Introduction to Software Engineering

CMPT 276
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Based on slides from Software Engineering 9th ed, Sommerville; Ch1
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 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.
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..
   - 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.
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.