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 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.
Discussion

In break-out groups of 3 to 4 people:
- Exchange name & email address;
- Answer the following:

1. What would be the hardest software system to create?

2. What is the greatest software success?

3. What is the worst thing computers have been, or are being used for?
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
Poll: What is hardest about developing...

- World of Warcraft?
- Anti-lock Brake Controller?
- Flappy Bird?

1) Life critical application: correctness and reliability
2) Security: cannot be hacked
3) Multi-user scalability
4) Fast delivery
5) Cheap
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 of Projects

- **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.