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

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.

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
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

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

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

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 invalidate that area
  • With framework:
    - Framework does common work
    - Calls view’s Draw method to draw contents of window
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