

CSE 8B—Intro to CS: Java

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Frameworks

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Frameworks

Definition

- Reusable design for a software system
- Set of abstract classes and the way their instances interact

Examples

- JUnit
- MacApp
- Ruby on Rails
- MFC (Microsoft Foundation Classes)
- Swing
- NextStep/Cocoa

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Principles

Don't call us, we'll call you

- Hollywood principle
- Behavior vs. protocol
 - Not just the behavior of a set of classes, but the protocol of how they interact with one another.
- Implementation vs. design
 - With a class library, you reuse the implementation of a class. With frameworks, you reuse the design of a generic solution to problems in the framework's domain.

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Overview

Your code starts the ball rolling

- Framework starts executing
- Sometimes, it needs help from you (hot-spot)
- Calls method you've over-ridden
- Sometimes, needs new objects
- You can usually create your own subclass
 - Then, its hotspots are called

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Advantages

Less code to write if you use a framework

New version of framework gives new functionality automatically

- A bug fixed in the framework fixes the bug in all applications that use the framework

Framework can be more fully tested

- Testing costs spread across multiple users of the framework

Framework can be more full-featured

- Developments costs spread across multiple users of the framework

Framework often embody much domain knowledge

- Allowing you to use your expertise in *your* area

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Disadvantages

May be hard to debug

- Especially if you don't have source code to the framework

May be hard to figure out where to plugin

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Frameworks vs. Code generation

Framework

- Common code is in the framework

Code generation

- Common code is duplicated among applications
 - You didn't have to write it, but it's still yours

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Application framework example

MacApp (*Macintosh Application*)

- Released in 1985
- Captures commonality of Macintosh Applications

Without Application Framework

- Application calls *libraries* of code

With Application Framework

- Framework calls libraries of code

Example: moving a window

- Without framework: app receives mouseDownEvent
 - app figures out the mouse is in title bar of window
 - app calls MoveWindow to move that window
 - If new part of window is now visible, app *invalidates* that area
- With framework:
 - Framework does common work
 - Calls view's Draw method to draw contents of window

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Application framework example

NextStep/Cocoa

- Originally developed for NeXt computers
- Now used for Mac OS X (called *Cocoa*)
- Captures commonality of Macintosh Applications

Your code does the things that make your application different from all others

- What is drawn in your windows
- What commands does your application support
- What happens on mouse clicks in your window
- What is stored in your documents

Framework Example

JUnit

- Framework for unit-testing

Start the framework running with `TestRunner.run` (you write the main)

It looks in your class for methods beginning with `test...`

It loops through each method:

- Calling `setUp`
- Calling your test method
 - With an exception handler around the call
 - Keeping track of failure
- Calling `tearDown`
- Prints status
- At end, prints info on each failed test