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Debugging with Confidence: Visualizing Code in Eclipse

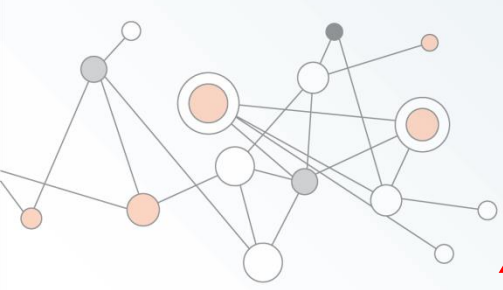
Eric Woestman

woestman@ensoftcorp.com

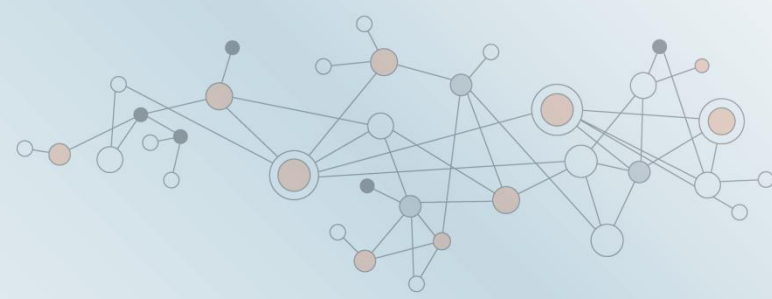
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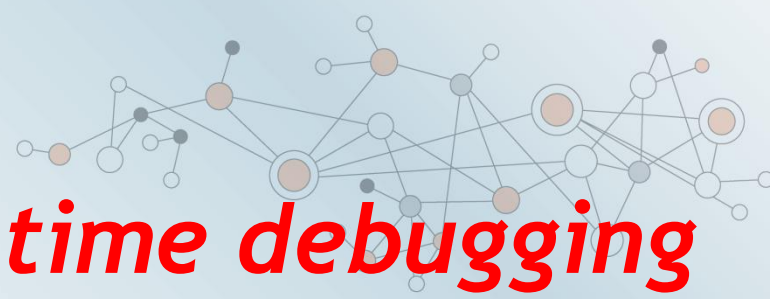


Agenda



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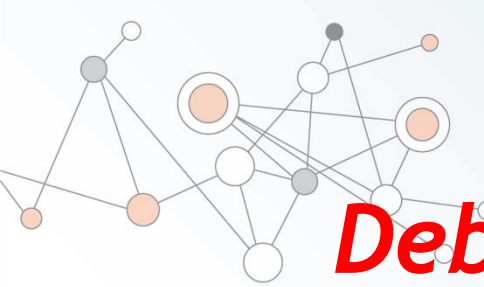
- Intro
- Debugging Process
- Setting Breakpoints
- Atlas for Java
- Example
- Debugging Concurrency in the CDT
- Demo



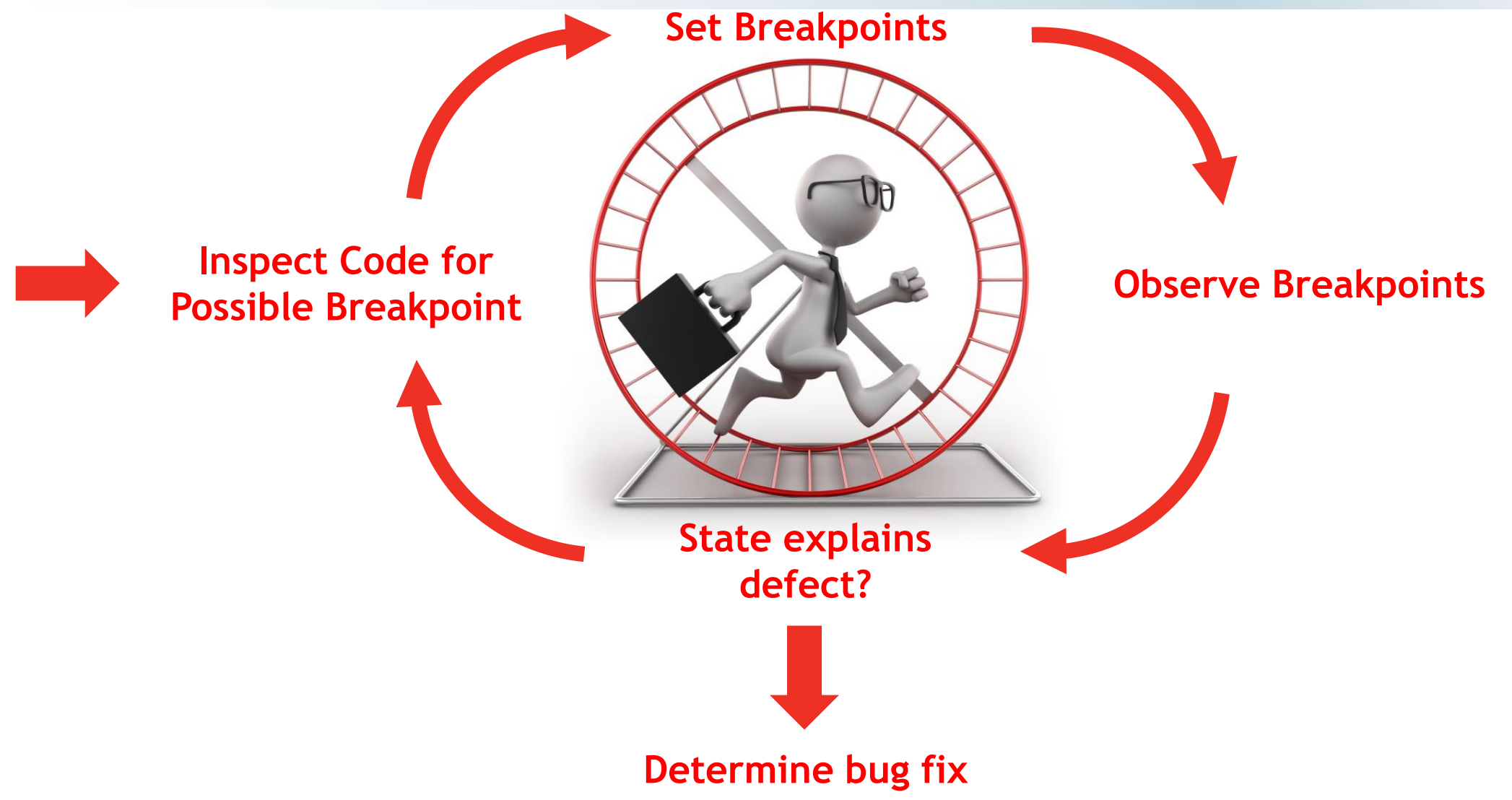
We spend too much time debugging

- Developers spend 60% of time reading and debugging code^[1]
- Increasing project complexity only worsens this problem
- Incomplete or incorrect documentation also makes this more difficult

1: T. Pigoski. Practical Software Maintenance: Best Practices for Managing your Software Investment. Wiley Computer Publishing, 1996.



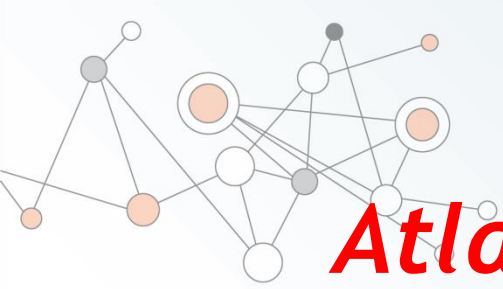
Debugging Process



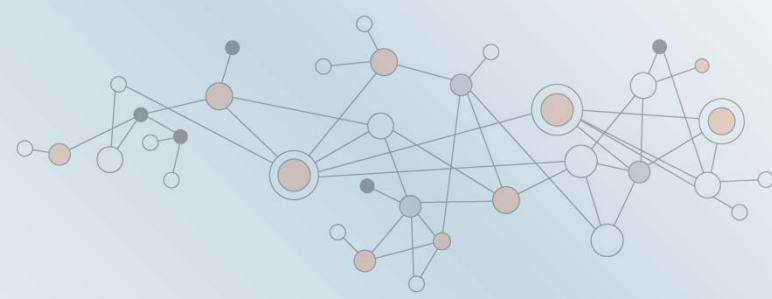


Efficiently Setting Breakpoints

- Breakpoints are trial and error
- Relies on code comprehension
- Goal: reduce the number of breakpoints
- Method: improve code comprehension

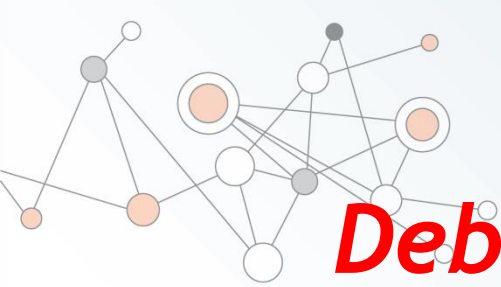


Atlas for Java

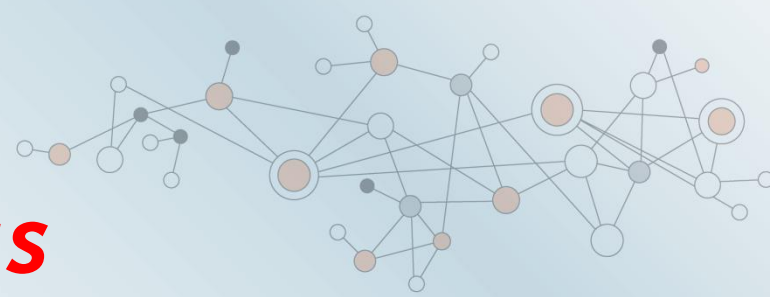


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- Indexes source and stores relations in a graph
- Common relations
 - Declaration, definition
 - Invoke
 - Data flow
 - Control flow



Debugging with Atlas



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- Visualizing graph helps comprehension
- Methods and classes are represented as nodes
- Visually represent source structure or flow



Simple Example

```
5 public class ListenerList {
6
7     public static interface Listener {
8         public void onEvent(Object event);
9     }
10
11     private final Collection<Listener> listeners = new HashSet<Listener>();
12
13     public void addListener(Listener l) {
14         listeners.add(l);
15     }
16
17     public void removeListener(Listener l) {
18         listeners.remove(l);
19     }
20
21     public void notifyListeners(Object event) {
22         for(Listener l : listeners) {
23             l.onEvent(event);
24         }
25     }
26
27 }
28
```

```
Exception in thread "main" java.lang.NullPointerException
    at ListenerList.notifyListeners(ListenerList.java:23)
    at Example3.changeText(Example3.java:35)
    at Example3.main(Example3.java:42)
```

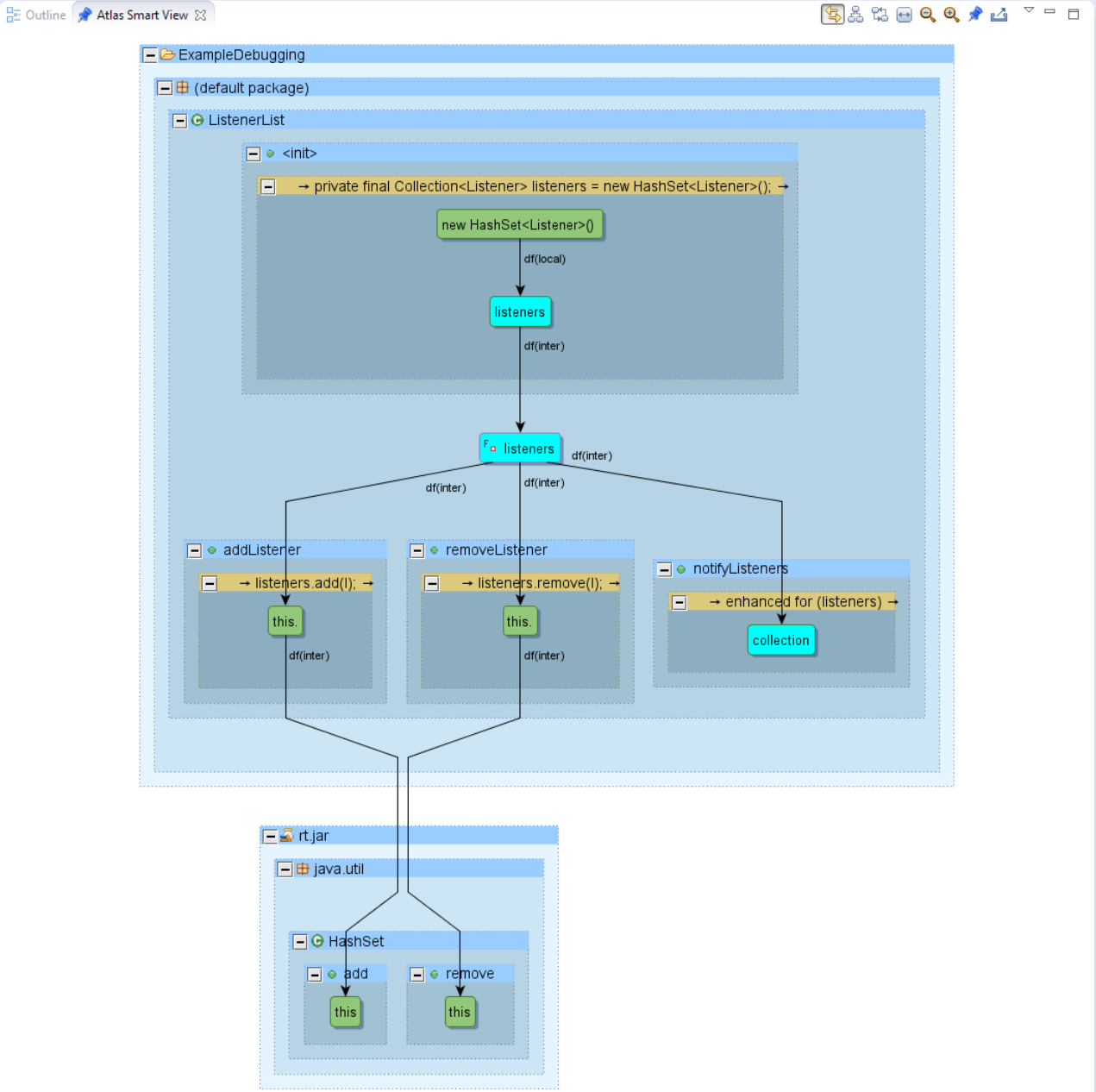
This code is most often spread across hundreds of lines.

Packa... Type ...

- connectbot
- ExampleDebugging
 - src
 - (default package)
 - Example3.java
 - ListenerList.java
 - JRE System Library [JavaSE-1]

```
1 import java.util.Collection;
2
3
4
5 public class ListenerList {
6
7     public static interface Listener {
8         public void onEvent(Object event);
9     }
10
11     private final Collection<Listener> listeners = new Has
12
13     public void addListener(Listener l) {
14         listeners.add(l);
15     }
16
17     public void removeListener(Listener l) {
18         listeners.remove(l);
19     }
20
21     public void notifyListeners(Object event) {
22         for(Listener l : listeners) {
23             l.onEvent(event);
24         }
25     }
26
27 }
28
```

<terminated> Example3 [Java Application] C:\Program Files\Java\jdk1.7.0_40\bin\javaw.exe (Jul 30, 2014, 12:16:06)
Exception in thread "main" java.lang.NullPointerException
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at Example3.changeText(Example3.java:35)
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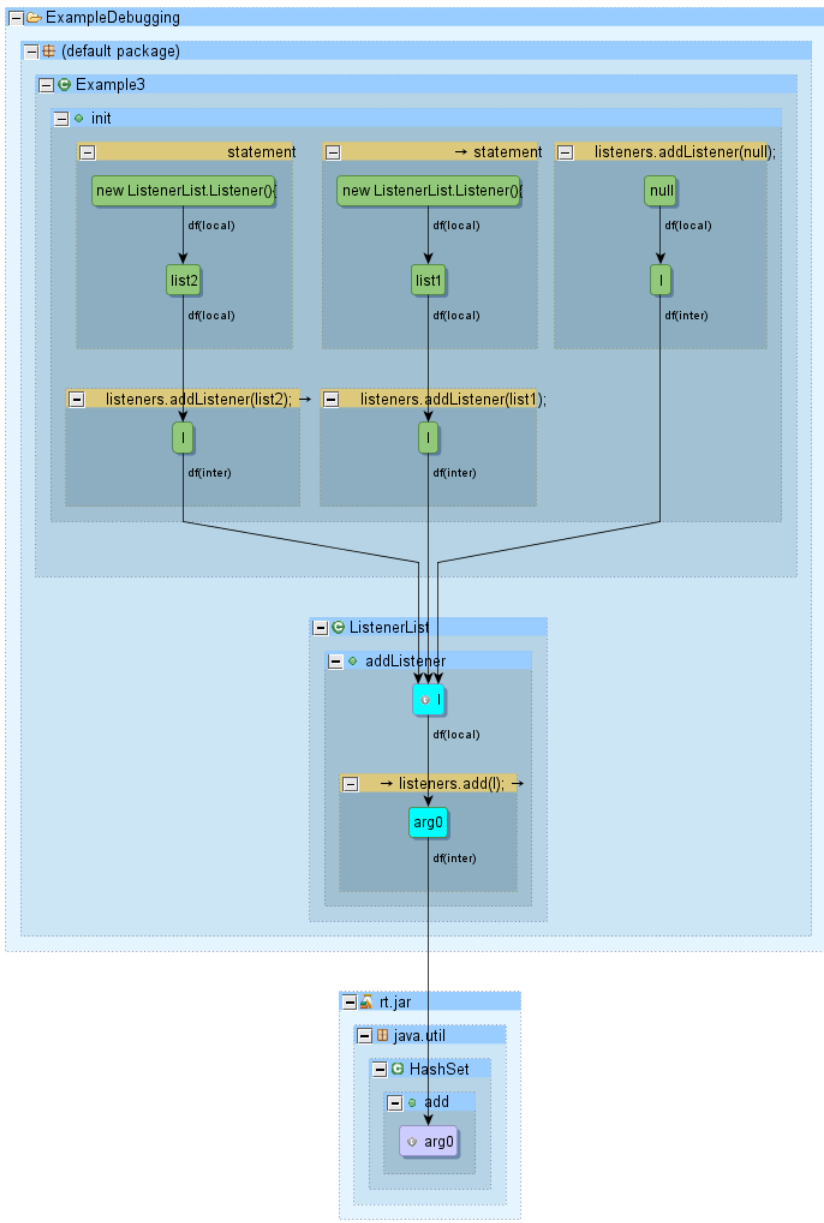
Script: Data Flow

Packa... Type ...

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- ExampleDebugging
 - src
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26
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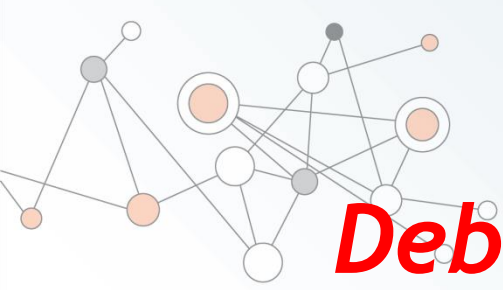
Outline Atlas Smart View



Pr... @ Ja... De... Se... C... Pr... Ca... El... Er... Atl...

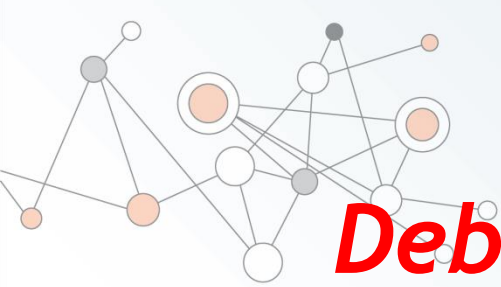
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Exception in thread "main" java.lang.NullPointerException
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    at Example3.main(Example3.java:42)
```

Script: Data Flow



Debugging Concurrency in the CDT

- Processing Linux kernel in Eclipse
- Bug: C AST intermittently missing macro definitions
- AST showed that each header file was included

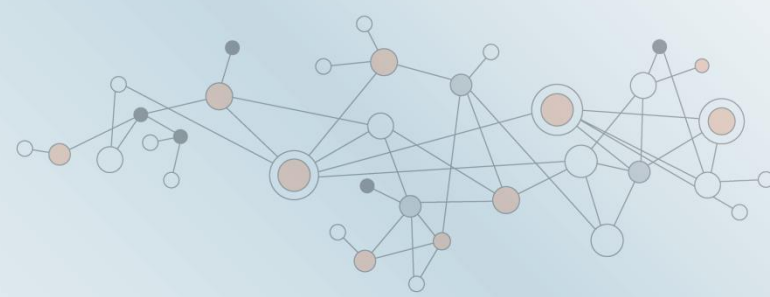
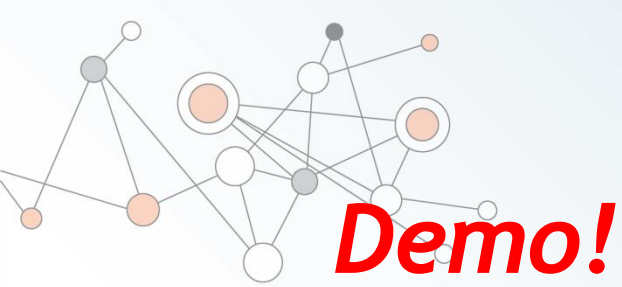


Debugging Process



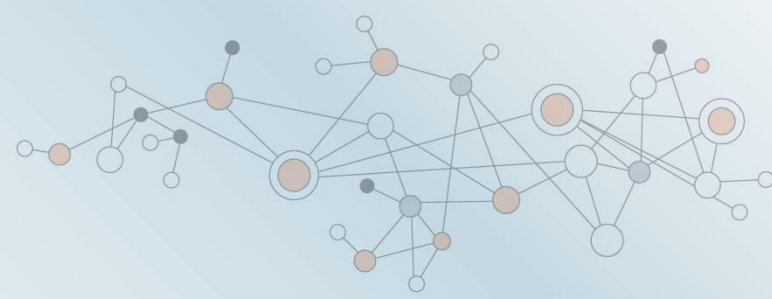
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1. Read the CDT code on parsing translation units
2. Recreate the C Preprocessor output
3. Determine where the include definitions were coming from

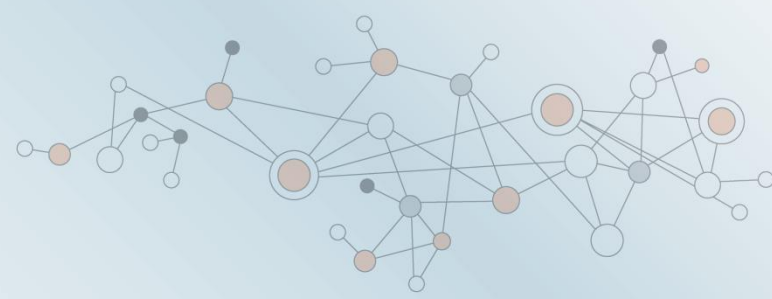
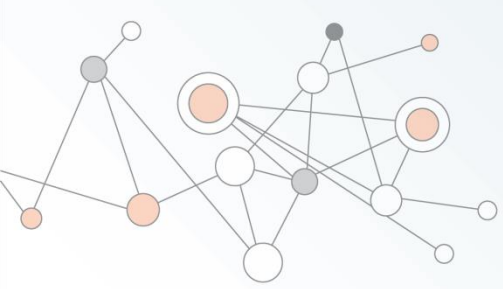


This slide is a placeholder for the demo that I will give showing how I found the bug in the Eclipse CDT. Some key points:

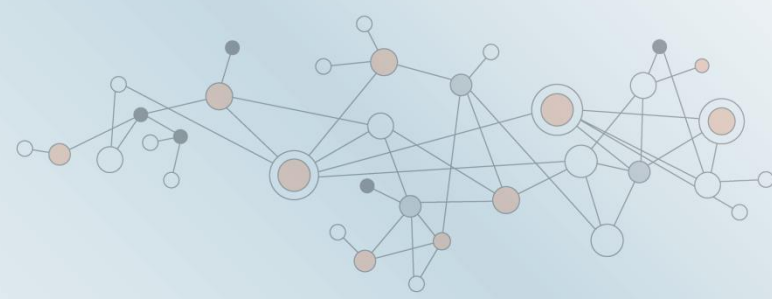
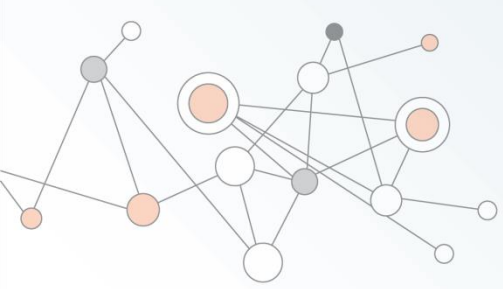
- Bug result was non-deterministic
- Bug disappeared when I reduced the number of Threads in our code using the CDT
- It would have taken me much longer to find the bug if I hadn't used Atlas
- My patch for the bug was recently reviewed and accepted into the CDT! 😊



Demo!



Questions?



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Thanks
for coming

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