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# Effective Eclipse: Coding, Debugging, Teamwork

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Senior Software Developer, Red Hat  
25 June 2010

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# Agenda

- Background
- Code editing
- Build and compiler integration
- Debugging
- Teamwork
- Linux-specific tools

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# Agenda

- **Background**
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# Background

- Eclipse has a long history
- Eclipse community is large
- Eclipse technology is diverse

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# Eclipse as a development tool

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What does it look like?

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C/C++ - factorial/factorial.cpp - Eclipse SDK

File Edit Source Refactor Navigate Search Project Run Window Help

Project Explorer: Project Ex

- asdf
- asdfasdf
- AutotoolsProject
- >eclipse [cvs.fedoraproject.org]
- factorial
- LTTng
- LTTng2
- rpm
- simpleMassifTest
- simpleMemcheckTest

Editor: factorial.cpp

```

#include <stdio.h>

unsigned long long factorial1(unsigned long long);
unsigned long long factorial2(unsigned long long);

int main() {
    for (int i = 0; i < 1000000; i++) {
        factorial1(20);
        factorial2(20);
    }
}

unsigned long long factorial1(unsigned long long n) {
    if (n <= 1)
        return 2;
    else
        return n * factorial1(n-1);
}

unsigned long long factorial2(unsigned long long n) {
    unsigned long long ret = 1;
    printf("hello");
    for (unsigned int i = 1; i <= n; i++)
        ret *= i;
}

```

Outline: stdio.h, factorial1(unsigned long long), factorial2(unsigned long long), main(): int, factorial1(unsigned long long), factorial2(unsigned long long)

Problems: 31 errors, 106 warnings, 0 others (Filter matched 131 of 137 items)

Description	Resource	Path	Location	Type
Errors (31 items)				
Warnings (100 of 106 items)				

Writable Smart Insert 17 : 23

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# RPMs

- C/C++ tools available in `eclipse-cdt` RPM
- Java tools available in `eclipse-jdt` RPM

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# Code Editing

- **Navigation**
- Outline
- Completion
- Error highlighting

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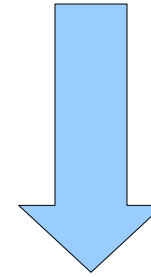
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```
//Initialize graph  
g = new StapGraph(graphComp, SWT.BORDER, treeComp, papaCanvas, this);  
g.setLay  
up.addSe  
org.eclipse.linuxtools.callgraph.StapGraph.StapGraph(Composite parent, int style,  
Composite treeComp, Canvas tCanvas, CallgraphView callgraphView)
```

Ctrl-click or F3



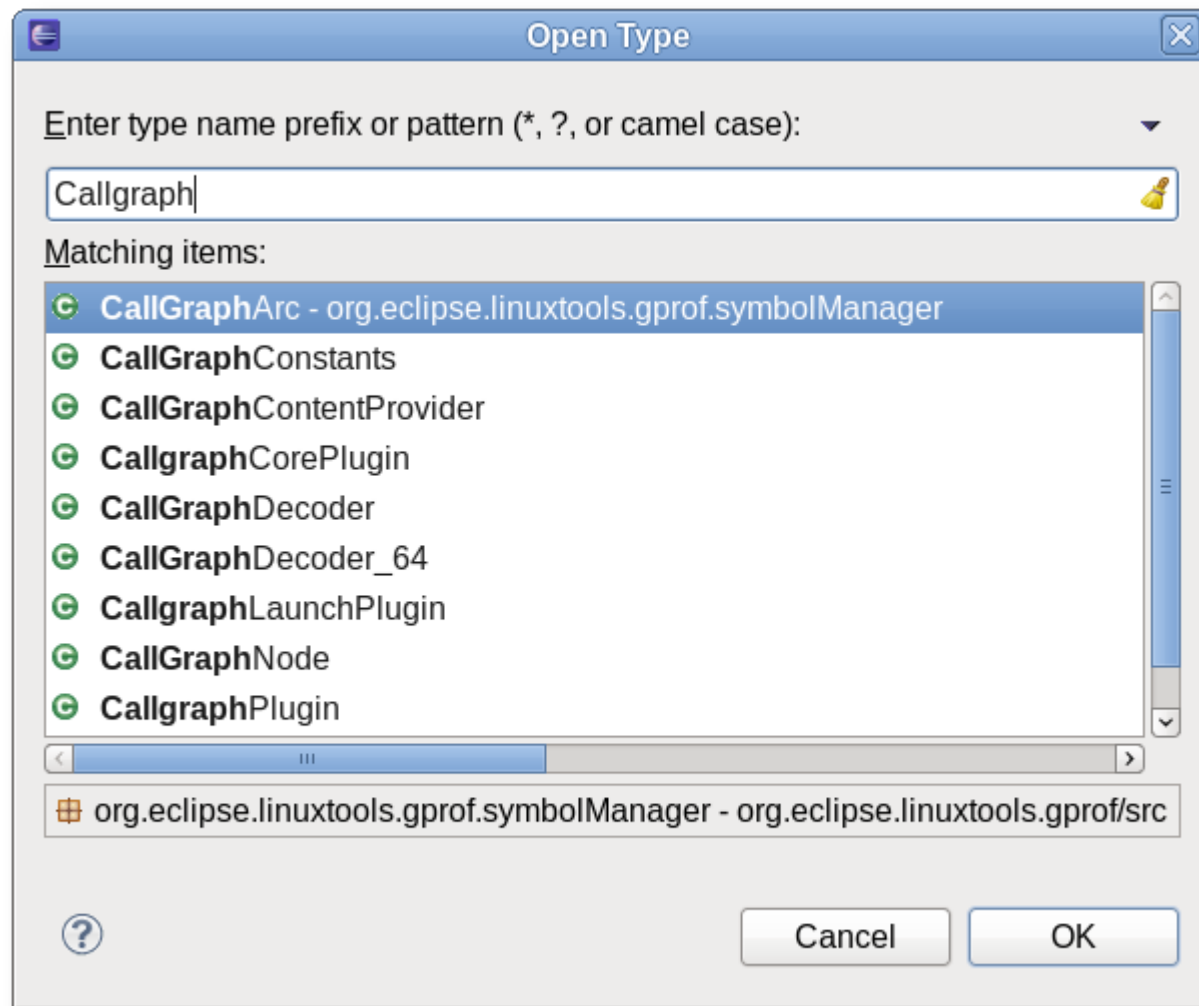
```
CallgraphView.java StapGraph.java  
public StapGraph(Composite parent, int style, Composite  
    CallgraphView callgraphView) {  
    super(parent, style);  
  
    //-----Initialize variables  
    thumbCanvas = tCanvas;  
    nodeMap = new HashMap<Integer, StapNode>();  
    levels = new HashMap<Integer, List<Integer>>();  
    nodeDataMap = new HashMap<Integer, StapData>();  
    aggregateTime = new HashMap<String, Long>();  
    aggregateCount = new HashMap<String, Integer>();  
    currentPositionInLevel = new HashMap<Integer, Integer>();  
    collapsedLevelSize = new HashMap<Integer, Integer>();  
    markedNodes = new ArrayList<Integer>();  
    markedCollapsedNodes = new ArrayList<Integer>();
```

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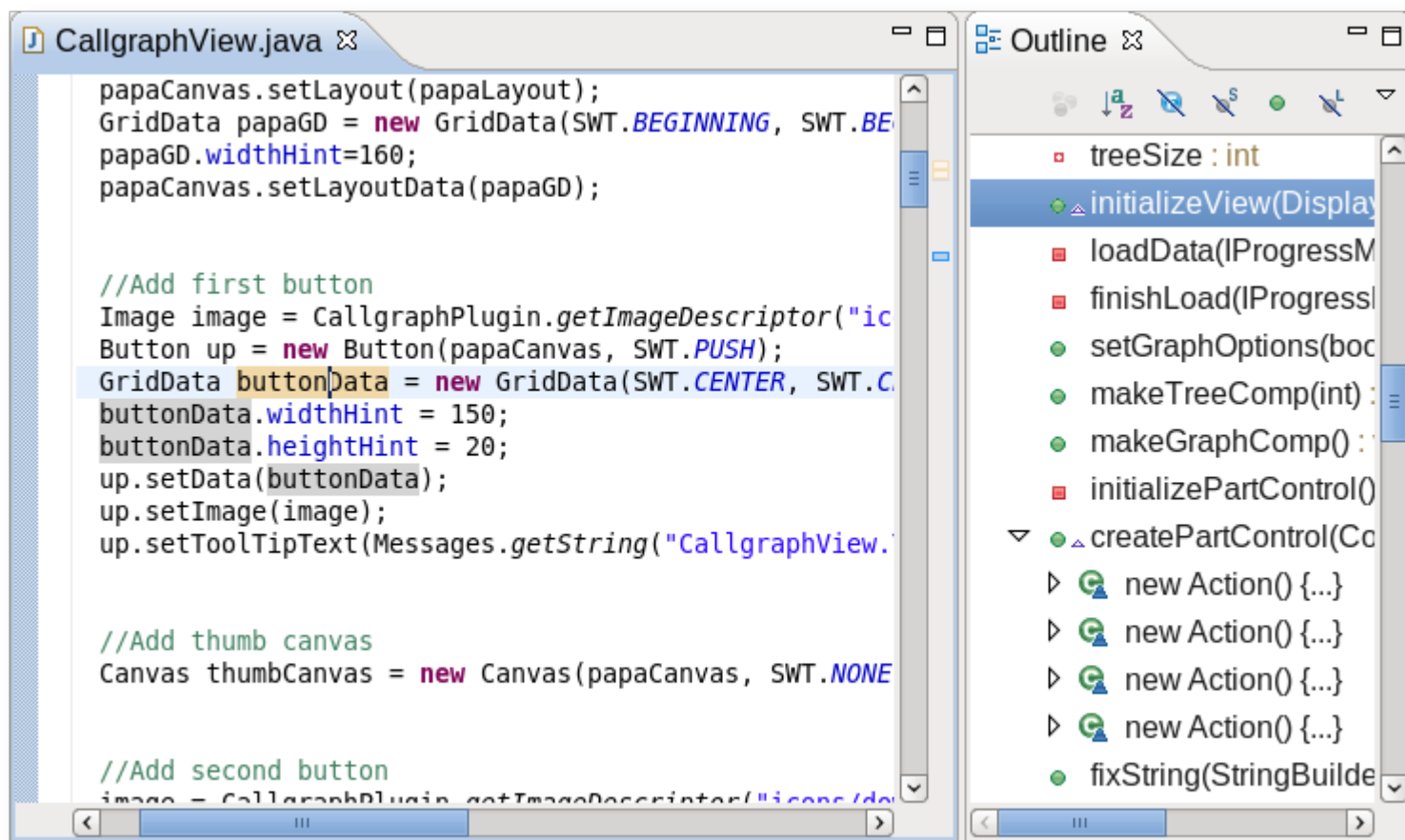
## Ctrl-Shift-t – Open Type

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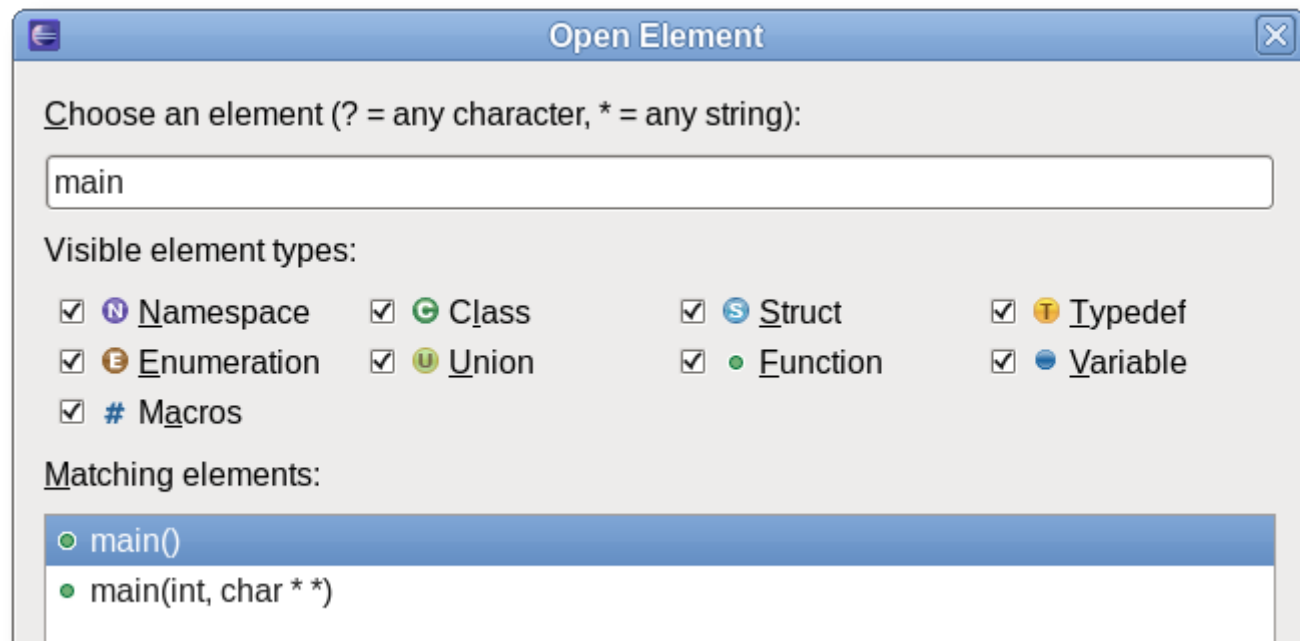


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## Ctrl-Shift-t – Open Element

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# Code Editing

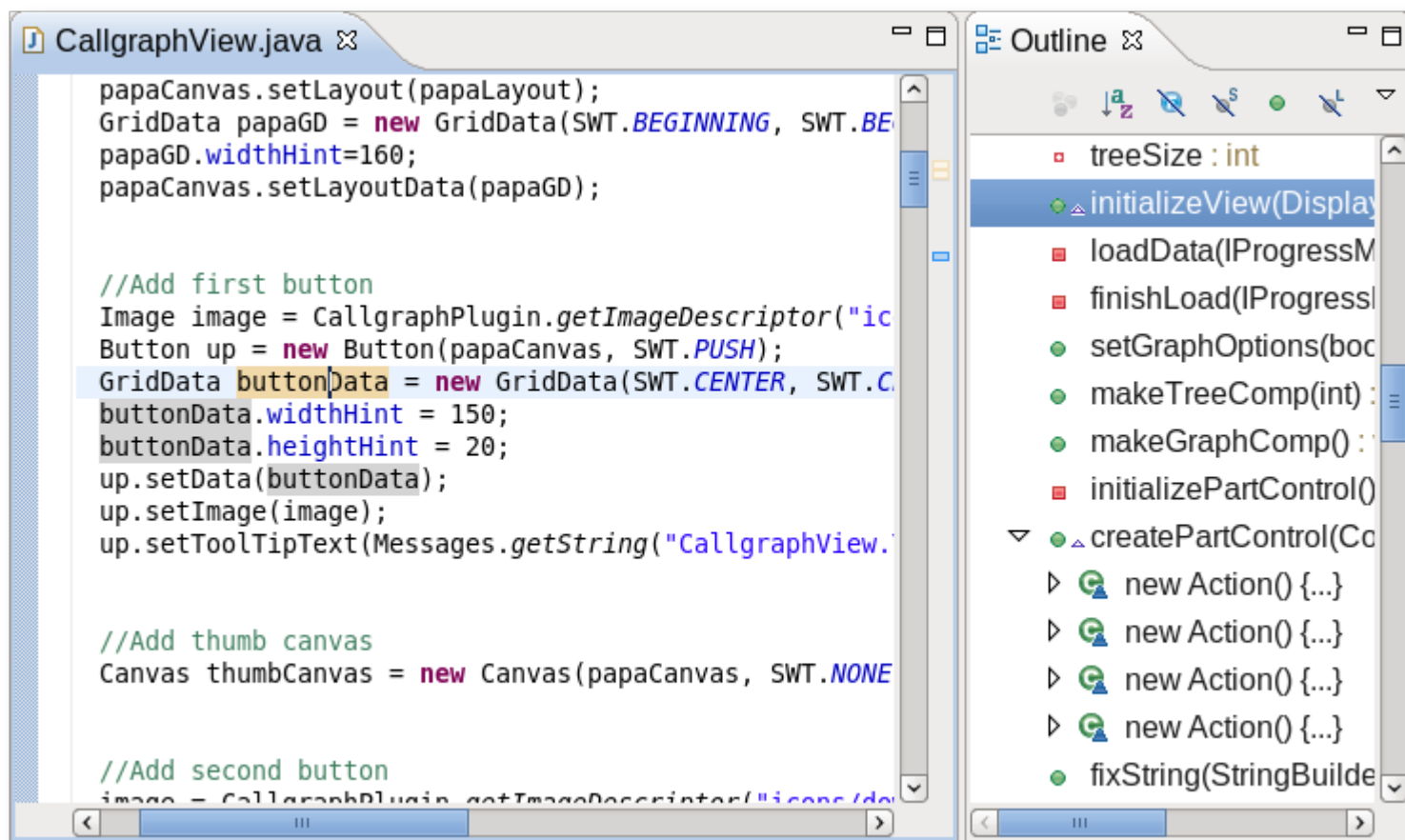
- Navigation
- **Outline**
- Completion
- Error highlighting

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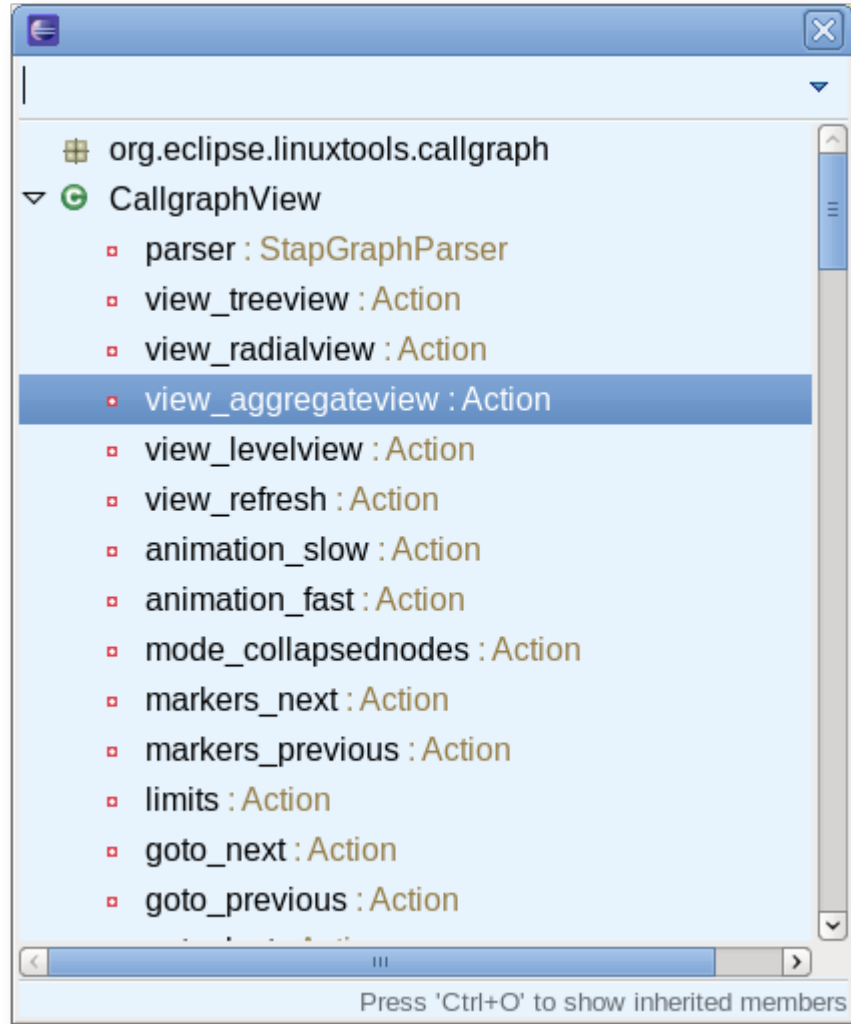


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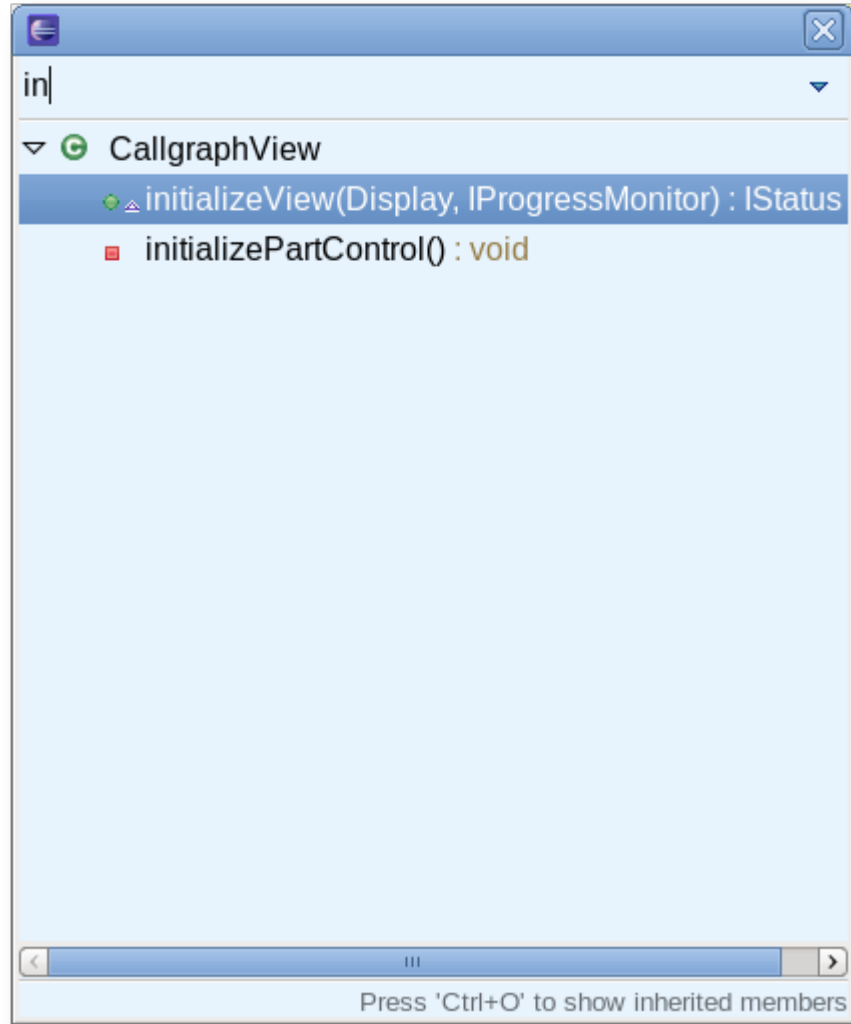
## Ctrl-o – Quick Outline (Java)

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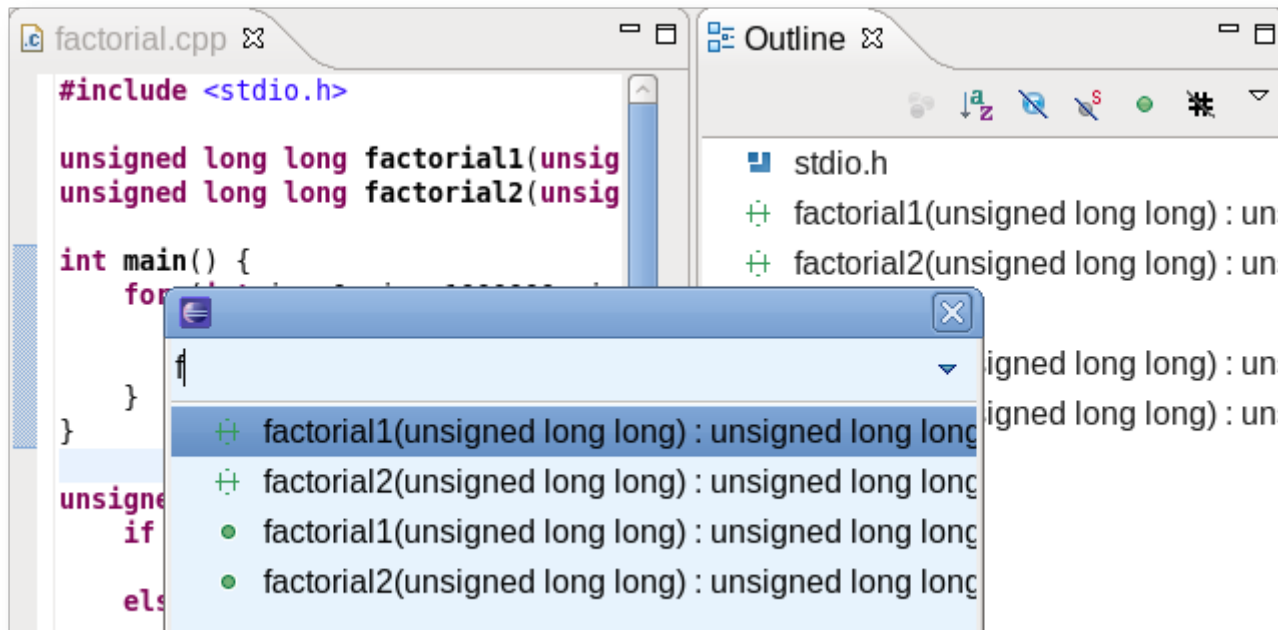
## Ctrl-o – Quick Outline (Java)

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## Ctrl-o – Quick Outline (C/C++)

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# Code Editing

- Navigation
- Outline
- **Completion**
- Error highlighting

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```
unsigned long long factorial1(unsigned long long n) {
    if (n <= 1)
        return 2;
    else
        return n * factorial1(n-1);
}
pri
```

- printf (const char \*template, ...) int
- printf\_size (FILE \*fp, const struct printf\_info \*info, const voi
- printf\_size\_info (const struct printf\_info \*info, size\_t n, int \*e
- printf(const char \* \_\_format,...) : int
  - PRIO\_PGRP
  - PRIO\_PROCESS

The printf function prints the optional arguments under the control of the template string template to the stream. It returns the number of characters printed, or a negative value if there was an output error.

**Ctrl-⟨Spacebar⟩**  
(Almost all languages and tools)



Java - org.eclipse.linuxtools.callgraph/src/org/eclipse/linuxtools/callgraph/CallgraphView.java - Eclipse SDK

File Edit Source Refactor Navigate Search Project Run Window Help

Package Explorer

- org.eclipse.linuxtools.all 24802 [s]
- org.eclipse.linuxtools.binutils 238
- org.eclipse.linuxtools.callgraph 24
- JRE System Library [JavaSE-1
- Plug-in Dependencies
- src 24482
- org.eclipse.linuxtools.callgra
- AggregateLayoutAlgorithr
- CallGraphConstants.java
- CallgraphPlugin.java 236
- CallgraphView.java 2412
- Messages.java 23197
- StapData.java 23739
- StapGraph.java 24114
- StapGraphParser.java 24
- StapNode.java 23900
- messages.properties 240
- org.eclipse.linuxtools.callgra
- org.eclipse.linuxtools.callgra

CallGraphConstants.java

```

papaCanvas.setLayout(papaLayout);
GridData papaGD = new GridData(SWT.BEGINNING, SWT.BE
papaGD.widthHint=160;
papaCanvas.setLayoutData(papaGD);

//Add first button
Image image = CallgraphPlugin.getImageDescriptor("ic
Button up = new Button(papaCanvas, SWT.PUSH);
GridData buttonData = new GridData(SWT.CENTER, SWT.C
buttonData.widthHint = 150;
buttonData.heightHint = 20;
up.setData(buttonData);
up.setImage(image);
up.

```

\*CallgraphView.java

Outline

- play : Action
- save\_dot : Action
- save\_col\_dot : Action
- save\_cur\_dot : Action
- save\_text : Action
- playImage : ImageDe
- pauselImage : Imagef
- menu : IMenuManage
- gotoMenu : IMenuMa

Writable

Press 'Ctrl+Space' to show Template Proposals

- handle : long - Widget
- addControlListener(ControlListener listener) : void - Con
- addDisposeListener(DisposeListener listener) : void - W
- addDragDetectListener(DragDetectListener listener) : vc
- addFocusListener(FocusListener listener) : void - Contro
- addHelpListener(HelpListener listener) : void - Control
- addKeyListener(KeyListener listener) : void - Control
- addListener(int eventType, Listener listener) : void - Wid
- addMenuDetectListener(MenuDetectListener listener) : v
- addMouseListener(MouseListener listener) : void - Cont
- addMouseMoveListener(MouseMoveListener listener) :

Adds the listener to the collection of listeners who will be notified when the control is moved or resized, by sending it one of the messages defined in the ControlListener interface.

**Parameters:**  
**listener** the listener which should be notified

**Throws:**  
[IllegalArgumentException](#) -  

- ERROR\_NULL\_ARGUMENT - if the listener is null

[SWTException](#) -  

- ERROR\_WIDGET\_DISPOSED - if the receiver has been disposed
- ERROR\_THREAD\_INVALID\_ACCESS - if not

Press 'Tab' from proposal table or click for focus

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# Code Editing

- Navigation
- Outline
- Completion
- **Error highlighting**

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```
//Initialize graph  
g = new StapGraph(graphComp, SWT.BORDER, treeComp  
ga.bla;
```

ga cannot be resolved to a variable

10 quick fixes available:

- ⊙ [Create local variable 'ga'](#)
- ▣ [Create field 'ga'](#)
- ⊙ [Create parameter 'ga'](#)
- ⊙ [Create class 'ga'](#)
- ▣ [Create constant 'ga'](#)
- ↔ [Change to 'g'](#)
- ⓘ [Create interface 'ga'](#)
- Ⓔ [Create enum 'ga'](#)

Press 'F2' for focus

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```
unsigned long long factorial1(unsigned long long n)
{
    if (n <= 1)
        return 2;
    else
        return n * factorial1(n-1);
}
pri
}
unsi
```

**x** 'pri' was not declared in this scope

Press 'F2' for focus

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# Build and compiler integration

- Java: on-the-fly, built-in compiler
- C/C++: gcc

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# Build and compiler integration

- Java: ant debugging
- C/C++: GNU Autotools, make

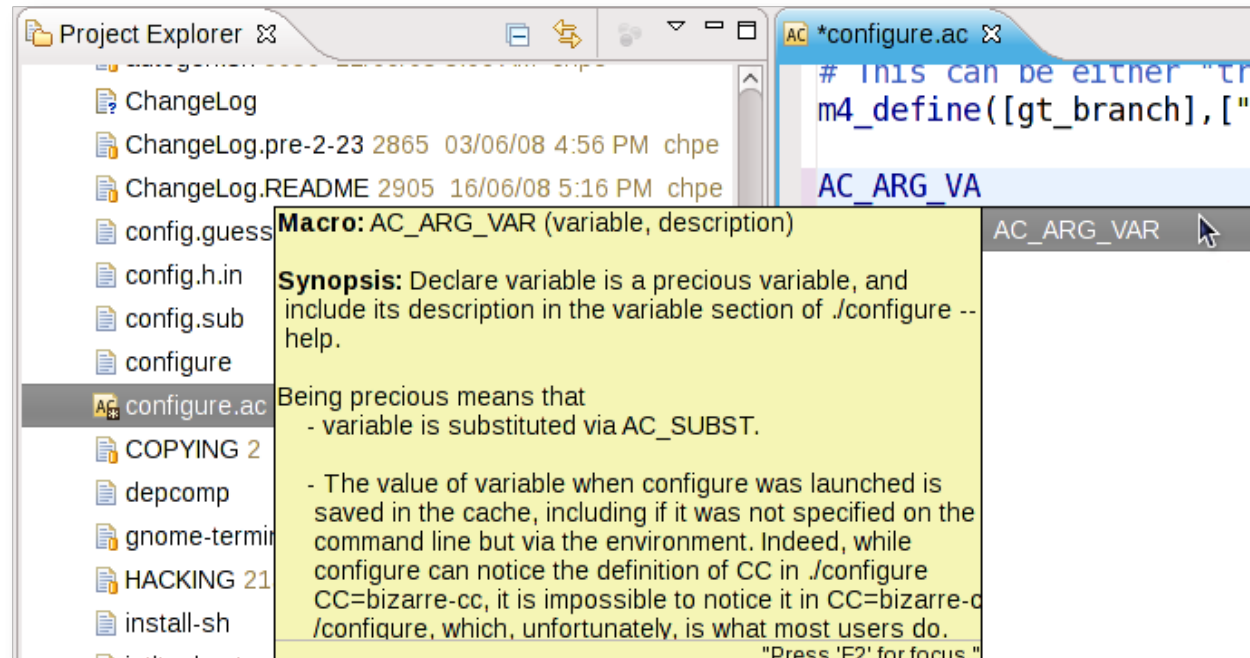
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# GNU Autotools

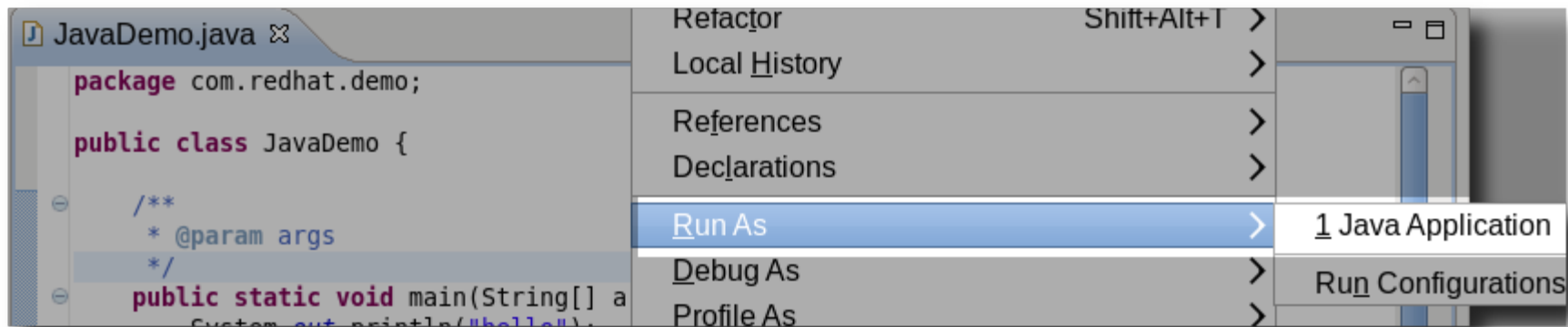


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## Launching what was built

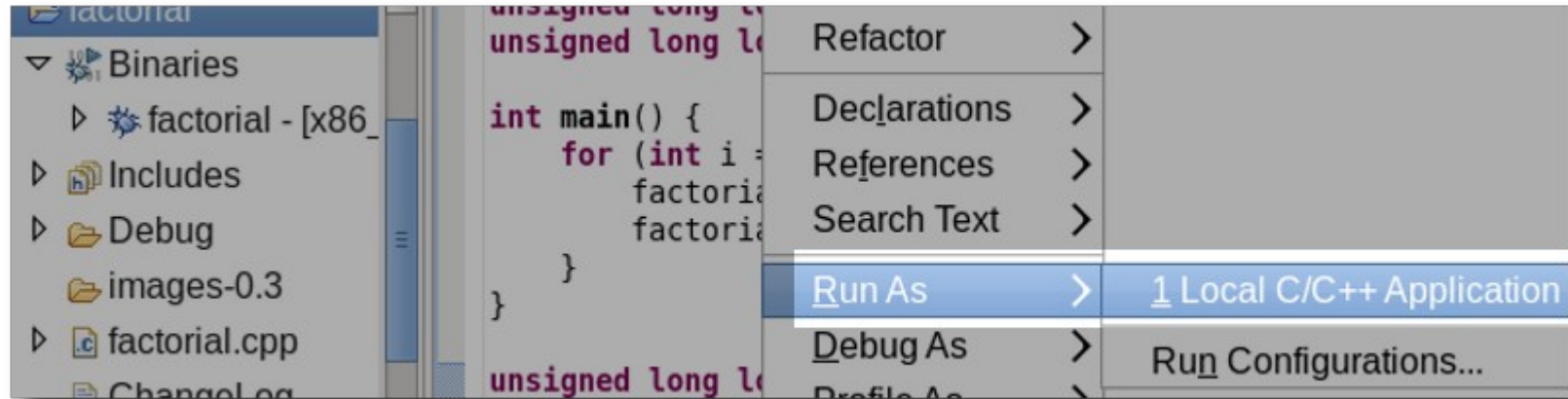
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## Launching what was built

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Debug - JOSM/src/org/openstreetmap/josm/Main.java - Eclipse SDK

File Edit Source Refactor Navigate Search Project Run Window Help

Debug

Thread [AWT-EventQueue-0] (Suspended (breakpoint hit in java.lang.Thread.sleep(0)))

- MainApplication(Main).addLayer(Layer) line: 219
- DownloadGpsTask\$Task.finish() line: 49
- PleaseWaitRunnable\$1.run() line: 69
- InvocationEvent.dispatch() line: 216
- EventQueue.dispatchEvent(AWTEvent) line: 602
- EventDispatchThread.pumpOneEventForFilters(int) line: 104

Variables

Name	Value
gettingStarted	GettingStarted (id=78)
menu	MainMenu (id=81)
redoUndoListener	Main\$1 (id=85)

Main.java

```

* Add a new layer to the map. If no map exists, create one.
*/
public final void addLayer(final Layer layer) {
    if (map == null) {
        final MapFrame mapFrame = new MapFrame();
        setMapFrame(mapFrame);
        mapFrame.selectMapMode((MapMode)mapFrame.getDefaultButtonAction());
        mapFrame.setVisible(true);
        mapFrame.setVisibleDialogs();
        // bootstrapping problem: make sure the layer list dialog is going to
        // listen to change events of the very first layer
    }
}

```

Writable Smart Insert

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Debug - archer.upstream/gdb/cp-namespace.c - Eclipse Platform

File Edit Source Refactor Navigate Search Run Project Pydev Window Help

Debug

gdb/mi (6/9/10 2:44 PM) (Suspended)

Thread [1] (Suspended)

22 cp\_lookup\_symbol\_imports() /notnfs/swagiaal/src/arch

21 lookup\_symbol\_aux\_local() /notnfs/swagiaal/src/archer

20 lookup\_symbol\_aux() /notnfs/swagiaal/src/archer.upstr

Variables

Name	Value
scope	0x00000000
name	0x00007ffffff

0x7fffffff630 "main"

dwarf2read.c temp-op.cc valops.c cp-namespace.c

```

/* Go through the using directives. If any of them add new
names to the namespace we're searching in, see if we can find a
match by applying them. */
for (current = block_using (block);
     current != NULL;
     current = current->next)
{
    len = strlen (current->import_dest);
    directive_match = (search_parents
                       ? (strncmp (scope, current->import_dest,
                                   strlen (current->import_dest)) =
                          && (len == 0

```

Outline

- initialize\_namespace\_synt
- get\_possible\_namespace\_t
- free\_namespace\_block(str
- check\_possible\_namespac
- check\_one\_possible\_name
- lookup\_possible\_namespac
- maintenance\_cplus\_names
- cp\_scan\_for\_anonymous\_r
- cp add using directive(cor

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# CVS / Subversion Annotation

**Revision** | **Tags**

Revision	Tags
Older than This Month	
1.704	eclipse-3_5_2-4_fc14
1.703	eclipse-3_5_2-3_fc14
1.702	eclipse-3_5_2-2_fc14

**eclipse-3\_5\_2-4\_fc14**

\* Mon Apr 12 2010 Andrew Overholt <overholt@redhat.com> 1:3.5.2-4  
- Rebuild to pick up new xulrunner.

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# CVS / Subversion Comparison

```
org.eclipse.linuxtools.chan...hangeLogAction.java [Local] | svn+ssh://aoverholt@dev.ec...ogAction.java [Base:24497]
```

```
if (formatterConfigElement.getAttribute("in
"true")) { //$NON-NLS-1$
try {
// Fix for bug #315976
changelog = openEditor((IFile)pf.ge
clw.setFormatter(extensionManager.g
clw.getEntryFilePath(), pre
} catch (Exception e) {
// do nothing changelog will be nul
}
} else {
// external changelog
// get formatter
clw.setFormatter(extensionManager.getFo
entryFileName, pref_Formatter))
}

"true")) { //$NON-NLS-1$
try {
IWorkbenchPage ref = getWorkben
IWorkbenchPart part = ref.getAc
if (part instanceof IEditorPart
changelog = (IEditorPart)pa
}
clw.setFormatter(extensionManag
clw.getEntryFilePath(),
} catch (Exception e) {
// do nothing changelog will be
}
} else {
// external changelog
// get formatter
```

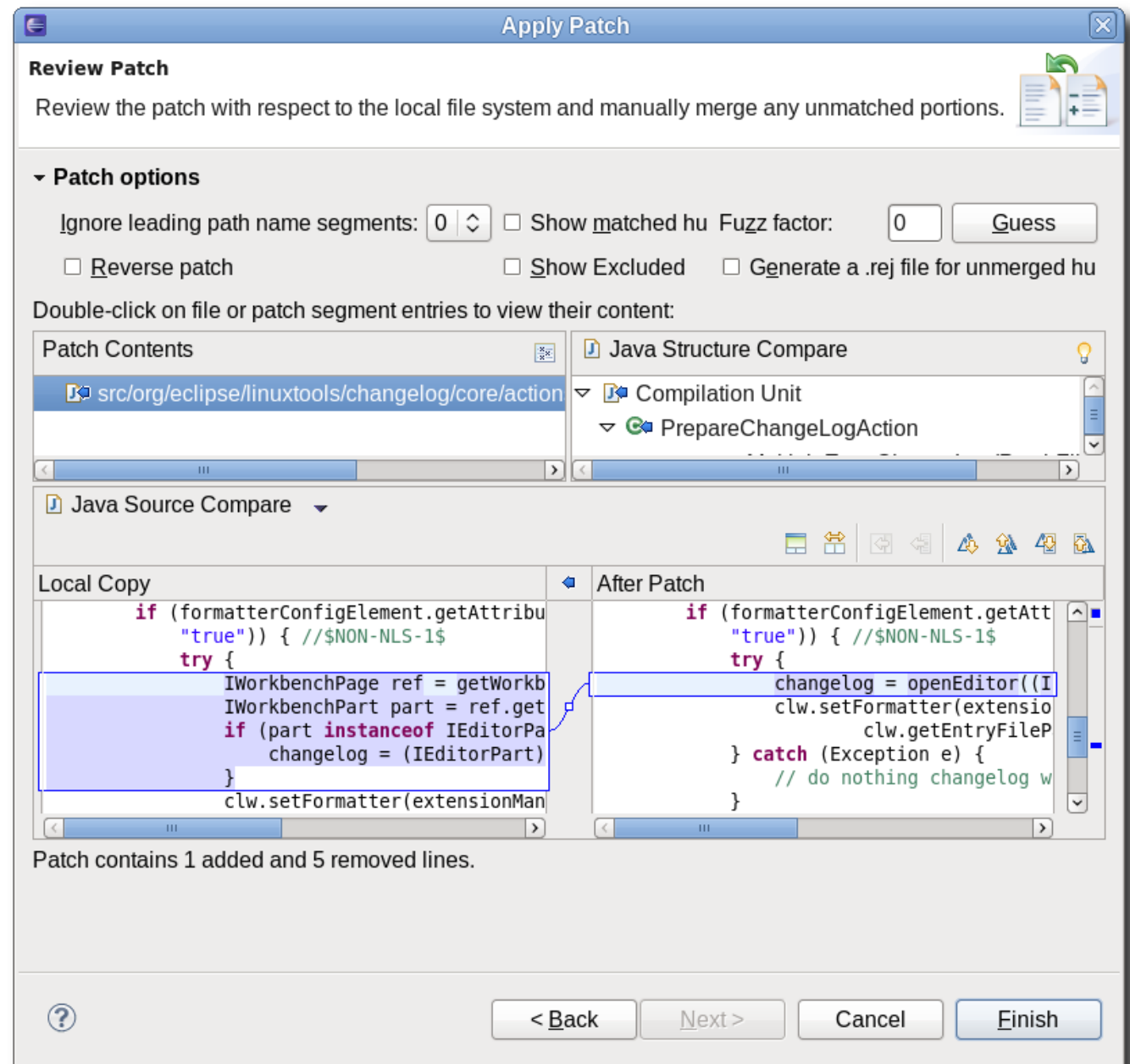
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# Patch Application



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# Teamwork with CVS and Subversion

- Commit, revert, etc.
- Comparison
- Annotations
- Branching, tagging
- Patch generation and application



# Teamwork with CVS and Subversion

- CVS integration part of all Eclipse RPM installations
- SVN comes with eclipse-subclipse RPM

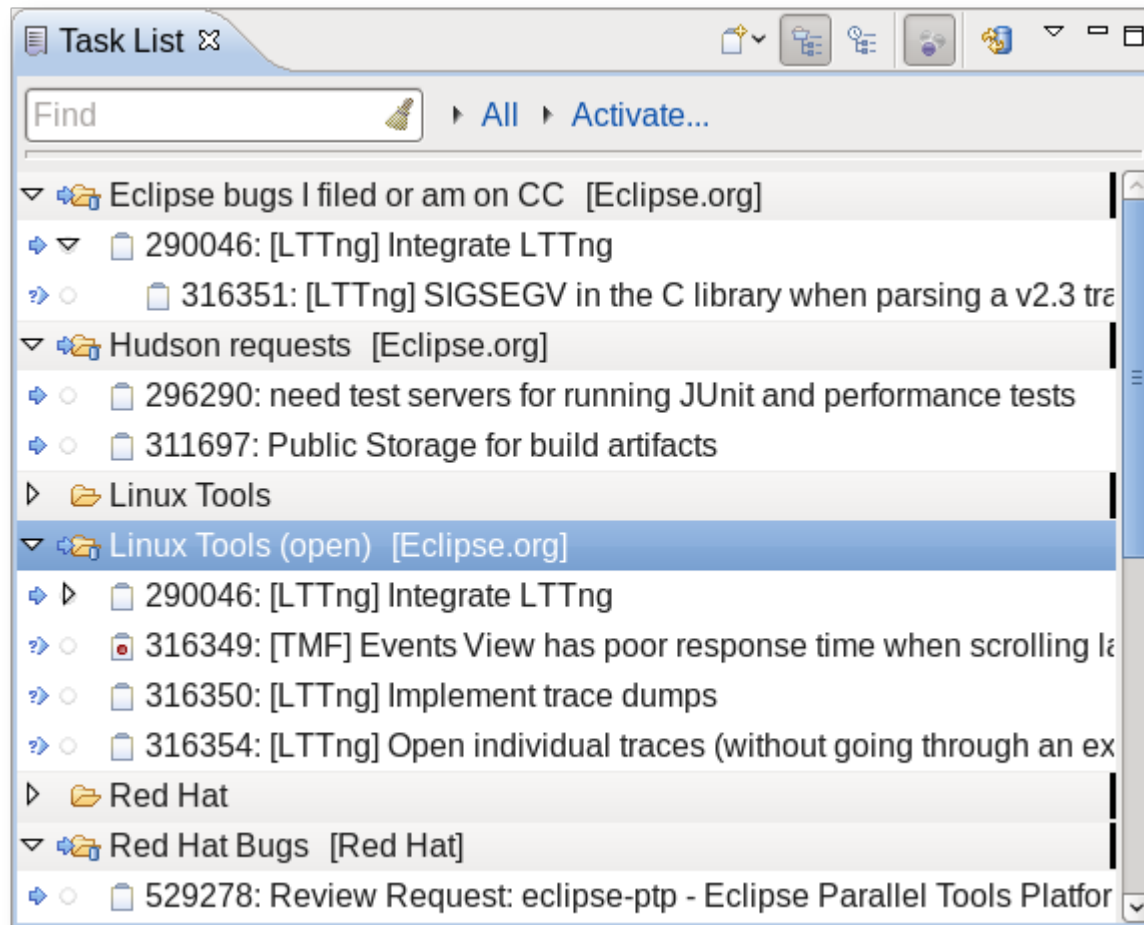
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# Bugzilla



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# Bugzilla

The screenshot shows a web browser window displaying a Bugzilla bug report. The browser tab is titled '315976: NPE pressing Ctrl-Alt-p on an RPM project'. The bug title is 'NPE pressing Ctrl-Alt-p on an RPM project'. The status is 'RESOLVED FIXED', opened on '7-Jun-2010', and modified on '9-Jun-2010 10:22 AM'. The bug is categorized under 'Linux Tools / ChangeLog'. There is one attachment named 'Patch' with a description 'Patch to fix RPM Pre' and a size of '13 bytes', created on '7-Jun-2010 6:17 PM'. A context menu is open over the attachment, showing options like 'Open', 'Open With', 'Save...', 'Copy URL', 'Copy Contents', 'Mark as', 'Detail...', 'Apply Patch...', and 'Compare'. The description of the bug includes a stack trace:

```
java.lang.NullPointerException
    at org.eclipse.linuxtools.rpm.ui.editor.action
(SpecfileChangeLogFormatter.java:49)
    at
org.eclipse.linuxtools.changelog.core.actions.Pre
(PrepareChangeLogAction.java:474)
    at org.eclipse.linuxtools.changelog.core.actions.PrepareChangeLogAction.prepareChangeLog
(PrepareChangeLogAction.java:389)
    at org.eclipse.linuxtools.changelog.core.actions.PrepareChangeLogAction.access$0
(PrepareChangeLogAction.java:269)
    at org.eclipse.linuxtools.changelog.core.actions.PrepareChangeLogAction$1.run
(PrepareChangeLogAction.java:145)
    at org.eclipse.jface.operation.ModalContext.runInCurrentThread(ModalContext.java:464)
```

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# Bugzilla

- Cache all data for offline use/manipulation
- Rich editor in Eclipse (no more Ctrl-w problems!)
- Auto-synchronization
- Filing (offline preparation)
- **No more bug email!**
- Also works with Trac, JIRA, etc.

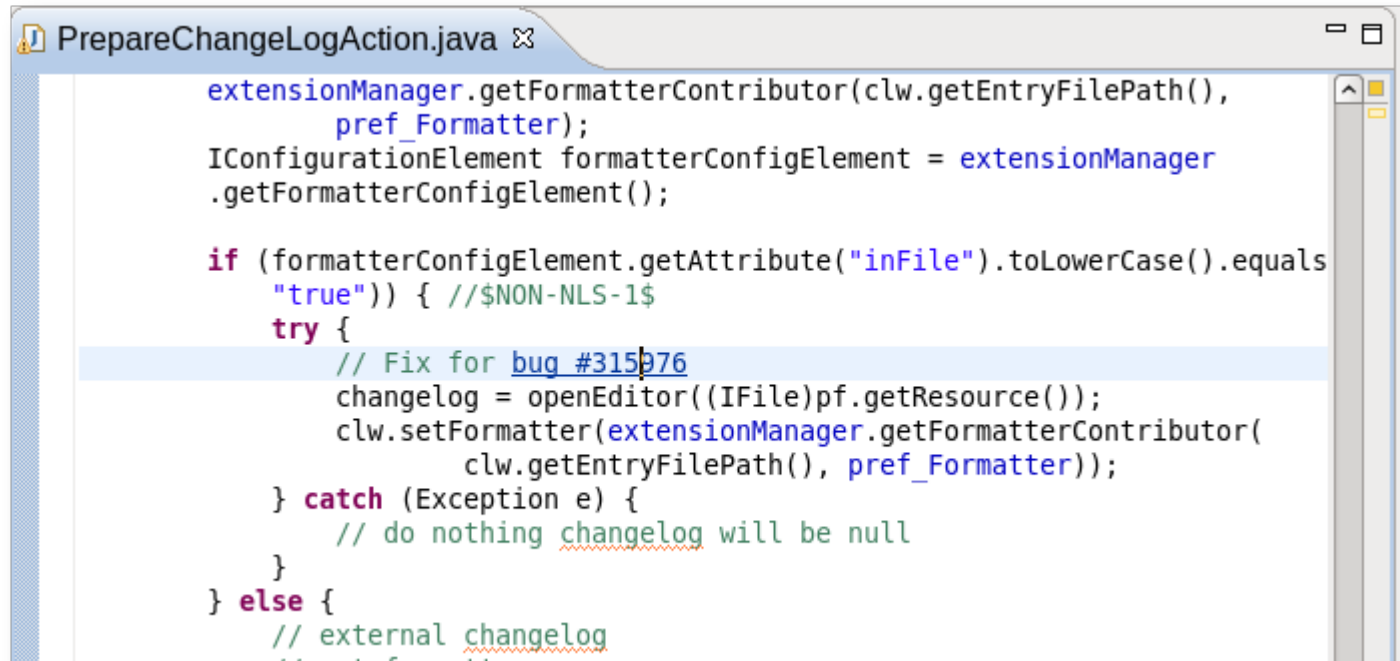
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# Bugzilla + Code Editor Integration



```
PrepareChangeLogAction.java ✖  
  
extensionManager.getFormatterContributor(clw.getEntryFilePath(),  
    pref_Formatter);  
IConfigurationElement formatterConfigElement = extensionManager  
.getFormatterConfigElement();  
  
if (formatterConfigElement.getAttribute("inFile").toLowerCase().equals  
    "true")) { //$NON-NLS-1$  
    try {  
        // Fix for bug #315976  
        changelog = openEditor((IFile)pf.getResource());  
        clw.setFormatter(extensionManager.getFormatterContributor(  
            clw.getEntryFilePath(), pref_Formatter));  
    } catch (Exception e) {  
        // do nothing changelog will be null  
    }  
} else {  
    // external changelog
```

Ctrl-click on “bug #315976”

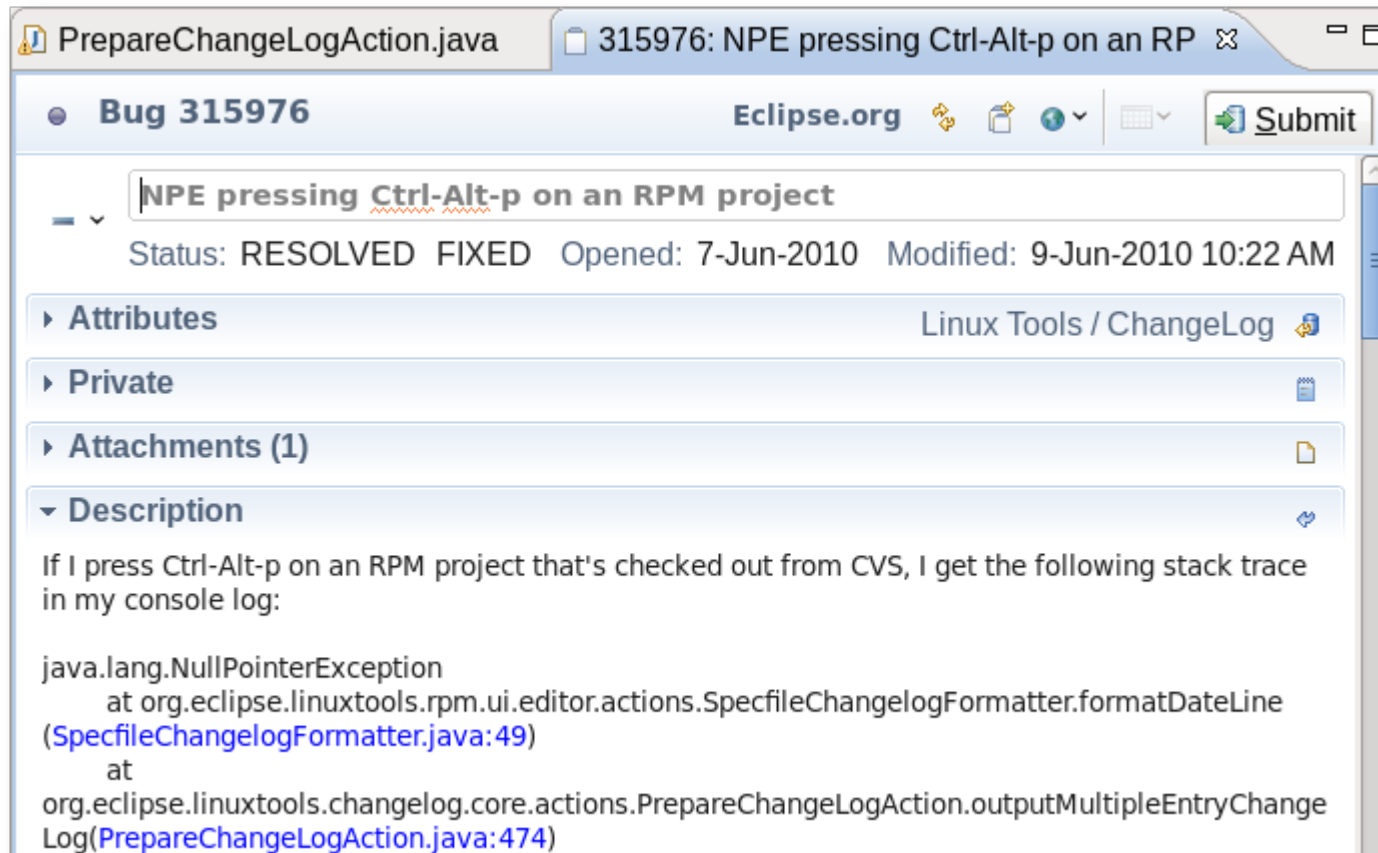
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# Bugzilla + Code Editor Integration



The screenshot shows the Eclipse IDE interface with a Bugzilla window open. The window title is "315976: NPE pressing Ctrl-Alt-p on an RP". The bug title is "NPE pressing Ctrl-Alt-p on an RPM project". The status is "RESOLVED FIXED", opened on "7-Jun-2010", and modified on "9-Jun-2010 10:22 AM". The description section is expanded, showing a stack trace for a `java.lang.NullPointerException` in the `PrepareChangeLogAction` class.

PrepareChangeLogAction.java | 315976: NPE pressing Ctrl-Alt-p on an RP

Bug 315976 | Eclipse.org | Submit

NPE pressing Ctrl-Alt-p on an RPM project

Status: RESOLVED FIXED | Opened: 7-Jun-2010 | Modified: 9-Jun-2010 10:22 AM

Attributes | Linux Tools / ChangeLog

Private

Attachments (1)

Description

If I press Ctrl-Alt-p on an RPM project that's checked out from CVS, I get the following stack trace in my console log:

```
java.lang.NullPointerException
    at org.eclipse.linuxtools.rpm.ui.editor.actions.SpecfileChangelogFormatter.formatDateLine
(SpecfileChangelogFormatter.java:49)
    at
org.eclipse.linuxtools.changelog.core.actions.PrepareChangeLogAction.outputMultipleEntryChange
Log(PrepareChangeLogAction.java:474)
```

## Bug #315976

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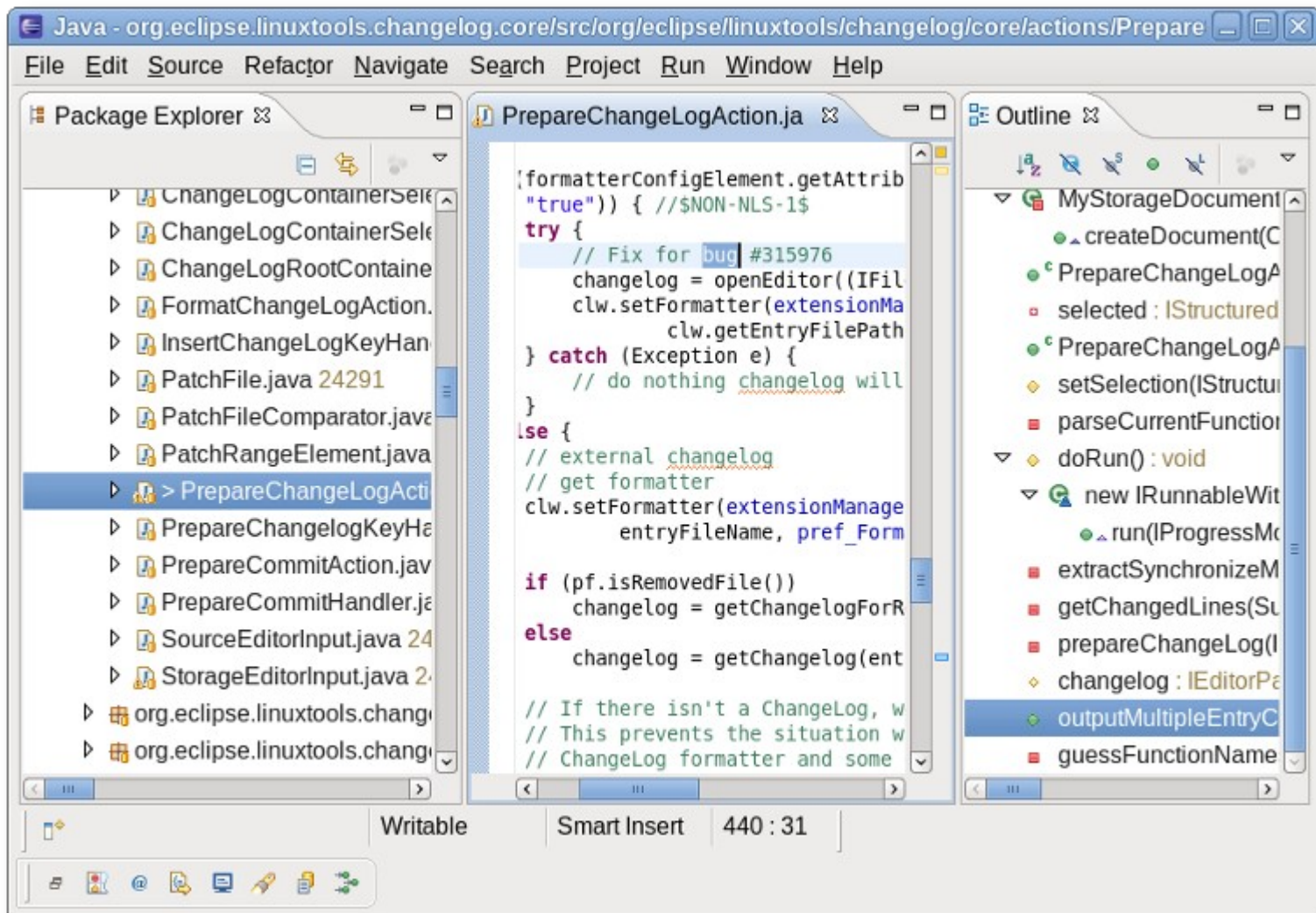
# Associate “task” with work

- Automatically keep track of where you navigate and what you edit as you work on a bug
- Build up **context** associated with the task
- Share this context with others and your future self
- Allows for focus on task at hand





# Clutter



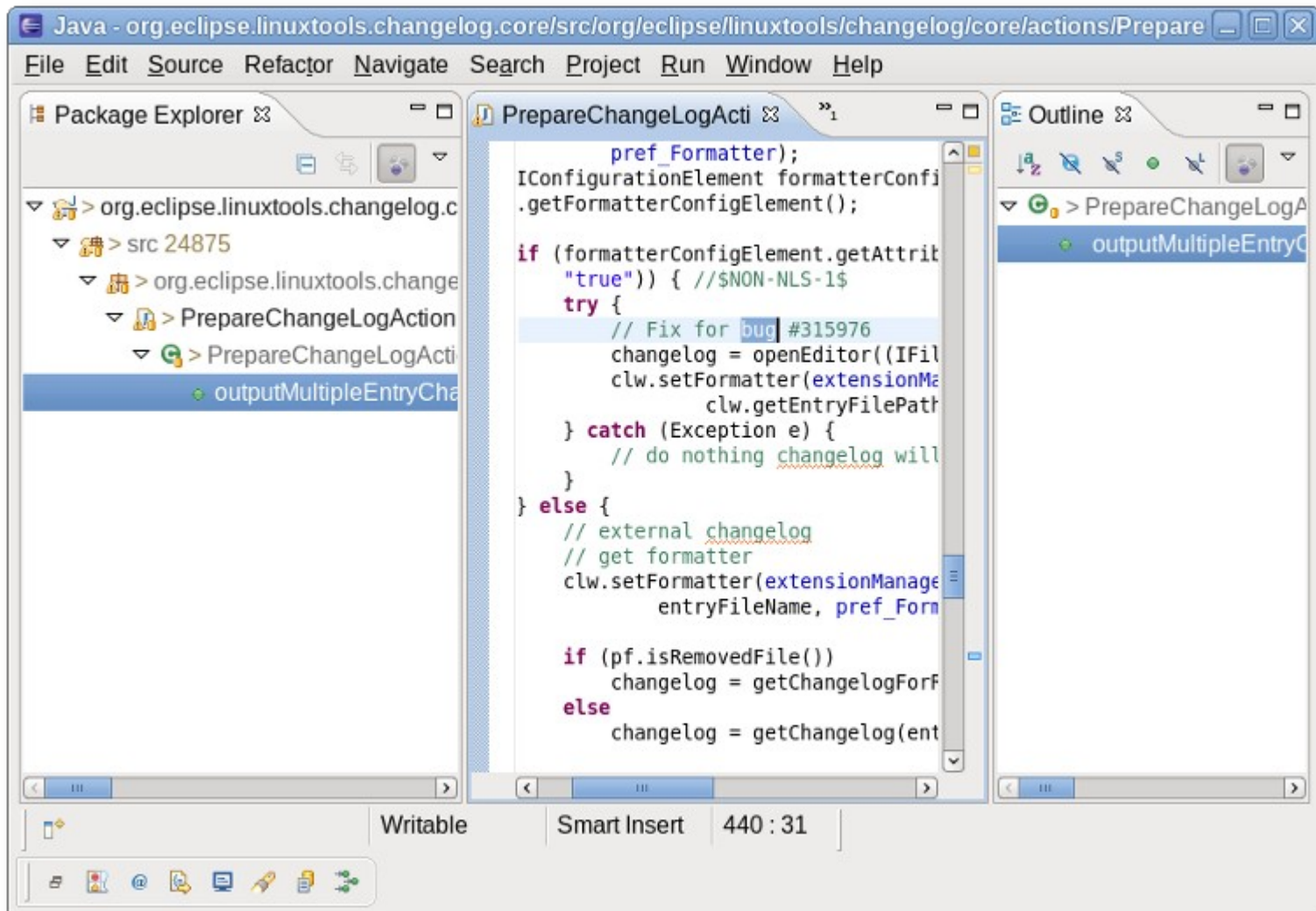
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# No clutter



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# Bugzilla and Tasks

- Bugzilla and task manipulation comes from Eclipse Mylyn project, available in `eclipse-mylyn*` RPMs

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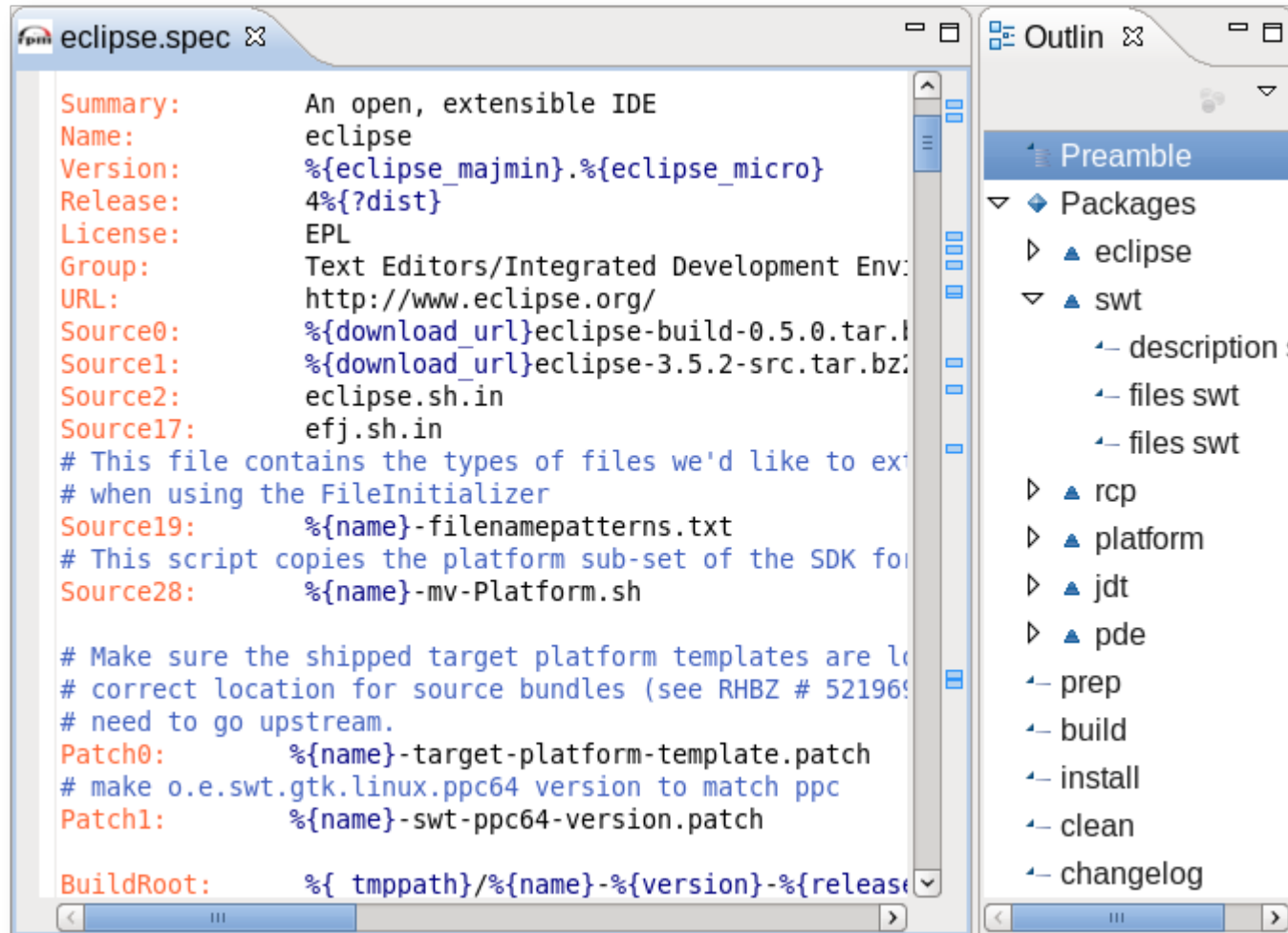
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# RPM Specfile Editor



The screenshot displays the RPM Specfile Editor interface. The main editor window shows the content of the `eclipse.spec` file, and the Outline view on the right shows the package structure.

```
Summary:      An open, extensible IDE
Name:         eclipse
Version:      %{eclipse_majmin}.%{eclipse_micro}
Release:      4%{?dist}
License:      EPL
Group:        Text Editors/Integrated Development Env:
URL:          http://www.eclipse.org/
Source0:      %{download_url}eclipse-build-0.5.0.tar.l
Source1:      %{download_url}eclipse-3.5.2-src.tar.bz
Source2:      eclipse.sh.in
Source17:     efj.sh.in
# This file contains the types of files we'd like to ext
# when using the FileInitializer
Source19:     %{name}-filenamepatterns.txt
# This script copies the platform sub-set of the SDK fo
Source28:     %{name}-mv-Platform.sh

# Make sure the shipped target platform templates are lo
# correct location for source bundles (see RHBZ # 52196
# need to go upstream.
Patch0:       %{name}-target-platform-template.patch
# make o.e.swt.gtk.linux.ppc64 version to match ppc
Patch1:       %{name}-swt-ppc64-version.patch

BuildRoot:    %{ tmppath }/%{name}-%{version}-%{releas
```

The Outline view on the right shows the following structure:

- Preamble
- Packages
  - eclipse
  - swt
    - description :
    - files swt
    - files swt
  - rcp
  - platform
  - jdt
  - pde
  - prep
  - build
  - install
  - clean
  - changelog

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# RPM Specfile Editor

```
BuildRequires: xulrunner-devel
```

```
BuildRequires: java-
```

```
%if !%{bootstrap}
```

```
BuildRequires: icu4
```

```
BuildRequires: tomc
```

```
BuildRequires: tomc
```

```
BuildRequires: ant-a
```

```
BuildRequires: ant-j
```

```
BuildRequires: jsch
```

```
BuildRequires: jakar
```

```
BuildRequires: jakar
```

```
BuildRequires: jakar
```

```
BuildRequires: jakar
```

```
BuildRequires: jetty
```

```
BuildRequires: lucen
```

```
rpm java-1.6.0-openjdk
```

```
rpm java-1.5.0-gcj-javadoc
```

```
rpm java-1.6.0-openjdk-src
```

```
rpm java-1.5.0-gcj
```

```
rpm java-1.6.0-openjdk-javadoc
```

```
rpm java-1.6.0-openjdk-devel
```

```
rpm java-1.5.0-gcj-devel
```

```
rpm java-1.6.0-openjdk-plugin
```

**Name:** java-1.6.0-openjdk

**Version:** 1.6.0.0

**Release:** 37.b17.fc12

**Summary:** OpenJDK Runtime Environment

**License:** GPLv2 with exceptions

**Group:** Development/Languages

**URL:** <http://icedtea.classpath.org/>

**Installation Date:** Fri 16 Apr 2010 08:49:20 AM EDT

**Vendor:** Fedora Project

**Size:** 83807713 bytes

**Build Date:** Tue 06 Apr 2010 07:49:09 AM EDT

**SRPM:** java-1.6.0-openjdk-1.6.0.0-37.b17.fc12.src.rpm

- Completion of macros, available RPMs
- Error checking as you type
- rpmlint integration

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# RPM Specfile Editor

- `eclipse-rpm-editor` RPM provides RPM specfile editor

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# Agenda

- Background
- Code editing
- Build and compiler integration
- Debugging
- Teamwork
- **Linux-specific Tools**

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# OProfile

The screenshot displays the Eclipse IDE interface. The top editor shows the source code for `factorial.cpp`. The code includes a recursive function `factorial1` and an iterative function `factorial2`. The `factorial1` function is highlighted in blue. The right-hand side of the IDE shows the Outline view, listing the functions: `factorial1(unsigned long long)`, `factorial2(unsigned long long)`, `main() : int`, `factorial1(unsigned long long)`, and `factorial2(unsigned long long)`.

The bottom panel shows the OProfile (OProf) view, which displays the performance profile for the current process. The profile is expanded to show the following data:

- CPU\_CLK\_UNHALTED**
  - current**
    - 100.00% in `/home/overholt/workspaces/runtime-EclipseApplication/factorial/D`
      - f0** 49.46% in `factorial1(unsigned long long) [factorial.cpp]`
        - 27.30% on line 15
        - 12.20% on line 16
        - 9.22% on line 11
        - 0.59% on line 12
        - 0.14% on line 13

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# OProfile

- Single-click launch of profiling
- Link hot spots with C/C++ source code
- Available in `eclipse-oprofile` RPM

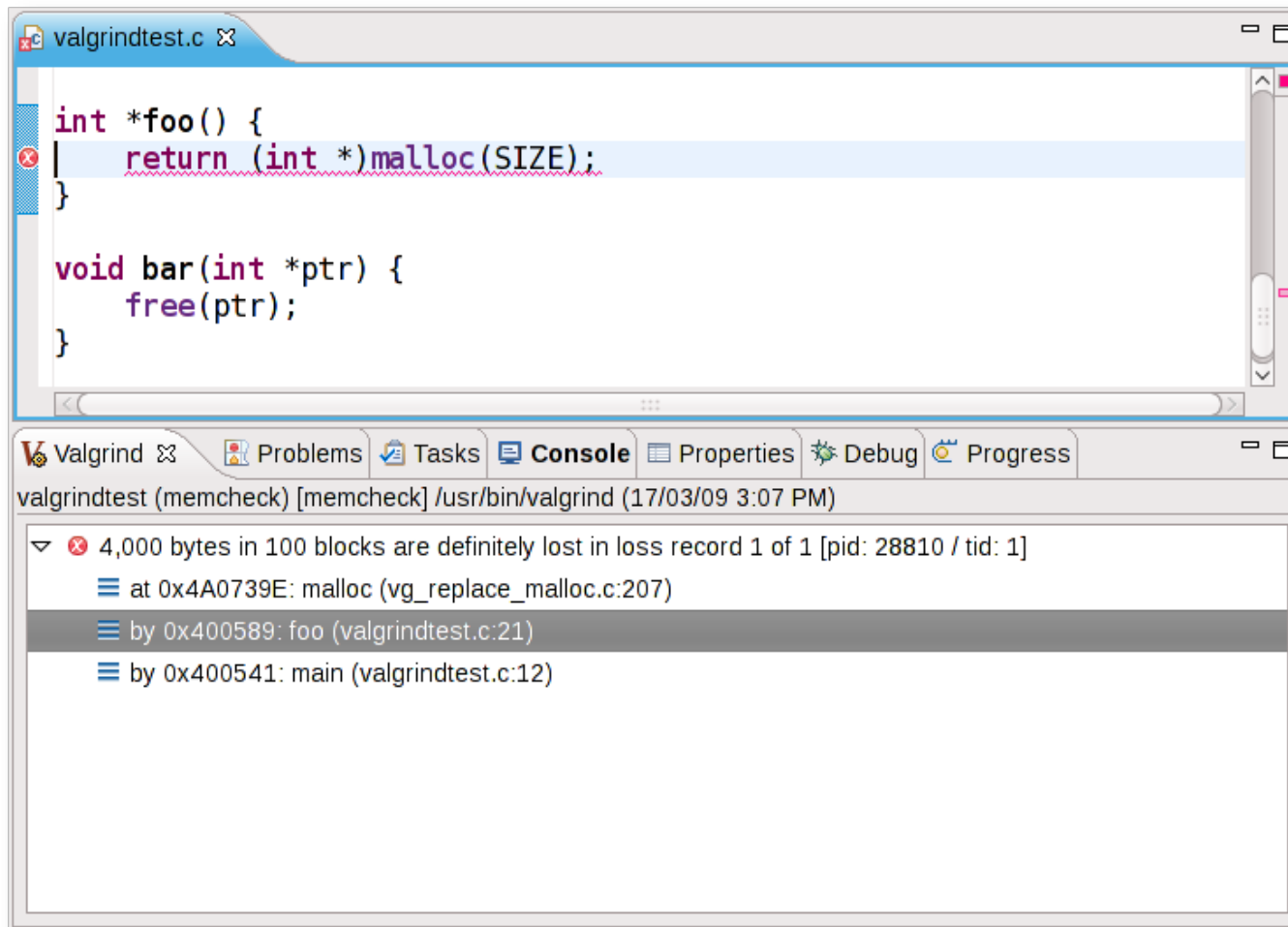
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# Valgrind



The screenshot shows a code editor window titled 'valgrindtest.c' with the following C code:

```
int *foo() {  
    return (int *)malloc(SIZE);  
}  
  
void bar(int *ptr) {  
    free(ptr);  
}
```

Below the code editor is the Valgrind interface. The 'Console' tab is active, showing the following output:

```
valgrindtest (memcheck) [memcheck] /usr/bin/valgrind (17/03/09 3:07 PM)  
4,000 bytes in 100 blocks are definitely lost in loss record 1 of 1 [pid: 28810 / tid: 1]  
  at 0x4A0739E: malloc (vg_replace_malloc.c:207)  
  by 0x400589: foo (valgrindtest.c:21)  
  by 0x400541: main (valgrindtest.c:12)
```

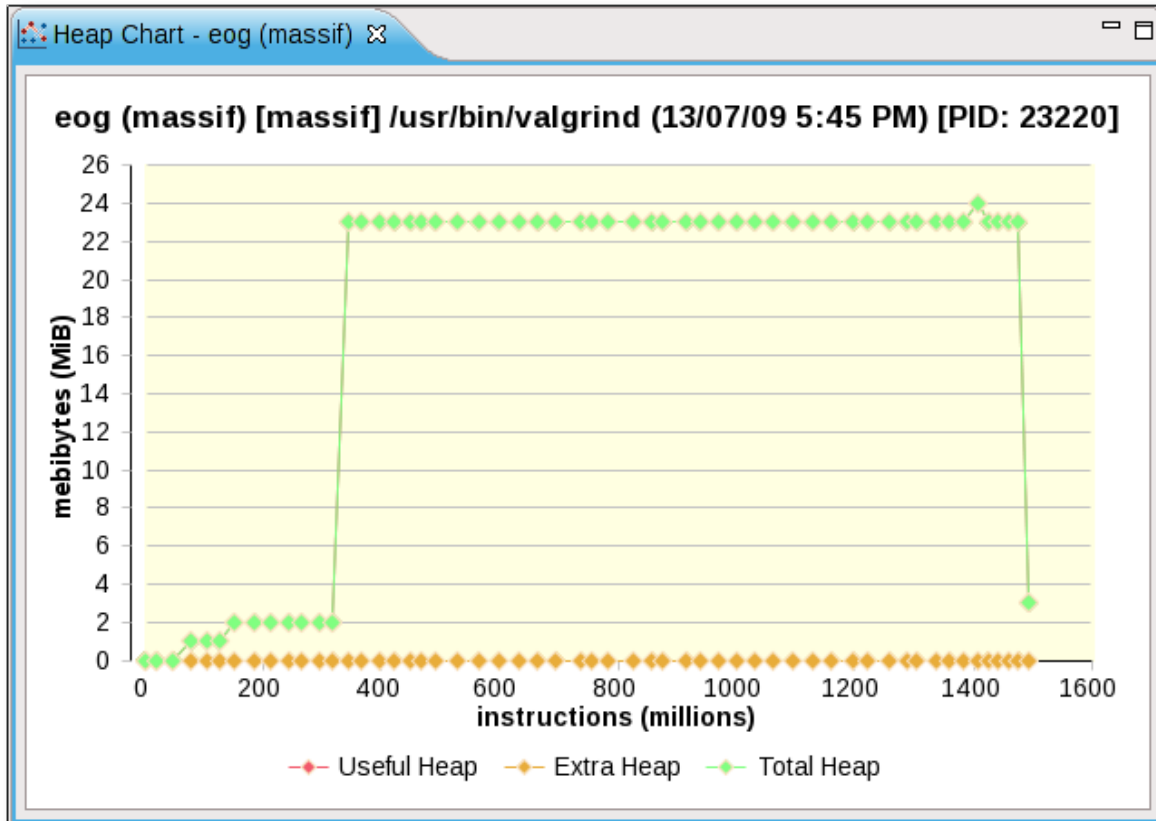
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# Valgrind



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# Valgrind

- Single-click launch of profiling
- Link hot spots with C/C++ source code
- Available in `eclipse-valgrind` RPM



# Agenda

- Background
- Code editing
- Build and compiler integration
- Debugging
- Teamwork
- Linux-specific tools

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# Why Eclipse?

- Tools to enhance productivity
- Large ecosystem, constant improvement, new tools
- Easily installed RPMs

Try it out!

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# Contact Information

- Eclipse
  - <http://www.eclipse.org>
- CDT
  - <http://www.eclipse.org/cdt>
- Mylyn
  - <http://www.eclipse.org/mylyn>
- Linux Tools Project
  - <http://www.eclipse.org/linuxtools>

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