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?

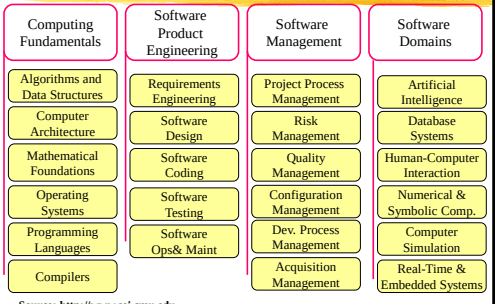
- Major or minor requirement
- Software engineer
- Graduate school
- Starting a business
- What can you do with this knowledge?
- 7 of 10 fastest growing careers are in software and computing
- The off-shore myth

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



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