What is Software Engineering?
CSC 4700 Software Engineering

Lecture 1

Introduction

Software engineering Facts

Fact: The economies of ALL developed nations are dependent on software.
Fact: More and more systems are software controlled
Fact: Expenditure on software represents a significant fraction of GNP in all developed countries.
Fact: Software often costs more than the computer it runs on.
Fact: Software costs more to maintain than to develop
What is software?

Software is:
• Computer programs
  • Source code
  • Executables, binaries, runtimes
• Associated documentation
  • Requirements
  • Design models
  • User manuals

What is software engineering?

• Software engineering (SE) is the design, development, and documentation of software by applying technologies and practices from computer science, project management, engineering, application domains, interface design, digital asset management and other fields.
• Term was invented in 1968
• Used to be called "programmer" or "systems analysis"

More definitions

• A discipline whose aim is the production of quality software, delivered on time, within budget, and satisfying users' needs.
• The specification, development, management, and evolution of software systems.
• Designing and developing high-quality software
Why do we need Software Engineering?

- Software is big business
- Bad software is expensive to a company
- Stakes are very high
- Having a good plan and good process improves chances for success
- Lots of high paying jobs in software

Careers

Why are you here?

- Major or minor requirement
- Software engineer
- Graduate school
- Starting a business
- What can you do with this knowledge?
- 7 of 10 fastest growing careers are in software and computing
- The off-shore myth
Software Engineering

Today

- Software Engineering
  - An engineering discipline that includes:
    - Software Engineering Management
    - Software Requirements Analysis
    - Software Configuration Management
    - Software Design
    - Software Construction
    - Software Testing
    - Software Engineering Infrastructure
    - Software Engineering Process
    - Software Evolution and Maintenance
    - Software Quality Analysis

Source: SWEBOK
http://www.swebok.org

Software Engineering Body of Knowledge

Computing Fundamentals
- Algorithms and Data Structures
- Computer Architecture
- Mathematical Foundations
- Operating Systems
- Software Engineering
- Programming Languages
- Compilers

Software Product Engineering
- Requirements Engineering
- Software Design
- Software Coding
- Software Testing
- Software Opak Maint

Software Management
- Project Process Management
- Risk Management
- Quality Management
- Configuration Management
- Dev Process Management
- Acquisition Management

Software Domains
- Artificial Intelligence
- Database Systems
- Human-Computer Interaction
- Numerical & Symbolic Comp.
- Computer Simulation
- Real-Time & Embedded Systems

Source: http://www.sei.cmu.edu

Software Engineering Jobs/Roles

- Systems Analyst — analyzes requirements for an application, many also do business case analysis (economic analysis)
- Software Architect — designs the overall structure of the application
- Software Network Specialist — LAN/WAN Network design, installation, maintenance
- Software Programmer — implements the design using software development tools, COTS software products, and computer languages
- Software Systems Administrator — administers user accounts, technology refreshment, software deployment to users, software problem solvers
- Software Database Administrator — administers the database (installation, maintenance, backup, refreshment)
Software Engineering Jobs/Roles (cont’d)

- Customer Support Engineer – solves customer, end-user problems with computer applications, configuration (e.g. ISP)
- Webmaster – designs, implements, and maintains a web site
- Software Security Engineer – identification, authorization, authentication, data protection, data integrity, CERT
- Software Tester – independent verification and validation – e.g. NASA IV&V Facility, South Fairmont
- Software Project Manager – plan, organize, direct, coordinate, control a software project (emphasis on risk management)
- Software Configuration Manager – identify, change control, status accounting, audits and reviews
- Software Quality Manager/Engineer – software reliability modeling, statistical quality control, defect analysis

It’s all about the process

The Software Engineering Project

- Project origins: Client, start-up, corporate, brainstorming
- Organizing a team: hiring, responsibilities, specialties, pay
- Process:
  - Design & Architecture: hardware, languages, tools, details
  - Tools: design, compilers, IDEs, version control, project management
  - Specification: what does it do? how do we know it works?
  - Development: team roles, tasks, meetings, progress
  - Milestones: daily, weekly, monthly, etc.
  - Documentation: the spec, release notes, comments, user manuals
  - Quality Assurance: testing, verification & validation
  - Packaging & Delivery
  - Maintenance & Support
  - Marketing & Sales
Activity

Write up the specification (sequence of steps) for making a peanut butter sandwich. Your steps will be followed by someone else.

Supplies:
• loaf of bread
• jar of peanut butter
• paper plate
• knife