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..

Discipline:
Using appropriate theories and methods to solve problems bearing in mind organizational 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..

(Loose) Overview of Job Terminology

- Programmer:
  -
- Engineer:
  - In Canada, the title "Engineer" is restricted to licensed members of the engineering profession.
  - Computing Science graduates are not generally "Software Engineers".
- Software Developer:
  - Someone who applies..
  - SFU SoSy program focuses on this.

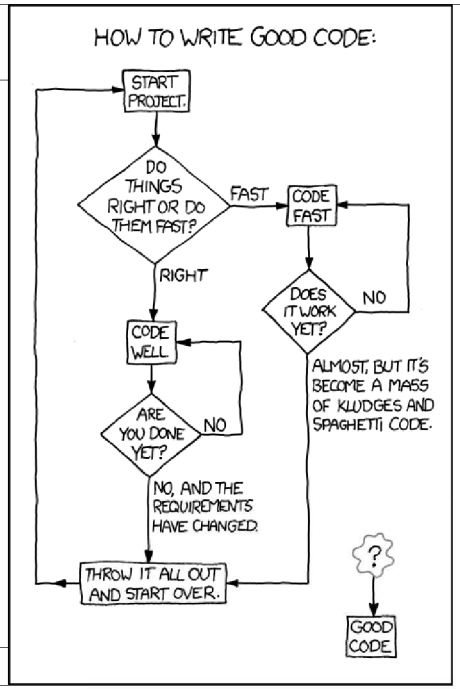
Importance of Software Engineering

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

Importance of SE.

- How can we create reliable systems economically and quickly?
  - Cheaper to use..

    methods vs write the programs as if it was a..
  - Majority of costs is for..



http://xkcd.com/844/

Software Process Activities

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

Essential Attributes of Good Software

- Maintainability
  - Change is inevitable: develop software so that it can..
- Dependability and Security
  - Must be..
    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:..

Generic vs Custom Software

- Generic Software:
  -
  - Ex: Word, Photoshop, CAD software, or for specific markets (dentist appointment system).
  - Specification created by...
- Custom Software:
  - Software that is commissioned by
  - Ex: embedded control systems, air traffic control software, traffic monitoring systems.
  - Specification given by...

Software Engineering Diversity

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...
- Different Needs: Different types of systems require...
  - Games developed in..
  - Life-critical systems need..
  -
- Select software engineering methods and tools by:
  - type of application being developed,
  - the requirements of the customer, and
  - the background of the development team.

Application Types

- Stand-alone applications
  - Include...
    and do not need to be connected to a network.
- Interactive transaction-based applications
  - User accesses an application running on a remote computer using their own PC.
  - Ex: web applications such as e-commerce applications.
- Embedded control systems
  - Software control systems...
  - More embedded systems than any other type of system.
- Entertainment systems
  - Primarily for personal use for entertainment (games).

Application Types (cont.)

- Batch processing systems
  - Business systems which process data in large batches.
  - Ex: payroll; monthly billing by a phone company.
- Systems for modelling and simulation
  - Developed by scientists and engineers to
  - Ex: car crashes, nuclear reactions, weather prediction.
- Data collection systems
  - Collect data from their environment using sensors to send to other systems for processing.
- Systems of systems
  - Composed of a number of other software systems.

Types of Applications

- What type of application are the following:
  1. SFU Web Registration (go.sfu.ca)
  2. Anti-lock brakes
  3. Eclipse
  4. Starcraft II

Web Software Engineering

- Software reuse heavily used for web-based systems.
  -
- User interfaces limited by...
- Cloud computing:
  - Applications run...
  - Users don't buy software buy pay according to use.

Software Engineering Fundamentals

- Fundamental principles for all software development
  - Develop using a ...

    (Different processes for different types of software.)
  - Dependability and performance are important.
  - Understand and manage the software specification and requirements.
  - Reuse software that has already been developed rather than write new software.

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.