Introduction to Software Engineering

Chapter 1.1

CMPT 276

Based on slides from Software Engineering 9th ed, Sommerville.

Topics

1) What is software engineering?
2) What types of software are there?
   (And how do we develop them?!?)

Software Engineering

Software Engineering

- Software engineering is concerned with..

  theories, methods and tools for professional software development

Discipline:
Using appropriate theories and methods to solve problems meeting business and financial constraints.

All Aspects:
Not just writing code: includes project management, development of tools, methods etc. to support software production.

- It is a discipline concerned with all aspects of software production..

  from early specification through maintaining system while in use

(Loose) Overview of Job Terminology

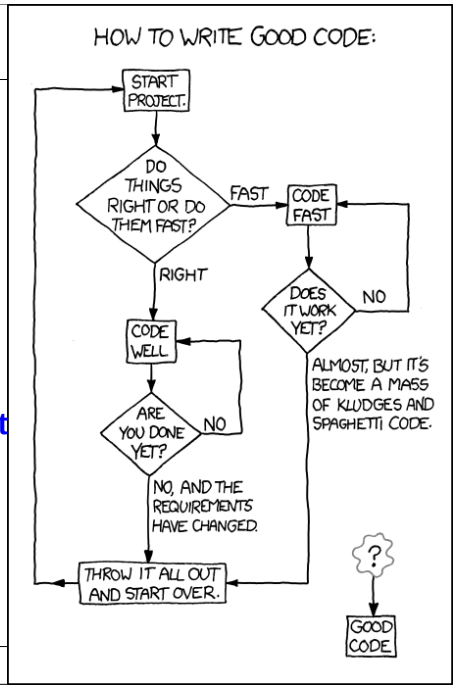
- Programmer
  - **someone who (just) writes code**
- Engineer
  - In Canada, "Engineer" often refers to licensed members of the engineering profession.
- Software Developer
  - Someone who applies.. **software engineering methods to create reliable, well designed and maintainable software systems**
  - SFU SoSy program focuses on this.

Importance of Software Engineering

- Society increasingly reliant on software systems.
  - Power grid, cell phone network, transportation network, Internet, Interact (debit cards), email, etc.

Importance of SE.

- How can we create reliable systems economically and quickly?
  - Cheaper to use.. **software engineering** methods vs write the programs as if it was a.. **personal programming project**
  - Majority of costs is for.. **changing software after it has gone in to use**



http://xkcd.com/844/

Software Process Activities

- **specification**
  - customer and developers define software features and constraints on its operation.
- **development**
  - design and program the software.
- **validation**
  - ensure software is what customer requires.
- **evolution**
  - modify software to reflect changing customer and market requirements.

SDVE lots to do with customer! remember this

Essential Attributes of Good Software

- Maintainability
  - Change is inevitable: develop software so that it can..
    evolve to meet changing customer and market requirements
- Dependability and Security
  - Must be.. **reliable, secure and safe**
    not cause physical or economic damage on failure.
  - Malicious users unable to access/damage system.
- Efficiency
  - Efficient use of resources: processing time, memory.
- Acceptability
  - Software must be acceptable its users:..
    understandable, usable and compatible with other systems

Generic vs Custom Software

- Generic Software:
  - **standalone systems marketed to anyone**
  - Ex: Word, Photoshop, CAD software, or for specific markets (dentist appointment system).
  - Specification created by developers, not customer.
- Custom Software:
  - Software that is commissioned by
    specific customer to meet their own needs
  - Ex: embedded control systems, air traffic control software, traffic monitoring systems.
  - Specification given by...

Software Engineering
Diversity

Activity: Classify Types

- In a group of ~2, complete the following table.

Application	Category	Hardest thing about doing it right?
World of Warcraft		
Anti-lock brake controller		
SFU Connect		
TD Bank online banking		
Angry Birds Android App		

Application Types

- Stand-alone applications
  - Include all necessary functionality; do not need to be connected to a network.
- Embedded
  - Software control systems...
  - More embedded systems than any other type of system.
- Entertainment
  - Games primarily for personal use.

Application Types (cont.)

- Batch processing
  - Ex: payroll; monthly billing by a phone company.
  - Process data in large batches.
- Modelling and simulation
  - For scientists and engineers to
  - Ex: car crashes, nuclear reactions, weather prediction.
- Data collection
  - Collect sensor data to send to other systems for processing.
- Systems of systems
  - Combine some other software systems. Ex: Car.

Application Types (cont.)

- Web software: Software reuse
  - User interfaces limited by...
- Cloud computing:
  - Applications run...
  - Users don't buy software buy pay according to use.
  - Ex: Google docs, Amazon Web Services, etc.

General Software Issues

- Diverse Types of Systems
  - Distributed systems operate across networks:..
- Business and Social Change
  - Software has to keep up with rapidly changing business and society.
  - Must change existing software and rapidly develop new software.
- Security and Trust
  - Software is intertwined with all aspects of our lives:..

Diversity

- Common Need: All software projects should be...
  professionally managed and developed
- Different Needs: Different types of systems require...
  different techniques
  - Games developed in.. **series of playable versions**
  - Life-critical systems need.. **a complete specification**
  - **no one method is better than others in all cases**

- Select software engineering methods and tools by:
  - type of application being developed,
  - the requirements of the customer, and
  - the background of the development team.

Summary

- Software engineering is a discipline concerned with all aspects of software production.
- Essential software attributes:
  - maintainability, dependability & security, efficiency, and acceptability.
- Software process activities:
  - specification, development, validation and evolution.
- Fundamentals of software engineering are applicable to all types of system development.
- Different types of system requires different software engineering tools and techniques for their development.