
  - ***Controlling changes*** throughout the development life cycle.
  - ***Maintain multiple versions*** of single application that is developed by multiple people/teams.
  - ***Can roll back*** to previous versions, when necessary.
  - ***Maintain links (relationships) between various items*** (i.e. notify when a change has been made to a dependent item).

“Software configuration management ***is the art of identifying, organizing, and controlling modifications to the software being built*** by a programming team. The goal is to maximize productivity by minimizing mistakes”

Babich, W.A. (1986). Software Configuration Management, Coordination for Team Productivity. 1st edition. Boston: Addison-Wesley

Configuration Management Process

- Identification of configuration items
  - Written code & derived (using external libraries), design doc, manual, …
- Set up the environment (i.e., tools)
- Record all changes and requests in a CM database.
- Change control policy
  - formally defined policy – e.g., who is allowed to change what?
- Status accounting
  - management checks progress

Typical Software Configuration Items

- Requirement specifications
- Design specifications
- Source code
- Test cases, test data, and recorded results
- User guides and installation manuals
- Executable programs
- Standards and procedures
  - (e.g. Java design guidelines)

Three important concepts in SCM

- **Version:**
  - A well-defined state of a configuration item at a given point of time.
    - version 3.2.1 has a meaning (e.g., major, minor, patch!)
    - more on *software versioning* later in this course!
- **Revision**:
  - Change to a version that corrects only errors in the design/code, but does not affect the documented functionality.
- **Release:**
  - The formal distribution to users of an approved version.

Configuration Management Process

- Identify a tool for SCM
- Identify configurable software ***items***
- Identify ***baselines***
- Define and assign roles
- Define change criteria
  - Consider Issue Based Information System (IBIS) technique
- Define release criteria

Change Management

- **Change management: handling of change requests.**
  - A change request leads to the creation of a new release.

- **General change process**
  - The change is requested (this can be done by anyone, including users and developers).
  - The change request is assessed against project goals.
  - Following assessment, the change is accepted or rejected.
  - If accepted, the change is assigned to a developer and implemented.
  - The implemented change is audited.

- **Complexity of change management process varies with size of project.**
  - Small projects can perform change requests informally and fast, while complex projects require detailed change request forms and the official approval of one or more managers.

Version Control

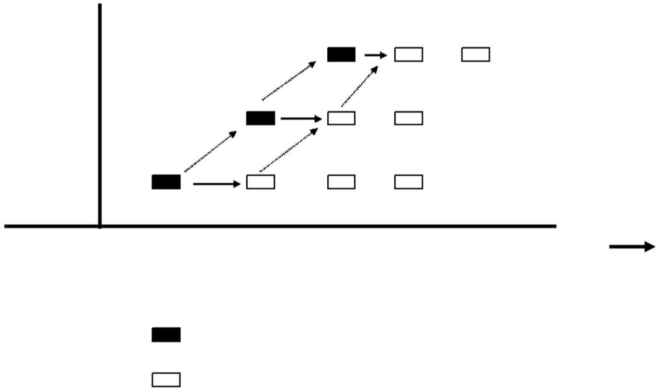
- Version control combines procedures and tools to manage different versions of the software, while production.

- A **version control system** records changes to a file or set of files over time so that you can recall specific **milestone** later.

Version control (VC) systems are covered next week!

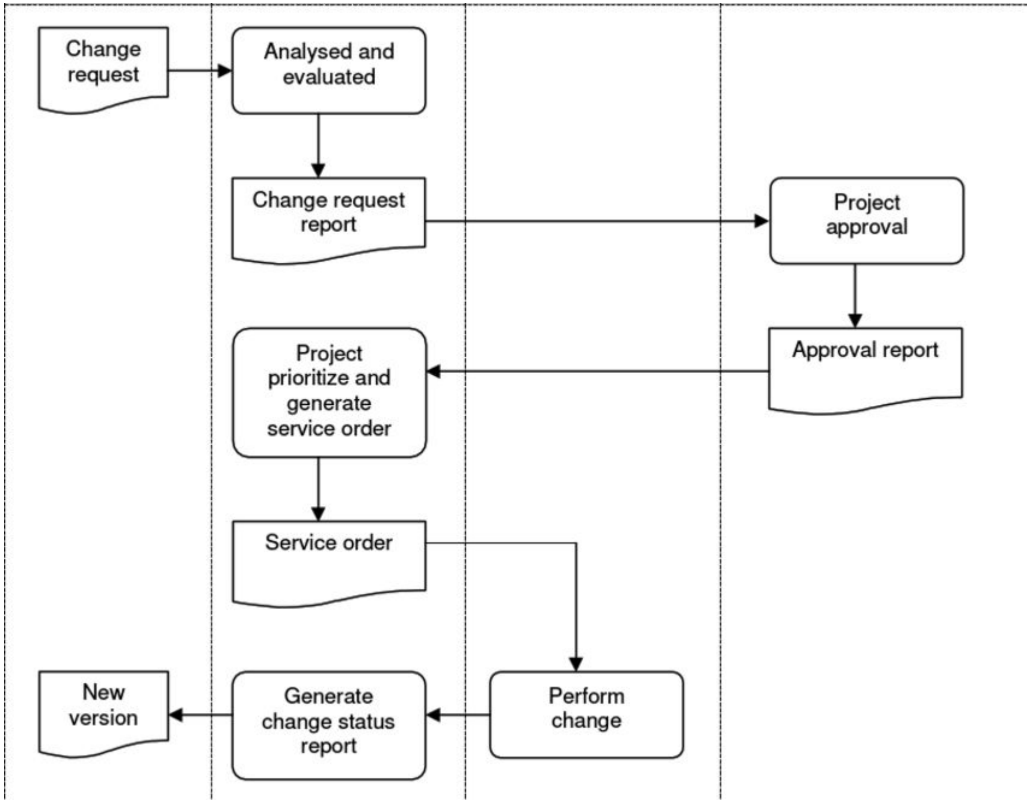
Baseline

- A baseline is a ***snapshot*** of the system that has been formally reviewed and agreed upon (approved).
- It is an approved revision of a document or source code file from which subsequent changes can be made.
- It serves as the basis for further development and be changed only through a formal change control procedure.
- In many cases, a Baseline represents the most stable version of the software.



Change control

- **Change control** is vital in any software development.
  - One of the most effective ways to control changes is through a ***change requests system***.
- A ***change request*** is submitted and evaluated to assess technical merit, potential side effects, overall impact on other configuration objects and system functions, and the projected cost of the change.



example change workflow

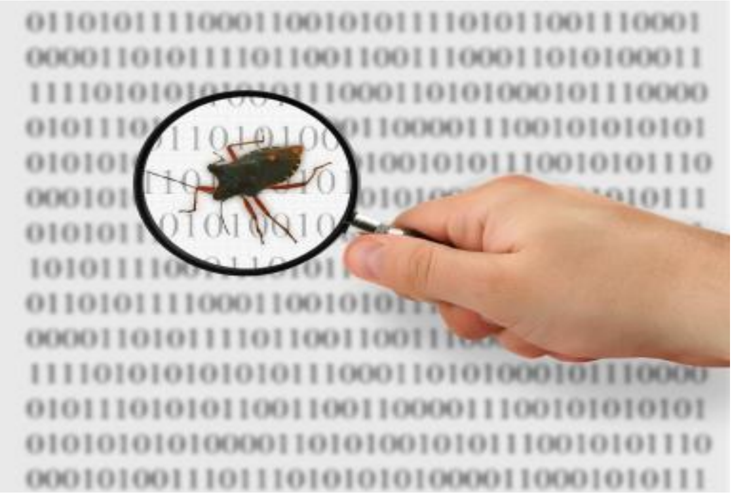
Misconception about *SCM*

- *SCM* is not only version control!

- *SCM* is not only source code management!

- *SCM is not* only for the coding stage of development!

Issue and Bug Tracking and Control



- Similar to *Change Management*, ***issues*** and ***bugs*** should be managed.
- Otherwise,
  - they will be reported multiple times
  - they will be reported in the wrong places
  - And they will be reported but will not be fixed!!

- All ***issues*** and ***bugs*** should be (1) <u>reported</u>, (2) <u>reviewed</u> and (3) <u>fixed</u> (if approved).

- Different types, *similar* structure:
  - Also known as issue tracker, bugs tracker or faults management system.

Bugs Management

- **What’s a software bug?**
  - A software bug is an error, failure or fault in a software program that causes it to produce an ***incorrect*** or ***unexpected*** result, or to ***behave in unintended ways***.

- Bugs are reported by either *developers* or *end-users*.

- A ***bug report*** provides details of reported bugs in a program.

Types of Bugs

- **Some bugs types**
  - **Logic bugs**
    - Infinite loop

```
for(int i=1; i>0;i++)
   {System.out.println(i);}
```

  - **Syntax bugs**
    - E.g., using x=y instead of x==y
  - **Resource bugs**
    - ***Stack*** or ***Buffer*** overflow.
    - Memory leaks

```
public static void main(String[]args){
         foo(0);}
public static int foo(int i) {
           return foo(i+1);}
```

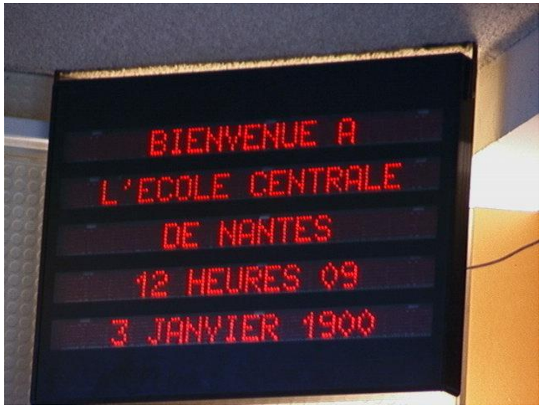
  - **Performance bugs**
    - Processor not able to handle computational tasks

Read: a list of well-known software bugs:
https://en.wikipedia.org/wiki/List_of_software_bugs

Examples

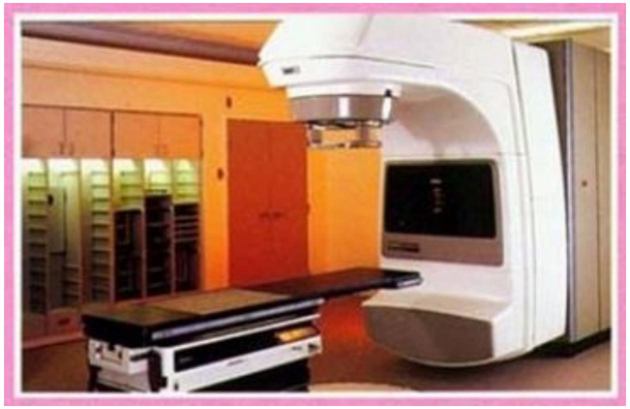
Well-known bugs

- Y2K bug – time tracking
  - A bug that have caused problems when dealing with dates beyond December 31, 1999



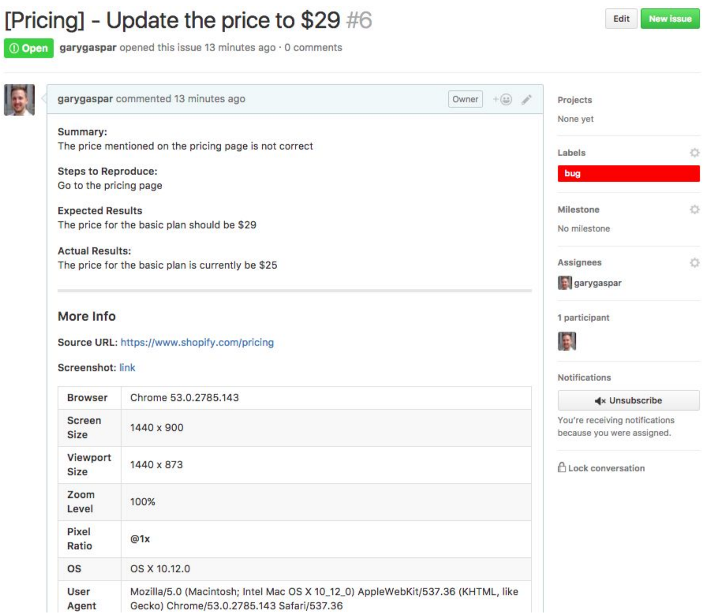
An electronic sign displaying the year incorrectly as 1900 on 3 January 2000 in France - Wikipedia

- Therac-25 - Radiation therapy
  - A software bug that resulted in a massive overdoses of radiation that killed and injured several people.



Bug Report

- A ***bug report*** is a document that include the list of issues and bugs in a software system.
- Most widely used as a software package.
- Details can be part of a bug tracker.
- A typical issues/bugs tracker will provide details of the reported issue such as the title, name of the person reported the issue



[Pricing] - Update the price to $29 #6

Open garygaspar opened this issue 13 minutes ago · 0 comments

garygaspar commented 13 minutes ago

Summary:
The price mentioned on the pricing page is not correct

Steps to Reproduce:
Go to the pricing page

Expected Results
The price for the basic plan should be $29

Actual Results:
The price for the basic plan is currently be $25

More Info

Source URL: https://www.shopify.com/pricing

Screenshot: link

Browser	Chrome 53.0.2785.143
Screen Size	1440 x 900
Viewport Size	1440 x 873
Zoom Level	100%
Pixel Ratio	@1x
OS	OS X 10.12.0
User Agent	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_12_0) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/53.0.2785.143 Safari/537.36

Projects
None yet

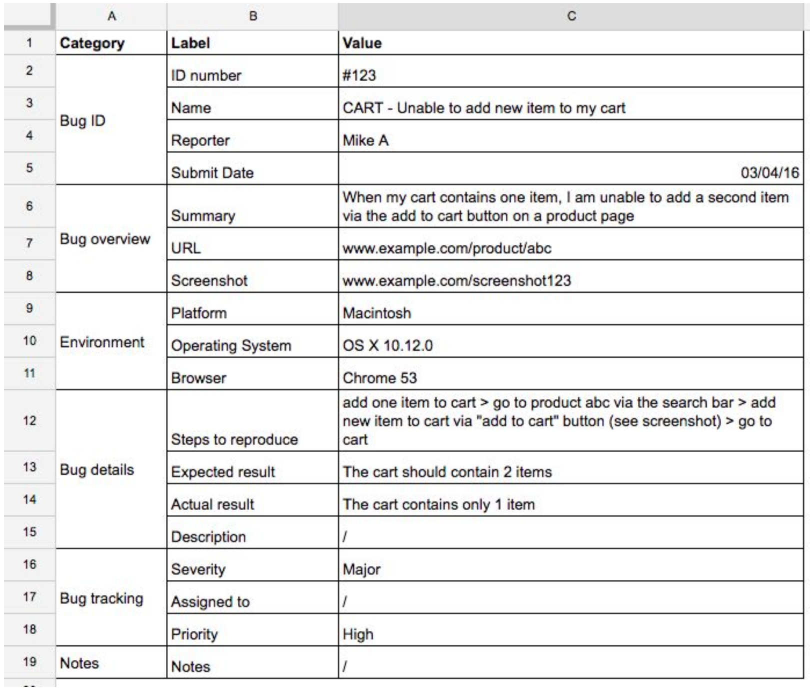
Labels
bug

Milestone
No milestone

Assignees
garygaspar

1 participant

Notifications
You're receiving notifications because you were assigned.



	A	B	C
1	**Category**	**Label**	**Value**
2	Bug ID	ID number	#123
3		Name	CART - Unable to add new item to my cart
4		Reporter	Mike A
5		Submit Date	03/04/16
6	Bug overview	Summary	When my cart contains one item, I am unable to add a second item via the add to cart button on a product page
7		URL	www.example.com/product/abc
8		Screenshot	www.example.com/screenshot123
9	Environment	Platform	Macintosh
10		Operating System	OS X 10.12.0
11		Browser	Chrome 53
12	Bug details	Steps to reproduce	add one item to cart > go to product abc via the search bar > add new item to cart via "add to cart" button (see screenshot) > go to cart
13		Expected result	The cart should contain 2 items
14		Actual result	The cart contains only 1 item
15		Description	/
16	Bug tracking	Severity	Major
17		Assigned to	/
18		Priority	High
19	Notes	Notes	/

Bug report in Github using Marker.io

Classical bug report using Spreadsheets (not very common nowadays)

source: https://marker.io/blog/bug-report-template/

Issues tracker
What can you report?

- Many issues can be tracked:
  - **Bugs**: error or failure in the software.
  - **Improvement**: a request or suggestion…
  - **Wish**: of a developer or user.
  - **Test**: test of an issue.

This usually done by developers or users.

Issues Management in Software Development

- A developer should report all issues and bugs found.
- Several vital information should be included:
  - Automatically generated:
    - Bugs ID, name of developer, time, version number, repository number etc…
  - Manually entered info:
    - Type of bug, impact (if known), circumstances etc…
  - ***Bugs are then categorised based on:***
    - ***Class*** - ***Severity*** - ***Priority***

Issues tracker
What can you report?
Cont'd.

- You can also mark the statues of the reported issue:
  - **Open**: has not been addressed yet.
  - **In progress:** currently under development.
  - **Resolved**: the issue has been resolved, but still open for discussion.
  - **Closed**: it has been resolved and discussion has been concluded.
  - **Reopened**: especially when an issue was marked as closed or resolved, but someone noticed that the issue still exist (e.g., bug reappeared).

- These options are monitored by a senior developer, team leader or quality assurance personal.

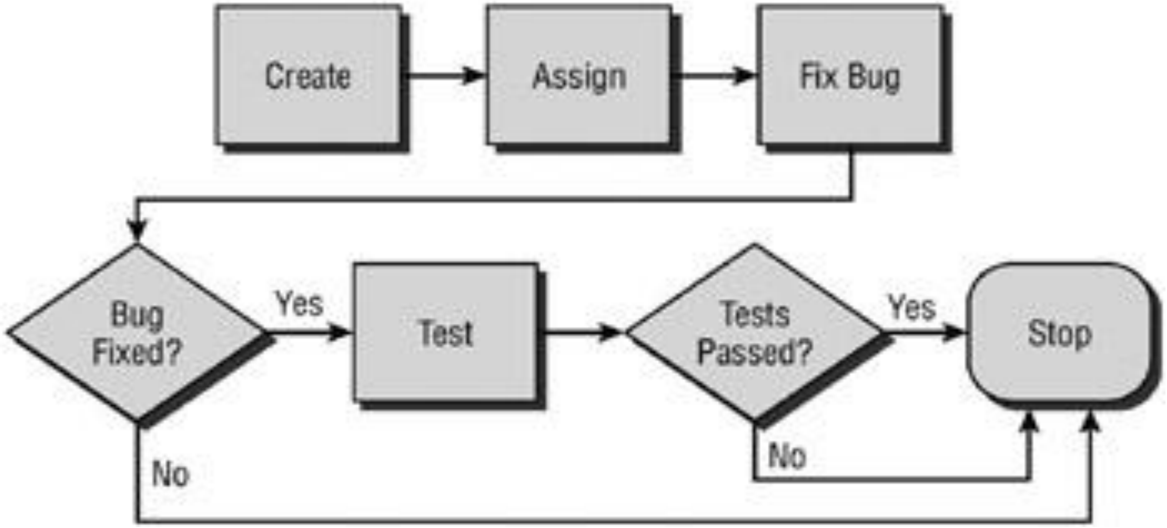
Bug Management in Software Development

- A developer should report all issues and bugs found.
- Several vital information should be included:
  - Automatically generated:
    - Generated number, name/ID of developer, time, version number, repository number etc…
  - Manually entered info:
    - Type of bug, impact (if known), circumstances etc…
  - ***Bugs are then categorised:***
    - ***Class*** - ***Severity*** - ***Priority***

After they are reported….

- Once reported, bugs get reviewed by team leaders, senior developers or quality assurance team.
- Each issue will be evaluated, and it’s impact will be rated.
  - Some bugs will be prioritized based on their immediate impact or the severity of their impact (minor of major).
    - Some tracking systems use a scale of 1-5 to rate bugs/issues.
- Then someone (or a team, depending on the bug) will be assigned to work on fixing the bug.

Bugs fixing workflow



Bug Tracking Systems

- A ***bug tracking system*** is a software application that keeps track of reported software bugs.
  - Usually comes as a part of the issue tracking system
- Allows developers to report and locate bugs that they need to resolve.
- Some software project management tools provide this as one of their functionalities.
- Several version control systems also provide bug tracking system.
- **Example of bug tracking system**: Bugzilla and JIRA

Bugzilla

- Open source bugs tracker.
- Originally designed by Netscape in 1998.
- Some of the open-source projects that uses bugzilla:

  Mozilla.org projects,

  Linux kernel,

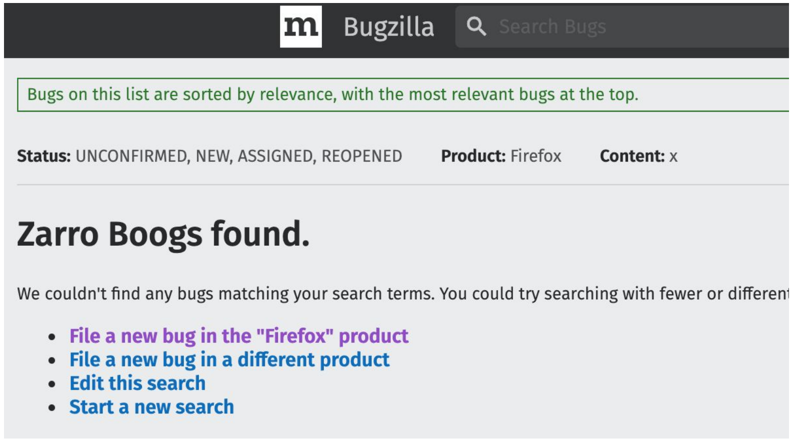
  Eclipse,

  FreeBSD,

  Apache (some projects!),

  Red had,

  LiborOffice



Bugs on this list are sorted by relevance, with the most relevant bugs at the top.

Status: UNCONFIRMED, NEW, ASSIGNED, REOPENED **Product:** Firefox **Content:** x

Zarro Boogs found.

We couldn't find any bugs matching your search terms. You could try searching with fewer or different

- File a new bug in the "Firefox" product
- File a new bug in a different product
- Edit this search
- Start a new search

The "zarro Boogs found" expression!

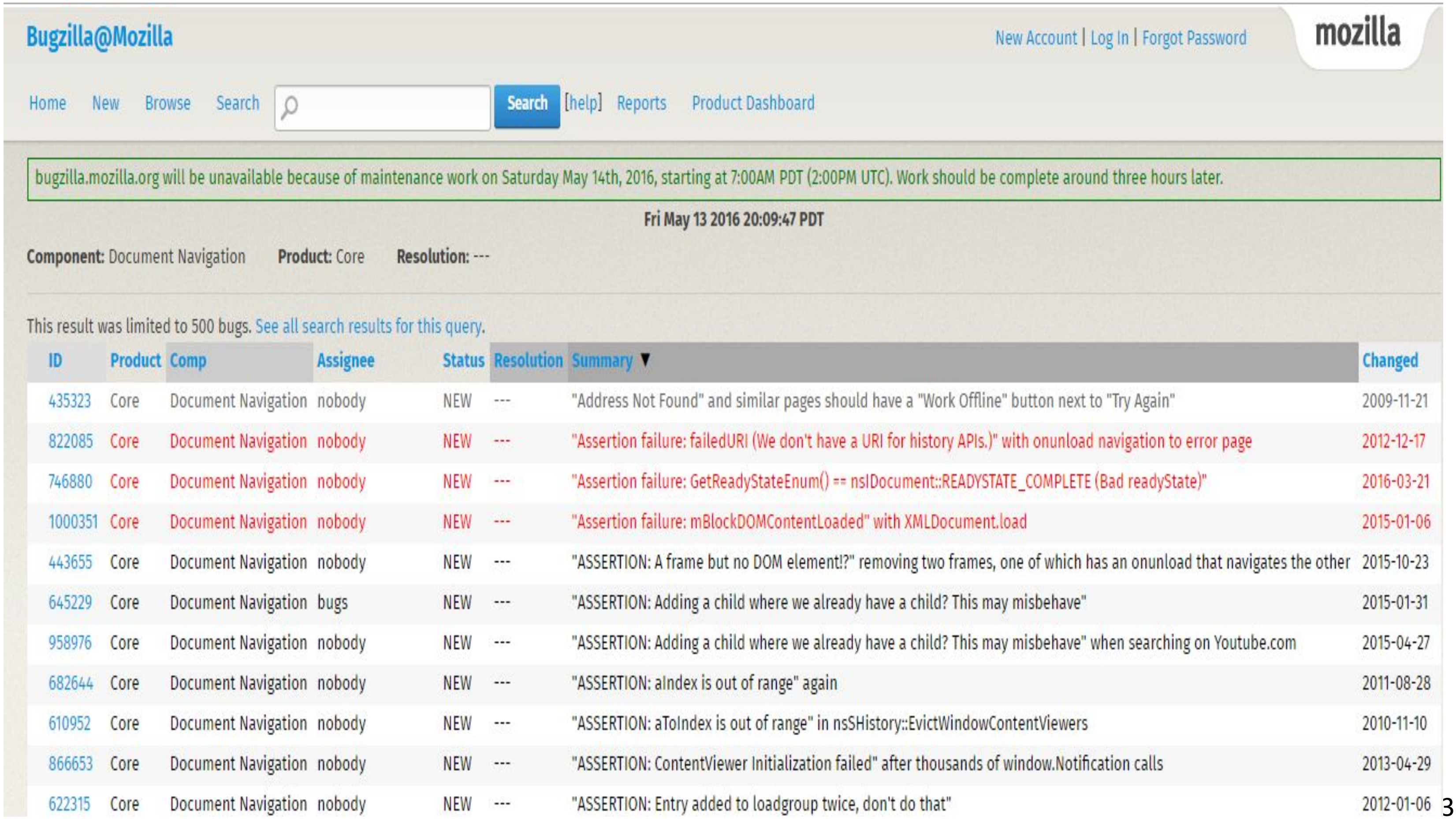
To operate Bugzilla…

- To use Bugzilla for your project, you’ll need the following:
  - A compatible database management system
    - Such as MySQL, SQLite, Oracle or PostgreSQL,
  - A compatible web server
  - A suitable release of Perl 5
  - A suitable mail transfer agent, or any SMTP server

Bugs Tracking System

Example 1- Mozilla Firefox

- Reported in Bugzilla



Bugzilla@Mozilla
New Account | Log In | Forgot Password
mozilla
Home New Browse Search
Search [help] Reports Product Dashboard

bugzilla.mozilla.org will be unavailable because of maintenance work on Saturday May 14th, 2016, starting at 7:00AM PDT (2:00PM UTC). Work should be complete around three hours later.

Fri May 13 2016 20:09:47 PDT

Component: Document Navigation **Product:** Core **Resolution:** ---

This result was limited to 500 bugs. See all search results for this query.

ID	Product	Comp	Assignee	Status	Resolution	Summary ▼	Changed
435323	Core	Document Navigation	nobody	NEW	---	"Address Not Found" and similar pages should have a "Work Offline" button next to "Try Again"	2009-11-21
822085	Core	Document Navigation	nobody	NEW	---	"Assertion failure: failedURI (We don't have a URI for history APIs.)" with onunload navigation to error page	2012-12-17
746880	Core	Document Navigation	nobody	NEW	---	"Assertion failure: GetReadyStateEnum() == nsIDocument::READYSTATE_COMPLETE (Bad readyState)"	2016-03-21
1000351	Core	Document Navigation	nobody	NEW	---	"Assertion failure: mBlockDOMContentLoaded" with XMLDocument.load	2015-01-06
443655	Core	Document Navigation	nobody	NEW	---	"ASSERTION: A frame but no DOM element!?" removing two frames, one of which has an onunload that navigates the other	2015-10-23
645229	Core	Document Navigation	bugs	NEW	---	"ASSERTION: Adding a child where we already have a child? This may misbehave"	2015-01-31
958976	Core	Document Navigation	nobody	NEW	---	"ASSERTION: Adding a child where we already have a child? This may misbehave" when searching on Youtube.com	2015-04-27
682644	Core	Document Navigation	nobody	NEW	---	"ASSERTION: aIndex is out of range" again	2011-08-28
610952	Core	Document Navigation	nobody	NEW	---	"ASSERTION: aToIndex is out of range" in nsSHistory::EvictWindowContentViewers	2010-11-10
866653	Core	Document Navigation	nobody	NEW	---	"ASSERTION: ContentViewer Initialization failed" after thousands of window.Notification calls	2013-04-29
622315	Core	Document Navigation	nobody	NEW	---	"ASSERTION: Entry added to loadgroup twice, don't do that"	2012-01-06

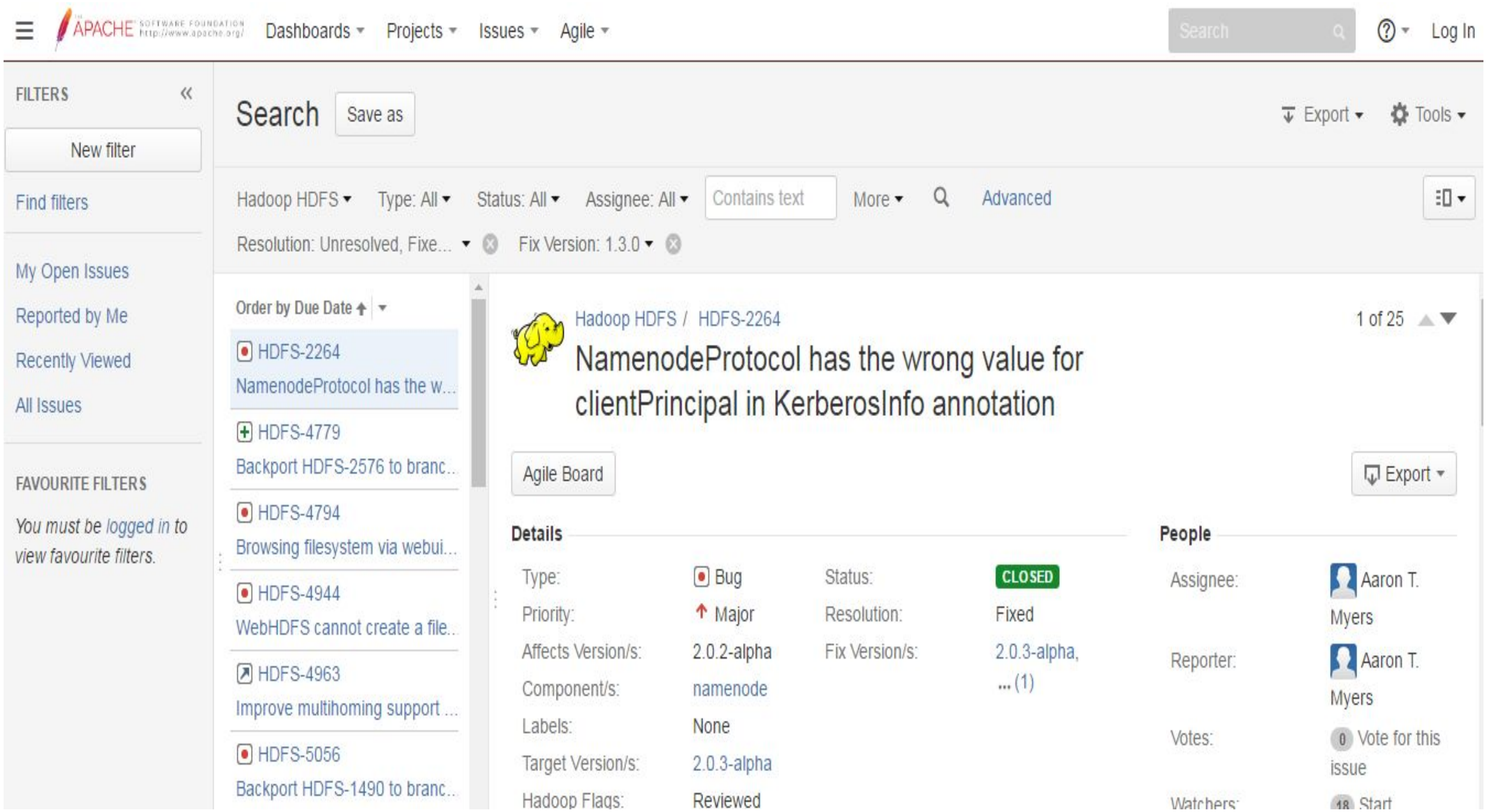
JIRA

- JIRA issue tracker is part of the JIRA software
- JIRA is an industrial-based tools from Atlassian, Inc.
- Integrates well with other JIRA software such as Bitbucket.
- Some of the projects/organisations that uses JIRA:
  - **Open-source:** JBoss, Fedora Commons, Spring Framework and several Apache projects (such as *Commons* libraries)
  - **Industry:** NASA JPL and Audi…

Bugs Tracking System

Example 2- Apache Hadoop

- Reported in JIRA



You must be logged in to view favourite filters.

Hadoop HDFS ▾ Type: All ▾ Status: All ▾ Assignee: All ▾

Resolution: Unresolved, Fixe... ▾ Fix Version: 1.3.0 ▾

- HDFS-2264 NamenodeProtocol has the w...
- HDFS-4779 Backport HDFS-2576 to branc...
- HDFS-4794 Browsing filesystem via webui...
- HDFS-4944 WebHDFS cannot create a file...
- HDFS-4963 Improve multihoming support ...
- HDFS-5056 Backport HDFS-1490 to branc...

Hadoop HDFS / HDFS-2264 1 of 25

NamenodeProtocol has the wrong value for clientPrincipal in KerberosInfo annotation

Details

Type:	Bug	Status:	CLOSED
Priority:	↑ Major	Resolution:	Fixed
Affects Version/s:	2.0.2-alpha	Fix Version/s:	2.0.3-alpha, ... (1)
Component/s:	namenode		
Labels:	None		
Target Version/s:	2.0.3-alpha		
Hadoop Flags:	Reviewed		

People

Assignee:	Aaron T. Myers
Reporter:	Aaron T. Myers
Votes:	0 Vote for this issue
Watchers:	18 Start

more on bugs

- **Can we really predict bugs?**

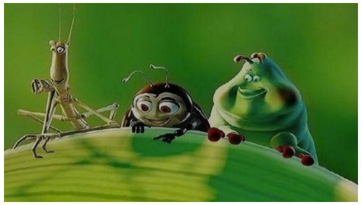
- **How to handle bugs?**

- **Now I know there is a bug in my class, how can I find the lines that caused that bug?**

more on bugs

- **Can we really predict bugs?**

  yes! we can use metrics (source code: lines of code, human: number of contributors) to predict the presence of bugs.



- **How to handle bugs?**

  well: reassign, and react!

  - assign the bug to somebody in the team
  - fix!

- **Now I know there is a bug in my class, how can I find the lines that caused that bug?**

  we use bug localisation techniques (static analysis, stack traces)

more on bugs

I THOUGHT YOU SAID THIS APPLICATION WAS BUG-FREE!
OH YES, THEY'RE FREE! WE DON'T CHARGE EXTRA FOR THEM!
LANG ©2014
SQLSERVERCENTRAL.COM

- **Can we really predict bugs?**

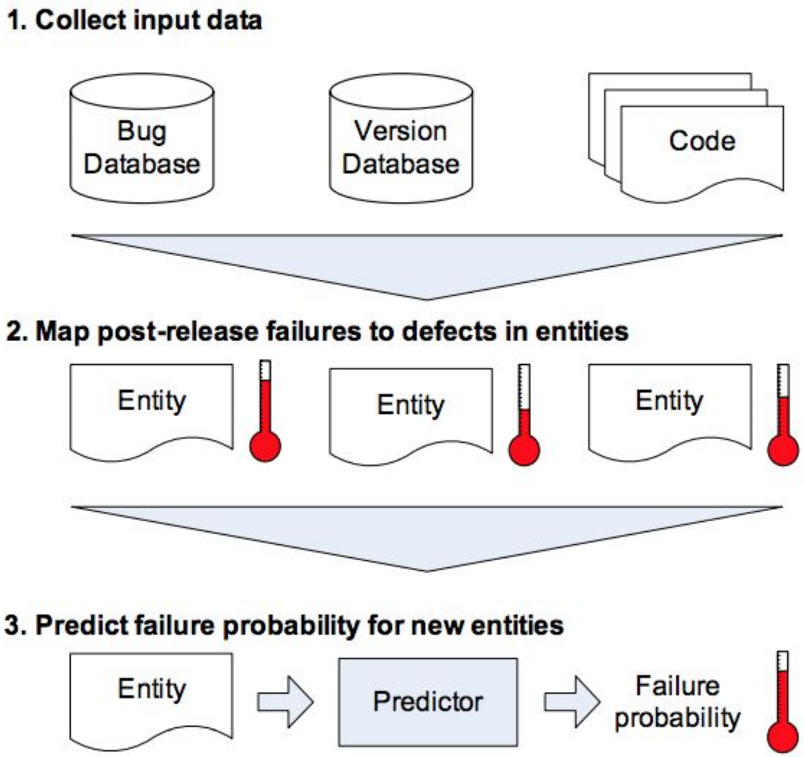
  yes! we can use metrics (source code: lines of code, human: number of contributors) to predict the presence of bugs.

```
find them before they find their way
into the program!!
```

Bug prediction uses statistical analysis/machine-learning to try to estimate (with some confidence range) whether:

1) a piece of code is potentially buggy (binary), or
2) how many bugs exist in a piece of code

Bugs prediction at microsoft!



Nagappan, N., Ball, T. and Zeller, A., 2006, May. Mining metrics to predict component failures. In *Proceedings of the 28th international conference on Software engineering* (pp. 452-461). ACM.

more on bugs

- **How to handle bugs?**

  well: reassign, and react!
  - assign the bug to somebody in the team
  - fix!

bugs-free day

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more on bugs

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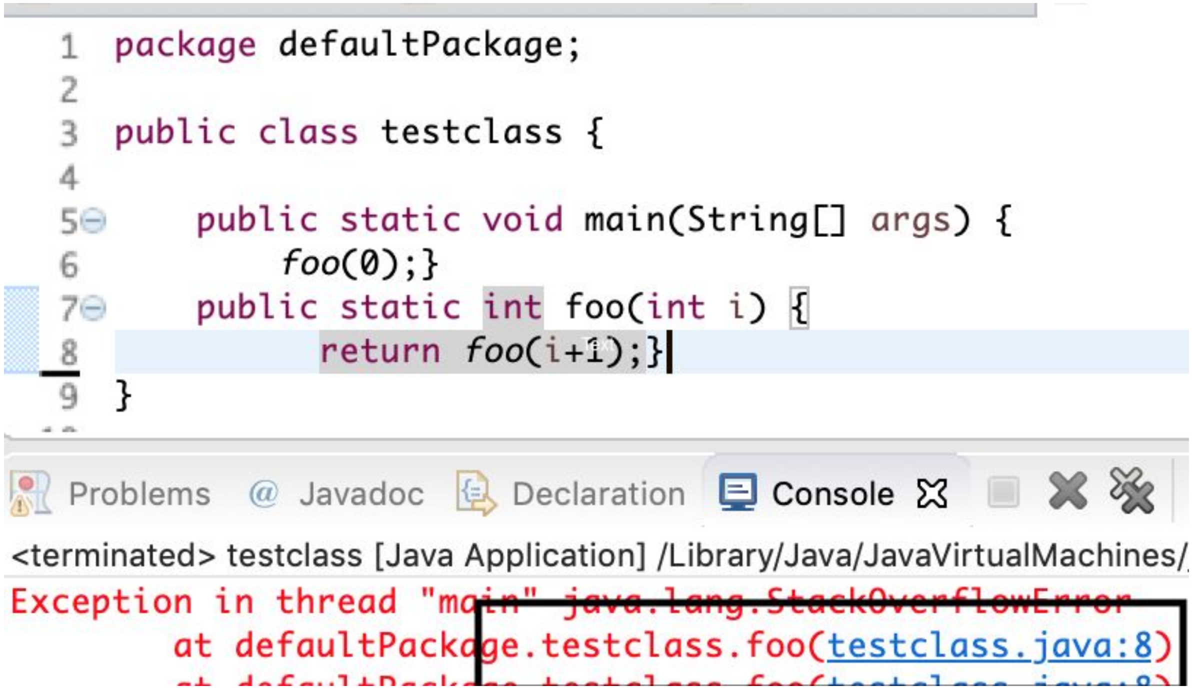

```
1  package defaultPackage;
2
3  public class testclass {
4
5      public static void main(String[] args) {
6          foo(0);}
7      public static int foo(int i) {
8              return foo(i+1);}
9  }
```

```
<terminated> testclass [Java Application] /Library/Java/JavaVirtualMachines/
Exception in thread "main" java.lang.StackOverflowError
        at defaultPackage.testclass.foo(testclass.java:8)
```