

CSEP 504

# Advanced topics in software systems

Reid Holmes • Winter 2010 • CSEP504 Lecture 6

# CSEP 504:

## Advanced topics in software systems

- Tonight: last lecture on software tools and environments – a look at recent research and future directions
  - Emphasis on:
    - Capturing latent knowledge
    - Task specificity and awareness
    - Supporting collaborative development

# Tonight

- Capturing latent knowledge
  - Hipikat / Bridge / Deep Intellisense / Hatari
- Task specificity
  - Mylyn
  - TeamTracks
  - Bubbles
- Supporting collaborative development
  - Jazz
  - FastDash
  - Customized Awareness Streams
  - Codebook
- Visualization stuff
  - Only if interested

# Latent Knowledge

- Embrace practice rather than force change
- Use available data more effectively
- Source code is king [Singer '98]
  - Bugs
  - Version control
  - E-Mail / mailing lists
  - Forums
- Improve mapping from data to task

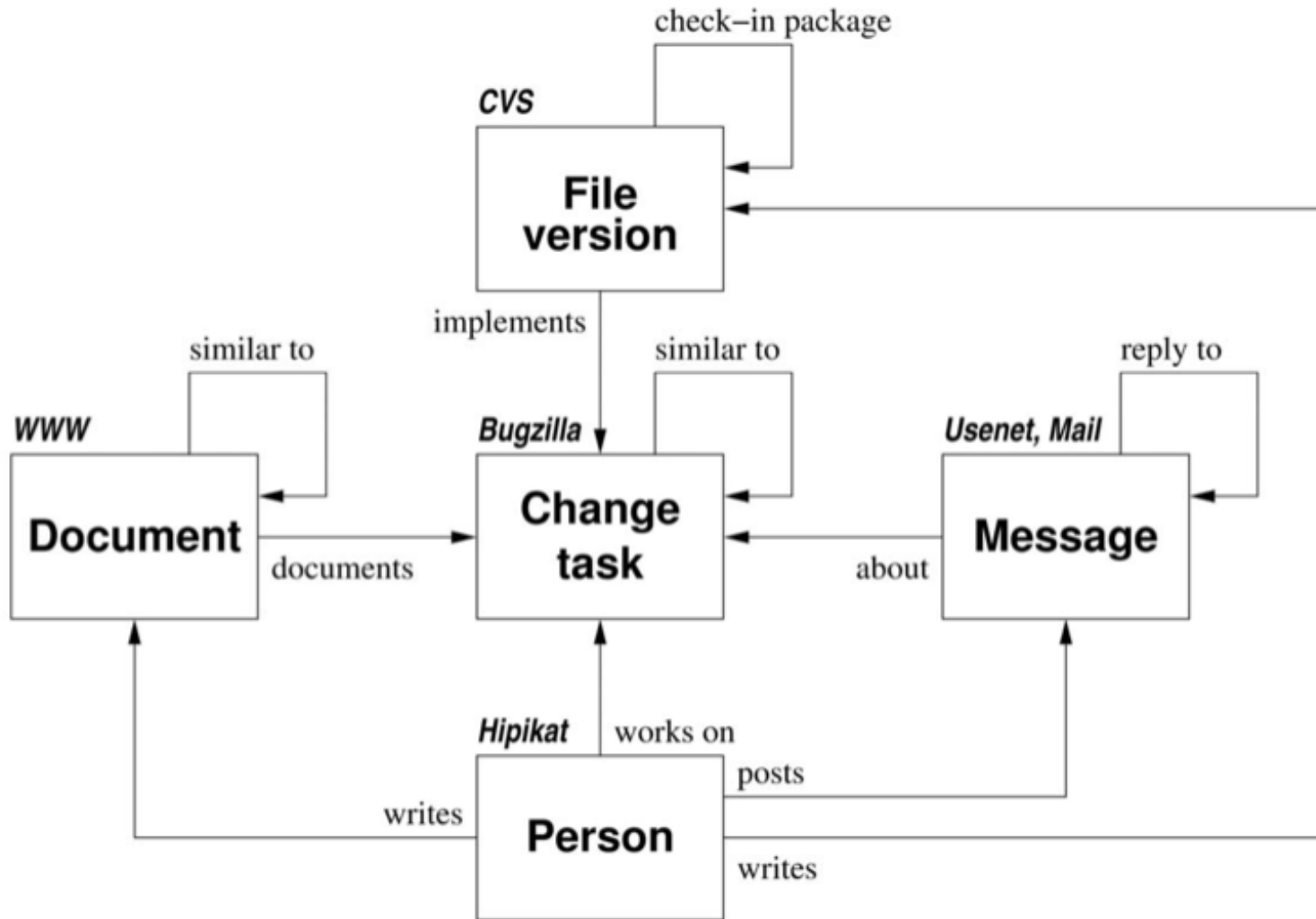
# Utility of Latent Knowledge

- High-level information is key
  - Observing developers to identify their information needs [Ko & DeLine '07]
- We rely heavily on implicit knowledge
  - Surveying developers to infer their habits and mental models [LaToza, DeLine, & Venolia '06]
- We search change and bug history daily
  - Surveying Windows developers about how they search through their source code

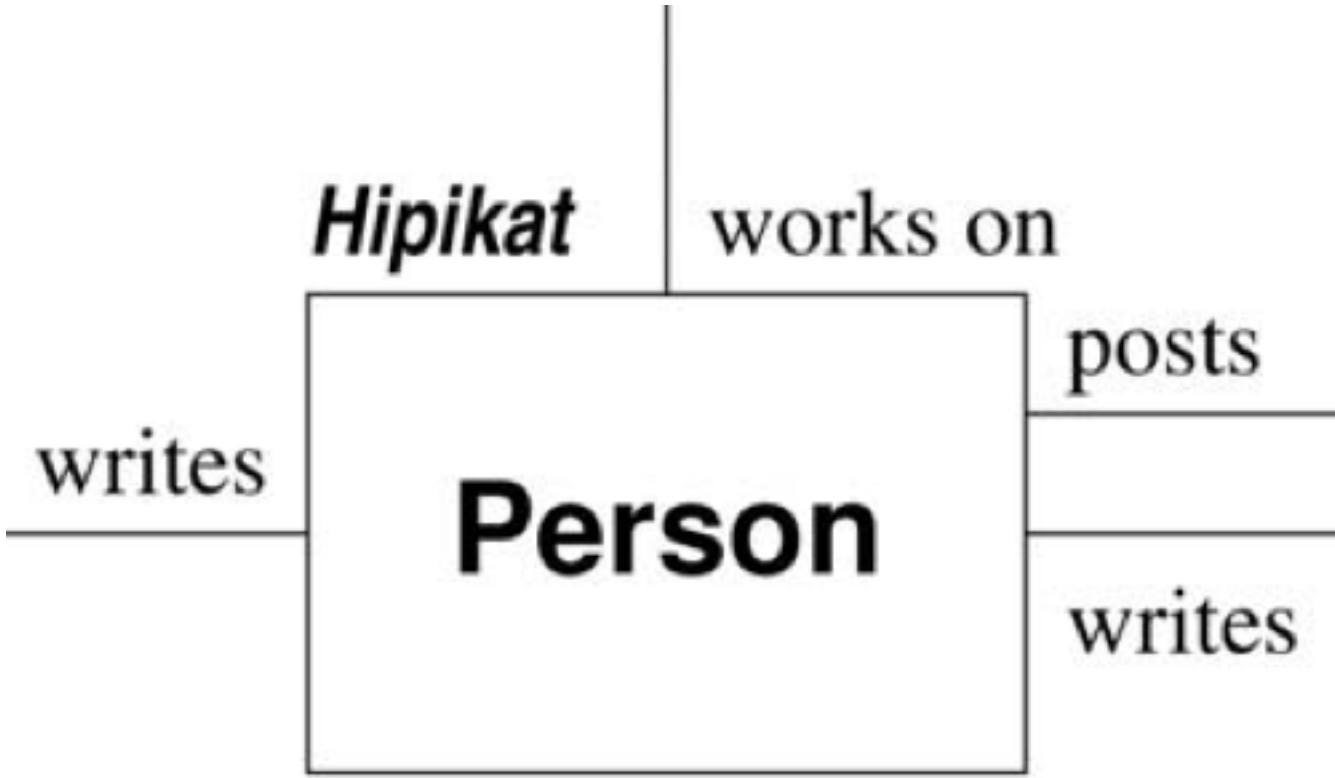
# Hipikat

- Cubranic et al. [TSE '05]
- Implicit group memory (project memory)
- Acts as informal mentor
  - Relevant for non-collocated teams
- Volume hampers browsing
- Silos impede searching

# Hipikat Artifacts



# People as First-Class Members





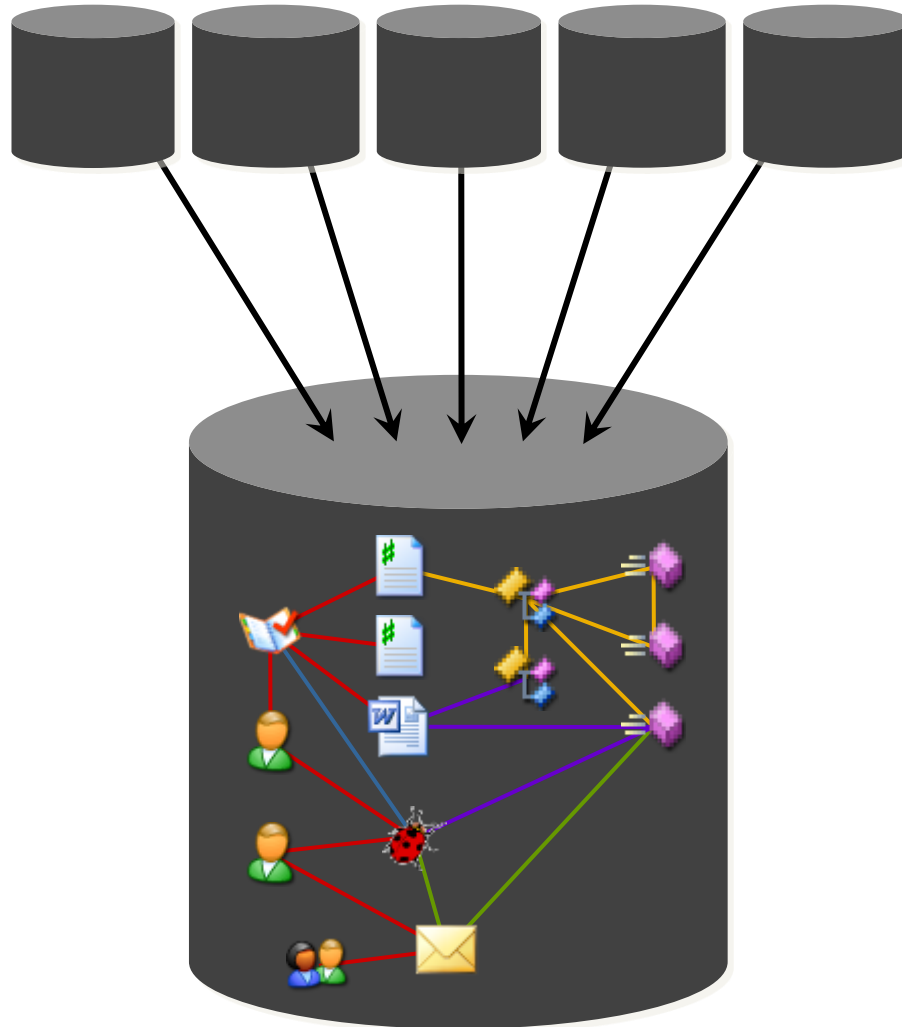
# Hipikat Evaluation

- 20 task case study
  - Identify most relevant files for 15T
  - 1<sup>st</sup> or 2<sup>nd</sup> file rec. relevant for 11 / 16T
  - 1<sup>st</sup> or 2<sup>nd</sup> construct rec. relevant for 10 / 13T
- Eclipse study (8 devs)
  - Used to study problem but not perform task
    - (e.g., orientation within test system)

# Bridge

- Venolia [MSR '06]
- Augments Hipikat with additional relations
  - Simple code relationships
  - Enhanced textual allusions
- Most pressing concern:
  - “Understanding the rationale behind a piece of code”

# Bridge Artifacts



# Bridge Evaluation

- Textual allusions == 19% of index
  - Source: 6 months of Windows development

		Mentioning Item Type				<b>Total</b>
		SCCS check-in	Email	Bug revision	Bug	
<b>Mentioned Item Type</b>	Identifier	221,510	197,301	298,173	224,436	941,420
	Number	309,403	209,630	89,139	66,431	674,603
	Bug	81,680	20,440	3,563	1,826	107,509
	HTTP URL	939	22,542	28,748	25,480	77,709
	Local file path	495	35,729	10,164	6,458	52,846
	Server file path	280	4,272	2,359	1,892	8,803
	Email address	21	773	241	207	1,242
	<b>Total</b>	614,328	490,687	432,387	326,730	1,864,132

# Deep Intellisense

- Holmes & Begel [MSR '08]
- Embed Hipikat-like functionality in VS
- Automatic updating; no queries required



# Usage Scenario

[Bug 12622] New: cs.ucalgary.ca mail failing	4/10/08 10:24 PM	e="cache"></param>
[Bug 203502] [files] Potential NPE in FileServiceSubSystem.getUserHome()	4/15/08 5:38 PM	/returns>
[Bug 68111] Data Collection Engine for Mac OS X	4/25/08 9:09 PM	List<SymbolPlus> getDefin
[Bug 68111] Data Collection Engine for Mac OS X	4/27/08 7:25 PM	
[Bug 68111] Data Collection Engine for Mac OS X	4/28/08 8:00 PM	ContainsKey(symbol))
[Bug 68111] Data Collection Engine for Mac OS X	5/4/08 4:42 AM	cache[symbol];
[Bug 57349] 'features' and 'plugins' directory should install to different ...	5/8/08 10:34 AM	= symbol.Symbol;
		n = symbol.FileName;

```
List<SymbolPlus> output = new List<S
try
```

67	Change 1788 on 2006/03/11 11:17:11 by REDMOND\g
69	Change 1959 on 2006/05/02 14:25:11 by REDMOND\g
87	Change 1865 on 2006/03/28 17:01:56 by REDMOND\g
98	Change 1809 on 2006/03/13 10:55:12 by REDMOND\g
102	Change 1788 on 2006/03/11 11:17:11 by REDMOND\g
112	Change 1959 on 2006/05/02 14:25:11 by REDMOND\g
160	Change 1865 on 2006/03/28 17:01:56 by REDMOND\g
161	Change 1809 on 2006/03/13 10:55:12 by REDMOND\g
163	Change 1788 on 2006/03/11 11:17:11 by REDMOND\g
164	Change 1959 on 2006/05/02 14:25:11 by REDMOND\g
165	Change 1865 on 2006/03/28 17:01:56 by REDMOND\g

Bug 84 - (41 of 49) DevUI

Title VSContextPI should send notifications when VS gets focus back Bug ID 84

Path \Oujia

Status	Closed	Opened	Date	3/2/2005	Resolved	Date	3/8/2005
Assigned To	Closed	By	krishnan	By	ginav	Fix By	
Issue type	Code Def...	Build	0	Resolution	Fixed	Accessibility	
Severity	2	Source		Build	0	Milestone	
Priority	2	Source ID		Cause			
Date	3/8/2005	How found		Change			
By	ginav			Closed	Date	3/8/2005	
Visible to				By	ginav		

Environment

Operator	Value
Equals	DevUI
Ever	ginav
Greater Than	2004/10/10

Change 198 on 2005/01/24 10:01
Change 190 on 2005/01/21 12:41
Change 137 on 2005/01/12 14:05
Change 112 on 2004/12/29 10:02
Change 101 on 2004/12/28 06:26
Change 91 on 2004/12/22 14:06
Change 85 on 2004/12/21 17:00

Title

Fix the path in the VS addin project

Move VSContextPI project into the main solution

Wake changes to SDDUI PS UI

Query filtering

Need to index Entry.Identifier column in SQL

VSContextPI should send notifications when VS gets focus back

Sidebar isn't responding to Visual Studio activation

Scanners should be moved to ItemType

Clean up f-key references in class hierarchy tables

Double-click on system tray icon to launch search on focus items

Filters should refer to EntryType and Entry instances by identifier, not by r...

Filter.Index is obsolete

Date filter should separate "strict" into a property

Create a Web UI

```
235
236     sb = new StringBuilder();
237 } else if(trimmed.Length > 0) {
238     sb.Append(line);
239     sb.Append("\n");
240     sb.Append(Environment.NewLine);
241 }
242 }
```

v-GINAU2 'Redoing visuals in flyout form'

v-GINAU2 'Better graphic for "paths busy"'

v-laptop 'Preview' becomes 'Snippet' in

# Deep Intellisense

The screenshot displays the Microsoft Visual Studio IDE with the following components:

- Code Editor:** Shows the `BlogEnabled(SPWeb oWeb)` method in `BlogContext.cs`. The code includes a try-catch block for null checks and a `BlogSettings` object creation.
- Deep Intellisense: Current Item:** Provides a summary for the `BlogEnabled(...)` method, including:
  - Checkin Overview:** 2 checkins between 11/29/2007 and 8/12/2008
  - Work Item Overview:** 0 active work items, 3 resolved since 6/9/2007, 1 proposed work item
  - People Overview:** 1 committer, 3 bug reporters/commenters, 5 message authors
- Deep Intellisense: Related People:** Lists 8 people shown, including `pointme`, `rdcpro`, and `TheKid` with their member since dates and work item statistics.
- Deep Intellisense: Event History:** Lists 11 events shown, including discussions and error messages like "Failed to render control: An error occurred during a call to extension function 'createMonthUrl'".

The status bar at the bottom shows "Ready", "Workspace: ABEGEL2", and cursor coordinates "Ln 43 Col 34 Ch 34 INS".

# Deep Intellisense

Deep Intellisense: Current Item

[CKS.EBE](#) [BlogContext](#)

[BlogEnabled\(...\)](#)

**Checkin Overview:**

2 checkins between 11/29/2007 and 8/12/2008

**Work Item Overview:**

0 active work items (last activity 4/24/2008)

3 resolved since 6/9/2007

1 proposed work items

**People Overview:**

1 committer

3 bug reporters/ commenters




5 message authors



# Deep Intellisense

## Deep Intellisense: Related People





8 people shown.

    [pointme](#) Member since 7/7/200

0 work items 0 commits 1 message

    [rdcpro](#) Member since 8/10/200

0 work items 0 commits 1 message






    [TheKid](#) Member since 1/29/200

2 work items 2 commits 0 messages

# Deep Intellisense

Deep Intellisense: Event History

11 events shown. Filter:  | Sort

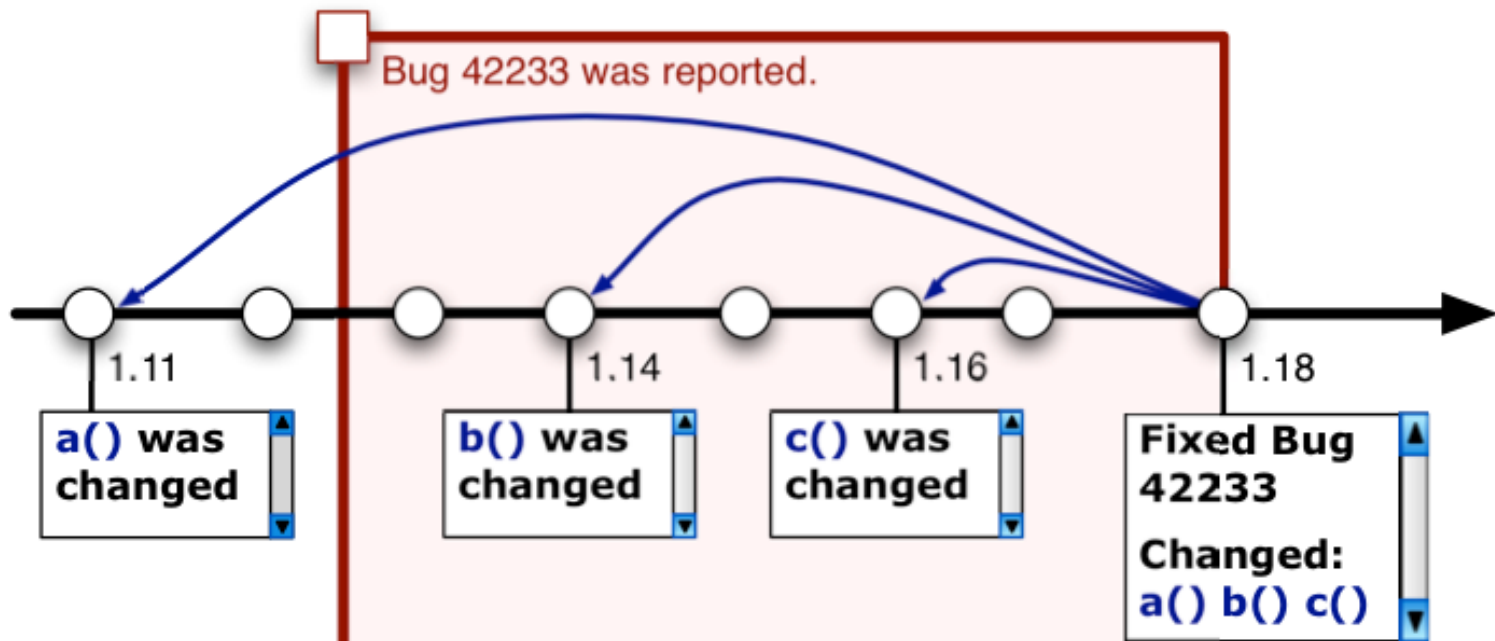
	<a href="#">Discussion #33905</a>	<a href="#">rdcpro</a>	Last year – Thu 8/21/2008 8:
EBE: Email address is collected when posting comments - where is en			
	<a href="#">Change Set #16109</a>	<a href="#">TheKid</a>	Last year – Tue 8/12/2008 1
	<a href="#">Discussion #33119</a>	<a href="#">pointme</a>	Last year – Thu 8/7/2008 1
EBE Error when deleting sites			
	<a href="#">Discussion #31112</a>	<a href="#">danielmc</a>	Last year – Tue 7/15/2008
Failed to render control: An error occurred during a call to extension f			
	<a href="#">Work Item #6067</a>	<a href="#">TheKid</a>	Pri 1 Proposed Last year – Th
Since activating the CKS:EBE feature on our Web			

# Deep Intellisense Evaluation

- Focus was on the information developers wanted, not the resulting tool
- Rolled into CodeBook prototypes

# Hatari

- Sliwerski et al. [FSE '05]
- Using past defects to predict future defects
- Identify fix-inducing changes



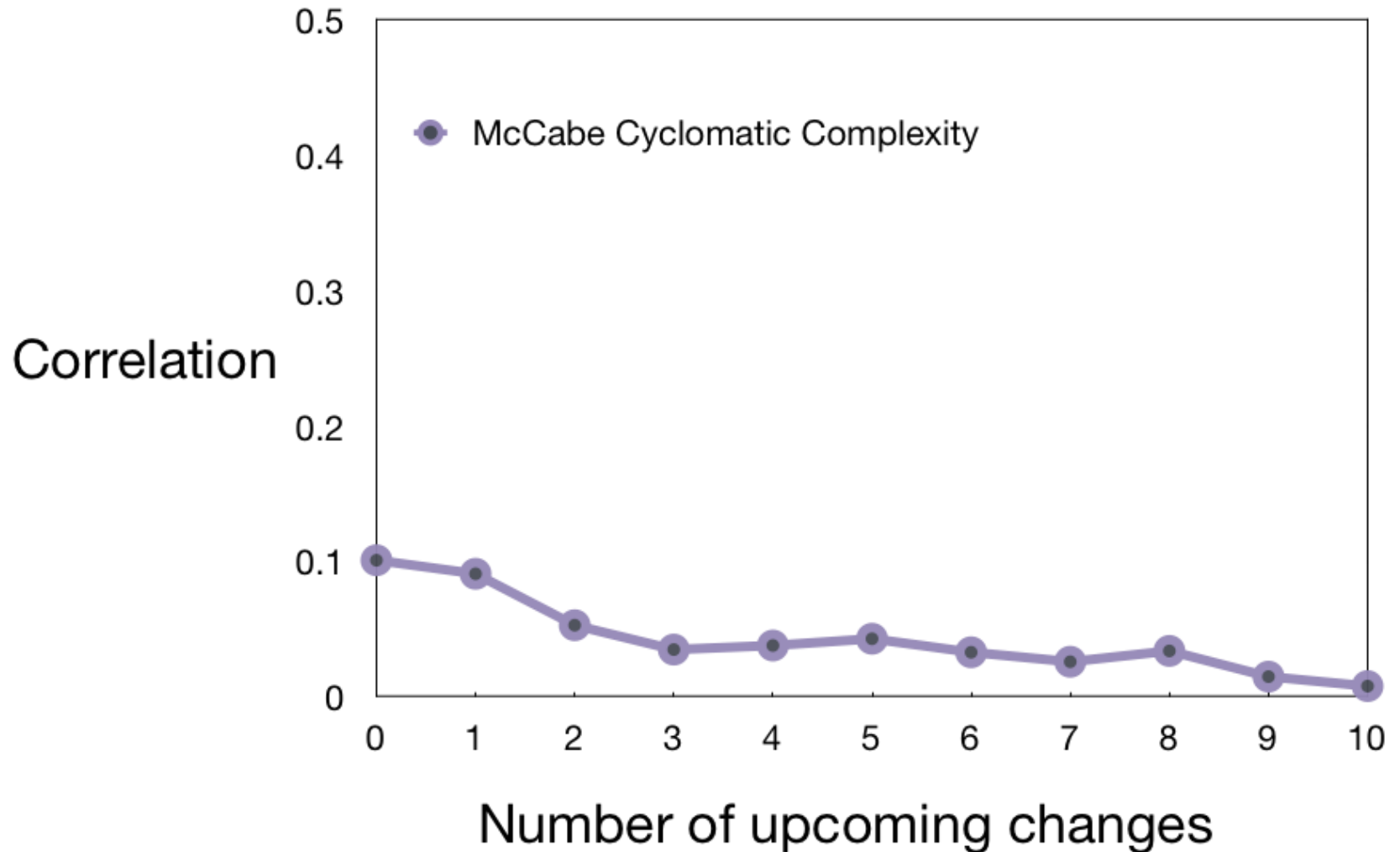
# Hatari

```
/* (non-Javadoc)
 * @see org.eclipse.jdt.launching.IRuntimeClasspathProvider#resolveClasspath
 * (org.eclipse.jdt.launching.IRuntimeClasspathEntry[], org.eclipse.debug.core.ILaunchConfiguration)
 */
public IRuntimeClasspathEntry[] resolveClasspath(IRuntimeClasspathEntry[] entries, ILaunchConfiguration configuration)
throws CoreException {
    List all = new ArrayList();
    for (int i = 0; i < entries.length; i++) {
        switch (entries[i].getKind()) {
            case IRuntimeClasspathEntry.KIND_PROJECT:
                // a project resolves to itself for source lookup (rather than to its source container)
                all.add(entries[i]);
                break;
            case IRuntimeClasspathEntry.KIND_RUNTIME_CLASSPATH_ENTRY:
                IRuntimeClasspathEntry entry = entries[i];
                if (entry instanceof IRuntimeClasspathEntry.Project) {
                    // add the project's runtime classpath entries
                    IRuntimeClasspathEntry[] projectRuntimeClasspath = ((IRuntimeClasspathEntry.Project) entry).getRuntimeClasspath();
                    for (int j = 0; j < projectRuntimeClasspath.length; j++) {
                        all.add(projectRuntimeClasspath[j]);
                    }
                }
                break;
            default:
                IRuntimeClasspathEntry entry = entries[i];
                for (int j = 0; j < entry.getRuntimeClasspath().length; j++) {
                    all.add(entry.getRuntimeClasspath()[j]);
                }
                break;
        }
    }
    return (IRuntimeClasspathEntry[])all.toArray(new IRuntimeClasspathEntry[all.size()]);
}
```

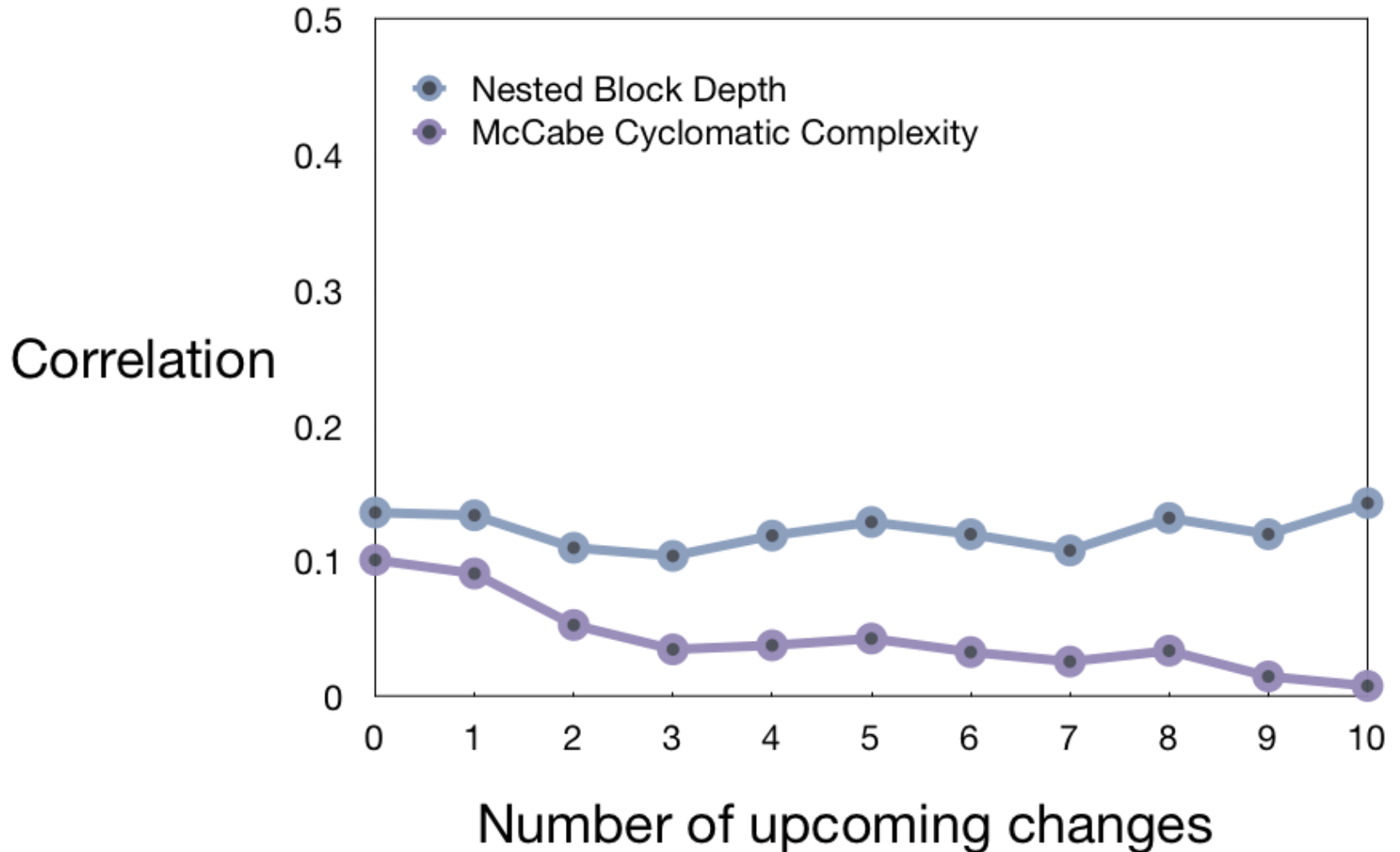


9 changes,  
all of them fixes  
8 fix-inducing changes  
one re-implementation

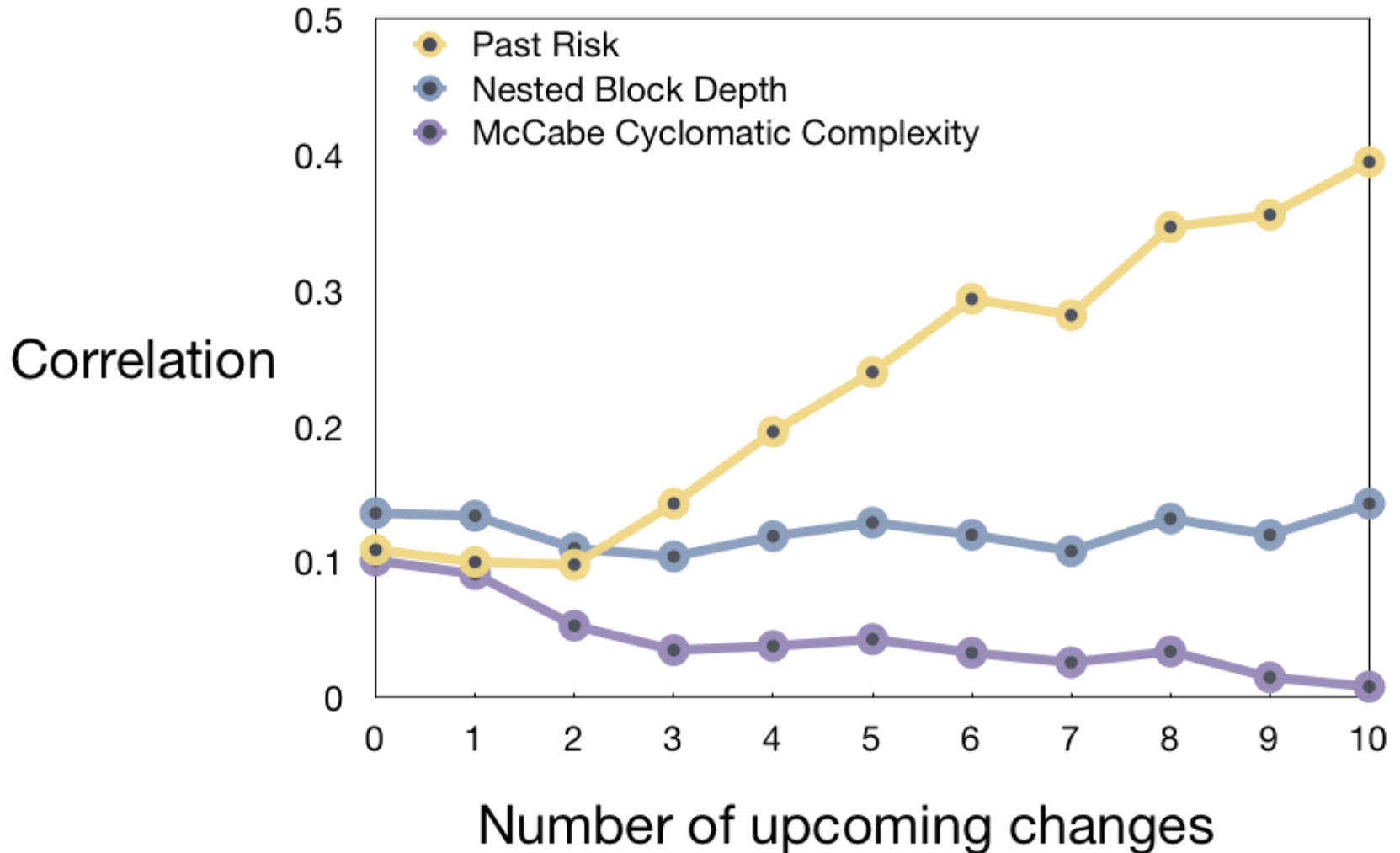
# How to predict future risk



# How to predict future risk

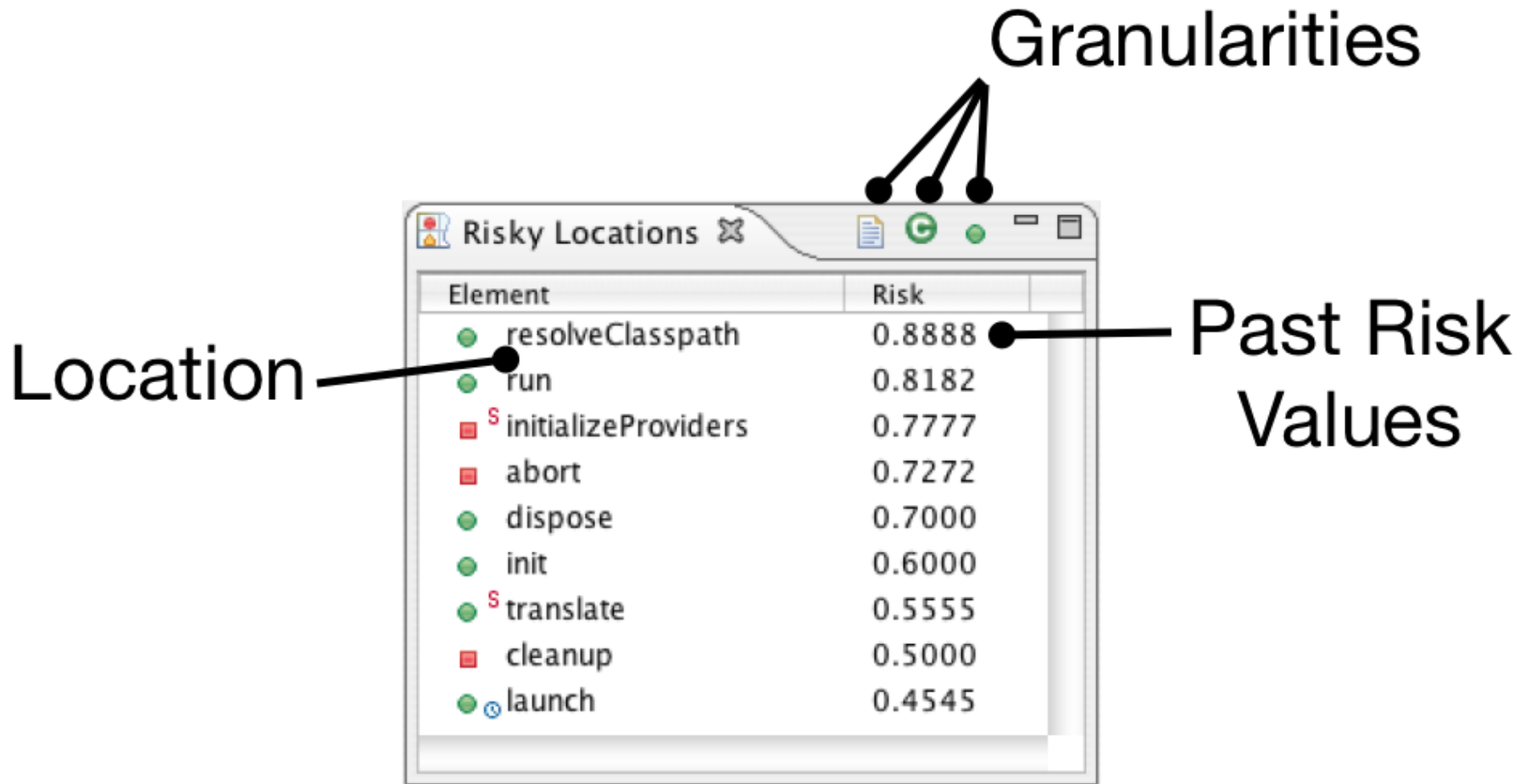


# How to predict future risk





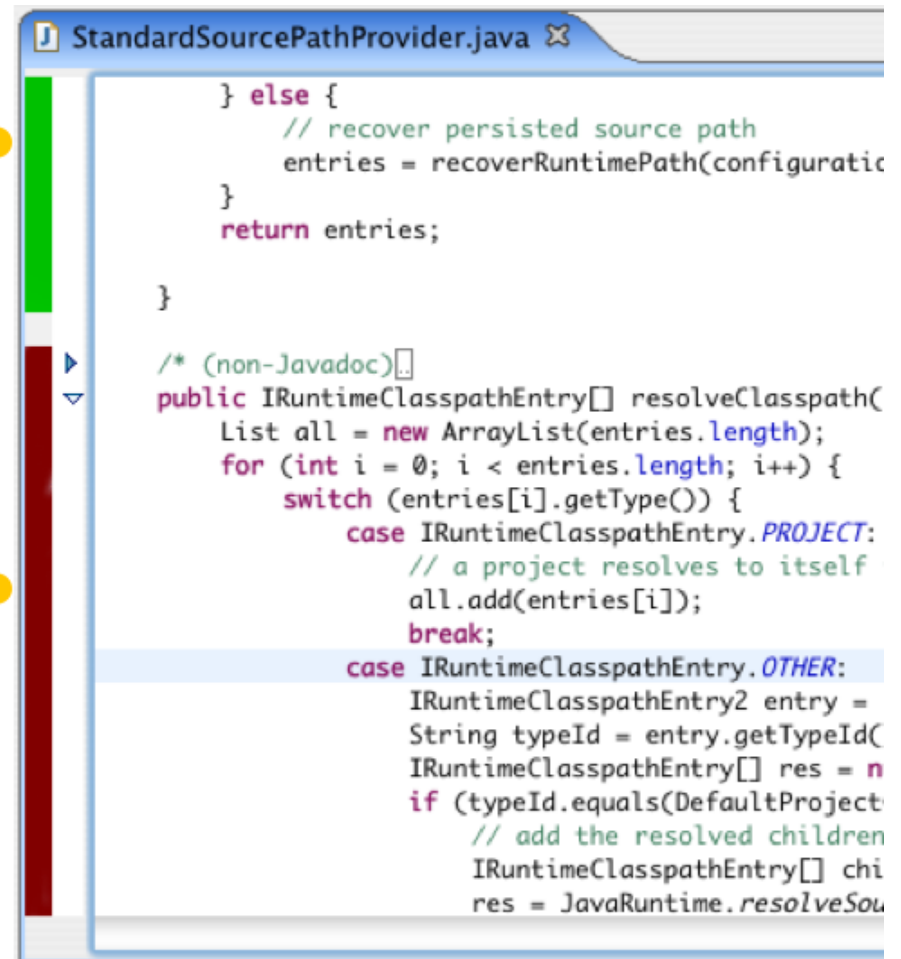
# Hatari: Risky Locations



# Hatari: Annotations

“Safe” Location  
(green)

Risky Location  
(dark red)



```
StandardSourcePathProvider.java x
} else {
    // recover persisted source path
    entries = recoverRuntimePath(configuratic
}
return entries;
}

/* (non-Javadoc)[]
public IRuntimeClasspathEntry[] resolveClasspath(
    List all = new ArrayList(entries.length);
    for (int i = 0; i < entries.length; i++) {
        switch (entries[i].getType()) {
            case IRuntimeClasspathEntry.PROJECT:
                // a project resolves to itself
                all.add(entries[i]);
                break;
            case IRuntimeClasspathEntry.OTHER:
                IRuntimeClasspathEntry2 entry =
                String typeId = entry.getTypeId(
                IRuntimeClasspathEntry[] res = n
                if (typeId.equals(DefaultProject
                    // add the resolved children
                    IRuntimeClasspathEntry[] chi
                    res = JavaRuntime.resolveSou
```

# Task Specificity

- Many development activities are task based
  - Fix this bug
  - Add this feature
- Single tasks can involve many different data sources (files, documents, past changes etc.)
- Tasks have collaborative and temporal aspects

# Mylyn

- Kersten and Murphy [FSE '06]
- Degree-of-interest model
  - Captures task context
  - Generated by observing navigation
- Connectors encourage adoption
  - Bug repositories
  - Version control
  - Tasks

# Mylyn

The image shows a screenshot of the Mylyn Usage Statistics window. The window is split into two panes. The left pane, titled "Outline", displays a hierarchical view of the project structure for "DOI Model". The right pane, titled "Usage Statistics", shows various metrics for the selected element.

**Outline Pane:**

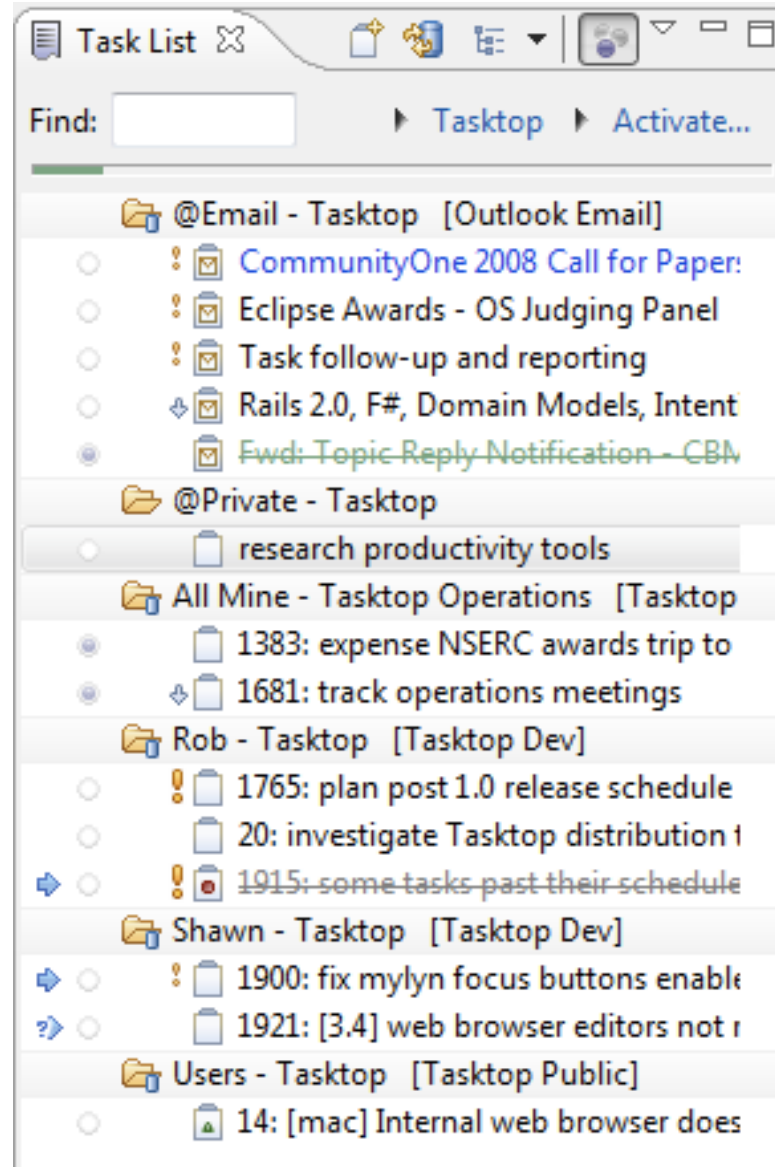
- RemoteException.class (137.59964)
- WSIFOperation\_Jms.java (112.40016)
- setPropertyValues (112.40016)
- WSIFOperation\_Jms (112.40016)
- org.apache.wsif (91.90017)
- WSIFService.java (91.90017)
- RemoteException (75.60011)
- WSIFDefaultCorrelationService (60.500053)
- checkForTimeouts (60.500053)
- org.apache.wsif.base (60.500053)
- WSIFDefaultCorrelationService.java (59.70004)
- put (59.70004)
- WSIFResponse.java (54.200096)
- setUpBindingNamespaceURIs (43.700047)
- setUpAddressNamespaceURIs (43.700047)
- get (39.400047)
- WSIFServiceImpl.java (33.400116)
- WSIFInterceptorConfig.java (32.700066)
- WSIFServiceFactory.java (32.500116)
- WSIFConstants.java (32.200066)
- PopulatedInstanceExtensionRegistry.java (32.200066)

**Usage Statistics Pane:**

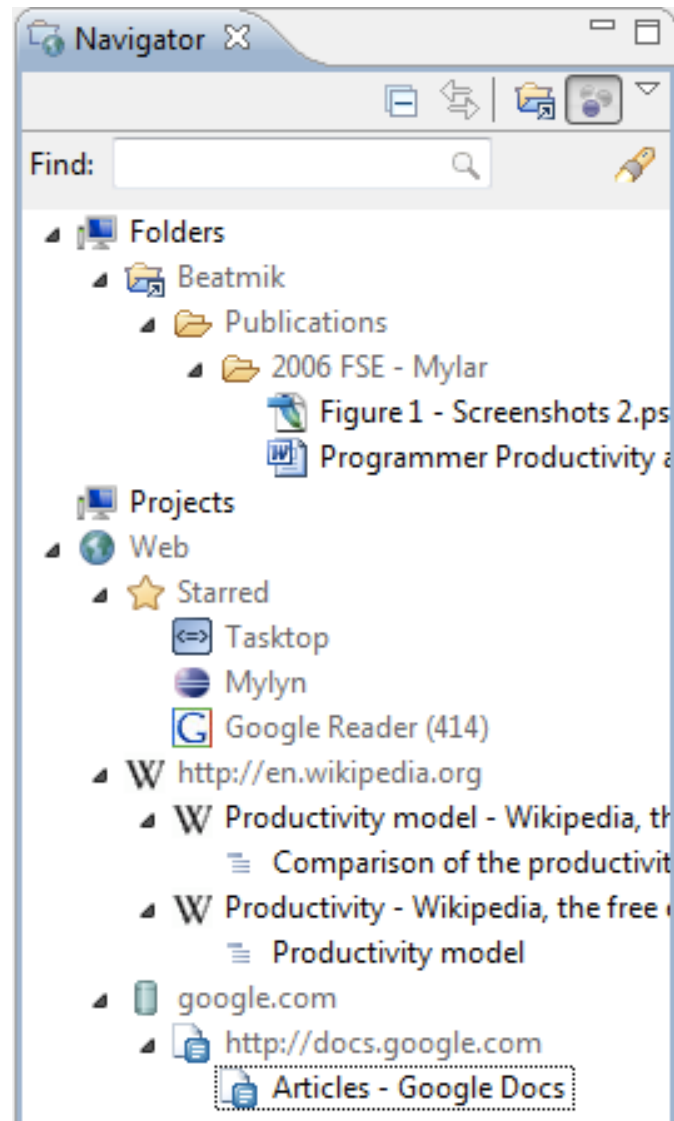
edit ratio: 0.05

- numKeystrokesJavaEditor: 54
- numSecondsElapsed: 2318
- numSelectionsJavaEditor: 45
- numSelectionsJavaEditorAutoFold: 0
- numSelectionsJavaOutline: 0
- numSelectionsJavaOutlineMylar: 14
- numSelectionsOther: 11
- numSelectionsPathfinder: 0
- numSelectionsPkgExplorer: 25
- numSelectionsPkgExplorerMylar: 8
- numSelectionsProblems: 1
- numSelectionsProblemsMylar: 1
- numSelectionsSearch: 3
- numSelectionsSearchMylar: 0
- startDate: 2004-09-20
- startTime: 20:3:15

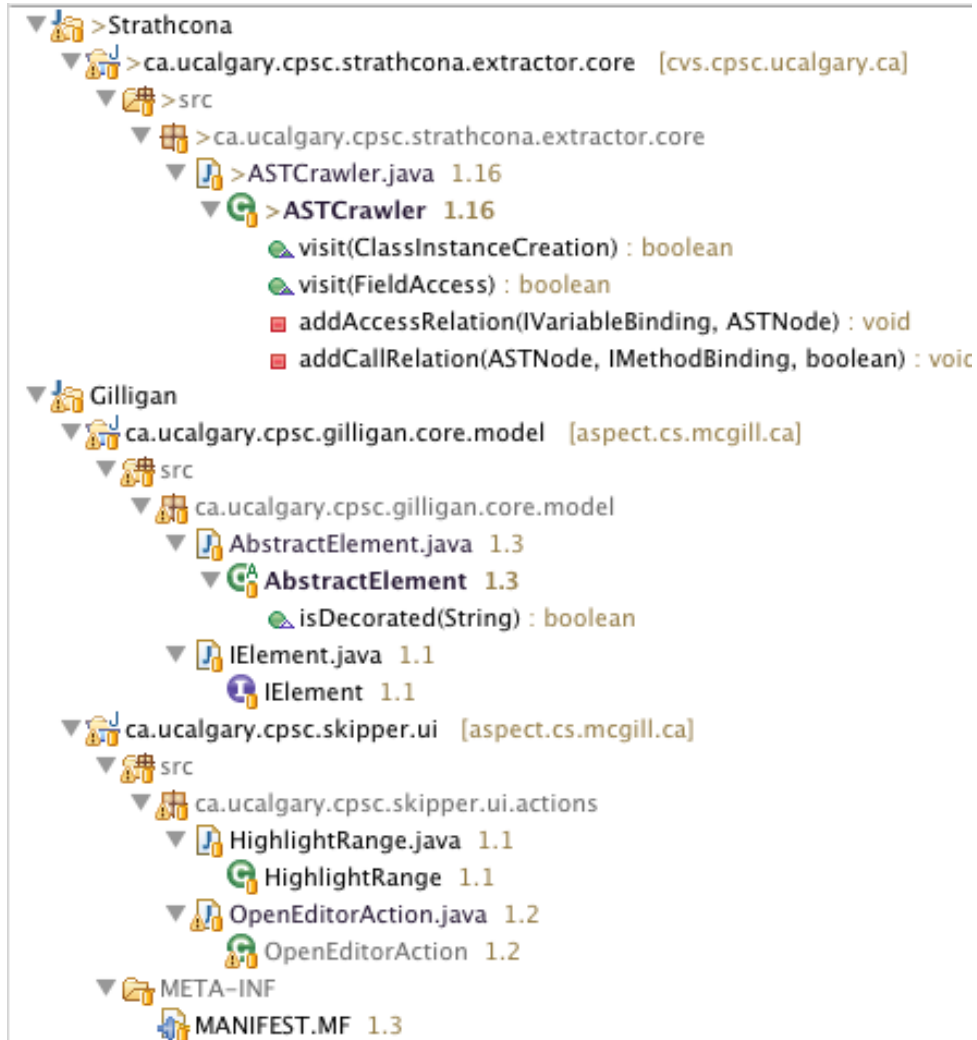
# Mylyn



# Mylyn

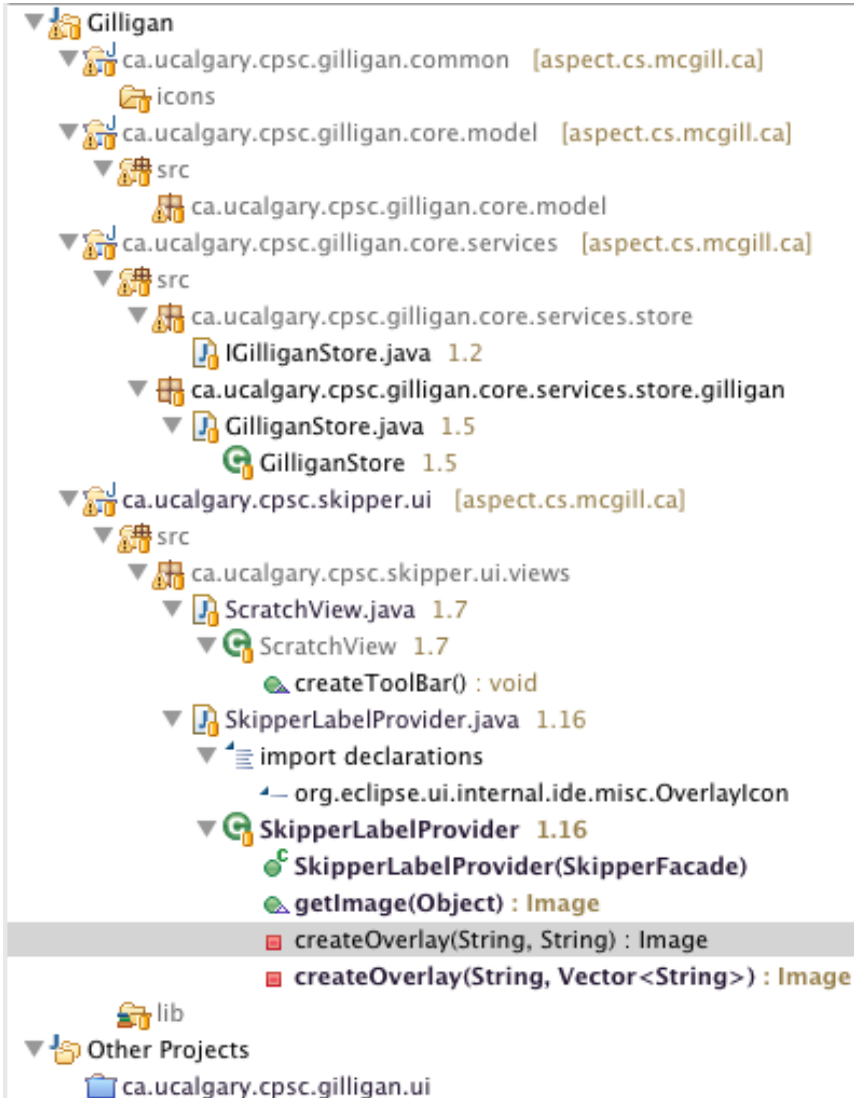


# Mylyn





# Mylyn



# Mylyn: Switching Contexts

The screenshot shows the Eclipse IDE interface with the following components and annotations:

- 1**: A red number '1' is placed in the top right corner of the IDE window.
- 2**: A red number '2' is placed in the center of the editor window, pointing to the code editor.
- 3**: A red number '3' is placed in the bottom left corner of the IDE window, pointing to the Package Explorer.
- 4**: A red number '4' is placed in the bottom right corner of the IDE window, pointing to the Outline view.

The editor window displays the following code snippet:

```
public class ResourceStructureBridge {  
  
    public final static String CONTENT_TYPE;  
  
    public ResourceStructureBridge() {  
  
    }  
  
    public String getContentType() {  
        return CONTENT_TYPE;  
    }  
  
    public Object getObjectForHandl...
```

The Task List view shows a task titled "T1: Refactor ResourceStructureBridge" with a description: "Mylar - All Mine [bug: People - Rob [bugs.e Products - Eclipse [bl".

The Outline view shows the class structure for "ResourceStructureBridge" with methods: "testDecrementAcrossBridges()", "plugin.xml: Ant Structure Bridge", "plugin.xml: structureBridge", "plugin.xml: Java Structure Bridge", "plugin.xml: PDE Structure Bridge", "getImage(IMylarElement)", "getChildHandles(String)", and "getText(IMylarElement)".

The Problems view shows a task titled "T1: Refactor ResourceStructureBridge" with a description: "ResourceStructureBridge.java - /org.eclipse.r".

# Mylyn: Switching Contexts

The screenshot displays the Eclipse IDE interface with the following components:

- Package Explorer:** Shows the project structure for 'org.eclipse.mylar.bugzilla.ui' and 'org.eclipse.mylar.tasklist'. The 'run()' method is highlighted in the 'SynchronizeReportsAction' class.
- Code Editor:** Displays the source code for 'SynchronizeReportsAction.java'. The 'run()' method is selected, showing its implementation with conditional logic for handling queries and connectors.
- Task List:** Located on the right, it shows a task 'T2: Fix NPE in S' with a red '5' next to it. The task description is 'Mylar - All Mine [bug: People - Rob [bugs.e]'. The Outline view below it shows the 'run()' method and its references.
- Problems View:** Located at the bottom, it shows two tasks: 'T1: Refactor ResourceStructureBridge' and 'T2: Fix NPE in SynchronizeReportsAction'. A red '6' is next to the second task.

# Mylyn Evaluation

- Early DOI study (6 devs)
  - Tasks are \*key\*
- Monitor study (99 devs monitored)
- Mylyn study (16 devs from monitor study)
  - Significant increase in edit ratio
- Ultimately, we vote with our feet
  - Mylyn is very popular in the Eclipse ecosystem

# TeamTracks

- DeLine et al. [VLHCC '05]
- “Pick the brain” of the original developer
- Two measures
  - Element is important if it is often visited
  - Two elements are related if visited in succession

# Team Tracks

The image displays a Visual Studio IDE with three main windows:

- Code Editor (left):** Shows the `InitFigure()` method in `TetrisGrid.cs`. The code uses a `switch` statement to initialize different Tetris pieces based on `nextFig`.

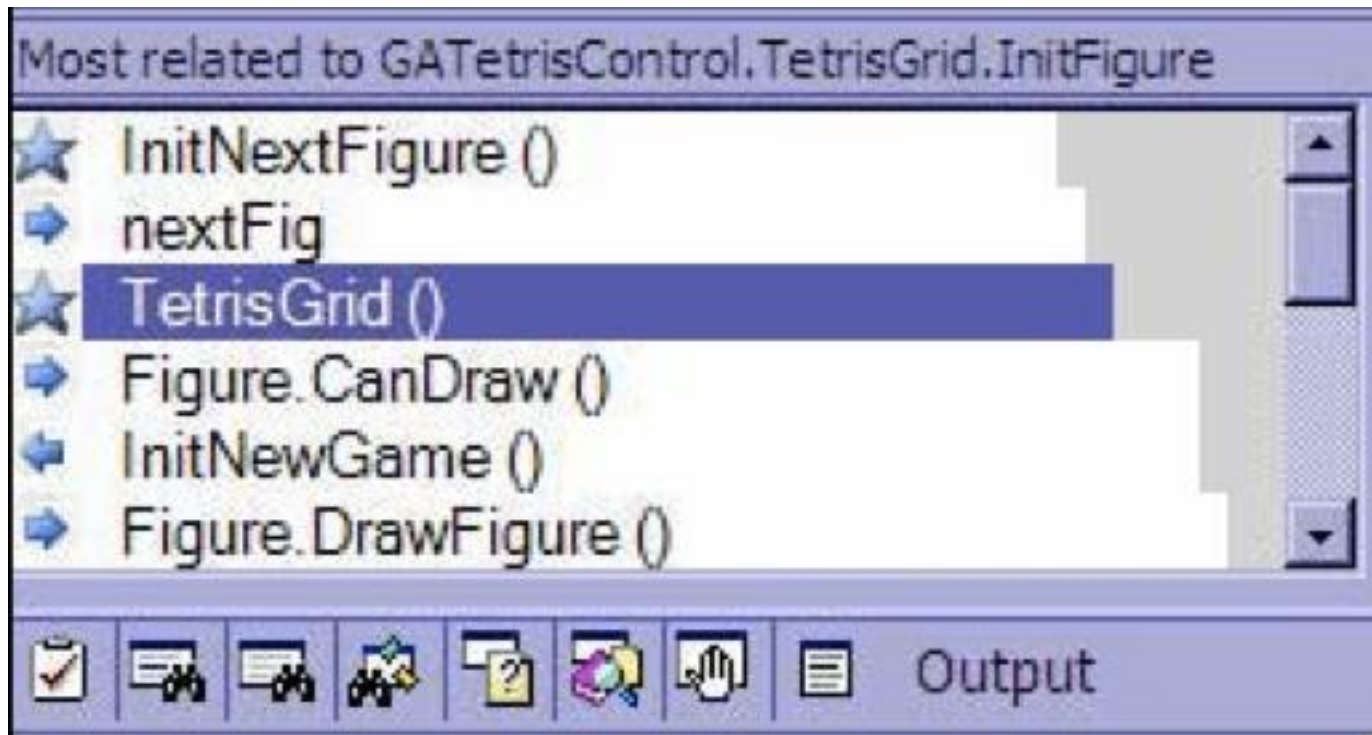
```
220         counter++;
221     }
222 }
223 }
224
225 void InitFigure()
226 {
227     if (DesignMode)
228         return;
229     switch (nextFig)
230     {
231     case 0:
232         currentFigure = new Line(this);
233         break;
234     case 1:
235         currentFigure = new Triangle(this);
236         break;
237     case 2:
238         currentFigure = new LThunder(this);
239         break;
240     case 3:
241         currentFigure = new RThunder(this);
242         break;
243     case 4:
244         currentFigure = new RightT(this);
245         break;
246     case 5:
247         currentFigure = new LeftT(this);
```
- Class View Favorites (middle):** Shows a tree view of the project's classes and members. The `GA TetrisControl` class is expanded, showing sub-classes like `Figure` and `TetrisGrid`, along with various methods and properties.
- Class View - GATetris (right):** Shows a detailed view of the `GA TetrisControl` class hierarchy, including its base classes and interfaces, and a list of its members.

At the bottom, a **Most related to GA TetrisControl.TetrisGrid.InitFigure** window shows a list of related methods and a snippet of the `TetrisGrid` constructor:

```
public TetrisGrid()
{
    ResizeRedraw = true;
    BackColor = SystemColors.window;
}
```

The letters **A**, **B**, and **C** are overlaid on the bottom right, middle, and bottom left windows respectively.

# Team Tracks



# TeamTracks Evaluation

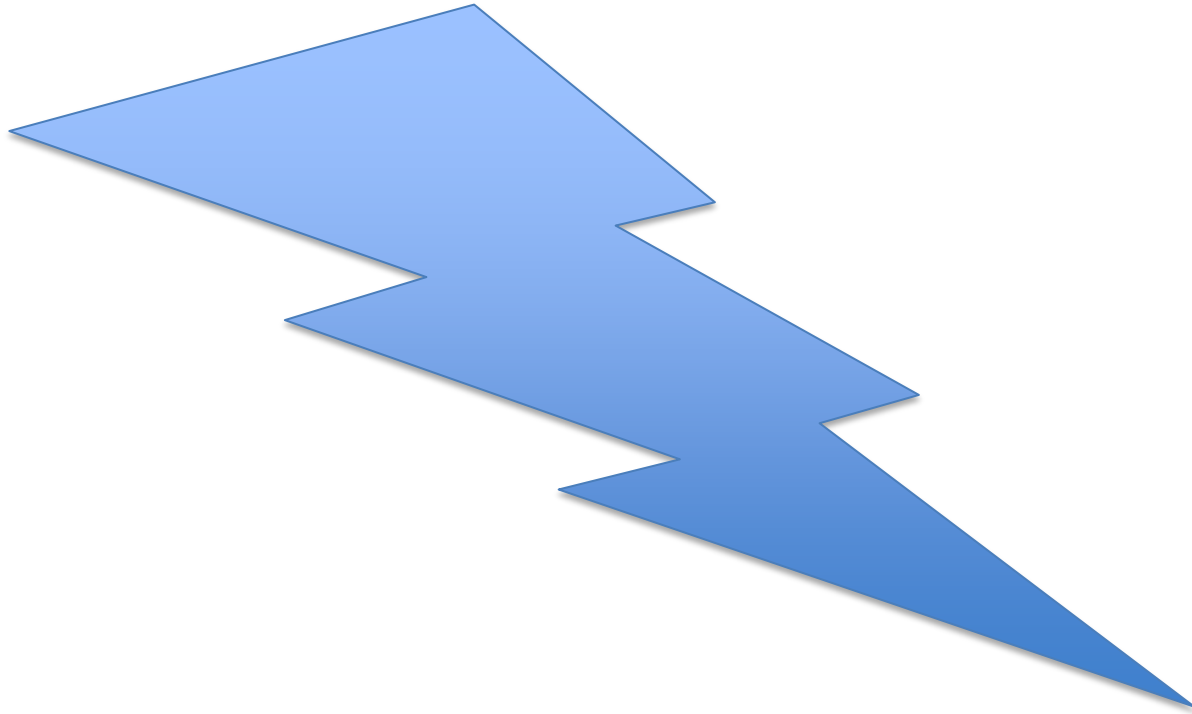
- Increased chances of success (set tasks)
- Large increase in comprehension
  - 2x more likely to give the right answer
- Privacy concerns must be considered
- Scope navigation data by time?
  - Hints at task specificity



# Code Bubbles

- Bragdon et al. [ICSE '10]
- Editable fragments rather than files
- Encourage task-based grouping
- Easily persist and share past tasks
  - Support context switching

# Code Bubbles



# Code Bubbles Evaluation

- Scrolling:
  - Decreased by ~49%
- Search / navigation:
  - Decreased by ~55%
- User study (20+ devs)
  - Generally positive, esp. about task-based features
  - Worried about scalability

# Collaborative Development

- Software is developed in teams
- IDEs are typically designed for individual devs
- Collaboration external to IDE
  - Valuable data can be lost
  - Processes unnecessarily ad hoc

# Jazz

- Li-Te Cheng [OOPSLA '03]
- Team communication
  - Explicitly link artifacts rather than mine them
  - Build chat logs into historical data
  - Enable snapshots to be sent by IM
- Lifecycle integration
  - Integrated handling of builds & tests
  - Promote enhanced reporting etc.

# Jazz

## What if your tools know...

... **about** your teams

... **about** your artifacts

... who **is responsible for** what

... **about your** process

Code delivery rules, code quality, traceability,  
test runs, intellectual property

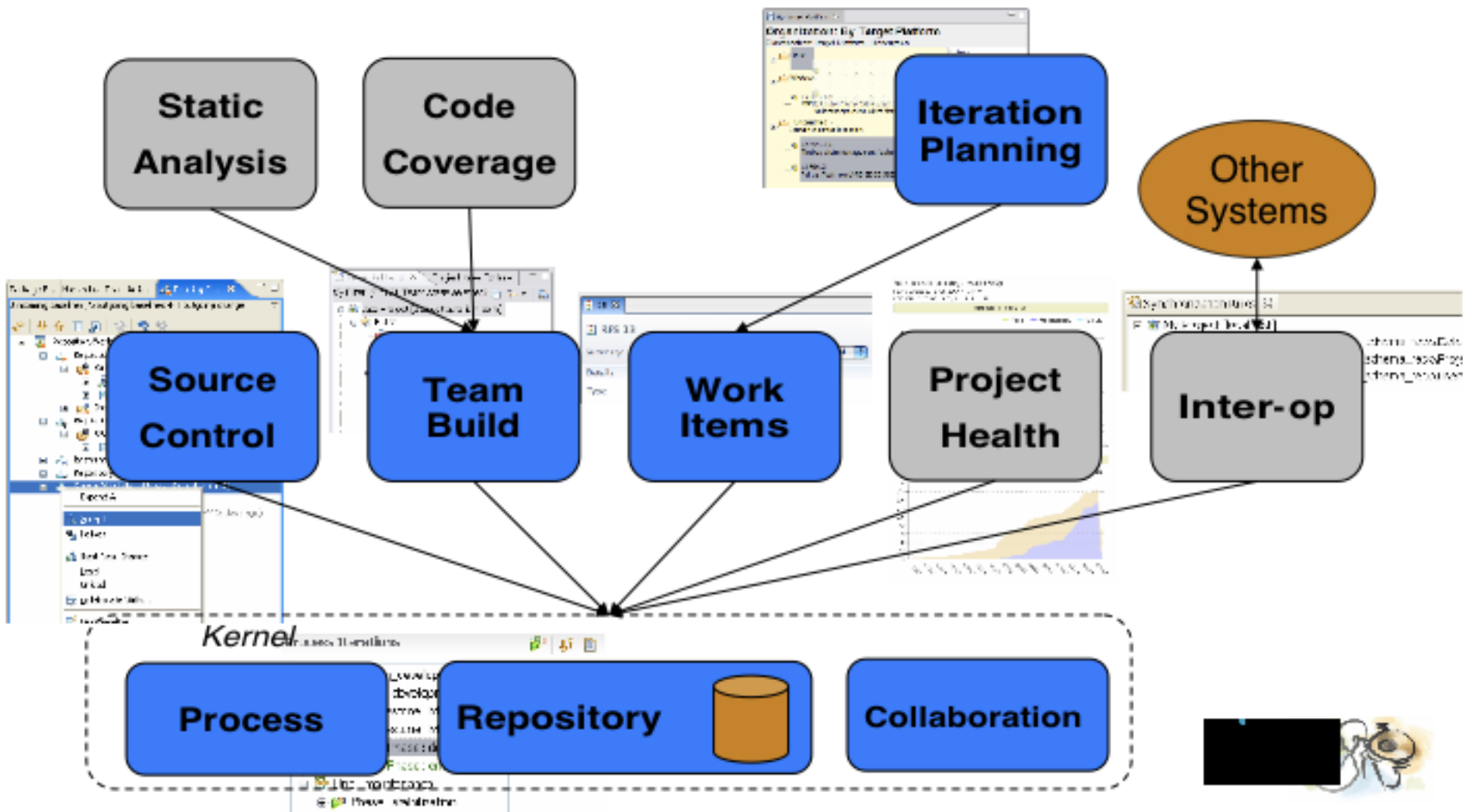
... **how to** bootstrap a project

... how to **help new team members get** started

... **your favorite** work item types **and their** state transitions

... **when the build runs and what to do if it** breaks

# Jazz Information Sources

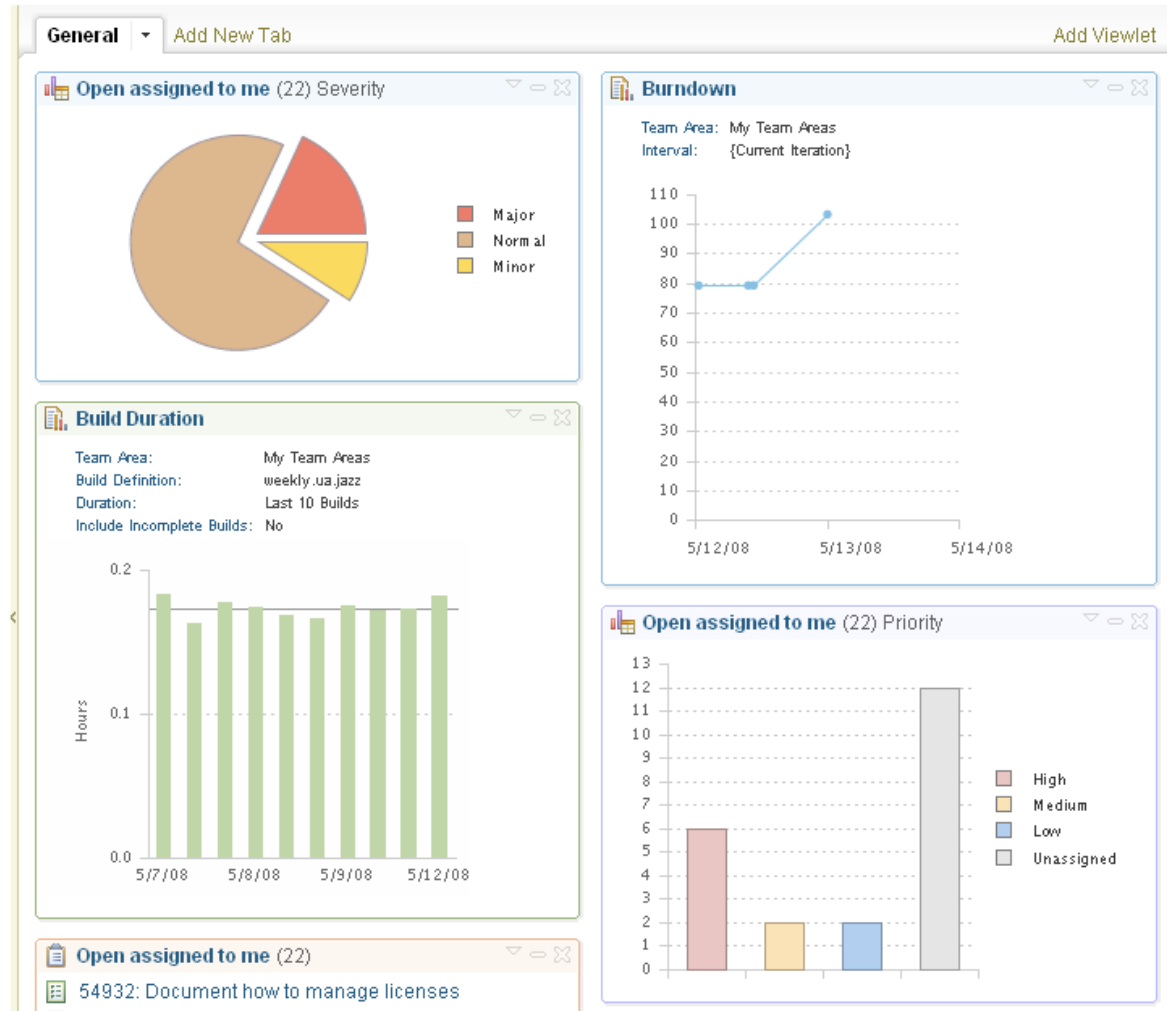


# Sample Jazz Workflow

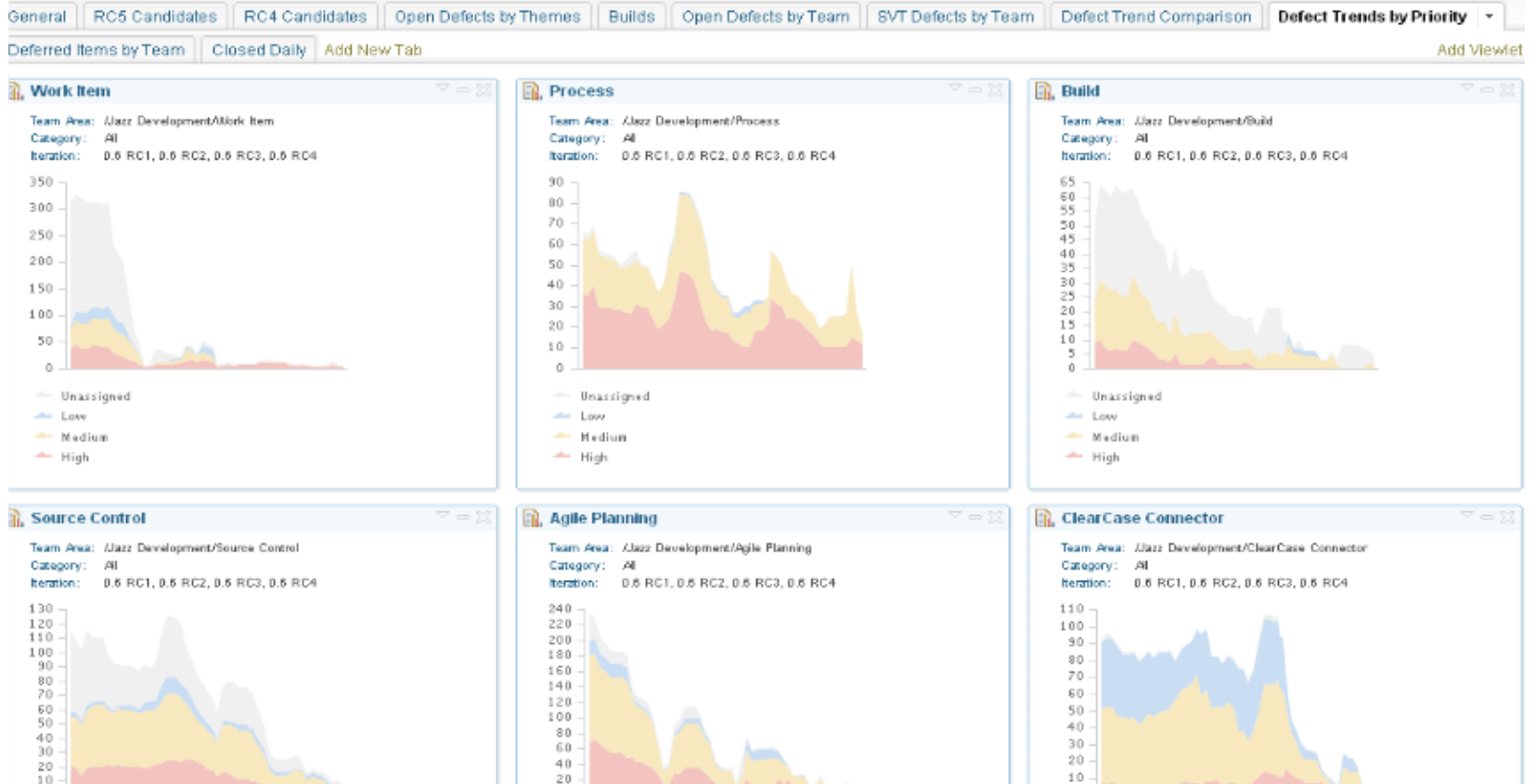
1. A build breaks owing to a test failure
2. A developer creates a bug report
3. Jazz links the bug report to both the build and the failed test
4. Jazz assigns the bug to an appropriate dev.
5. The dev commits their change set
6. Jazz links the change set to the bug and to the build



# Jazz Dashboard



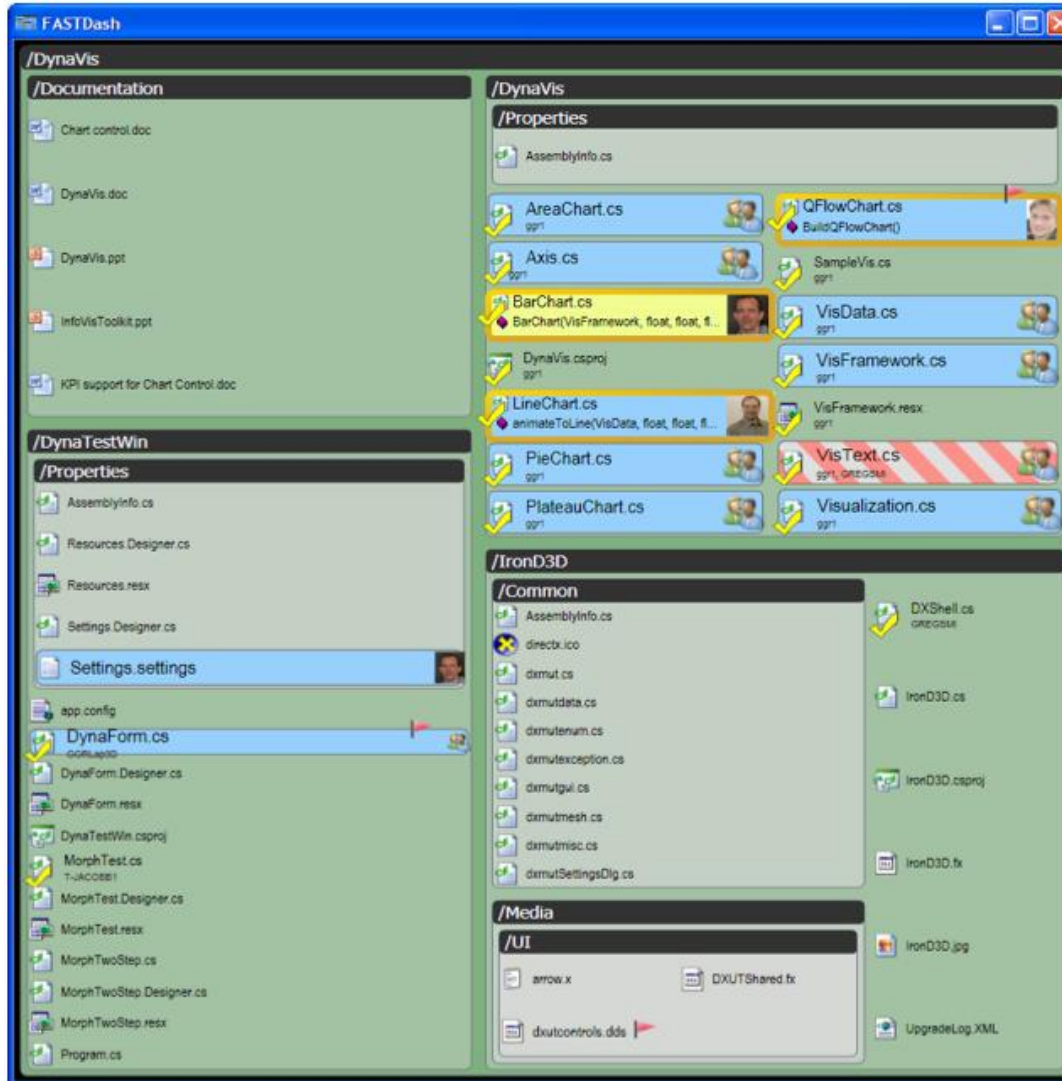
# Jazz Dashboard



# FastDash

- Biehl et al. [CHI '07]
- Assumption: Developers want to know what their co-workers are doing
  - Maintain awareness about:
    - Files being edited
    - Task assignments
    - Bug assignments
- Targeted at large displays in common space
- Decreased need for explicit communication

# FastDash



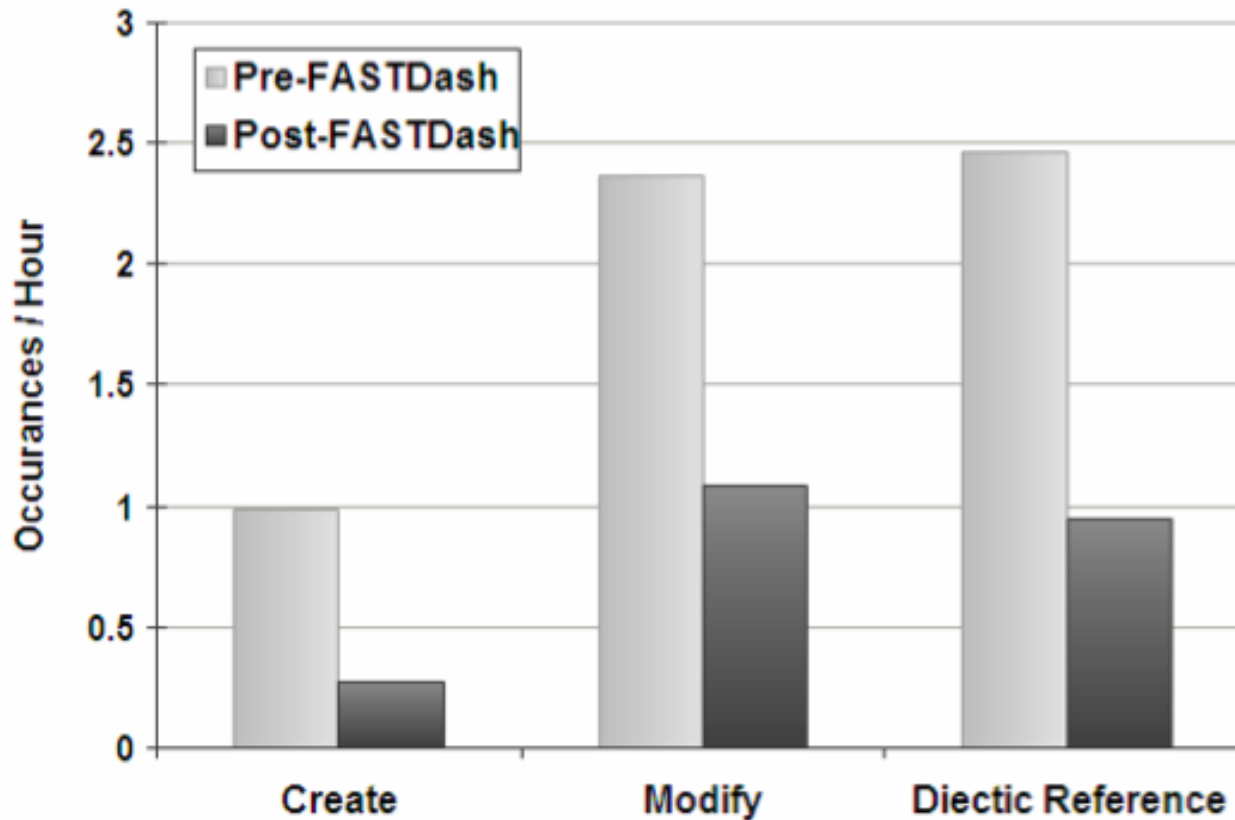
# FastDash

The image shows a screenshot of a software development tool interface, likely Visual Studio, displaying a list of files and their authors. The files are arranged in a grid-like structure. Each file entry includes a file icon, the filename, the author's name, and a small profile picture. Some entries also include a method signature or a description of the file's content.

File Name	Author	Additional Info
AreaChart.cs	ggr1	
Axis.cs	ggr1	
BarChart.cs	ggr1	BarChart(VisFramework, float, float, fl...)
DynaVis.csproj	ggr1	
LineChart.cs	ggr1	animateToLine(VisData, float, float, fl...)
PieChart.cs	ggr1	
PlateauChart.cs	ggr1	
QFlowChart.cs	ggr1	BuildQFlowChart()
SampleVis.cs	ggr1	
VisData.cs	ggr1	
VisFramework.cs	ggr1	
VisFramework.resx	ggr1	
VisText.cs	ggr1, GREGSMI	
Visualization.cs	ggr1	

# FastDash Evaluation

- Shared resource contention decreased



# Codebook

- Begel & DeLine [MSR '08]
- Extend social networks into software systems
  - E.g., developers can be 'friends' with their code
  - Social call graphs
    - Enable informal feedback channel for your APIs
- Provide alternative means for discovering time contention
- Evaluation not yet complete

# Codebook

## EventLogger.Connect() in [EventLogger.cs](#)

In class [EventLogger](#) in [Microsoft.Research](#)

Compiled into [Logging.DLL](#)

16 checkins between 1/24/2005 and 1/31/2006

5 prio bugs, 10 pri1 bugs, 1 pri2 bug

3 sibling methods:

`void OnConnection\(...\)`

`bool Close\(\)`

`void OnFailure\(...\)`

2 sibling fields:

`int numberConnections`

`bool currentlyConnected`

Uses [MAPI](#), [OWA](#), and [Passport](#) external APIs.

Spec can be found in <http://team/sites/devui/docs/Logger.doc>

## Callers

Called by 41 methods: See all

[EventLogger.OnConnection\(\)](#): 3 calls

[EventLogger.OnFailure\(\)](#): 2 calls

[Recommender.Startup\(\)](#): 1 call

Code owned by 24 people calls [Connect\(\)](#):

[Mike Diaz](#), [Jerry Ryan](#), [Sumeet Gupta](#), [Aaron Martin](#),

[Jenna Goldberg](#) ... (see all)

## Gadgets

Churn metrics

Get definition

## Newsfeed

— March 2009 —

[Pialic](#) checked in [#1181](#) (tfs) and marked bug [#9902](#) (ps) as closed.

changed methods [openLogFile\(\)](#) and [Connect\(\)](#) in class [Connect](#)

Moved to [EventLogger](#) class from [OldEventLogger](#) class by [pialic](#)

Modified by checkin [#1181](#) ("BUG 9902...") by [pialic](#)

Mentioned in bug [#9902](#) ("fails to connect...") is pri 1 by [abegel](#)

— February 2009 —

Mentioned in checkin [#381](#) ("BUG 3384...") by [sumeetg](#)

Mentioned in email ("Failed to connect...") from [rdeline](#)

Mentioned in bug [#3384](#) ("hang when...") is pri 1 by [ginav](#)

Mentioned in bug [#1022](#) ("connects too slow...") is pri 2 by [pialic](#)

— December 2008 —

Added by checkin [#211](#) ("ongoing...") by [pialic](#)

## Related People

2 committers, 3 bug reporters/commenters (see all)

[pialic](#) RSDE MSR-Research 99/4219

[rdeline](#) SENIOR RESEARCHER MSR-Research  
99/2132

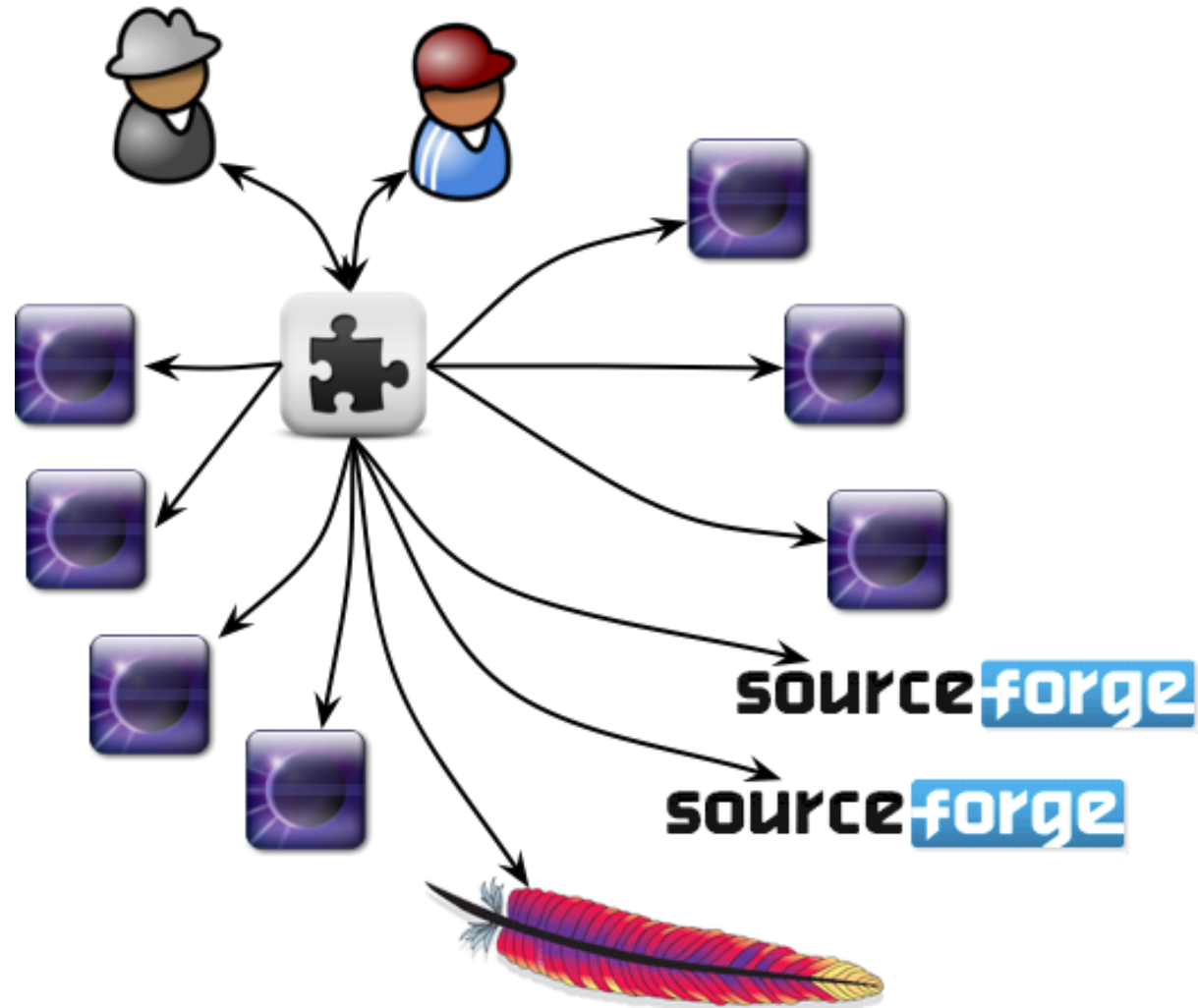
[sumeetg](#) DEV LEAD 2 Windows 26/3012



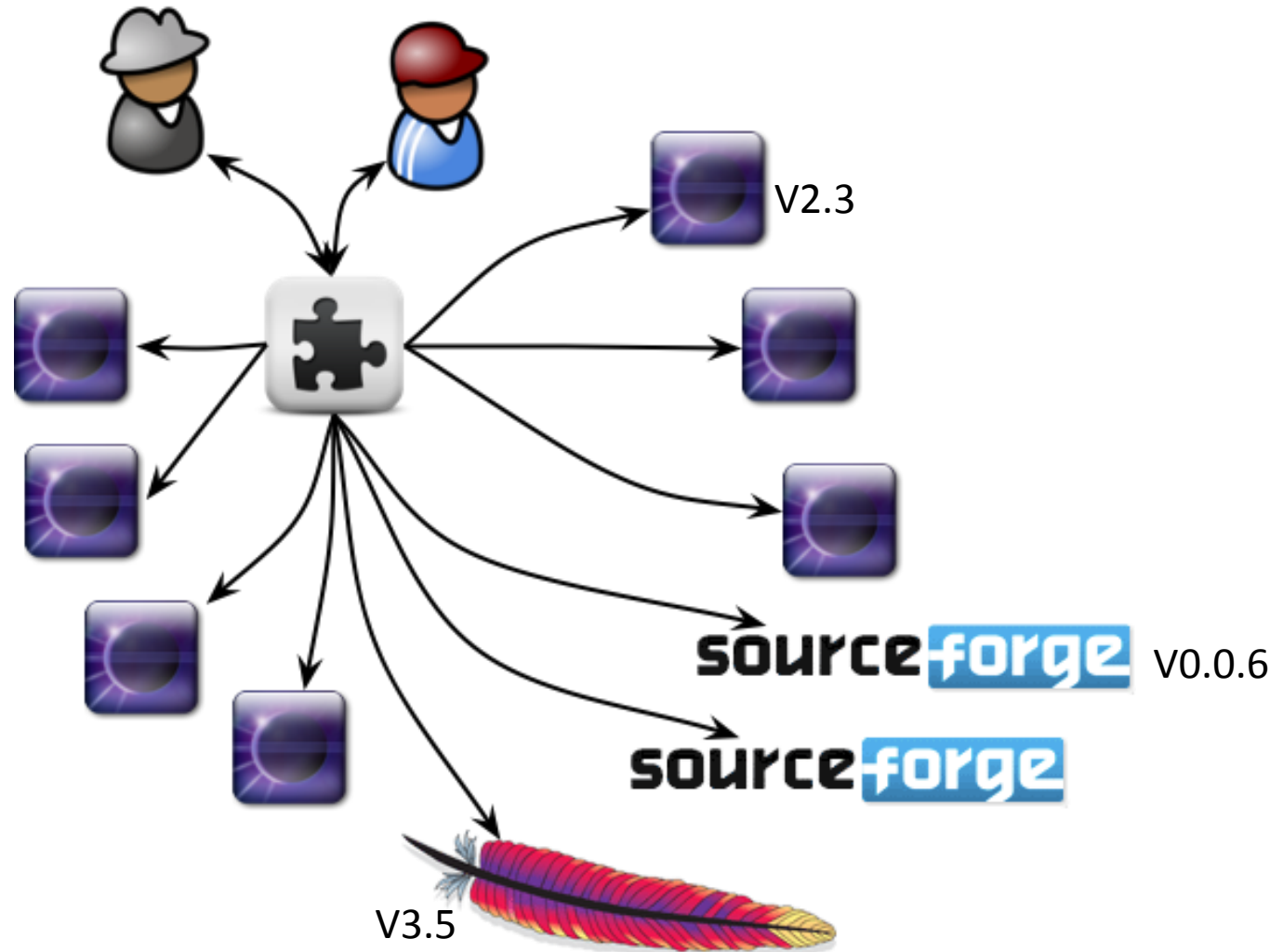
# Customized Awareness

- Holmes and Walker [ICSE '10]
- Projects are not created in isolation
  - Sometimes control is ceded to external teams
- Similar information spread across many projects

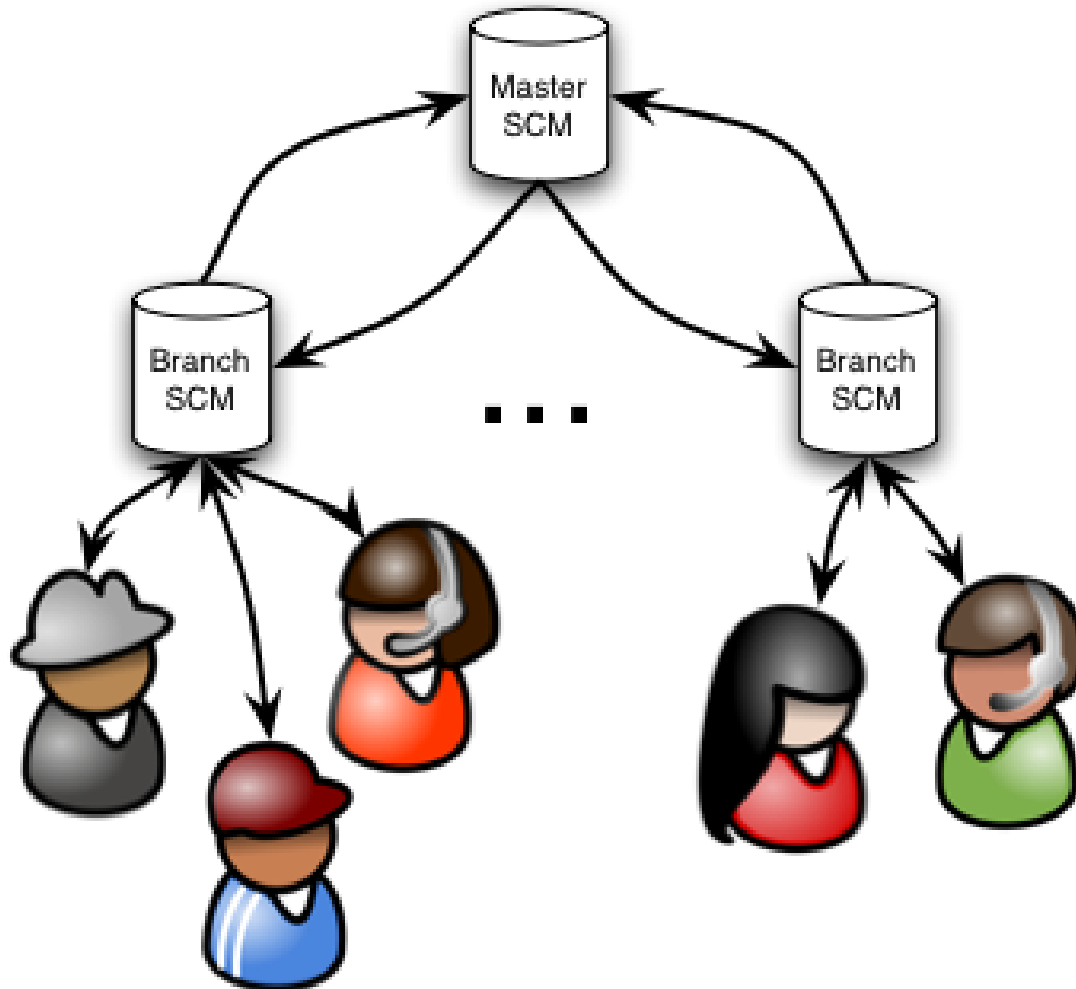
# Heterogeneous Environments



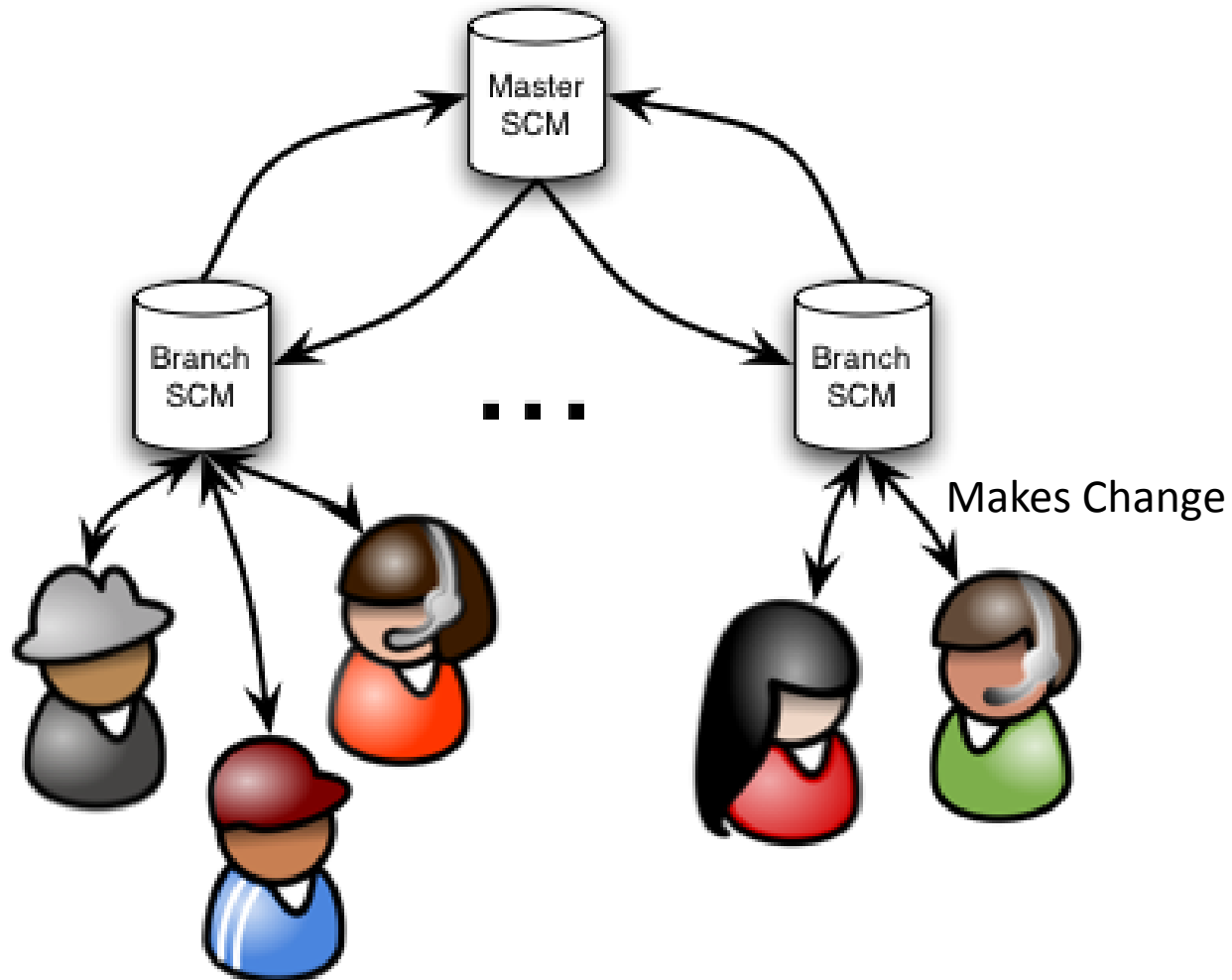
# Heterogeneous Environments



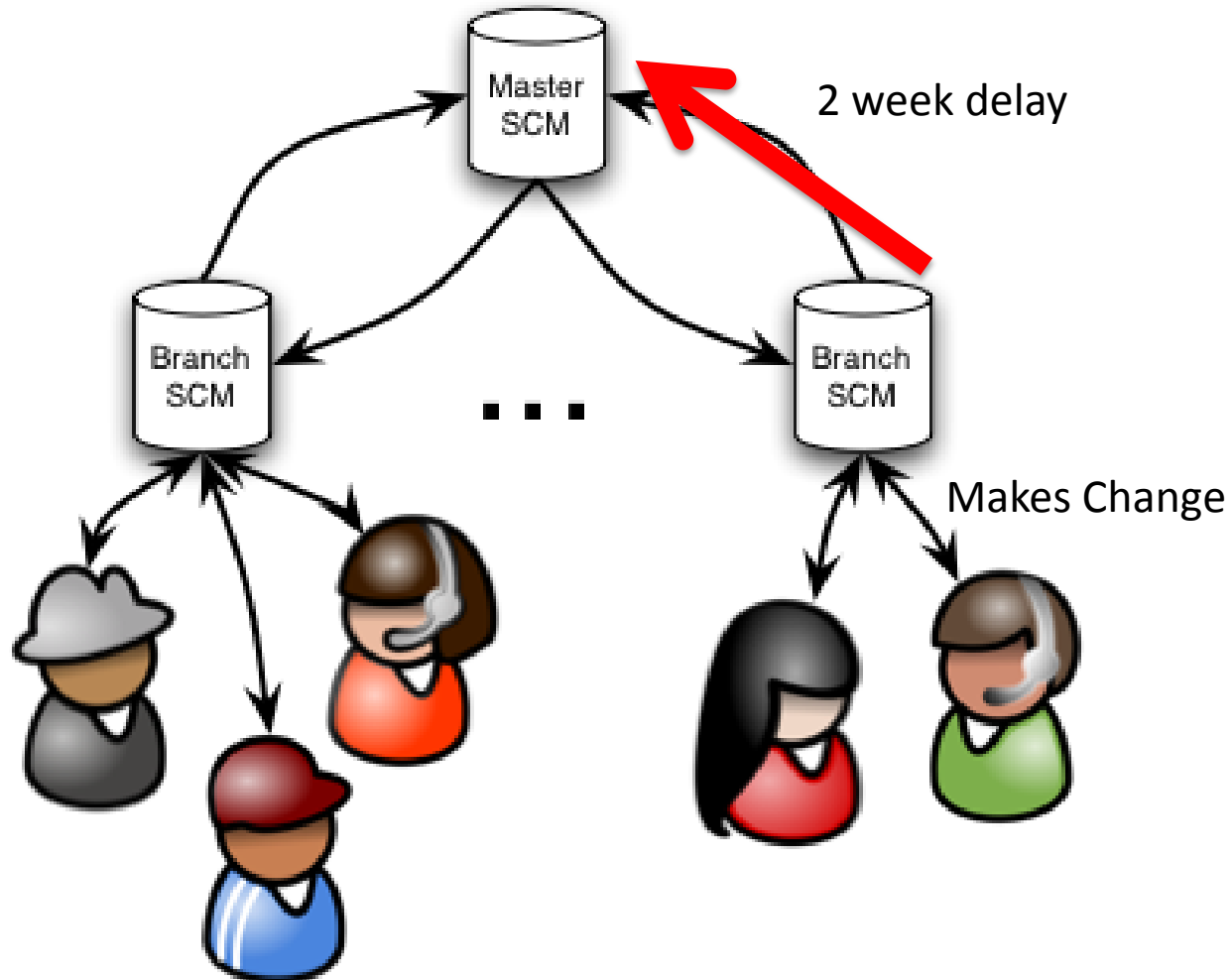
# Large Teams



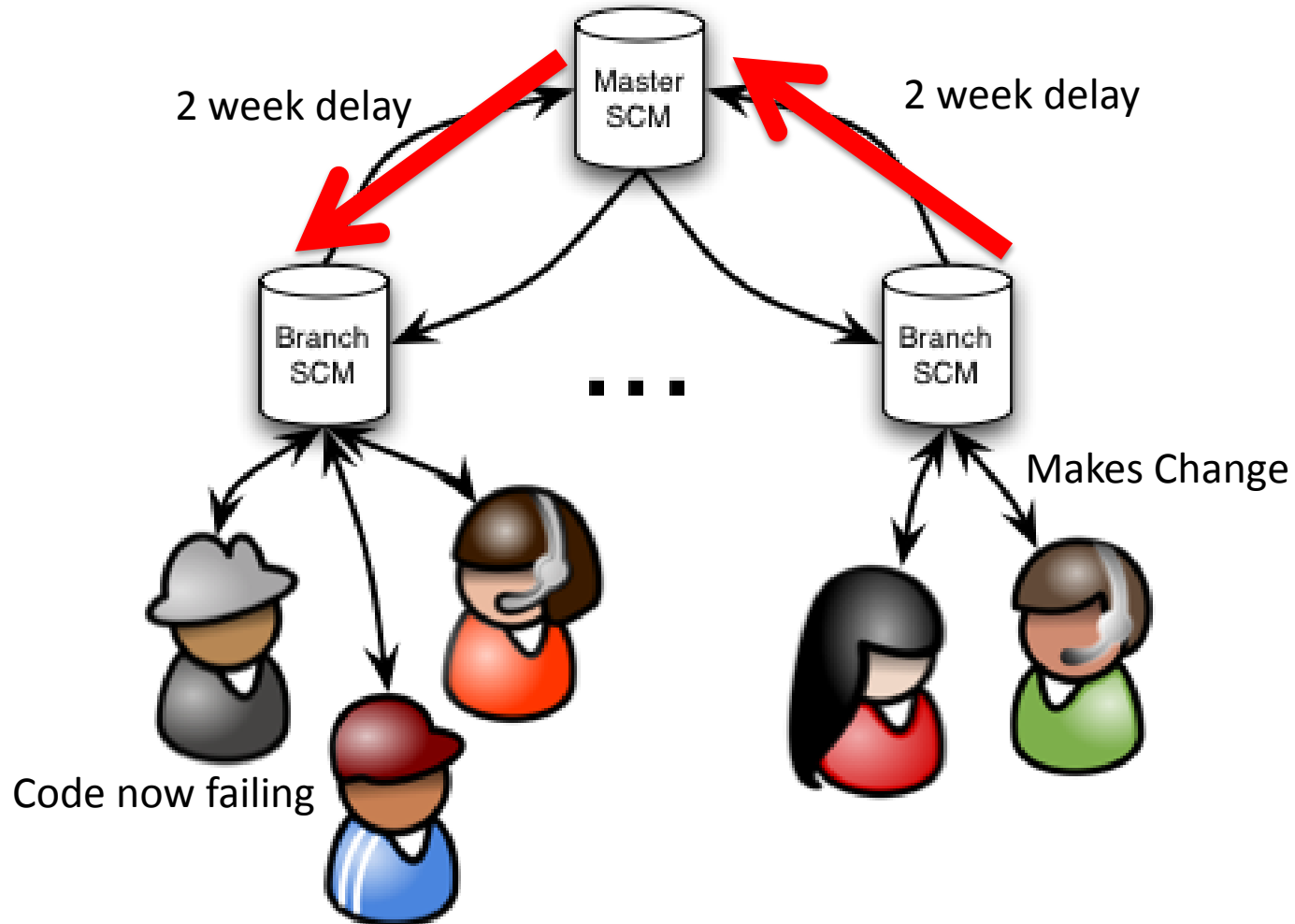
# Large Teams



# Large Teams



# Large Teams



# Commit Logs

Subject: [r9g-cvs] [hg] refactoring.java: #144961: fixing NPE

From: Jan P. <jp... (at) netbeans.org>

Message-id: hg.abbaf0f1ff63.1219918286.1797694213 (at)

hg.netbeans.org

Date: 2008-08-28 12:11:26

changeset abba0f1ff63 in main

details: [http://hg.netbeans.org/main?cmd=changes baf0f1ff63](http://hg.netbeans.org/main?cmd=changes+baf0f1ff63)

description:

#144961: fixing NPE

diffs (12 lines):

diff -r eb7c38562250 -r abba0f1ff63

a/refactoring.java/src/org/netbeans/modules/refactoring/java/ui/UIUtilities.java

b/refactoring.java/src/org/netbeans/modules/refactoring/java/ui/UIUtilities.java

Aug 28 12:03:58 2008 +0200

```
@@ -92,7 +92,7 @@ public final class UIUtilities {
```

```
    headerRenderer = table.getTableHeader().
```

```
    getDefaultRendererer();
```

```
}
```

```
    Component comp = headerRenderer.
```

```
    getTableCellRendererComponent(
```

```
-    null, column.getHeaderValue(), false, false, 0, 0);
```

```
+    table, column.getHeaderValue(), false, false, 0, 0);
```

```
    int width = comp.getPreferredSize().width;
```

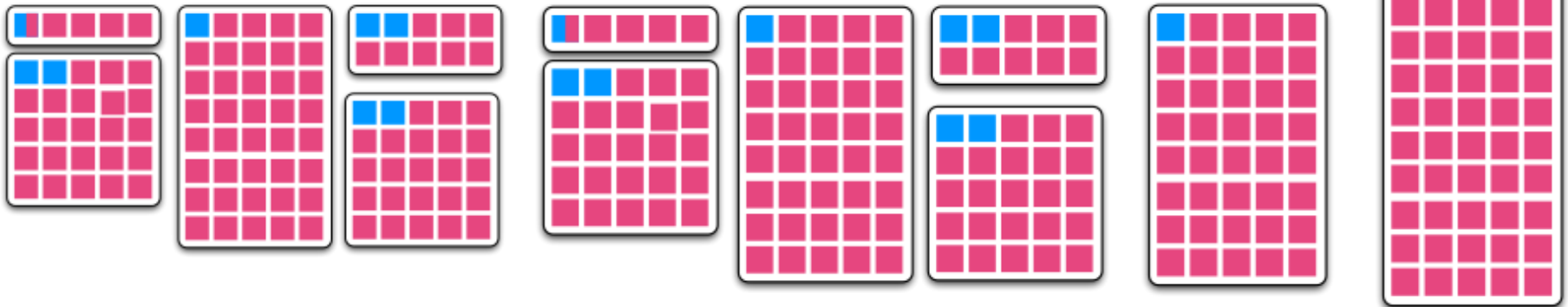


# Commit Log Volume

System	msg / work day
• KDE	515
• Open Office	505
• NetBeans	353
• Linux Kernel	157

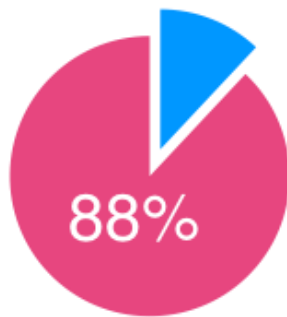
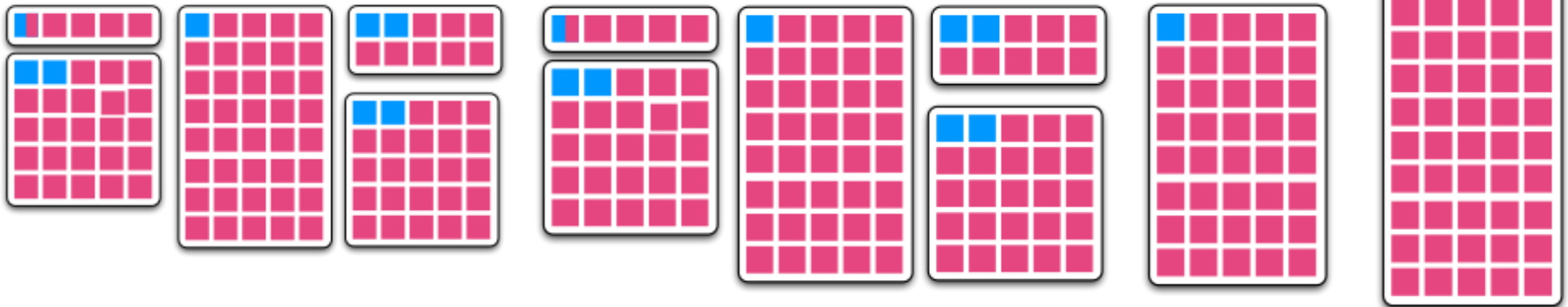
# Concrete Example

- Eclipse Metrics plug-in
  - Depends on 9xEclipse, 7xApache, 1xSF
  - Only uses a minority of each

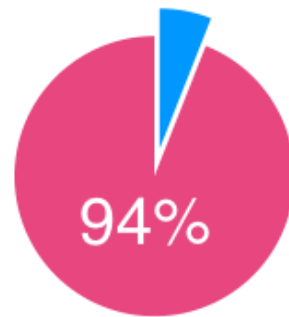


# Concrete Example

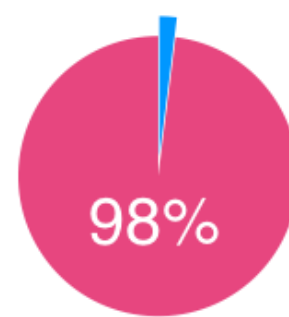
- Eclipse Metrics plug-in
  - Depends on 9xEclipse, 7xApache, 1xSF
  - Only uses a minority of each



Classes



Methods



Fields

# Approach

- Infer interest set
  - Code ownership + static analysis
- Analyze changes
  - Identify changed elements
- Determine change relevance
  - Structural relevance
  - Practical relevance

# Evaluation

- RQ1: How well is the stream compressed?
- RQ2: Are impactful events really impactful?
- RQ3: Are any impactful events misclassified?

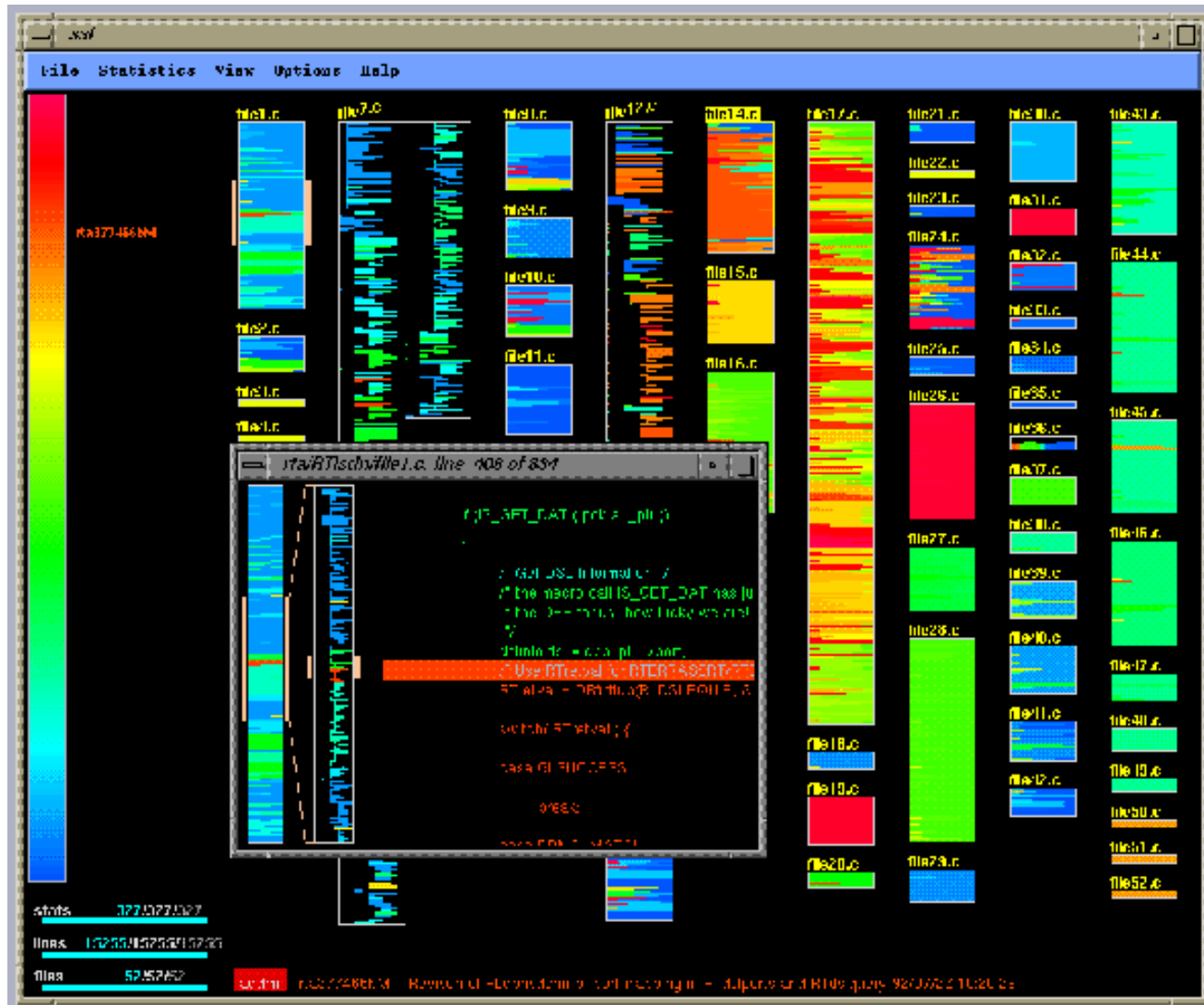
	<b>Impactful</b>	<b>Uncertain</b>	<b>Information</b>	<b>Irrelevant</b>
Metrics (sau erf)	9	674	273	618,219
Checkstyle	6	604	266	381,788

	<b>TP</b>	<b>FP</b>	<b>TN</b>	<b>FN</b>
Metrics	10	2	619,163	0
Checkstyle	5	0	382,658	1

# Visualizations

- Seek to provide unique insights about systems
  - Task-specific or general ‘understanding’?
- Mappings to physical analogs difficult

# SeeSoft





# RIGI





# AspectBrowser

Aspect Browser - ClassDictionary.java - Eclipse Platform

File Edit Source Refactor Navigate Search Project Run Window Help

Aspect Tree

Create Aspects

Grep Pattern:

Create Group Create Aspect

Show and Hide Aspects

- Aspect Index
  - length (138)
  - \.set (70)
  - file\* = (12)
  - new (202)
  - modifier (23)

Computed Source Information

- Redundant Lines Present
- Most Common Identifiers
- Eclipse Resource Markers
  - org.eclipse.jdt.core.task
  - org.eclipse.jdt.debug.javaLineBreakpoint
    - Line breakpoint: Traversal [line...]
    - Line breakpoint: Traversal [line...]

Run Analysis

Visualization and Navigation

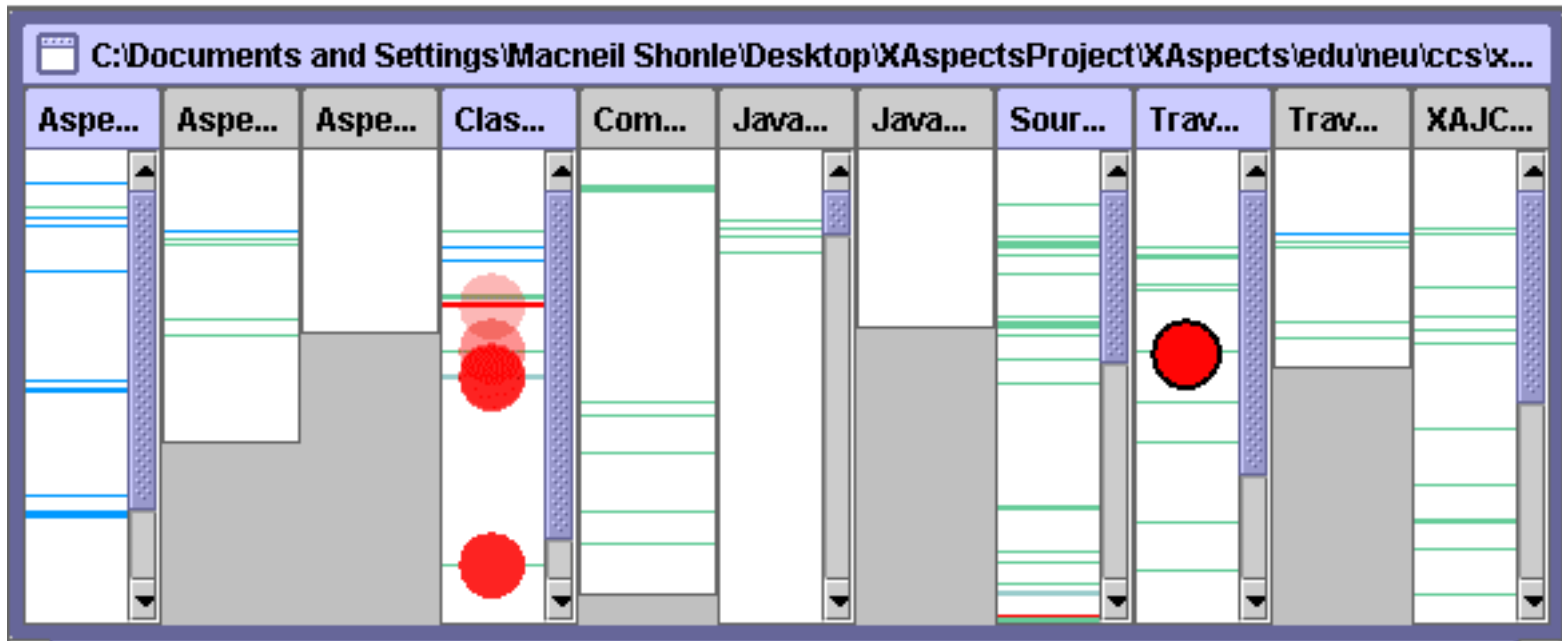
Aspe...	Aspe...	Aspe...	Clas...	Com...	Java...	Java...	Sour...	Trav...	Trav...	XA.JC...
			●					●		

JavaTok... AspectI... SourceE... ClassDi... x Travers... »5

```
PrintStream origOut = System.out;
PrintStream origErr = System.err;
File out = new File(getWorkingDirectory(), "ou
File err = new File(getWorkingDirectory(), "ex
try {
    System.setOut(new PrintStream(new FileOutp
    System.setErr(new PrintStream(new FileOutp
}
catch (FileNotFoundException fnfe) {
```

Writable Smart Insert 156 : 1

# AspectBrowser



# Tarantula

The screenshot shows the Tarantula Bug Finder application window. The title bar reads "Tarantula Bug Finder". The menu bar includes "File". The main interface features a toolbar with radio buttons for "Default", "Discrete", "Continuous" (which is selected), "Passes", "Fails", and "Mixed". A progress indicator shows "Line: 6862". Below the toolbar is a "Test:" input field. The central area is a large grid of vertical panels, each displaying a different execution trace of the code. The traces are color-coded, with yellow and green indicating passed executions and red indicating failed ones. At the bottom, a status bar shows the current line of code: 

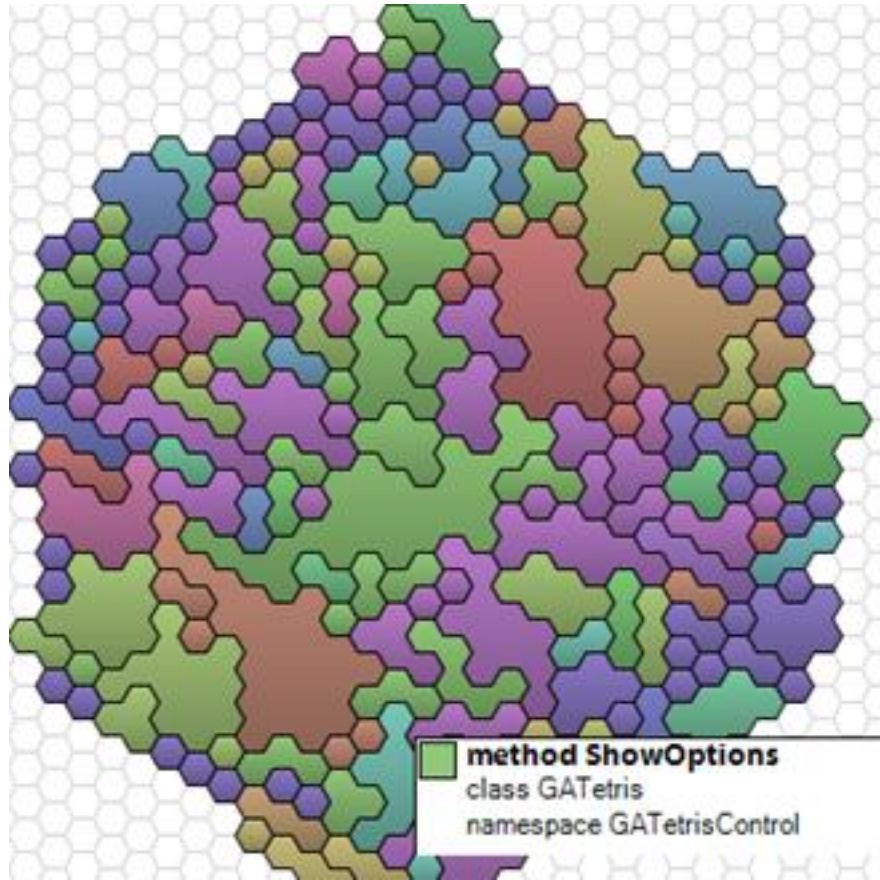
```
if (error != 0)
    *ppqdim_unit_ptr = 0;
```

 To the right of the code, it displays "Line 6862", "Executions: 66 / 300", "Passed: 63 / 297", and "Failed: 3 / 3". A "Color Legend" is also visible on the right side of the status bar.

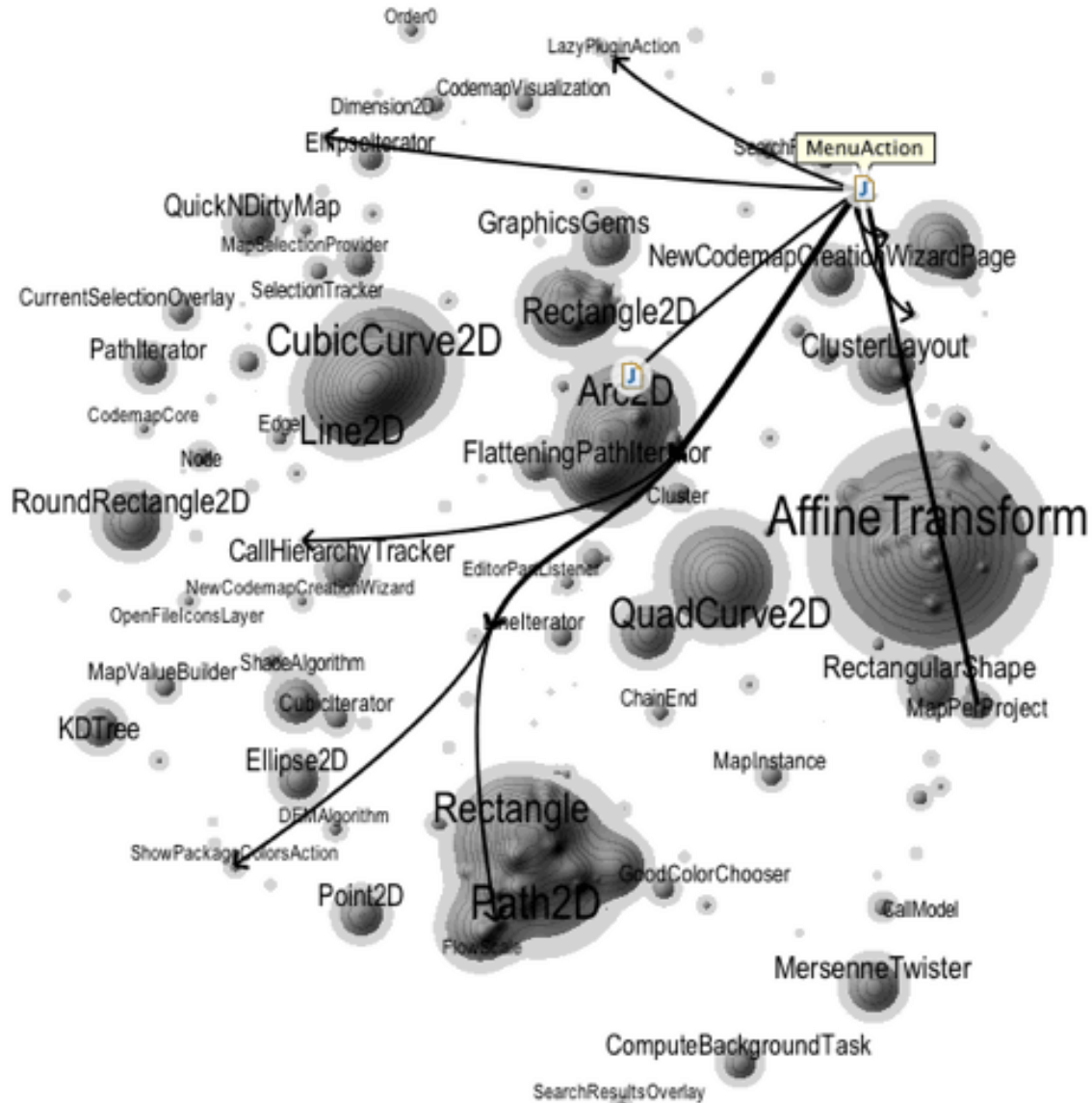
# Software Terrain Maps

- DeLine [VLC 2005]
- Navigate perceptually rather than cognitively
- Ease navigation esp. backtracking
- Region size corresponds to code size
- Region locations capture affinity

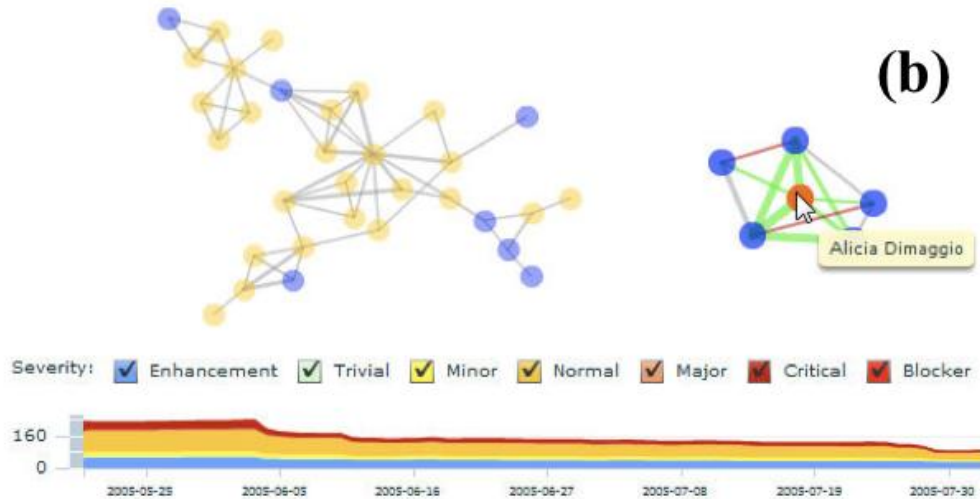
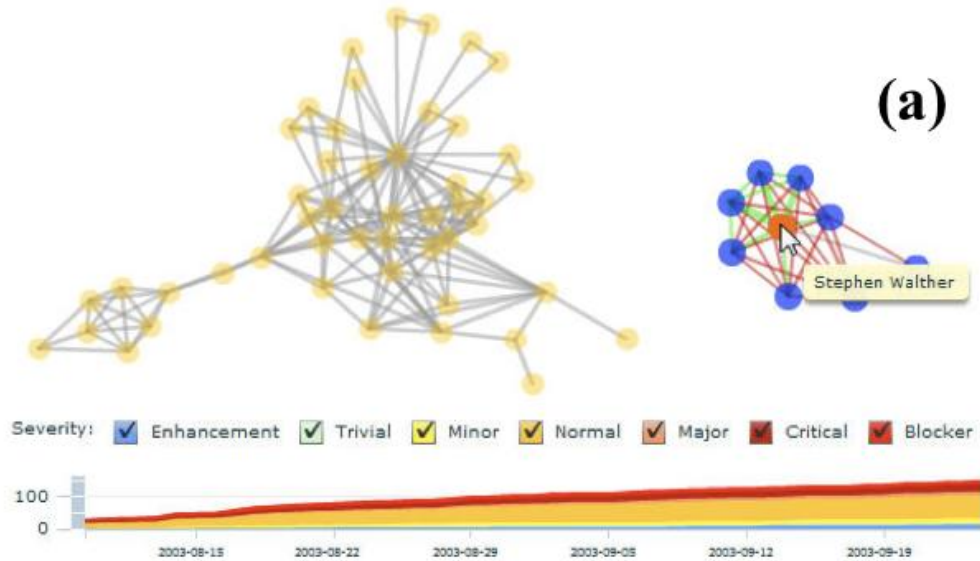
# Software Terrain Maps



# Software Cartography



# Tesseract



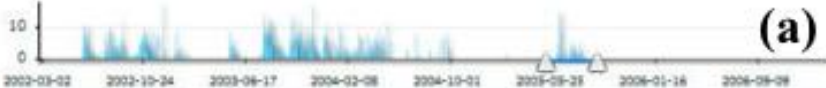


# Tesseract

**Project**  
gnome/rhythmbox  
DoubleClick node to drill down upon all selected.

Search

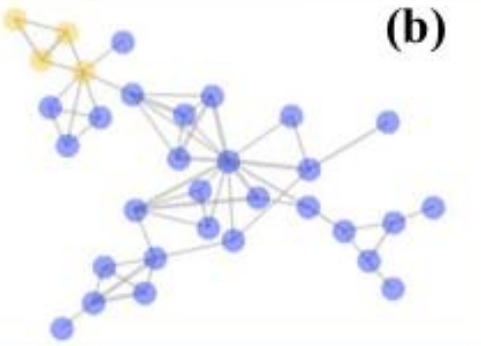
(a)



**Files** Show Settings

File name
widgets/rb-property-view.c
widgets/rb-query-creator.c
player/rb-recorder-gst.c
shell/rb-shell.c
shell/rb-remote.c
widgets/rb-rating-helper.c
player/rb-recorder.h
radio/rb-station-properties-dialog.c


(b)



**Developers** Show Settings

Name
Stephen Walthe
Lynda Finney
Alicia Dimaggio
Tony Theriault
Billy Mick
Glenda Whyte


(c)



**Issues**

Severity:  Enhancement  Trivial  Minor  Normal  Major  Critical  Blocker

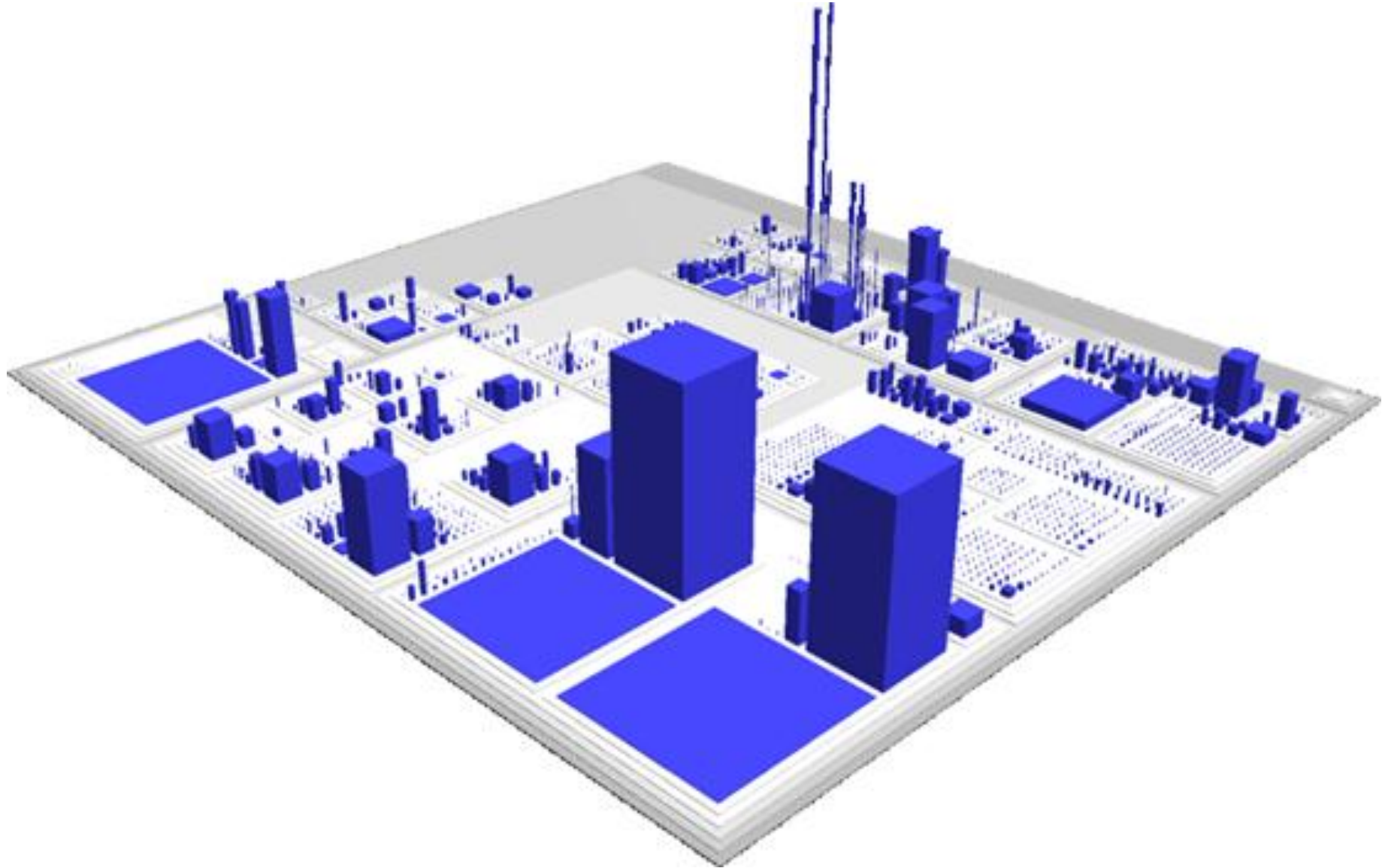
(d)



Bug ID	Start	End	Severity	Priority	Status	Resolution	Description
9027	2004-11-22	2005-08-22	normal	Normal	RESOLVED	FIXED	default ordering of tracks in smart playlists
9028	2004-11-22	2005-08-26	enhancement	Normal	RESOLVED	FIXED	Add "minutes" type to automatic playlist limits
9030	2004-08-26	2005-06-06	critical	High	RESOLVED	OBSOLETE	Crash when resuming play



# Code City



# Summary

- Tools help developers do something
- The path from a research prototype to an industrial tool is convoluted at best
  - Start with an idea that *could* be useful in practice
- Evaluation mismatch:
  - Academic merit vs. industrial merit