Because you can’t fix what you don’t know is broken…
About me

• Initiator of the Automated Error Reporting Initiative
• Project Lead of Eclipse Code Recommenders
• Eclipse Committer since 2010
• Plug-in Developer for 10+ years (Eclipse 2.1)
• Member of the Eclipse Architecture Council
• Co-Lead of Java User Group Darmstadt
• CEO of Codetrails

• Passion to improve developers day-to-day work with intelligent and practical tools - mostly using Data Mining on Big (Software Engineering) Data.
Adding a **new character** to the plot

Software User

Application Developer

Product Manager
Imagine the following situation...
But when the user **starts the app**...
In the logs you’d find…
The tragedy of manual error reports
The tragedy of manual error reports
What can we do?

Application Developer
The Automated Error Reporting Initiative
Live Demo

Automated Error Reporting Configuration

Thank you for using the Automated Error Reporter
Please take a moment for the initial configuration. All values can be changed in the preferences at any time.

Name: Marcel Bruch
E-mail: marcel.bruch@codetrails.com
Report Anonymization
- [ ] Anonymize package, class, and method names
- [ ] Anonymize error log messages

Learn more... Provide feedback...

Enable Disable

Eclipse Error Reporting

Welcome to the Eclipse Mars Error Reporting Service.
Do you want to help Eclipse?

With your permission Eclipse can inspect errors logged inside the IDE and inform project committers about the issues you experienced. Do you want to help and enable the error reporter?

Enable Disable
„Keep users informed about your progress…“

About server responses, Bugzilla, and immediate feedback
Not yet tracked problems…
Committers needinfo…

Bug 442500 – ….  

Status: NEW  
Resolution: -- --

Your assistance is requested: NullPointerException in Plugin.  
Your issue is known but further information is required.  
Visit #460231  Visit Submission
Fixed...
Won’t Fix…
Invalid (aka log messages)

Bug 442500 – ....

Status: CLOSED
Resolution: INVALID

Log message: NullPointerException in PluginAction....

Your report has been marked as a log message.
If you think your report is actually an error, please visit your report and leave a comment.
Thank you for your help!

Visit #460231  Visit Submission
Do we send all errors to Eclipse...?
The error reporting funnel

structural filter
#1: Structural Filtering

Error connecting to 'http://marketplace.eclipse.org/rss.xml'.

Exception Stack Trace:

java.net.UnknownHostException: marketplace.eclipse.org
    at java.net.AbstractPlainSocketImpl.connect(AbstractPlainSocketImpl.java:184)
    at java.net.Socket.connect(Socket.java:538)
    at com.example.HttpClient.openServer(HttpClient.java:527)
    at com.example.http.HttpClient.<init>(HttpClient.java:211)
    at com.example.HttpURLConnection.connect(HttpURLConnection.java:932)
    at org.eclipse.recommenders.internal.news.rcp.PollFeedJob.run(PollFeedJob.java:69)
    at org.eclipse.core.internal.jobs.Worker.run(Worker.java:55)
#2: Did I already sent this?

- structural filter
- personal filter
#3: Did **anyone else** sent this?
If you hit a known issue…

You hit a known issue in Eclipse. Now we need your help.

'some error message' appears to be hard to reproduce. Please help us fixing it by providing further details.

View Details

You hit an already fixed issue. Time to update?

'some error message' was marked as FIXED.
Please visit Eclipse Bugzilla for details.

View Details  Visit #452200
#4: Review

- structural filter
- personal filter
- global hist.
- review
#4: Review

We noticed a new error event was logged. Such error events may reveal issues in the Eclipse codebase, and thus we kindly ask you to report them to eclipse.org.

Which steps did cause this issue?

### Details

**Exception:** java.lang.ClassNotFoundException: org.apache.commons

at org.eclipse.epp.internal.logging.aeri.ui.actions.Log
at org.eclipse.epp.internal.logging.aeri.ui.actions.Log
at org.eclipse.epp.internal.logging.aeri.ui.actions.Log
at org.eclipse.epp.internal.logging.aeri.ui.actions.Log
at org.eclipse.core.internal.jobs.Worker.run(Worker.java

```
REPORT
-----
anonymousId  f8087d7b-9d38-4c73-aeb1-6991603c2a84
name         Marcel Bruch
email        marcel.bruch@codetrails.com
comment      Which steps did cause this issue?
eclipseBuildId  unit-tests
```

- [ ] Mark this event as 'not a bug'
- [ ] Skip similar errors in the future

- [ ] Remember my decision
  - permanently
  - until restart
  - for 24 hours
Walkthrough through the committer front-end

The server side
The core concepts
The committer front-end
Creating bug reports

![Image of bug report creation in Eclipse]

**Problem Summary**
- **Problem Id:** 5589244be4b08735226aa9d4
- **Summary:** NullPointerException in LauncherUtilsStatusHandler.selectWorkspaceField (74)
- **Projects:** Plug-in Development Environment

**Watchers:**
- **Email:** cedric brun@obeo.fr
- **When:** CC_LIST_ON_CREATION

**Reporters:**
- **Anonymous Id:** 8a78fb03-87cd-46ed-950c-327afddc93ce

**Opening Incident**
- **Environment:**
  - **Id:** 5589244be4b08735226aa9d3
  - **Created on:** 15-06-23 11:18:03
  - **Kind:** NORMAL

**Quick Actions**
- Create bug report
- Close as log message
- Go to triage page
Creating bug reports

The following incident was reported via the automated error reporting:

code: 0
plugin: org.eclipse.ui_3.107.0.v20150507-1945
message: Unhandled event loop exception
fingerprint: c43cfc79
exception class: org.eclipse.swt.SWTException
exception message: Failed to execute runnable (java.lang.NullPointerException)
number of children: 0
org.eclipse.swt.SWTException: Failed to execute runnable (java.lang.NullPointerException)
at org.eclipse.swt.SWT.error(SWT.java:4491)
at org.eclipse.swt.widgets.Synchronizer.runAsyncMessages(Synchronizer.java:138)
at org.eclipse.swt.widgets.Display.runAsyncMessages(Display.java:4155)
at org.eclipse.swt.widgets.Display.readAndDispatch(Display.java:3772)
at org.eclipse.ed.ui.internal.workbench.swt.PartRenderingEngine$4.run(PartRenderingEngine.java:1127)
at org.eclipse.core.databinding.observable.Realm.runWithDefault(Realm.java:337)
at org.eclipse.ed.ui.internal.workbench.swt.PartRenderingEngine.run(PartRenderingEngine.java:1018)
Notifying committers
Project Alerts

Alerts Configure how and when Confess informs you about new and updated problems.

**Label:** Weekly Normal Problems Digest for Recommenders

**Conditions**
Minimum numbers of distinct reporters: 1

**Problem kind:**
NORMAL, OOME, SOE

**Actions**
- Automatically executed (once) when above conditions are met
  - Bugzilla: Create Bugzilla bugs for every problem when above conditions are met
  - Weekly Digest Email: Notify developers listed below by weekly emails.
  - Daily Digest Email: Notify developers listed below by daily emails about every problem that met above conditions the first time

Enter email address...
Add
Weekly or daily email digests

Eclipse Error Reports Bot
To: Recommenders developer discussions
Weekly Normal Problems Digest

Hi,

this is the weekly digest for Code Recommenders. The status of all problems on this list is open. Items on this list may already be tracked in Bugzilla but were not closed yet. To remove a item from this list, you can either (i) set the status of its associated bug to resolved, verified, or closed or (ii) mark it as log message in the reporter's web ui.

If you have any questions about this report, please send an email to error-reports-inbox@eclipse.org

Top new problems (last 7 days):

<table>
<thead>
<tr>
<th>Problem</th>
<th>Reporters</th>
<th>Bug</th>
</tr>
</thead>
<tbody>
<tr>
<td>NullPointerException in BinaryTypeBinding.getMethod (1191)</td>
<td>2</td>
<td>469460 N</td>
</tr>
<tr>
<td>ArrayIndexOutOfBoundsException in AssistParser.popElement (1912)</td>
<td>1</td>
<td>469471 N</td>
</tr>
<tr>
<td>NullPointerException in BinaryTypeBinding.resolveType (160)</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>StandInException in PrivacySettingsService.store (147)</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Top unresolved, active problems (last 7 days):

<table>
<thead>
<tr>
<th>Problem</th>
<th>Reporters</th>
<th>Bug</th>
</tr>
</thead>
<tbody>
<tr>
<td>OperationCanceledException in CompletionEngine.checkCancel (1683)</td>
<td>46</td>
<td>459172 U</td>
</tr>
<tr>
<td>ClassNotFoundException in BundleLoader.findClassInternal (423)</td>
<td>25</td>
<td>466885 N</td>
</tr>
<tr>
<td>ClassNotFoundException in BundleLoader.findClassInternal (432)</td>
<td>5</td>
<td>467950 N</td>
</tr>
<tr>
<td>LogTraceException in AbstractCompletionSessionProcessor.applied (191)</td>
<td>3</td>
<td>467798 N</td>
</tr>
<tr>
<td>LogTraceException in Repositories.getRepository (104)</td>
<td>2</td>
<td>469016 N</td>
</tr>
</tbody>
</table>
Some fun facts

e = mc²  →  errors = (more code)²
Disclaimer

Don’t draw preliminary conclusions!
Please consult your personal statistician…
How many Mars users?

450 simrel committers
1200 eclipse committers
~150,000 error reporters
Mars Users?
Error reporters per week
When do they report?
What **kinds of errors** do users report?

- **Logged Errors and Exceptions**: 79%
- **3rd Party reports**: 18%
- **UI Freeze reports**: 3%
How hard do they suffer?

1-2 reports
83,000 users

3-50 reports
64,000 users

50-300 reports
2,200 users

300 - 7000 reports
140 users
The suffering top 100
Excursion on duplicate detection

Incoming Error Reports

problems grouped into

assigned to

Projects
Effect of grouping errors by location

1,067,422 error reports

group by location and exception type

29,489 problems

16,577 exceptions
3,851 ui freezes
other
First-time appearance of a problem
What are the most 'popular' exceptions?
What are the most 'popular' exceptions?

by unique location in source code

- **NullPointerException**: 29%
- **ClassCastException**: 4%
- **IllegalArgumentException**: 8%
- **IndexOutOfBoundsException**: 4%
- **{File} IOException**: 9%
- **Other**: 39%
- **No{XYZ}DefFoundError**: 8%
NullPointerExceptions by Projects

Statisticians, note: Projects automatically marked as „being responsible“ fixing these NullPointerExceptions but does not mean the NPE happened in their code.
Tip: Enable null analysis

```java
@Override
protected void run(@Nullable List<Incident> slice) {
    for (Incident incident : slice) {
```
JDT offers a lot…
Tip: Never return **null**

Use `java.util.Optional` or `com.google.common.base.Optional` instead

```java
@Override
public Optional<String> getReason() {
    return Optional.ofNullable(cause);
}
```
Oh Class, Were Art Thou?

Use proper `import` ranges and define `uses` on your exports to get rid of {Class | Method | Field} DefNotFoundErrors, LinkageErrors, and some ClassCastException. OSGI needs that information to work properly...

```
Import-Package: 
    com.google.common.annotations;version="[15.0.0,16.0.0)",

Export-Package: org.eclipse.recommenders.utils;
    uses:="org.osgi.framework,
        org.eclipse.core.runtime,
        com.google.common.base,
        com.google.common.collect"
```
Index out of bounds?

-1 and `array.length` do not work. No matter how often you try…

There is no tool support for this. Just unit tests and code that tries to fail gracefully.
Tip: If error messages are not helpful...

10% of all logged errors do not contain stack traces.

```java
try {
    // ...
} catch (Exception e) {
    log("An error occurred", e);
}
```

```java
try {
    // ...
} catch (Exception e) {
    log("Invalid argument {}", value, e);
}
```
Are your users ready for Java 8?

Which VM do users run the Eclipse IDE with?

Java 1.8
73%

Java 1.7
25%

Java 1.9
0.1%

both
1.7%
Do people anonymize their messages?

Are you concerned that your exception message may reveal sensitive data?

- Yes: 18%
- Sometimes: 2%
- No: 80%
Speak plain: Does it work?

Bugfixing Rates
Fixed bugs by projects

- More (50) - 214
- Platform - 13
- JSDT - 21
- JDT - 25
- Papyrus - 28
- Recommenders - 58
- Xtext - 69
- Oomph - 81

Bugzilla
TL;DR

Since January 2015 149,115 users reported 1,067,422 logged errors with 526,942 unique stack traces which dupe detection grouped into 16,577 problems in Eclipse code and 3,851 ui freezes of which committers created 1,913 Bugzilla bugs and fixed 512 to date.

But we are not quite done yet…
Future Work?

To be decided tonight.

Join the AERI BoF tonight at 20:00 in Seminarraum 5, Ground Floor.

The BoF session will have a walk-through through the committer UI.

Committer discussions how error reporting should evolve for Neon.
How to reach EPP Logging

- **Code:** Check out the **EPP Logging** Oomph profile
- **Wiki:** https://wiki.eclipse.org/EPP/Logging
- **Manual:** https://dev.eclipse.org/recommenders/community/confess/#/about
- **Forum:** https://www.eclipse.org/forums/index.php/f/69/
- **Bugzilla:** https://bugs.eclipse.org/bugs/buglist.cgi?component=logging&product=EPP
- **Mail:** error-reports-inbox@eclipse.org
Credits

• Daniel Haftstein, Codetrails – Eclipse client conception and implementation
• Marcel Bruch, Codetrails – Server-side conception and implementation

• Webmasters, Eclipse Foundation – Eclipse server infrastructure & integration
• Thanks to many early adopters and committers providing feedback
Contact Us

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