Building Performance Swing Applications

NetBeans 3.5 Case Study

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Presentation Goal

The techniques used to improve the UI responsiveness of NetBeans 3.5

Things they don't tell you in performance textbooks

BEGINNING

About NetBeans

- large IDE application written using Java/Swing
- runs on many OSes
- platform to build desktop apps
- very modular extensible architecture
- NetBeans 3.5 was released this Monday, June 9
- http://www.netbeans.org/

BEGINNING

Speakers' Qualifications

- Petr Nejedly has been working on performance of NetBeans for the last two years
- Trung Duc Tran manages Sun's NetBeans Platform engineering team, he led the performance action team during NetBeans 3.5 release cycle

BEGINNING

Agenda

- The problem
- What is UI responsiveness
- How to measure/profile responsiveness
- How to improve responsiveness
- Summary
- Q&A

BEGINNING

The Problem

- “nice features but too slow”
- “sluggish, can't keep up with me typing”
- “memory hog”
- “I need to buy a new machine to be able to use it”

UI Responsiveness != Raw Performance

- Performance: raw numbers
- UI responsiveness: perception, timely feedback
- Example: splash screen during startup
  - the app starts more slowly
  - but better user perception

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Design Principles for Responsive UI

- timely feedback
- acknowledge user inputs immediately
- three time constants:
  - 100 msec: eye-hand coordination tasks (mouse, typing)
  - 1 sec: opening a new window/dialog, reformatting source files,...
  - 10 sec: unbroken concentration on a task, “unit task”, progress indicator is necessary
- Reference:
  Jeff Johnson:“GUI Bloopers” book

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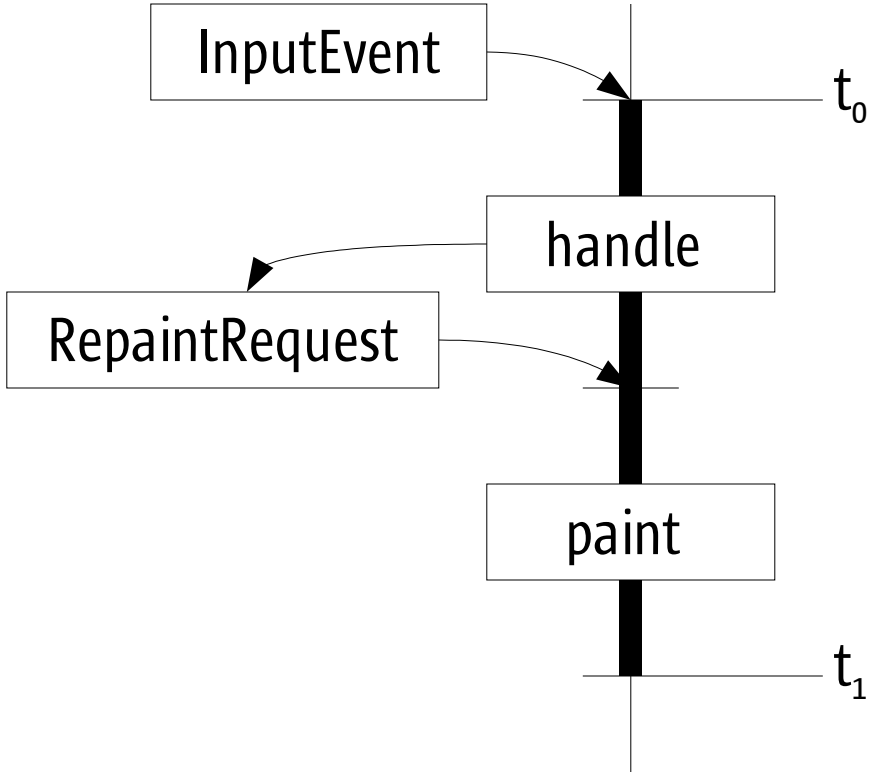
Measure/Profile Responsiveness

- needs accuracy of 10 msec
  System.currentTimeMillis() is fine
- start: mouse/keyboard event
- stop: the last paint event
- technique:
  patching AWT/Swing code
  application code remains unchanged
- profiler start/stop API

The Event Flow




```
> java -Xbootclasspath/p:/path/to/uiresp.jar Main
```

Patch download: http://performance.netbeans.org/

Demo

Identified Problems in NetBeans

- slow main menus, context menus
- slow expansion, navigation in the explorer tree
- the missing wait cursor, no progress indicator
- frequently used dialogs are slow
- opening files is slow
- temporary “freeze” during typing
- first use is especially slow

http://performance.netbeans.org/responsiveness/issues.html

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Techniques Used in NetBeans 3.5

- standard performance tuning techniques
- automatic wait cursor
- warm-up
- lazy initialization
- progressive rendering
- UI redesign

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Automatic Wait Cursor

- all actions are called through the ActionManager
- easy to wrap action invocation inside show/hideWaitCursor()

```
try {
    MouseCursorUtils.showWaitCursor();
    ...
} finally {
    MouseCursorUtils.hideWaitCursor();
}
```

- consistency

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Warm-up

- first use is slow (loading classes,...)
- prepare in advance for expected user tasks
- example: context menu in the editor is computed in the background and cached when a file is opened

Lazy Initialization

- wizard panels used to be init'ed before the wizard is shown -> slow
- to show the wizard we only need the first panel
- the second panel is created when the user clicks “Next”

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Progressive Rendering

- show the most important information first
- the secondary information can be filled in later

What's if it's too hard?

- redesign the UI

Demo

Summary

- perceived performance != raw performance
- timely feedback
- three time constants: 0.1 sec / 1 sec / 10 sec
- measuring/profiling UI response time
- techniques used in NetBeans 3.5
- http://performance.netbeans.org

END

What Users Say

"NetBeans in the past has operated pretty slow, enough to frustrate even the biggest fan. [....] In my personal testing of 3.5, NetBeans performs as fast as any native application."

http://dmartin.org/blog/Java/?permalink=Netbeans_3_5_Beta1_is_released!.html

END

If You Only Remember One Thing...

UI applications should be optimized for human users, not for machines.

END

URLs

- NetBeans open source project
  http://www.netbeans.org/
- NetBeans architecture and APIs
  http://openide.netbeans.org/
- NetBeans performance HOWTOs, guidelines
  http://performance.netbeans.org/

END

Q&A

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