CSE 403 Wrapup
Software lifecycle

• Determines the order for tasks:
  – Requirements
  – Design
  – Implementation
  – Testing
  – Maintenance

• Goal: Perform work as early as practical
  – Costly to discover information or make changes late
  – Costly to make decisions too early
  – Costly to do tasks multiple times

• In CSE 403: iterative process
Requirements

• “What”, not “how”
• Reflects user view, not developer view
• Understand the customer
  – Preferably better than they understand themselves
  – Seek transformational solutions (beware risk)
• Common technique: use case / scenario / story
• User interfaces
  – High-level concepts & metaphors
  – Low-level efficiency
• Get feedback early (example: paper prototype)
Architecture

• Divide and conquer (with simple interfaces)
• Modules for logical units of computation
  – Minimize coupling, maximize cohesion
• Draw it as a picture (maybe UML)
  – Key purpose: to communicate to others
• Interactions are part of the architecture too
Divide and conquer: Modularity, abstraction, specifications

• No one person can understand all of a realistic system
• Modularity permits focusing on just one part
• Abstraction enables ignoring detail
• Specifications and documentation formally describe behavior
• Helps to understand/fix errors
  – Or to avoid them in the first place
Teamwork

• Dividing work
  – By module in the architecture
  – By task (PM, development, testing, …)

• Decisions
  – Get understanding and buy-in

• Communication
  – Specifications
  – Deadlines
  – Effective meetings

• Motivation, trust, and morale
Working in a team

• No one person can understand all of a realistic system
  – Break the system into pieces
  – Use modularity, abstraction, specification, documentation
• Different points of view bring value
• Work effectively with others
  – Sometimes challenging, usually worth it
• Manage your resources effectively
  – Time, people
  – Engineering is about tradeoffs
• Both technical and management contributions are critical
Process

Needed to keep your project under control:

• Specification
• Schedule
• Source control
• Testing
• Automated build and test
• Bug database (and fix bugs first)
Testing

• Goal: completely verify functionality
  – In practice: heuristics improve completeness
• Much cheaper than discovering errors later
• Be systematic
• Test early and often
• Tests are code too
• Involve users
• Can be fun!
Reviews

- Another way to get feedback early
- Team members critique documents, code, etc.
- Greatly improves quality

- Identifies opportunities for refactoring
- Refactoring improves the design
  - Design quality has many facets, depends on task
Design

• Design of classes: similar considerations to architecture
• Design patterns: the vocabulary of program development
  – Helps you design
  – Helps you communicate
• Don’t reinvent the wheel!
Getting it right ahead of time

• Design: predicting implications
• Example: understanding interconnections
• Understanding the strengths and weaknesses
• If you don’t understand a design, you can’t use it
• Documentation matters!
Documentation

• Everyone wants good documentation when using a system
  – Not everyone likes writing documentation
• What’s obvious to you probably isn’t obvious to others
• Documentation is the most important part of a user interface (in a nontrivial system)
• “An undocumented software system has zero commercial value.” – John Chapin (CTO of Vanu, Inc.)
Maintenance

• Maintenance accounts for most of the effort (often 90% or more) spent on a successful software system

• A good design enables the system to adapt to new requirements while maintaining quality
  – Think about the long term, but don’t prematurely optimize

• Good documentation enables others to understand the design
Interviewing

• Know your audience
• Communicate about yourself
• Be competent
• Be honest (about yourself, knowledge, etc.)
• You are evaluating them too
What you have learned in CSE 403; what you will learn later

• Compare your skills today to a quarter ago
  – Bottom line: Your project would be easy for you
  • This is a measure of how much you have learned

• Your next project can be much more ambitious

• You will continue to learn
  – Building interesting systems is never easy
  • Like all worthwhile endeavors
  – Practice is a good teacher
    • Requires thoughtful introspection
    • Don’t learn only by trial and error!
Course evaluation

• Please complete the course evaluation form online
  – Useful to future students
  – Useful to course staff
  – Useful to the department
Go forth and conquer

• System building is fun!
  – It’s even more fun when you build them successfully

• Pay attention to what matters
  – Use the techniques and tools of CSE 403 effectively