LittleApp to BigApp

CSE 403, Winter 2003
Software Engineering

http://www.cs.washington.edu/education/courses/403/03wi/
Readings and References

• Reading
  » Chapters 1-3, *Pragmatic Programmer*, Hunt and Thomas

• Other References
  » Chapter 19, Designing for Change, *Rapid Development*, McConnell
  » *Perfection and Simplicity*, and *Designing Distributed Systems*, from A Conversation with Ken Arnold, by Bill Venners, artima.com
Programming Systems

LittleApp

3 X

3 X

Programming Product

generalization, testing,
documentation, maintenance

Programming Systems Product

BigApp

interfaces, system integration

from Mythical Man-Month
From LittleApp to BigApp

• Our LittleApp prototypes have shown that the basic concepts are workable

• Likely open issues
  » Correctness - dummy data
  » Completeness - inflexible sources, usability
  » Robustness - frustrating response to errors
  » Style - design, generalization, documentation
Design issues

• Interfaces
  » What are the defined interfaces?
  » Which fundamental decisions cannot be changed and still use the same architecture?

• Modules
  » What are the major modules using those interfaces?
  » Can fundamental design decisions in one module be changed without affecting the other modules?

• Documentation
Designing for Change

• Change happens
  » underlying technology changes, a performance goal is not met, new requirements are levied
  » perhaps the product is a success and lives for a decade or two!

• A successful design
  » hides the implementation decisions
  » can change locally without causing ripples throughout the entire structure
Not a single tool, but an approach

- Identify areas likely to change
- Use information hiding to conceal the design decisions
- Develop a change plan
- Define families of programs
- Use object-oriented design

from McConnell, Chap 19
What might change?

- Hardware for sure - many possible platforms
- File formats - how many graphics formats?
- Inputs and outputs, user’s natural language
- Non-standard language features, libraries
- Features that are difficult to implement (AWT)
- Global variables
- Specific data structures and abstract data types
- Business rules, sequence of actions
- Requirements that were excluded, new features
Implementation is not just a detail

• What is important to keep in mind when you are designing a distributed system?
  » A distributed system, in the sense in which I take any interest, means a system in which the failure of an unknown computer can screw you.
  » Failure is the defining difference between distributed and local programming, so you have to design distributed systems with the expectation of failure.

from Designing Distributed Systems, A Conversation with Ken Arnold, by Bill Venners
Develop a change plan

• Use abstract interfaces first, then classes
• Never use hardcoded literals
• Use late binding strategies
  » dynamic allocation of data structures
  » let the data structure tell you how big it is
• Use table driven strategies
  » getAppProperty(String key) midlet jad file
  » getInitParameter(String name) servlet web.xml file
  » servlet name to class mapping in web.xml
More change plan

• Don’t duplicate code or state
  » put it in a single method and call it when needed

• Keep the methods and classes simple and cohesive
  » easier to reuse or use in a new way

• Avoid coupling

• Keep the general purpose layers free of implementation leakage from below
Define families of programs

- What are the change vectors?
- If your product is a success, where will it go next?
  - international? - language, currency, measurement
  - system scale? - cell, PDA, desktop browser, server
  - product distribution? - corporate, personal retail, educational, ad supported, free “lite”
- Think about the minimal subset of functions needed in all versions and how to present it
Perfection and Simplicity

- I once heard you say there is no such thing as a perfect design. Could you clarify what you meant by that?

- There is no such thing as a perfect design for a couple of reasons.
  
  » All designs take place in context … who will be using your design? … if you try to create a perfect design you will expend a huge amount of effort ... then there's the problem of predicting the future.

- The best that people can reasonably hope for is to put forth an appropriate amount of effort and get a good design that is sufficient.

from Perfection and Simplicity, A Conversation with Ken Arnold, by Bill Venners
Now build it!

- Bad design leads you down the wrong road
- Bad construction takes you down a road full of potholes and bone-jarring problems
- Good construction techniques
  - help build in quality the first time
  - avoid having to back up and start over
  - provide good visibility on how it’s going without using made-up numbers
    - “we’re 96% done”
Some construction fundamentals

• Agreed-on coding standards
  » naming, layout, documentation

• Data-related concepts
  » scope, persistence, binding times

• Control-related
  » complexity, control structures, exceptions

• Errors and exceptions
  » assertions, defining and handling exceptions
More construction fundamentals

• Integration strategies
  » Unit-testing and debugging
  » Build and packaging practices
• Code tuning and performance measurement
• Programming tools
  » editors, IDE, interoperability
  » group work support tools (email, change visibility)
  » source code revision management
  » bug tracking
Someday this will no doubt be a vivacious page, brimming with fascinating information, penetrating analysis, and the most succulent links. Until then, this will have to do.

http://java.sun.com/people/arnold/