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Using the Oracle Solaris Studio IDE

To Dive Deeply into HotSpot JVM Source Code

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Oracle,
Solaris Developer Tools
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Safe Harbor Statement

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Session Agenda

1. My challenges as a developer, and HotSpot JVM
2. Mixed Language Development with Studio IDE
3. More highlights about Studio IDE
4. Live Demo!
5. Summary and Q&A

My challenges as a developer

- I develop my applications using OpenJDK
  - And sometimes to debug my app,
    I need to dive into OpenJDK
- I'd like to contribute to HotSpot JVM
  - I will certainly need to dive deeply here
- My codebase is a mix of Java and C/C++
  - Moreover, it is very big
- My target platforms are… many!
  - Windows, Mac OS X, Linux, Solaris, …

HotSpot JVM - facts

- Oracle's JVM for desktops and servers
- Open Source, a part of OpenJDK
- Multi-Platform
- HotSpot is written in C/C++
  - OpenJDK is a mix of Java and C/C++
- **16 years** of development
- **3.3K**: all C/C++ part of OpenJDK
  - **1.4M** lines of code

Developer expectations

- I'd like to edit/build/debug in same integrated environment
  - With Java and C/C++ mix, like OpenJDK is
- I need an IDE which works fast
  - With a really big codebase, like OpenJDK has
- My work platform is…
  - Why should I stick to a particular one?

    Let me choose!

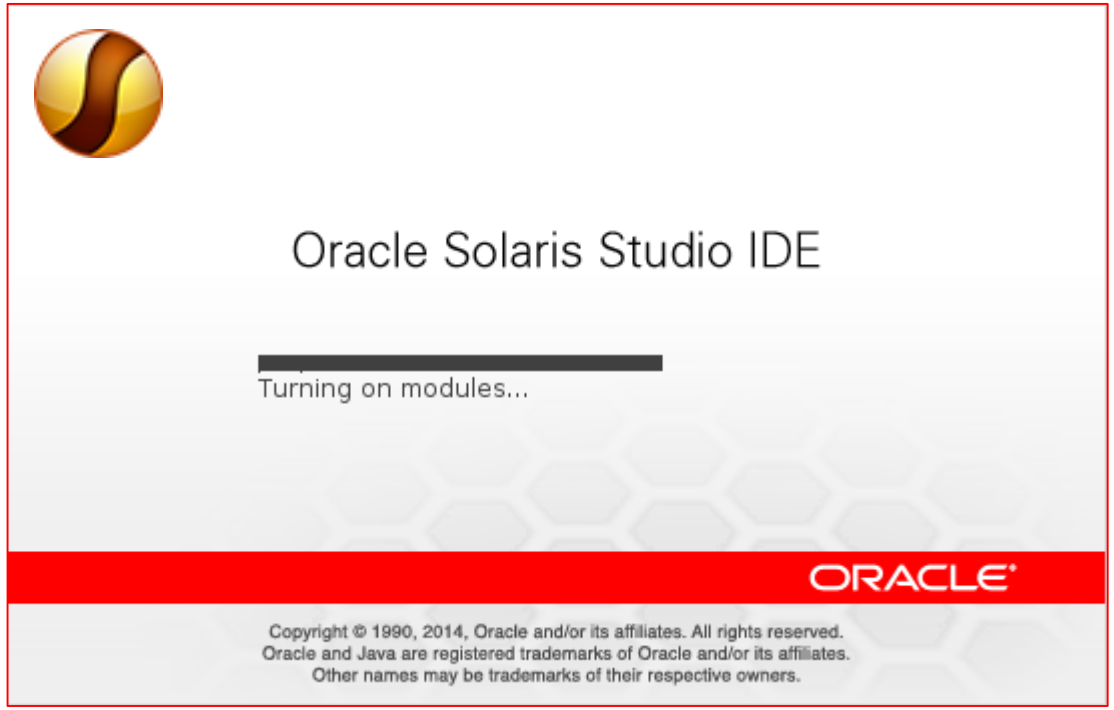
I’d like to be effective at work

- But, is there any IDE which can support my challenges

  … and meet my expectations?

So… which IDE?

- There is one!



Mixed Language Development

With Studio IDE

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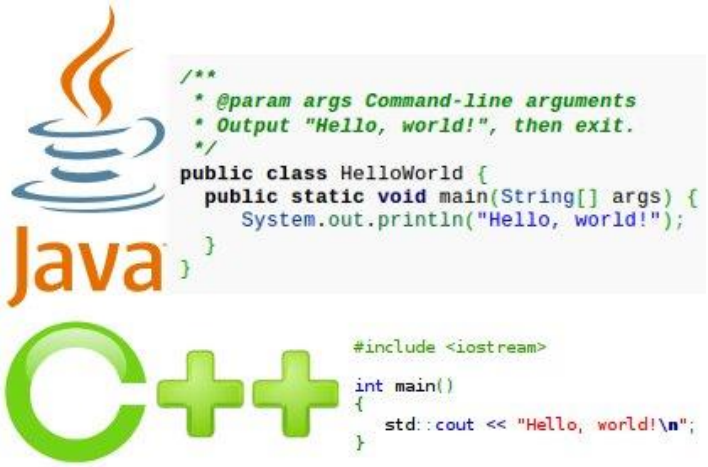
Mixed Language Development

- Java code and native (C/C++) code get mixed
  - Call native code from Java
  - Use Java objects in native method
- Why call native code?
  - Hardware and platform features
  - Existing native code base
  - Legacy binary
  - Performance concerns... really faster than JIT?
- JNI, JNA



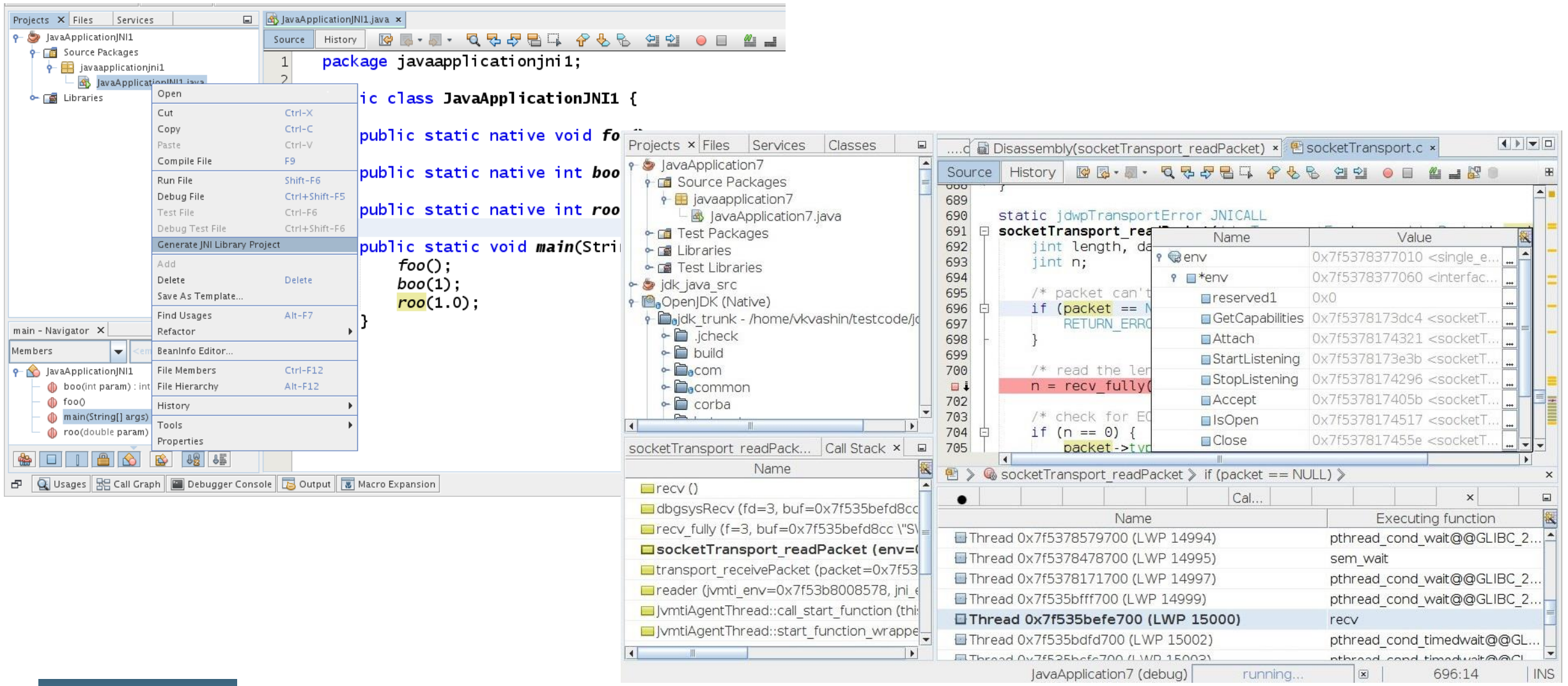
JNI vs JNA – w/o Studio IDE

	Easy to use	Works for existing binary	C/C++ experience NOT required	Speedy	Good for complicated C++ code
JNI				√	√
JNA	√	√	√		

JNI vs JNA – w/ Studio IDE

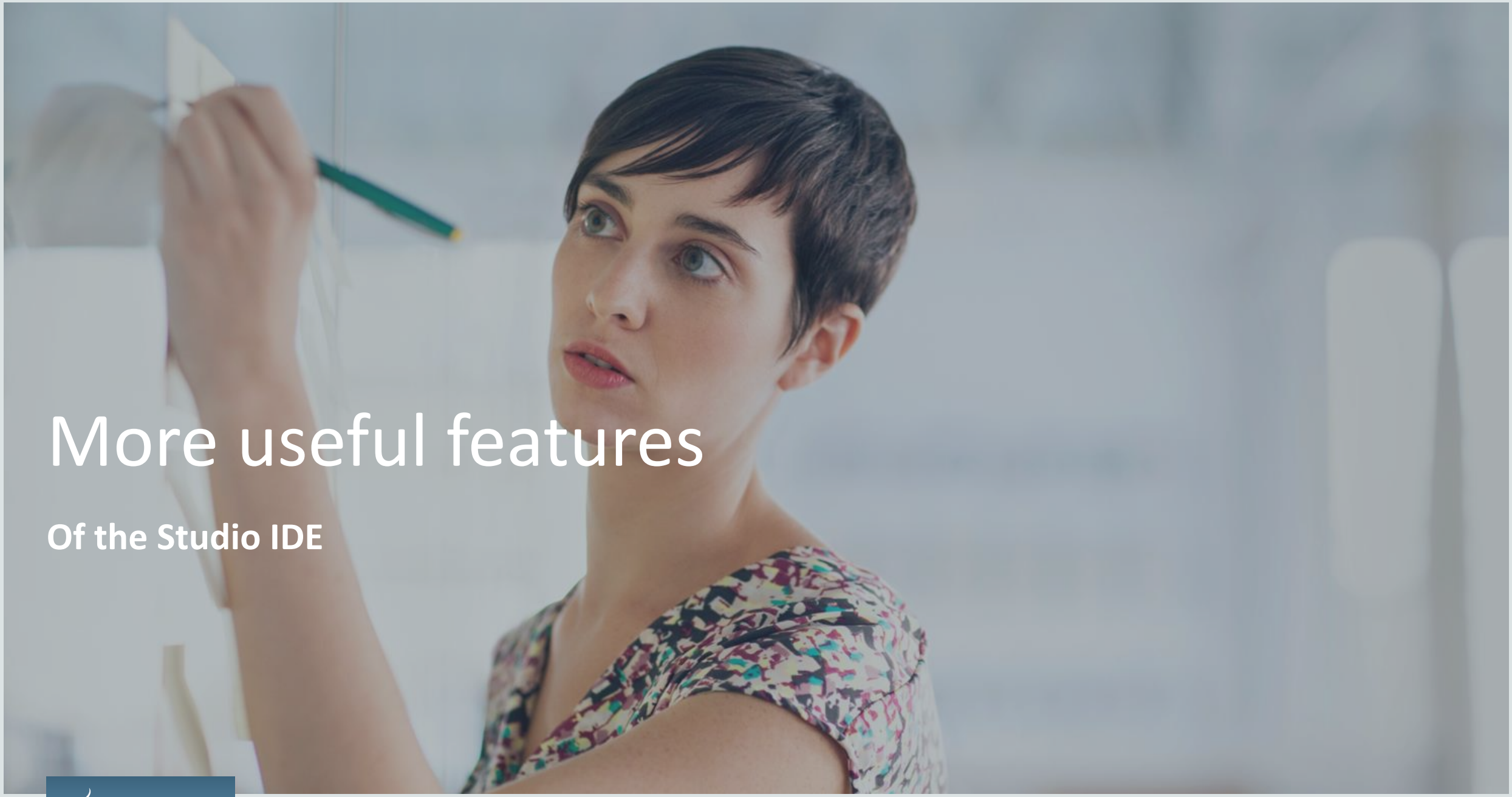
	Easy to use	Works for existing binary	C/C++ experience NOT required	Speedy	Good for complicated C++ code
JNI				√	√
JNA	√	√	√		

Studio IDE: Unique IDE for Mixed Development



Studio IDE: Unique IDE for Mixed Development

- **Generate** JNI library project
  - With only a right-click on Java class!
  - Regenerates header files If Java interface changes later
- **Navigate** from Java code to native code
  - Both for JNI and JNA
- **Debug** mixed languages code:
  - **Seamless** debugging of Java and native code
  - Breakpoints, Step Into, Call Stack, Registers, Variables, Debugger Console etc.



More useful features

Of the Studio IDE

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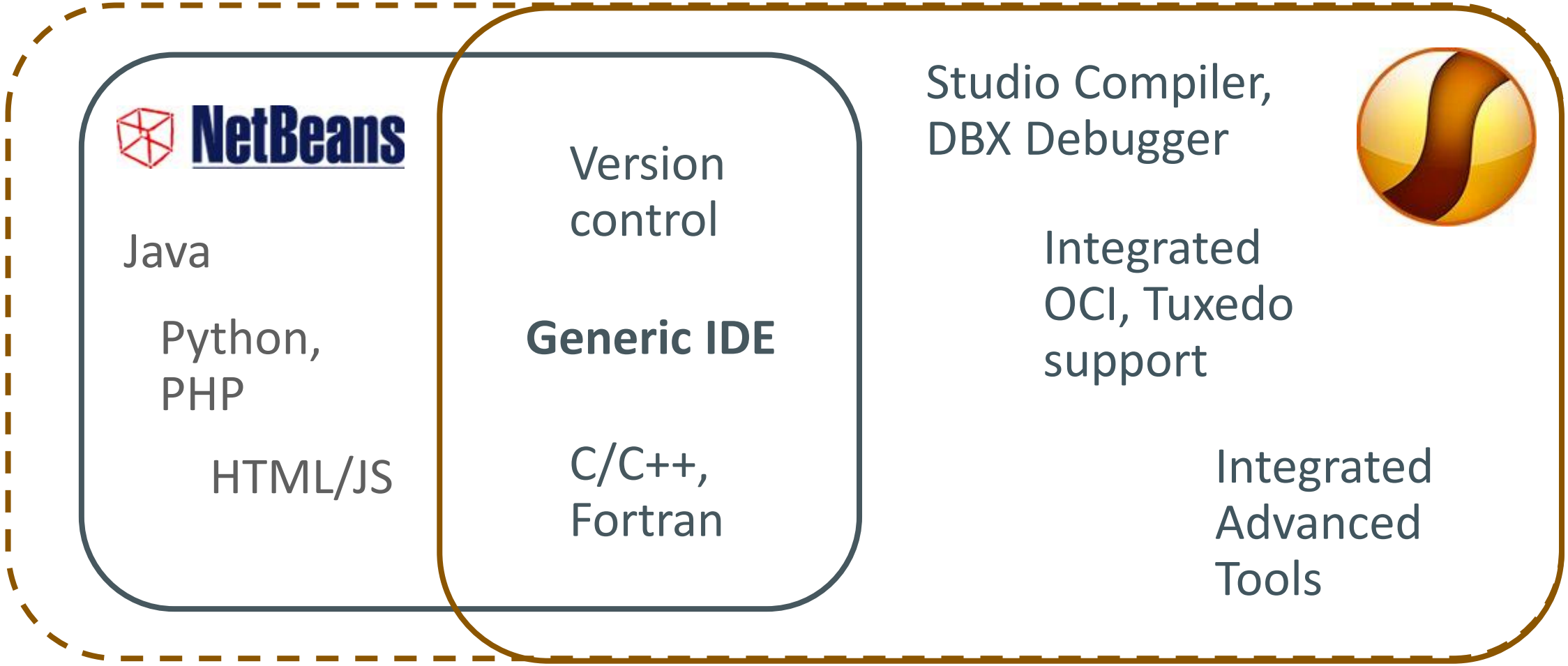
Studio IDE and NetBeans



Studio IDE: Large Codebases

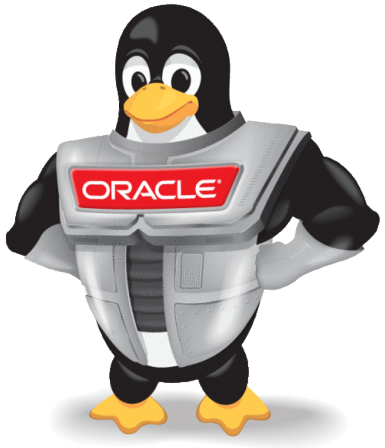
- Low Memory Footprint
- Fast Parse Time
- Fast Search

3.3K files
1.4M LOC
(C/C++ code only)

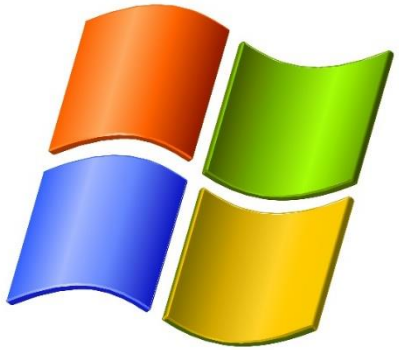
7K files
13M LOC

16K files
6M LOC

Studio IDE: Platforms

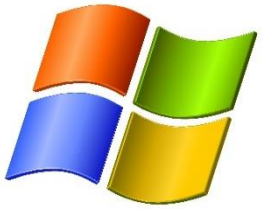


IDE can also run on:



Studio IDE: Remote Development

Increase Efficiency



- Develop applications from virtually any desktop environment
- IDE can remotely build, debug, analyze

Studio IDE: New Features

- Mixed Development has been integrated
- New Project Wizard
- Version Control support in Remote mode
- New Audits, Hints and Refactoring
  - Including Secure Coding rules
- Call Graph enhancements

- In progress: IDE for C/C++ in the Browser

Live Demo!

HotSpot diving with Studio IDE

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Studio IDE: Summary

- Best fit for developing with OpenJDK and HotSpot
  - Tuned for Enterprise-class Codebases
  - Mixed-Language Development
  - Multi-Platform
  - Cross-Platform Development: Remote modes
  - There is ***already*** configured NetBeans/Studio project for HotSpot! (/common folder)
- You also get
  - Code Editor With Rich Capabilities
  - C++11 Standard Support

Oracle Solaris Studio

Learn More & Resources

- **Main Studio page:** oracle.com/goto/solarisstudio
  - Free download!
- **How to setup OpenJDK in the IDE:** https://dzone.com/articles/hack-openjdk-netbeans-ide

Oracle Solaris Studio

Please visit this Studio JavaOne session right next after this session, it should be very interesting.

- **Improving the Performance of Your Java Application: Getting Beyond the Basics [CON8342]**
  - Thursday, Oct 29, 4:00 p.m. | Hilton—Imperial Ballroom B

Q&A

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Learn More & Resources

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More about Studio IDE and other Studio Tools

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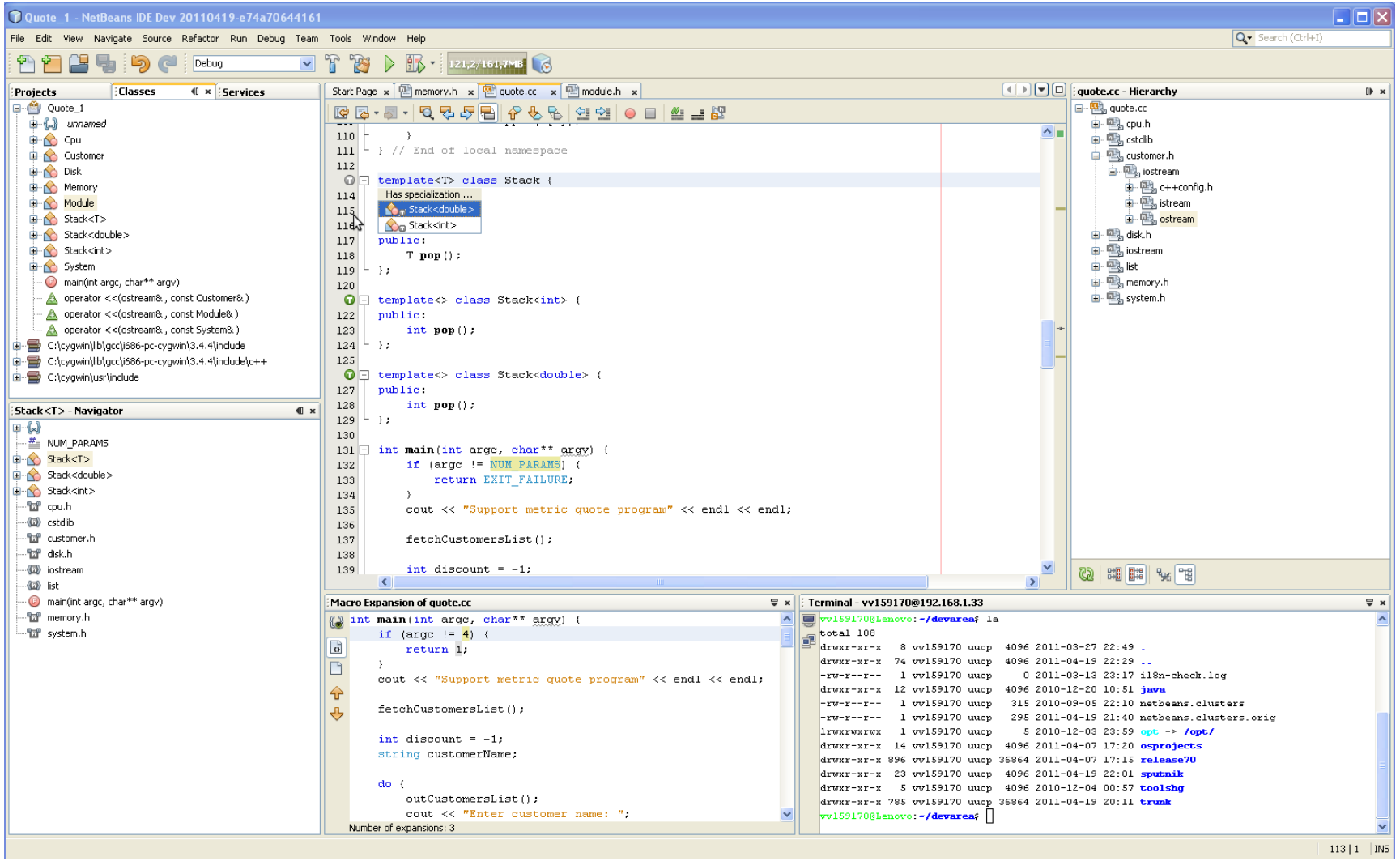
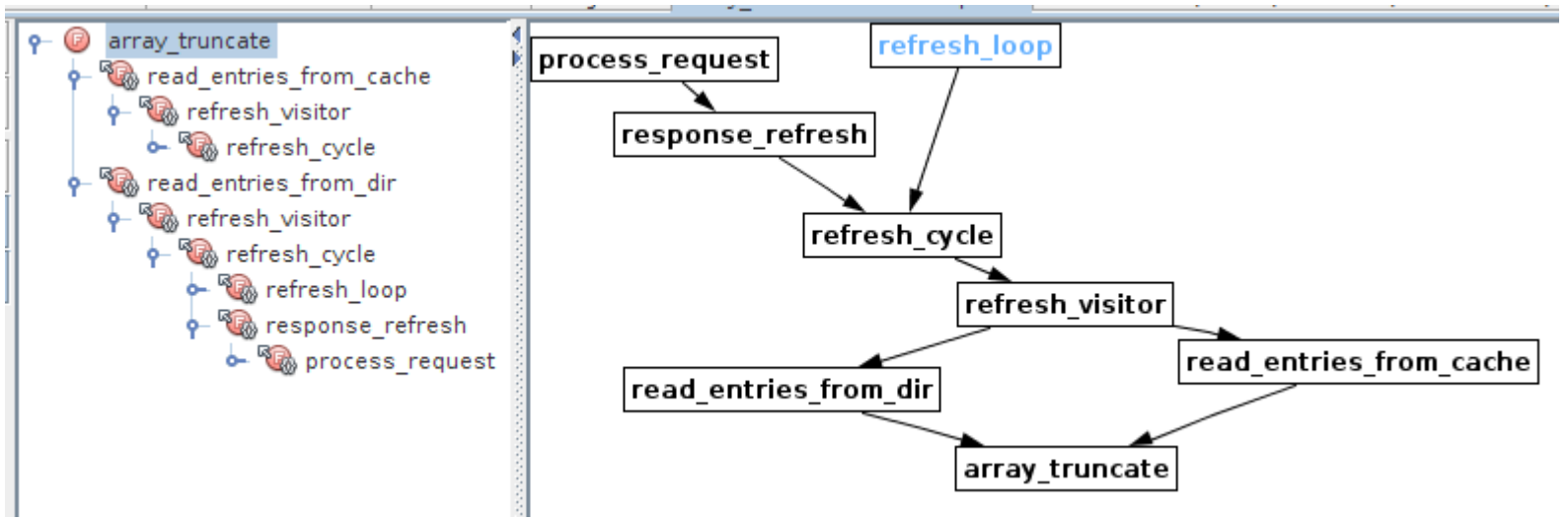
IDE – More Highlights

- Code editor
  - Code Generation
  - Highlighting
  - Folding
  - Navigation
  - Formatting



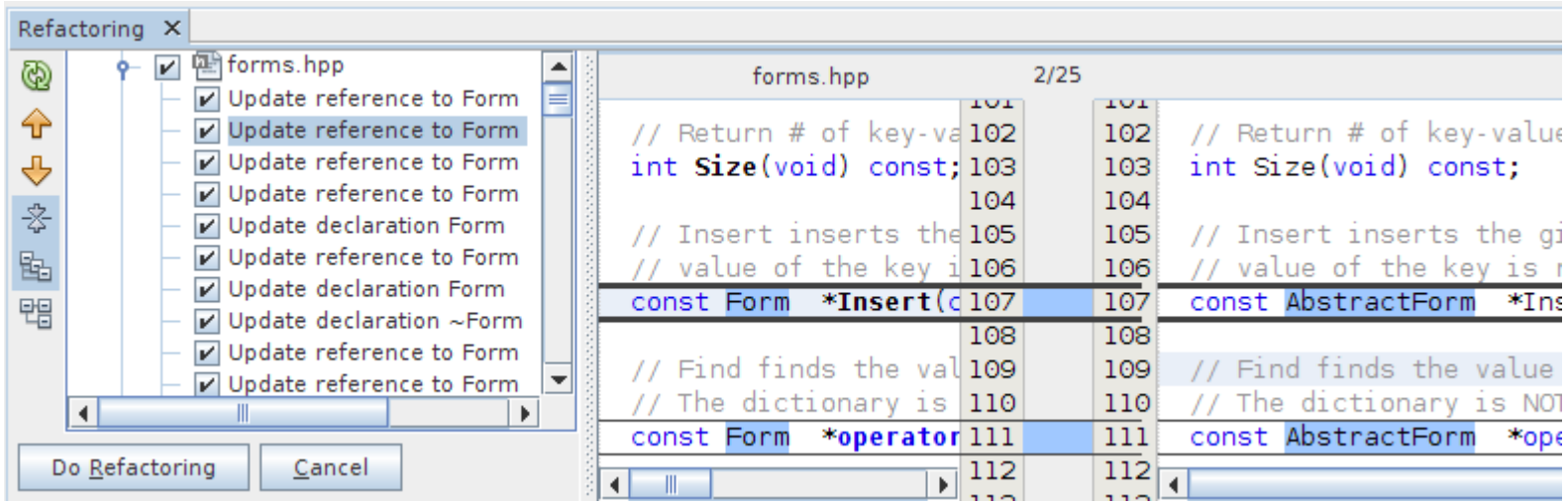
IDE – More Highlights

- Rich reverse engineering capabilities
  - Find Usages
  - Call Graph
  - Macro View
  - Include Hierarchy
  - Class Hierarchy



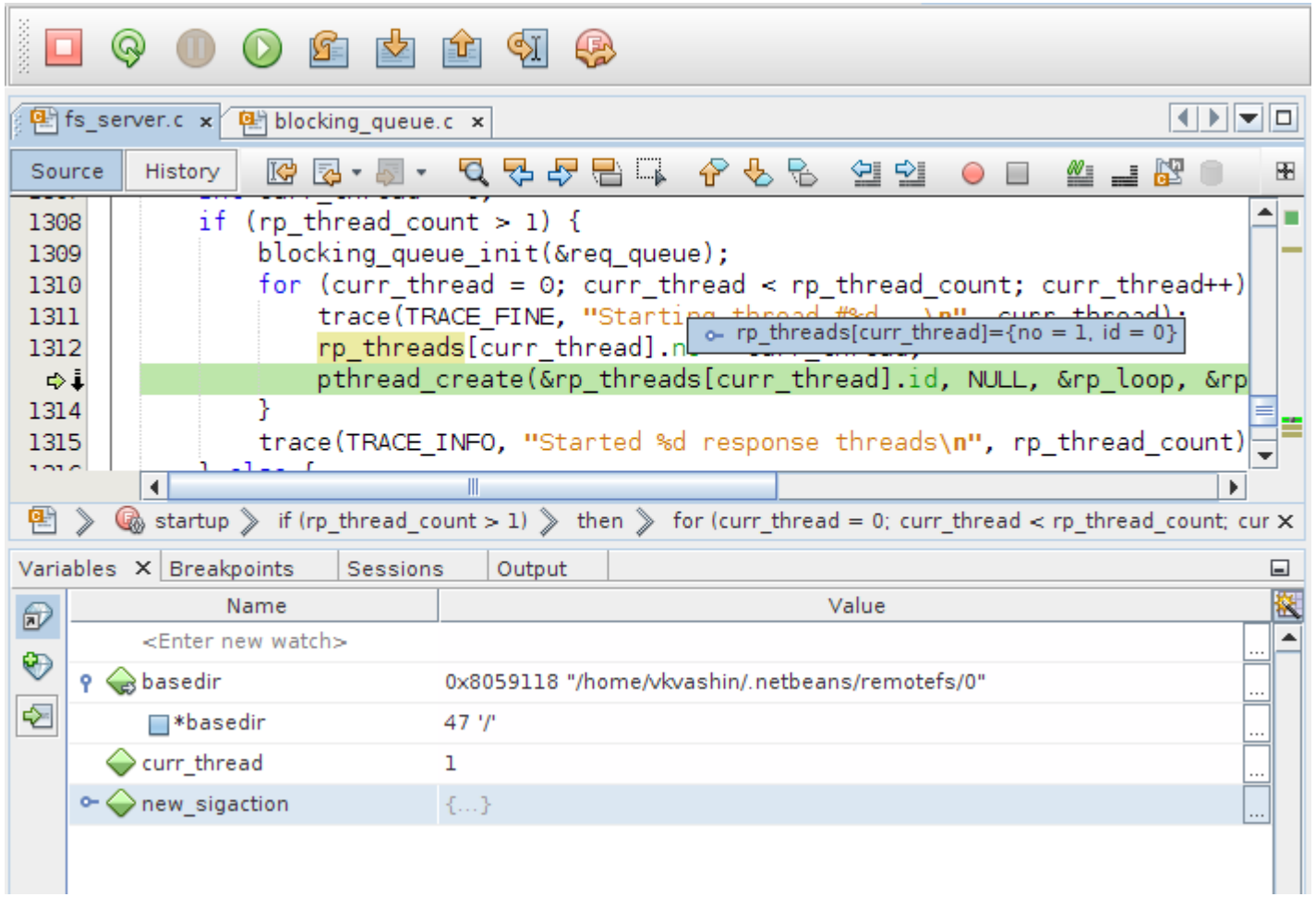
IDE – More Highlights

- Code Refactoring support



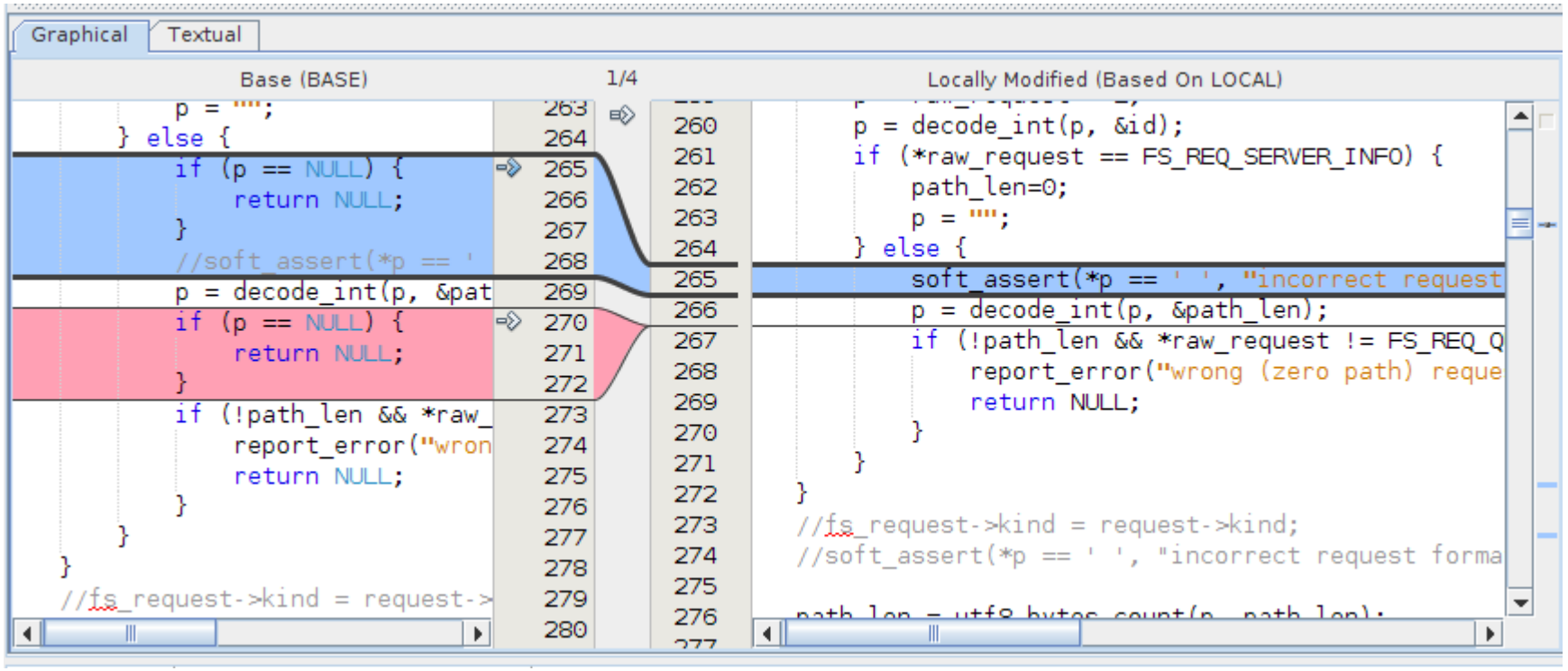
IDE – More Highlights

- Visual Debugging



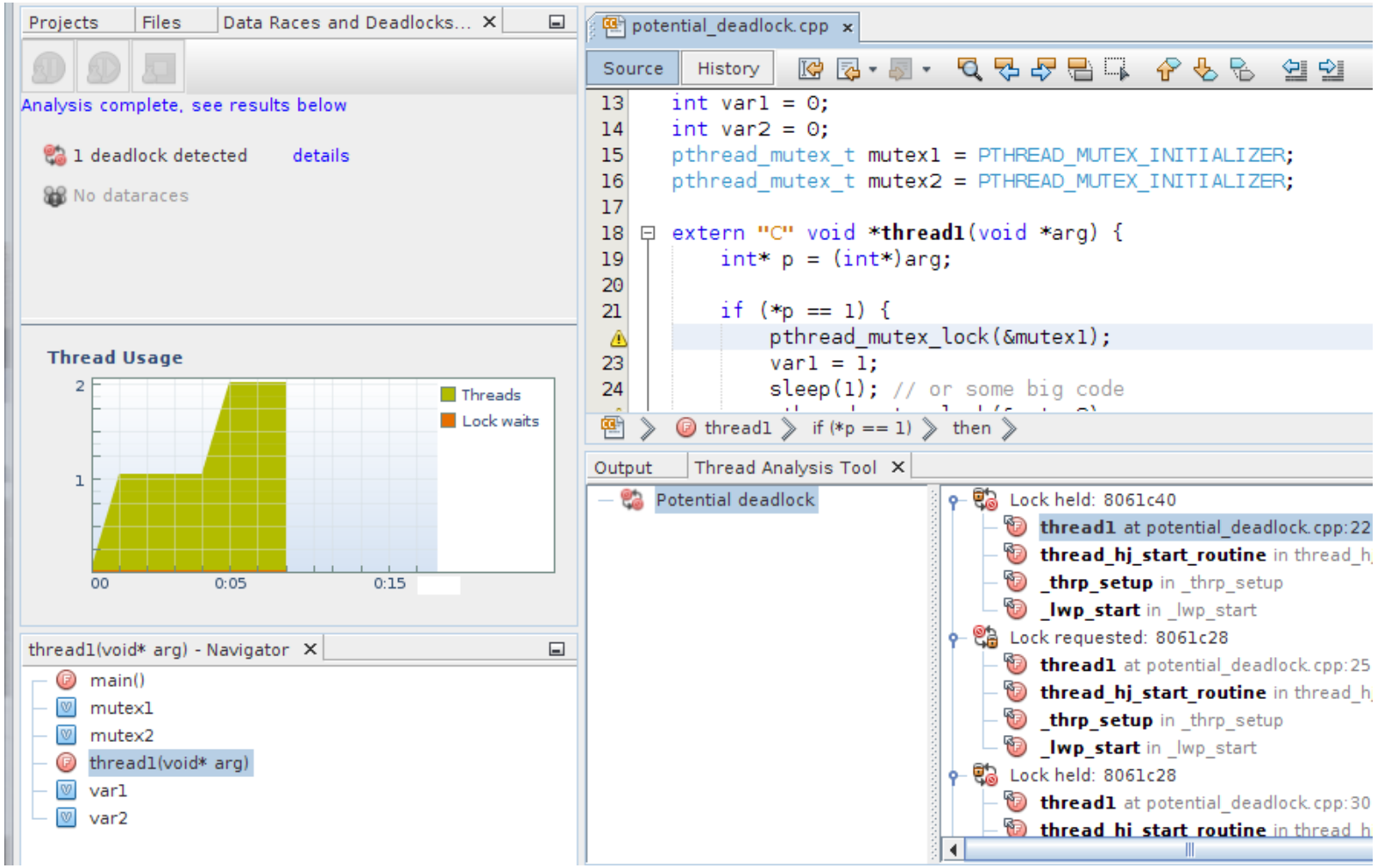
IDE – More Highlights

- Smooth Integration with popular VCS tools
  - GIT
  - Mercurial
  - Subversion



IDE – More Highlights

- Integration with static and dynamic analysis tools
  - Code Analyzer
  - Performance Analyzer
  - Thread Analyzer



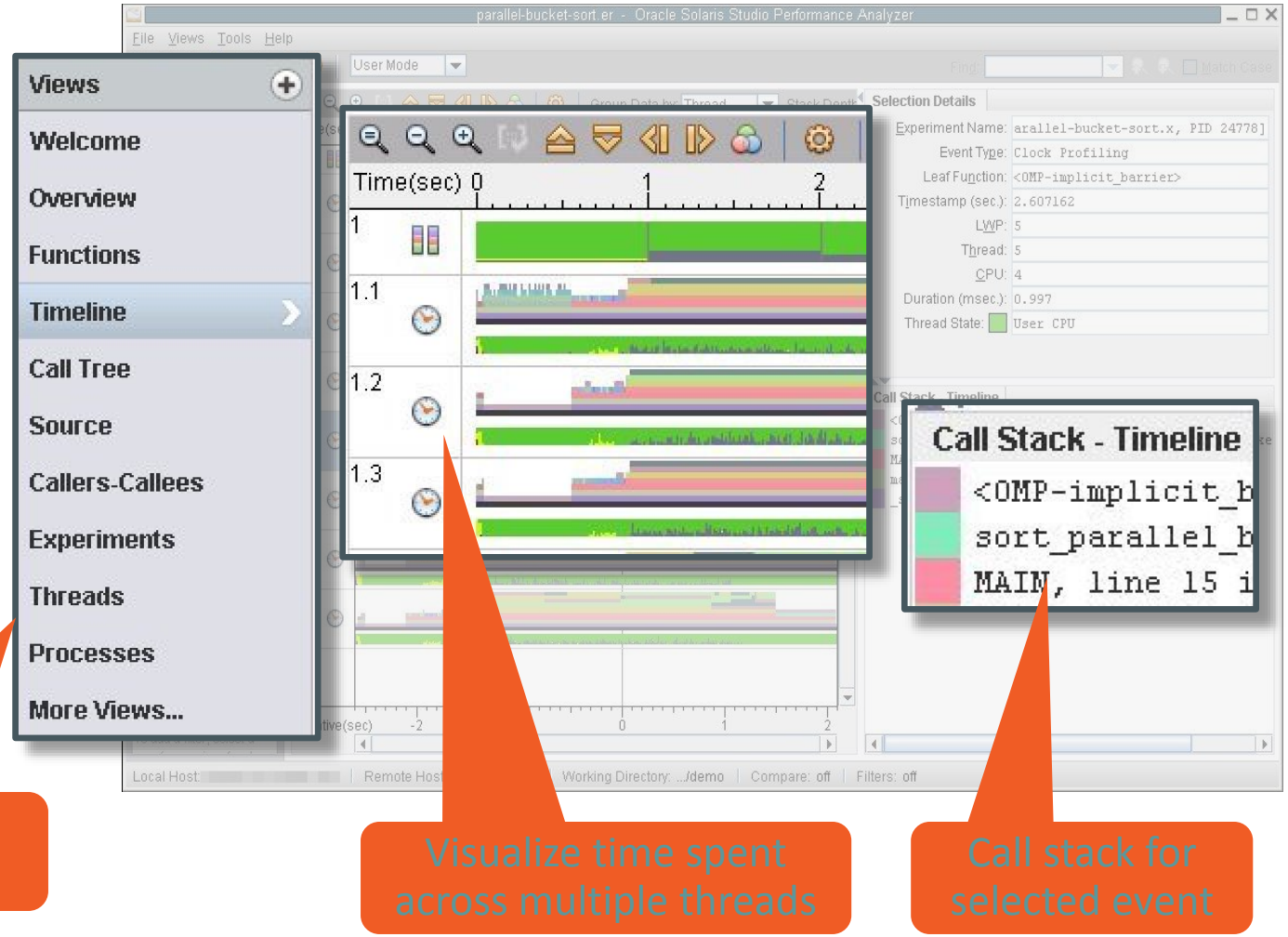
Studio IDE – Cloud Development Support

- Everything is moving towards Web and Cloud development
- Studio/NetBeans IDE provides:
  - Web languages support
    - HTML5, JS
  - Frameworks
    - Node.js is available, Docker is in the plans
  - Web IDE
    - Java and Web languages are available
    - C/C++ is in the plans
    - Both for Public and on-premises clouds

Performance Analyzer

Optimize Application Performance

- Quick identification of bottlenecks with intuitive UI
- Rich set of performance metrics
- Easy profiling with remote and cross-platform analysis
- Supports C, C++, Fortran, Java and OpenMP



Data organized by a variety of Views

Visualize time spent across multiple threads

Call stack for selected event

Studio 12.4 Code Analysis Tools

Previse

Source code analysis

- Beyond array bounds access
- Freed memory
- Memory leaks
- No change to the executable

```
int a[5];
…
for (i=0;  i<=5;  i++)
     printf (“%d\n”, a[i]);
```

Discover

Memory corruption detection

- Uninitialized memory and beyond array bounds access
- Heap, stack, globals
- Points to allocation&free code
- Memory leak APIs

```
char *z = (char *) malloc(1)
…
free (z);
…
z = ‘a’;
```

Uncover

Code coverage

- Source line granularity
- Orders functions by priority
- No recompilation
- Accumulates coverage over multiple runs

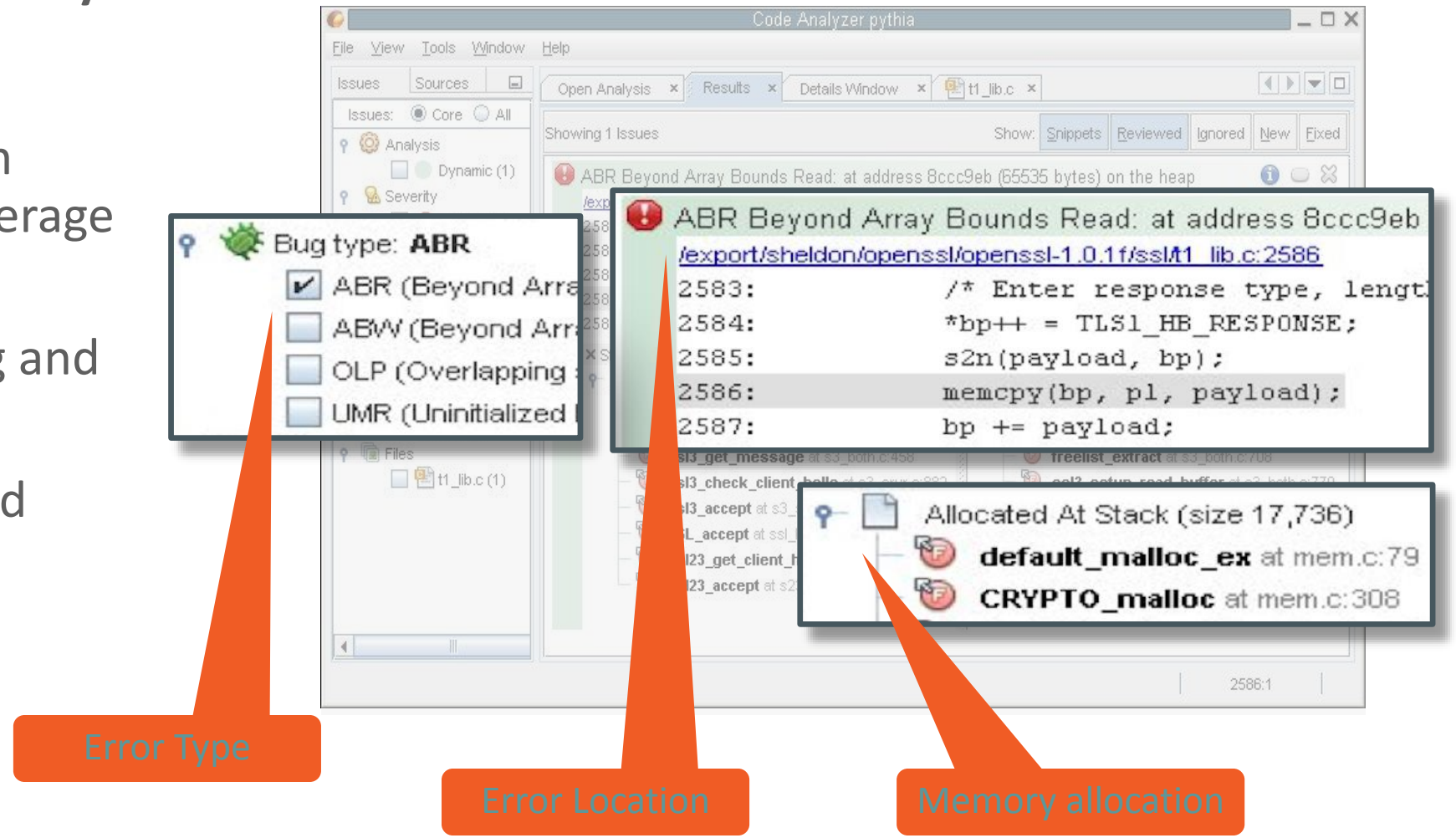
```
if (unmet_condition)
    *y = ‘a’;
…

printf (“*y = %c\n”, *y);
```

Code Analyzer

Ensure Application Reliability

- Synthesizes results from static, dynamic and coverage analysis tools
- Advanced error filtering and sorting
- Source code viewing and hyperlinks

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