Introduction to Software Engineering

Chapter 1.1

Software Engineering

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

Software Engineering

- Software engineering is concerned with..

**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.
(Loose) Overview of Job Terminology

- Programmer
- Engineer
  - In Canada, "Engineer" often refers to licensed members of the engineering profession.
- 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, etc.

Importance of SE.

- How can we create reliable systems economically and quickly?
  - Cheaper to use..
  - Cheaper to use methods vs write the programs as if it was a..
  - Majority of costs is for..

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.

How to write good code:

1. Start project
2. Do things right or do them fast
3. Fast code first
4. Almost but it's become a mass of kludges and spaghetti code
5. Are you done yet?
6. Yes and the requirements have changed
7. Throw it all out and start over
8. Good code

http://xkcd.com/844/
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:

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Generic vs Custom Software

- Generic Software:
  - 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
  - Ex: embedded control systems, air traffic control software, traffic monitoring systems.
  - Specification given by...

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Activity: Classify Types

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

<table>
<thead>
<tr>
<th>Application</th>
<th>Category</th>
<th>Hardest thing about doing it right?</th>
</tr>
</thead>
<tbody>
<tr>
<td>World of Warcraft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-lock brake controller</td>
<td></td>
<td></td>
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<tr>
<td>SFU Connect</td>
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<tr>
<td>TD Bank online banking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angry Birds Android App</td>
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</tbody>
</table>
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...

- 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.

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.