Introduction to Software Engineering

CMPT 276
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Based on slides from Software Engineering 9th ed, Sommerville; Ch1
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 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**
  - (code monkey)

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

- **Software Developer**
  - Someone who applies..

  - SFU SoSy program focuses on this.
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..

  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: understandable, usable, and compatible with other systems.
Software Engineering
Diversity
### 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>TD Bank online banking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angry Birds Android App</td>
<td></td>
<td></td>
</tr>
</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**
  - Reuses many system components
  - User interfaces limited by...

- **Software as a Service**
  - Applications run..
    Users don't buy software buy pay according to use
  - Ex: Google docs, Amazon Web Services, etc.
  - Cloud ‘as-a-service’ types:
    - Software as a Service (**SaaS**)
    - Infrastructure as a Service (**IaaS**)
    - Platform as a Service (**PaaS**)
General Software Issues

• **Diverse Types of Systems**
  - Distributed systems operate across networks:

• **Changing Environment**
  - 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.
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.