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Software Engineering HS'16

# Software Evolution

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*Many thanks to H. Gall, K. Kevic, M. Allen, V. Razmov, M. Lanza, D. Shepherd, M. Felici, G. Murphy*

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# Learning Goals

By the end of this unit, you will be able to:

- Explain why evolution is difficult but inherent
- Describe three categories of reasons why useful software must evolve and identify what kind of reason motivates a given software change
- Reason about and argue whether a given change retains binary/contract compatibility
- Describe the role of issue tracking systems in the software development process
- Discuss the life cycle of a bug report, criteria for writing a good one and general steps for working on one

# Importance of Maintenance/Evolution



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# Maintenance Examples

- Microsoft Windows XP:
    - ❑ Released 12/31/2001
    - ❑ Service packs ended 8/30/2005
    - ❑ Support ended 4/14/2009 (7.5 years)
    - ❑ Extended support still possible
  
  - Red Hat Enterprise Linux 3
    - ❑ Released 10/23/2003
    - ❑ End of life cycle 10/31/2010
    - ❑ End of extended support 01/30/2014
-

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# Software Maintenance/Evolution

Producing new (versions of) software under the **constraints** of existing software

- ❑ Backwards compatibility is often assumed / required
- ❑ aka “Brownfield development”
- ❑ Legacy Software: “software which is vital to our organization, but we don’t know what to do with it” (Bennett and Rajlich)

Can comprise all phases of the lifecycle, starting with requirements gathering

- ❑ Another turn of the spiral

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Similar to development, but **HARDER!**

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# Software change

Software change is inevitable

- ❑ **New requirements** emerge when the software is used
- ❑ The **business** environment changes
- ❑ **Errors** must be repaired
- ❑ **New computers** and equipment is added to the system
- ❑ The **performance or reliability** of the system may have to be improved

A key problem for organisations is implementing and managing change to their *existing* software systems.

# Y2K Example



Memory space used to be a problem, so, store 2 digit years

- ❑ Rollover problem: ascending numbering assumption becomes invalid

Mitigation efforts cost ~\$300 billion worldwide

Valuable surge in IT modernization

- ❑ major issue for business: enterprise architecture

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Computerworld: <http://goo.gl/1ABH2>

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# Software Evolution

- Organizations have **huge investments** in their software systems - they are **critical business** assets.
- To **maintain the value** of these assets to the business, they must be changed and updated.
- The majority of the **software budget** in large companies is devoted to **evolving** existing software rather than developing new software.



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# Lehman's laws

Observations (~laws) on large systems developed by large organizations

## **Continuing change**

A program that is used in a real-world environment necessarily must change or become progressively less useful in that environment

## **Increasing complexity**

As an evolving program changes, its structure tends to become more complex. Extra resources must be devoted to preserving and simplifying structure.

## **Declining quality**

The quality of systems will appear to be declining unless they are adapted to changes in their operational environment

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# Evolution is hard

- Systems not robust under change.
  - Lack of traceability (e.g. between requirements and code)
  - Poor documentation of code, of design process and rationale and of system evolution.
  - “Stupid” code features may not be so stupid.
    - work-arounds of artificial constraints may no longer be documented (e.g. OS bugs, memory limits, etc.)
  - Poor management attitudes and culture:
    - Maintenance is not high-profile.
    - It is just patching code.
    - Easier/less important than design.
-

```
... @@ -51,10 +51,12 @@ public void onModuleLoad() {
51     try {
52         displayset.add( tabMe.renderTable( dSMngr.getDataSet( (long) 1 ) ));
53     } catch (DataSetNotPresentException e) {
-        // TODO Auto-generated catch block
54 +        // TODO: Some kind of intelligent response to a missing DataSet
55         e.printStackTrace();
56     }
57
58 +
59 +    // TODO: What does this hideous block of code actually do?
60     HorizontalPanel buttonPanel = new HorizontalPanel();
61     buttonPanel.setHorizontalAlignment(HasHorizontalAlignment.ALIGN_CENTER);
62     root.add(buttonPanel, 0, 50);
... @@ -80,18 +82,33 @@ public void onFinish(IUploader uploader) {
82         }
83         });
84     }
-    });
85 +    });
```

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# Discussion Question

If we build a game like Halo 5, do we ever need to change the application's source code?

When? Why?

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# Reasons for evolutionary changes

## Corrective

- ❑ correct faults in system behaviour
- ❑ caused by errors in coding, design or requirements

## Adaptive

- ❑ due to changes in operating environment
- ❑ e.g., different hardware or operating system

## Perfective

- ❑ due to changes in requirements
  - ❑ often triggered by organizational, business or user learning
-

# What is the reason for this change?

## same Jajuk database/config/cache working accross different systems and different platforms Opened 4 months ago

|              |                             |              |                  |
|--------------|-----------------------------|--------------|------------------|
| Reported by: | fsck222                     | Assigned to: | bflorat          |
| Priority:    | 5                           | Milestone:   | 1.5 "Lothlórien" |
| Component:   | (Java Developer) Functional | Version:     | 1.3.10           |
| Keywords:    |                             | Cc:          |                  |

### Description

[Reply](#)

from discussion on [#318](#)

I would like to have the same Jajuk database, some of the config, the cache, etc... working across different systems and different platforms. The user case is the following: You have an external hard drive, a desktop PC under Windows at work, a desktop PC under Linux at home. You want to have your music and your Jajuk files (database, cache, config, perspective, etc...) only on your external hard drive. I believe the best way is to use alternate path in the devices configuration. I think we should start to use profiles to separate hardware configurations options from the others. My propositions is described below:

- In the database, in the device declaration section, we need to have a list of alternate path of the device. Those alternate path could be configured in the device property box.
- When mounting a device, Jajuk will try using the first path of the list and if he can't it will try the second one, and etc...

Not sure it's faisable as device id is computed on the raw name but, please create a feature, we'll check that later. For windows drive letter issue (letter can change according to connected devices, we have a solution: we can map a letter to a device using some advanced parameters/ storage options)

# What is the reason for this change?

## track progression not displayed properly for VBR mp3s

Opened 2 months ago  
Last modified 1 month ago

|              |   |              |                    |
|--------------|---|--------------|--------------------|
| Reported by: | dxnihilo@yahoo.com                      | Assigned to: | bflorat (accepted) |
| Priority:    | 5                                       | Milestone:   | 1.5 "Lothlórien"   |
| Component:   | (Jajuk Members) Any (Default Component) | Version:     | 1.3.11             |
| Keywords:    |   | Cc:          |                    |

### Description

[Reply](#)

The track progression bar does not display properly for variable bitrate mp3 files. It usually adds anywhere from about 20 seconds to 5 minutes to the real length of the track, although in one case it actually subtracted some time from the length (and the track stopped playing at that shorter length). Also, the track position slider does not work properly for these files. If I let a track play through without moving the slider, it ends at the proper time, but if I move the slider it does not skip to the corresponding position in the track (part of the track can play more than once). The time remaining field displays properly but if the slider is moved past the real track length it displays 0:00 while part of the track is still playing.

# What is the reason for this change?

## Implement an alarm clock function

Opened 1 week ago  
Last modified 2 days ago

|              |   |              |                  |
|--------------|---|--------------|------------------|
| Reported by: | sebokie@hotmail.fr                      | Assigned to: | varun            |
| Priority:    | 3                                       | Milestone:   | 1.5 "Lothlórien" |
| Component:   | (Jajuk Members) Any (Default Component) | Version:     | 1.4              |
| Keywords:    |   | Cc:          |                  |

### Description

[Reply](#)

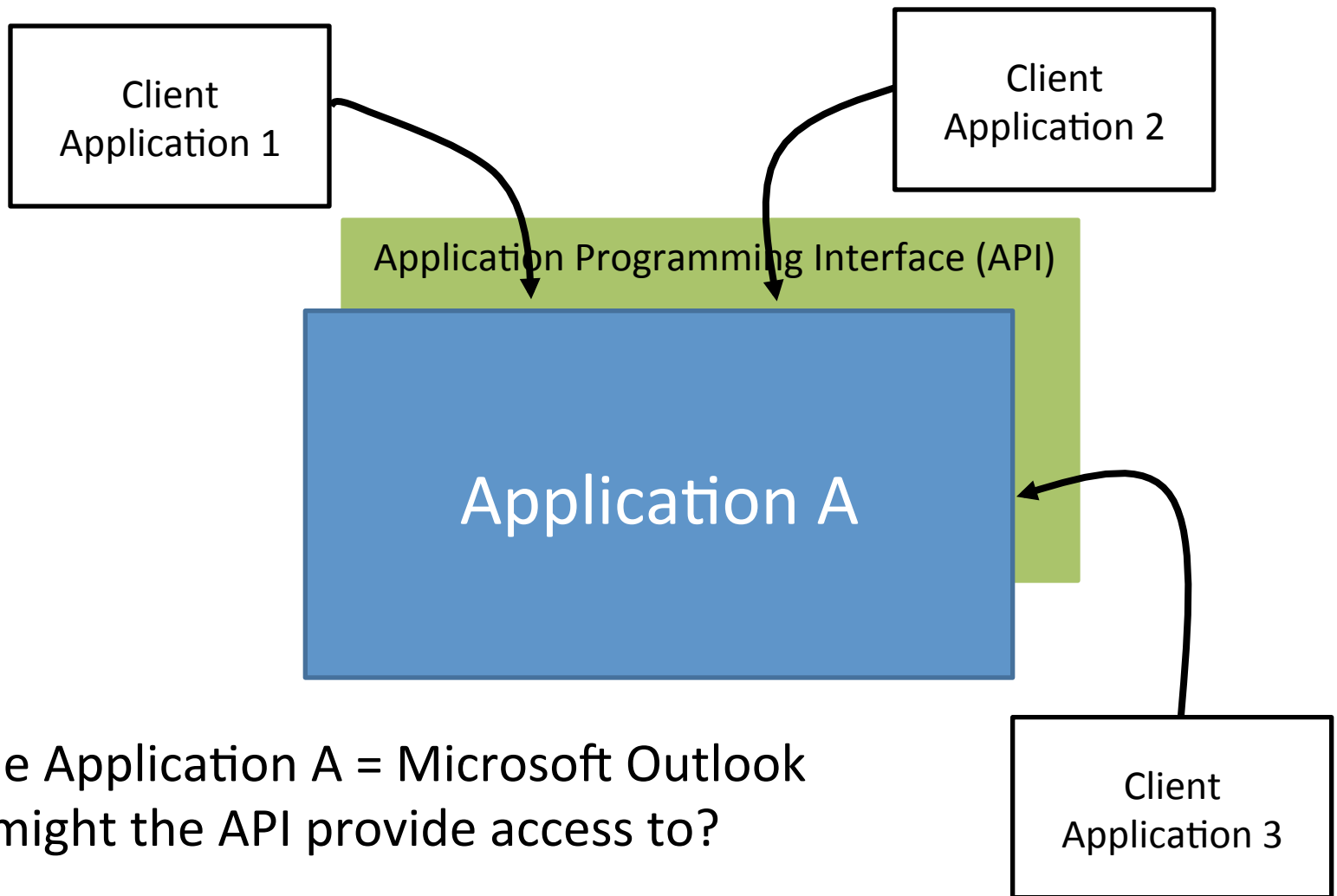
Hello and thanks for that great software.

Would it be possible to implement an alarm clock function in Jajuk, as it would be one of the only players to do this and I'm convinced it would be used by many other persons than me!

Thanks and keep up with the good work!



# Evolution and Compatibility



Imagine Application A = Microsoft Outlook  
What might the API provide access to?  
Why?

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# API (Java perspective)

## e.g., Moyosoft Java Outlook Connector

```
public class SendMail
{
    public static void main(String[] args)
    {
        try
        {
            // Outlook application
            Outlook outlookApplication = new Outlook();

            // Get the Outbox folder
            OutlookFolder outbox = outlookApplication.getDefaultFolder(
                FolderType.OUTBOX);

            // Create a new mail in the outbox folder
            OutlookMail mail = (OutlookMail) outbox.createItem(ItemType.MAIL);

            // Set the subject, destination and contents of the mail
            mail.setSubject("Hello world !");
            mail.setTo("your_email@test.com");
            mail.setBody("This is a test message.");

            // Send the mail
            mail.send();
        }
    }
}
```

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# Evolving a Java-based API

What kind of changes to the Java API code can we make to maintain **binary compatibility** so that existing (already compiled) applications using the API do not break?

Add a new (Java) package to the API?

Change name of a public method in a public class?

Change the name of a parameter to a method?

# Try these ones...

1. Re-order methods in a class declaration?
2. Add an unchecked exception thrown to an API method?
3. Change an API method from public access to protected access?
4. Add API field?

See [http://wiki.eclipse.org/Evolving\\_Java-based\\_APIs\\_2](http://wiki.eclipse.org/Evolving_Java-based_APIs_2)  
(don't memorize these and just understand the very basic kinds of changes)

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# API Contract Compatibility

API changes must not invalidate formerly legal Client code.

Consider the following API method specification.

```
/** Returns the list of children of this widget.  
 * @return a non-empty list of widgets  
 */  
Widget[] getChildren();
```

---

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# API Contract Compatibility...

What if that specification was changed in a revised API to allow an empty list of widgets to be returned?

```
/** Returns the list of children of this widget.  
 * @return a list of widgets  
 */  
Widget[] getChildren();
```

Would this change break a client who calls `getChildren()`? Why or why not?

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# API Contract Compatibility...

## What about this one?

```
/** Removes the given widgets from this widget's  
 * list of children.  
 * @param widgets a non-empty list of widgets  
 */  
void remove(Widget[] widgets);
```

## changes to

```
/** Removes the given widgets from this widget's  
 * list of children.  
 * @param widgets a list of widgets  
 */  
void remove(Widget[] widgets);
```

---

# API Contract Compatibility..

|                        |            |                                  |
|------------------------|------------|----------------------------------|
| Method pre-conditions  | Strengthen | Breaks compatibility for callers |
|                        | Weaken     | Contract compatible for callers  |
| Method post-conditions | Strengthen | Contract compatible for callers  |
|                        | Weaken     | Breaks compatibility for callers |

For more, see:

[http://wiki.eclipse.org/index.php/Evolving\\_Java-based\\_APIs](http://wiki.eclipse.org/index.php/Evolving_Java-based_APIs)

This is just part of the story of contract compatibility as the compatibility depends on the role of the client code.



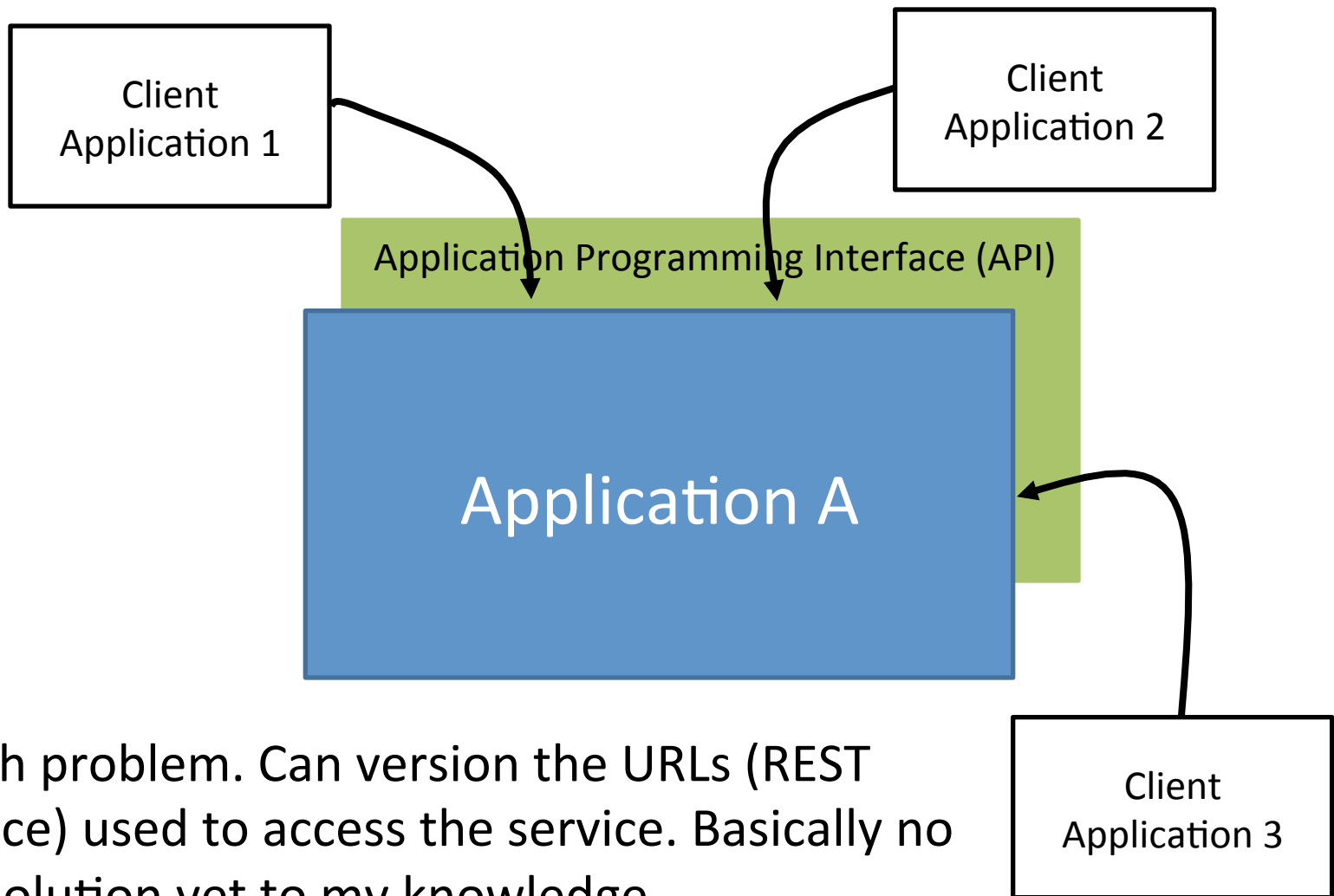
---

# Coping with API evolution

What if you need to upgrade part of an API and it breaks compatibility?

- a) add new API elements alongside the old  
e.g., `search()` and `search2()`
  - b) deprecate the old “version” of the API
-

# What if the API is to a web service?



A tough problem. Can version the URLs (REST interface) used to access the service. Basically no great solution yet to my knowledge.

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# Issue Trackers

Are critical to teams for tracking and managing bugs and feature requests

Some examples

- Bugzilla
  - Jazz/RTC (work items)
  - Jira
  - ...
-

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# Issue Tracking Systems

- Manage development requests (also called bug reports, work items, change requests, change tasks)
    - Defects, e.g. “Using Ctrl-+ to enlarge display fails to add scroll bars when content exceeds window size”
    - Enhancements (new features), e.g. “Add an option to render page immediately without waiting CSS to load”
    - boundary between defects and enhancements can be fuzzy
  - Maintain a list of bugs in the software
    - In a database called the bug repository
  - Assign responsibility for each bug, feature, or task
  - Organize the work to be done
    - Life cycle of a bug report
  - Break up the work into “releases” or other deadlines
-

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# Issues / Bug Reports / Work Items

Are often the major piece of information in software development teams

- Contain the rationale for changes (provide documentation)
- Contain the links to related documents
- Contain information on the people who are involved
- ....

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# Anatomy of a bug report

A bug report has the following fields:

- Title (also called Summary)
  - Description
  - Status
  - Assignee
  - Priority
  - Target Milestone
  - ...
  - Comments
-

## Bug 484329 - Upgrading to 3.0 causes "archives" folder disappears

[Last Comment](#)

**Status:** RESOLVED FIXED      **Reported:** 2009-03-19 21:12 PDT  
**Whiteboard:** [has patch for review][no l10n impact]      **Modified:** 2010-06-27 09:51 PDT  
**Keywords:**      **CC List:** 8 users ([show](#))  
**Product:** Thunderbird      **Flags:**  
**Component:** Folder and Message Lists      david.ascher: blocking-thunderbird3+  
**Version:** Trunk  
**Platform:** x86 Linux  
**Importance:** -- major ([vote](#))  
**Target Milestone:** Thunderbird 3.0b4  
**Assigned To:** David :Bienvenu  
**QA Contact:** folders-message-lists

**URL:**

**Depends on:**

**Blocks:**

### Attachments

|  |                          |  |
|--|--------------------------|--|
| <a href="#">proposed fix</a> (3.32 KB, patch)<br>2009-08-20 14:30 PDT, David :Bienvenu | mkmelin+mozilla: review+ | <a href="#">Details</a>   <a href="#">Diff</a> |
| <a href="#">Add an attachment</a> (proposed patch, testcase, etc.)                     |                          | <a href="#">View All</a>                       |

Makoto Kato 2009-03-19 21:12:59 PDT

[Description](#)

When I use version 2.0, I use a folder in mailbox as name as "archives".  
After upgrading to 3.0, this "archives" folder disappears. because new feature  
of 3.0 creates "Archives" folder in mailbox.

- Environment  
Thunderbird 3.0 beta2  
thunderbird 3.0 latest thunk

Summary  
(Title)

Description

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# Filing and triaging a bug report

## Who can file a bug report?

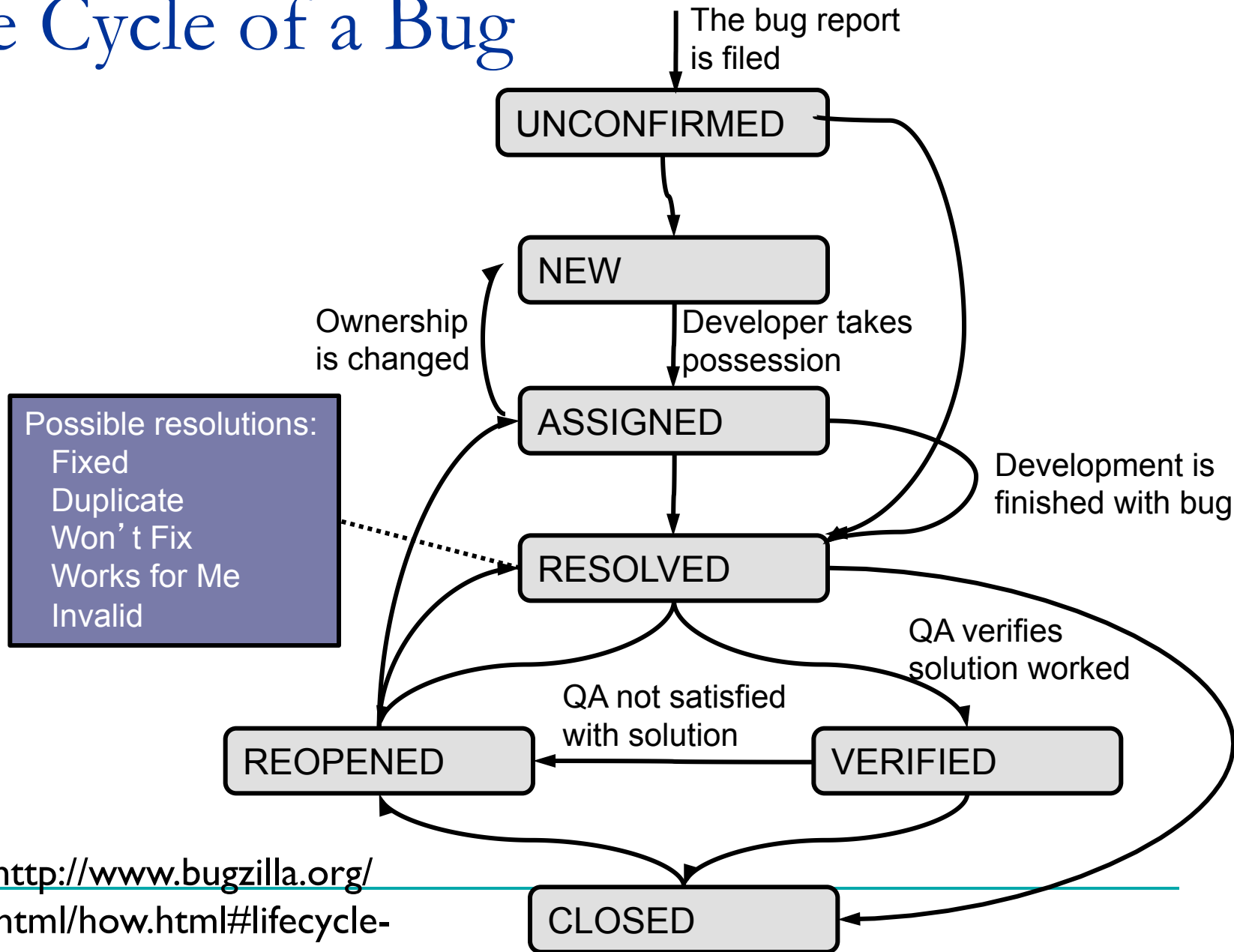
- ❑ Open bug repository: Any user (usual case in OSS)
- ❑ Closed bug repository: Developers, Testers, QA (usual case in proprietary software)

Triaging: go through a newly filed bug report to **validate** and **assign** the bug to a developer.

- ❑ Over the first six months of 2010, 19839 reports were filed for Eclipse: 110 reports/day; ~5 min per bug report: ~9 person-hours/day spent on triaging
  - ❑ Validate: confirm it is a non-duplicate bug report; of 20K bug reports for Eclipse, 3.4K (17%) were marked invalid, duplicate, could not be replicated or won't fix
-



# Life Cycle of a Bug



Based on: <http://www.bugzilla.org/docs/2.16/html/how.html#lifecycle-image>

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# Role of bug report comments

- **Discussion** among reporters and developers
  - Might be the only way of communication for a distributed development team (different locations, time zones)
  - Even when the developers have a mean of communicating face-to-face, it provides a way of **documenting** the **history** of the development process and the **rationale**.
    - e.g. why it was decided to fix a bug in a certain way.
-

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# Summary of Bug Report Writing Guidelines (Mozilla)

- Be precise
- Be clear - explain it so others can reproduce the bug
- One bug per report
- No bug is too trivial to report - small bugs may hide big bugs
- Clearly separate fact from speculation

**Based on:**

[https://developer.mozilla.org/en/Bug\\_writing\\_guidelines](https://developer.mozilla.org/en/Bug_writing_guidelines)

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# Guidelines cont' d

A good *summary (title)* should

- quickly and uniquely identify a bug report
- explain the problem, not your suggested solution
- Good: "Cancelling a File Copy dialog crashes File Manager"
- Bad: "Software crashes"
- Bad: "Browser should work with my web site"

A good *description* should include

- Provide enough context
- Overview, steps to reproduce, actual results, expected results
- Survey study found most helpful information to be: Steps to reproduce, stack traces, test cases

# One bug



Bugzilla

Bugzilla Version 2.19.1+

**Bugzilla Bug 305134** **Description : Remove FeedView from Firefox 1.5** Last modified: 2005-08-28 01:41 PDT

[Search page](#)

[Enter new bug](#)

**Bug#:** [305134](#) alias:

**Hardware:** All

**Reporter:** [Ben Goodger \(use ben at mozilla dot org for email\)](#)  
<[bugs@bengoodger.com](mailto:bugs@bengoodger.com)>

**Product:** Firefox

**OS:** All

**Add CC:**

**Component:** RSS Discovery and Preview

**Version:** unspecified

**CC:** alex@spamcop.net  
axel@pike.org  
bugs.mano@sent.com  
bugtrap@psychoticwol  
bugzilla@dougweb.org

**Status:** RESOLVED

**Priority:** -

**Resolution:** FIXED

**Severity:** normal

**Assigned To:** Ben Goodger (use ben at mozilla dot org for email)  
<[bugs@bengoodger.com](mailto:bugs@bengoodger.com)>

**Target Milestone:** -

Remove selected CC

**QA Contact:** nobody@mozilla.org

**URL:**

**Flags: (Help!)**

mtschrep: blocking1.8b4rc

bugs: blocking1.8b4

blocking1.9a1

blocking-aviary1.0.7

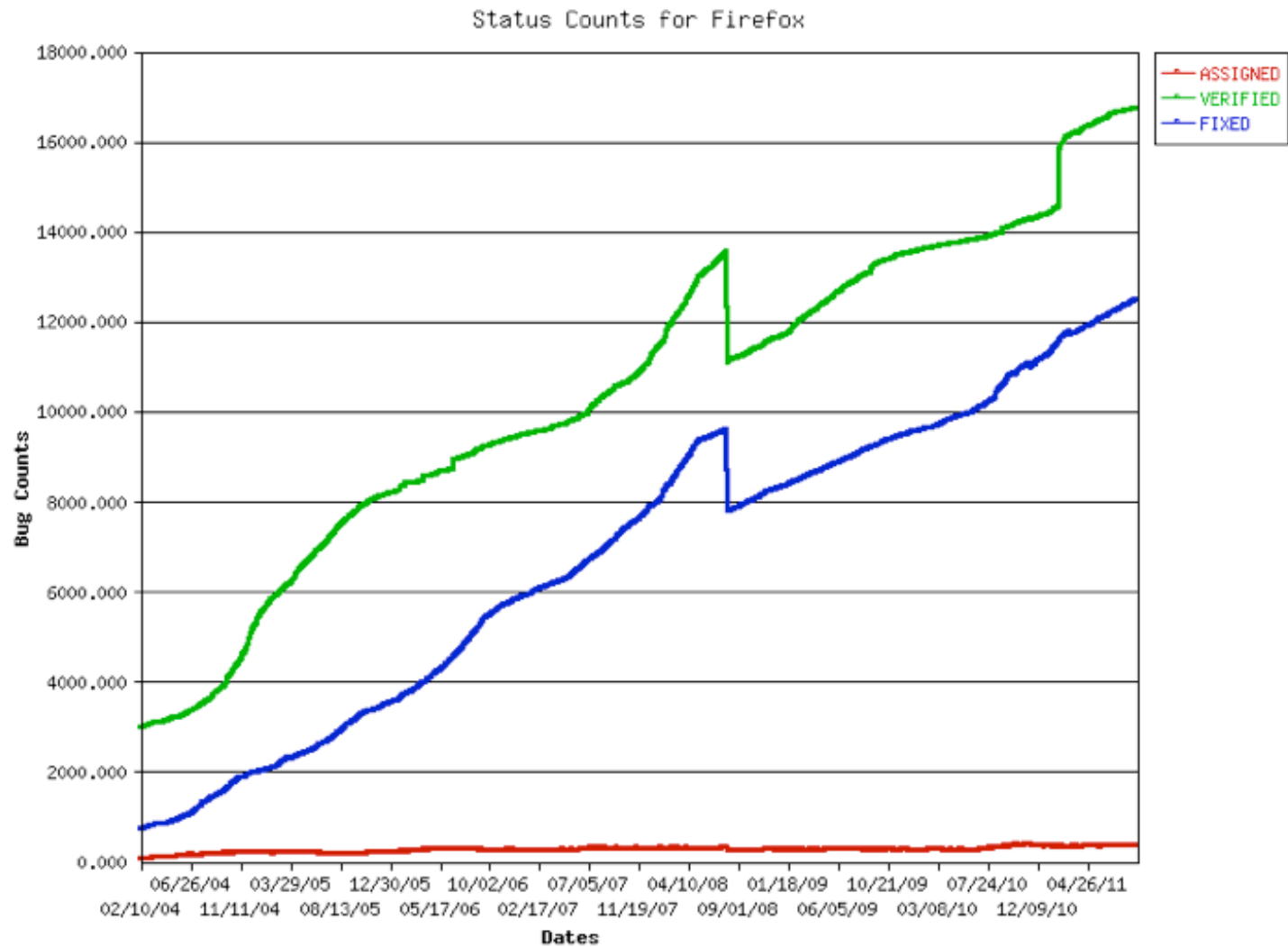
blocking-suisse2.0

**Summary:** Remove FeedView from Firefox 1.5

**Status:**

**Whiteboard:**

# Many bugs



# Many issues/bugs

**JIRA Software**

**Teams in Space**  
Scrum: Teams in Space

**Backlog** Configure

QUICK FILTERS: [Product](#) [Recently updated](#) [Only my issues](#) [Server](#) [UI](#)

**VERSIONS**

- Backlog
- Agile board
- Releases
- Reports
- All issues
- Components
- Add-ons

**PROJECT SHORTCUTS**

- Mars Team HipChat Room
- Space Station Dev Roadmap
- Teams in Space Org Chart
- Orbital Spotify Playlist
- Hyperspeed Bitbucket Repo
- + Add shortcut

**EPICS**

- All issues
- SeeSpaceEZ Plus
- Large Team Support
- Space Travel Partners
- Summer Saturn Sale
- Afterburner Plus
- Local Mars Office
- Hyper-speed shuttles
- New launch platforms
- Delicious Space Nutrition
- Spacetaiment

**Sprint 1** 14 issues 3 6 5

**Sprint 2** 6 issues Start sprint

Start: 10 Aug 2015 — Release: 9 Oct 2015

- TIS-25 Engage Jupiter Express for outer solar system travel SeeSpaceEZ Plus 5
- TIS-37 When requesting user details the service should return prior trip info Large Team Support 1
- TIS-9 After 100,000 requests the SeeSpaceEZ server dies Local Mars Office 1
- TIS-7 500 Error when requesting a reservation Large Team Support 1
- TIS-10 Bad JSON data coming back from hotel API Space Travel Partners 5
- TIS-18 Enable Speedy SpaceCraft as the preferred individual transit provider Large Team Support 1

**Backlog** 49 issues Create sprint

- TIS-25 Engage Jupiter Express for outer solar system travel Local Mars Office 5
- TIS-37 When requesting user details the service should return prior trip info Space Travel Partners 1
- TIS-9 After 100,000 requests the SeeSpaceEZ server dies Space Travel Partners 1
- TIS-7 500 Error when requesting a reservation Local Mars Office 1

# Question:

## How do you perform a change task?

### **Summary:**

Application crash on clicking the SAVE button while creating a new user.

### **Description:**

Application crash on clicking the SAVE button while creating a new user, hence unable to create a new user in the application

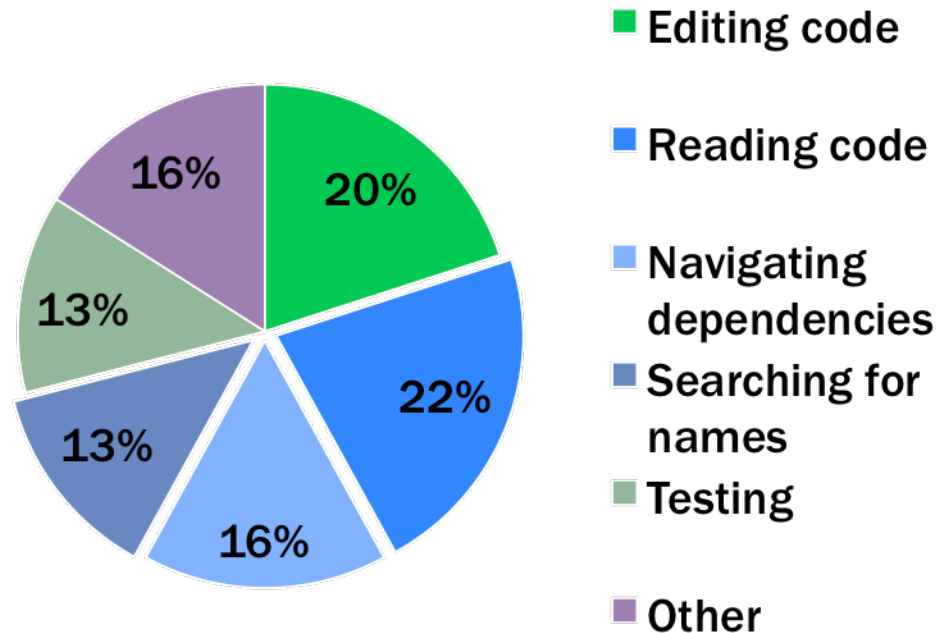
### **Steps to reproduce:**

- 1) Logon into the application
- 2) Navigate to the Users Menu > New User
- 3) Filled all the user information fields
- 4) Clicked on 'Save' Button
- 5) Seen an error page "ORA1090 Exception: Insert values Error..."
- 6) See attached logs for more information and also attached screenshot



# Time spend during change tasks

Division of labor while performing a change task



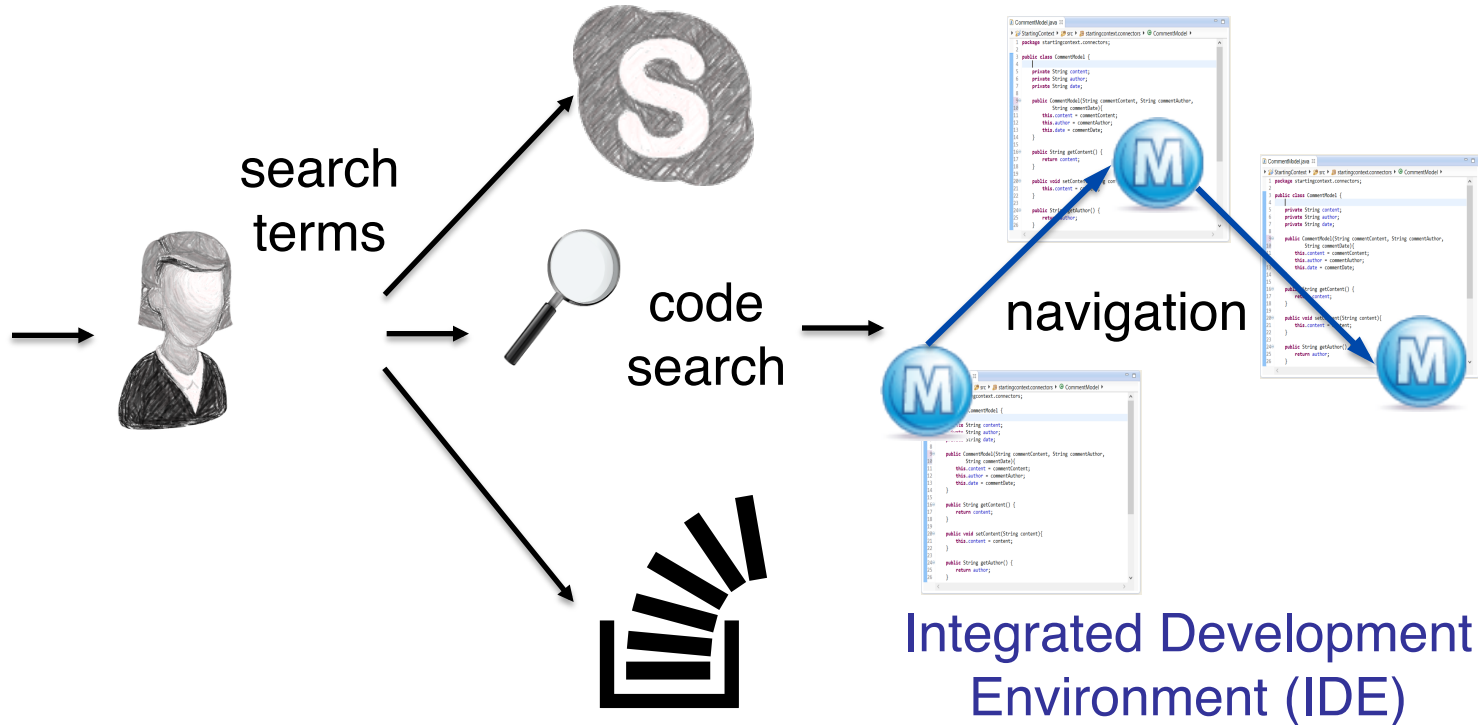
# Working on a change task...

Bug 339808 - mark as landmark and remove from context key-bindings do not work on context page

Status: NEW  
Product: Mylyn Context  
Component: Framework  
Version: unspecified  
Hardware: PC Linux  
Importance: P2 normal (vote)  
Target Milestones: ---  
Assigned To: Shawn Minto (CLA)  
QA Contact: Steffen Pingel (CLA) 2011-03-12 18:20:30 EST

The selection provider of the task editor does not provide the selection of the context viewer, hence the command handlers for remove from context and mark as landmark do not work on the TaskEditor context tab.

change task  
(Jira/Bugzilla/...)



...eventually editing

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# Working on a change task

## Problems/Difficulties:

- Too much code to understand/read all
- Language mismatch: bug reports (NL)  $\neq$  source code
- Crosscutting concerns: code is often tangled and scattered
- ...

## To localize and edit relevant code...

- Identify good search terms
- Take advantage of tool support, e.g. code search, structural navigation support, breakpoints (debugging)
- Take advantage of information provided in bug reports, such as stack traces, and also on news forums, such as stackoverflow

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# Summary

- Evolution is tough but an inherent and important part of software development
  - Evolutionary changes can be corrective, adaptive and perfective
  - API contract compatibility ensures that client code still runs as expected after API evolves
  - Issue Tracking Systems are an integral part of most software development and writing good bug reports is important
  - Much time on a change task is spend navigating and searching
-

# Evolution in action

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## JHotDraw Beta

Brought to you by: [egamma](#), [jeckel](#), [mrfloppy](#), [rawcoder](#)

Summary | Files | Reviews | Support | Wiki | Mailing Lists | **Tickets** | News | Discussion | SVN | CVS

Search Bugs

[Create Ticket](#)  
[View Stats](#)

Group Searches

Changes **18**  
Closed Tickets **95**  
Open Tickets **18**

Help  
[Formatting Help](#)

### #105 Advanced Colors

**Status:** closed-fixed    **Owner:** [Werner Randelshofer](#)    **Labels:** None  
**Priority:** 5  
**Updated:** 2009-03-29    **Created:** 2008-06-16    **Creator:** [Michael Hänni](#)    **Private:** No

Hello

I found a bug in:  
org.jhotdraw.draw.action.EditColorChooserAction  
of JHotDraw 7.1  
java.lang.NullPointerException

How to reproduce:

1. Create a figure (e.g. a rectangle)
2. Choose a fillcolor not from the default colors, but from the advanced colors. (e.g. RGB:red=100:green=100;blue=100)

You get a NullPointerException when you apply this color.  
The reason of this seems to be that the private member "fixedAttributes" of org.jhotdraw.draw.action.EditColorChooserAction is never initialized.

Regards,  
Michael

<https://sourceforge.net/p/jhotdraw/bugs/105/>

<https://sourceforge.net/p/jhotdraw/bugs/search?q=status%3Awont-fix+or+status%3Aclosed-invalid+or+status%3Aclosed-later+or+status%3Aclosed-duplicate+or+status%3Aclosed-accepted+or+status%3Aclosed-remind+or+status%3Aclosed+or+status%3Aclosed-fixed>

# What kind of task? Corrective / adaptive / perfective

The screenshot shows the SourceForge website interface. At the top, there is a navigation bar with the SourceForge logo, a search box, and links for Browse, Enterprise, Blog, Deals, and Help. A 'Create' button is also visible. Below this, there are links for SOLUTION CENTERS and various categories like Go Parallel, Resources, Newsletters, etc. The main content area is for the JHotDraw project, specifically a bug report titled '#105 Advanced Colors'. The bug report includes a search box, a 'Create Ticket' button, and a 'View Stats' button. The bug details are as follows:

- Status:** closed-fixed
- Owner:** Werner Randelshofer
- Labels:** None
- Priority:** 5
- Updated:** 2009-03-29
- Created:** 2008-06-16
- Creator:** Michael Hänni
- Private:** No

The bug description reads: "Hello I found a bug in: org.jhotdraw.draw.action.EditColorChooserAction of JHotDraw 7.1 java.lang.NullPointerException". It includes a "How to reproduce" section with two steps: "1. Create a figure (e.g. a rectangle)" and "2. Choose a fillcolor not from the default colors, but from the advanced colors. (e.g. RGB:red=100:green=100;blue=100)". The report concludes with: "You get a NullPointerException when you apply this color. The reason of this seems to be that the private member 'fixedAttributes' of org.jhotdraw.draw.action.EditColorChooserAction is never initialized." The report is signed "Regards, Michael".

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# Evolution in action

1. Download JHotDraw from  
[ifi.uzh.ch/seal/people/kevic/tools/JHotDraw\\_LabStudy\\_2.zip](http://ifi.uzh.ch/seal/people/kevic/tools/JHotDraw_LabStudy_2.zip)
2. Open Eclipse
3. Import JHotDraw  
Package Explorer > Import >  
Projects from Folder or Archive > Archive
4. Run JHotDraw
  1. Run As > Java Application
  2. Select Main class `org.jhotdraw.samples.draw`

# Fix the bug: first steps?

The screenshot shows the SourceForge website interface. At the top, the SourceForge logo is on the left, followed by a search bar and navigation links: Browse, Enterprise, Blog, Deals, Help, Create, Log In or Join. Below this is a secondary navigation bar with links for SOLUTION CENTERS, Go Parallel, Resources, Newsletters, Cloud Storage Providers, Business VoIP Providers, and Call Center Providers. The main content area shows the breadcrumb path: Home / Browse / JHotDraw / Bugs. The JHotDraw logo is prominently displayed with a 'Beta' badge. Below the logo, it says 'Brought to you by: egamma, jeckel, mrfloppy, rawcoder'. A horizontal menu contains links for Summary, Files, Reviews, Support, Wiki, Mailing Lists, Tickets (selected), News, Discussion, SVN, and CVS. The 'Tickets' dropdown is open, showing a search bar for 'Search Bugs' and buttons for 'Create Ticket' and 'View Stats'. On the left side, there are 'Group Searches' for 'Changes' (18), 'Closed Tickets' (95), and 'Open Tickets' (18), along with 'Help' and 'Formatting Help' buttons. The main ticket area is titled '#105 Advanced Colors' and includes a RSS icon. The ticket details are: Status: closed-fixed, Owner: Werner Randelshofer, Labels: None, Priority: 5, Updated: 2009-03-29, Created: 2008-06-16, Creator: Michael Hänni, Private: No. The ticket content starts with 'Hello' and describes a bug in JHotDraw 7.1 where a NullPointerException is thrown. It provides steps to reproduce the error: 1. Create a figure (e.g. a rectangle), 2. Choose a fillcolor not from the default colors, but from the advanced colors. (e.g. RGB:red=100:green=100;blue=100). The text explains that a NullPointerException is thrown when applying this color, and the reason is that the private member 'fixedAttributes' of org.jhotdraw.draw.action.EditColorChooserAction is never initialized. The ticket concludes with 'Regards, Michael'.

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## JHotDraw Beta

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### #105 Advanced Colors

Status: **closed-fixed** Owner: [Werner Randelshofer](#) Labels: None

Priority: 5

Updated: 2009-03-29 Created: 2008-06-16 Creator: [Michael Hänni](#) Private: No

Hello

I found a bug in:  
org.jhotdraw.draw.action.EditColorChooserAction  
of JHotDraw 7.1  
java.lang.NullPointerException

How to reproduce:

1. Create a figure (e.g. a rectangle)
2. Choose a fillcolor not from the default colors, but from the advanced colors. (e.g. RGB:red=100:green=100;blue=100)

You get a NullPointerException when you apply this color.  
The reason of this seems to be that the private member "fixedAttributes" of org.jhotdraw.draw.action.EditColorChooserAction is never initialized.

Regards,  
Michael