CMSC 128

Introduction to Software Engineering
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Software Configuration Management

- 'Nothing is constant but change'
  - Even in software
- Change increases the level of confusion among software engineers
  - Changes are not analyzed before they are made
  - Recorded before implemented
  - Reported to those who need to know
  - Controlled to improve quality and reduce error

Software Configuration Management

- SCM is an umbrella activity
  - – Identify change
  - – Control change
  - – Ensure change is properly implemented
  - – Report change to others
- Is it the same as maintenance?
  - – Maintenance – occur after system has been delivered
  - – SCM – tracking and control

Software Configuration Management

- A primary goal of SE is to improve the ease with which changes can be accommodated and reduce the amount of effort expended when changes must be made
- SCM helps in this goal

Software Configuration Management

- Software Configuration: Output of software process
  - Computer Programs(source and executable)
  - Documents
  - Data
- SCI – Software Configuration Item
  - Number grows rapidly as process progresses
  - One item may spawn another: PP -> SRS

Software Configuration Management

- Sources of Change
  - New business or market conditions
  - New customer needs that demand modification of data produced by software
  - Reorganization that cause changes in project priorities and team structure
  - Budgetary or scheduling constraints

Baselines

- Customers modify requirements, developers modify technical approach, managers modify project approach
  - Because as time goes by, they 'know more'
  - Therefore: Most changes are justified!
    - Hard to to accept for many software engineers
- Baseline is a specification/product that has been formally reviewed and agreed upon, becomes a basis for further development....

Baselines

- ...and can be changed through formal procedures
- Analogy: Restaurant, waiter serving customer's order
- In SE, baseline is a milestone that is marked by the delivery of one or more SCI and the approval is obtained through a formal technical review

Baselines

- Common Baselines
  - System Specification
  - Software Requirement Specification
  - Design Specification
  - Source Code
  - Test Plans/Procedures/Data
  - Operational System

Baselines

- How are baselines created

1. Each SE task results to one or more SCI
2. The SCI are reviewed and approved
3. Once approved, SCI are stored in a repository and become baselines
4. In case of modification, SCI is extracted from repository and local copy is created, modification is applied on the local copy
5. If developer is authorized to make modifications, go to step 2

SCI

- SRS – Graphical Models, Process
- User Manual
- Design Spec – Data design, achitectural
- Source Code
- Operation/Installation Manual
- Database Schema and Initial Data
- Maintenance Documents
- Software Tools – version dependencies

SCM Process

- Some issues
  - How should we manage different versions of programs so that changes can be made easily?
  - How should we control changes before and after release?
  - Who has the responsibility for approving changes?
  - How can we assure that changes has been made properly?
  - How should we inform others ot the changes?

Identification of Objects

- Basic Object
  - 'unit of text'
  - ex. section of documents, source code for module, test cases
- Aggregate Object
  - Collection of basic or other aggregate objects
  - ex. design specification(data model, architecture)

Identification of Objects

- Object features
  - Name
  - Description
    - SCI type(document, program, data)
    - Project identifier
    - Change version information
  - Resources
    - Entities provided or referenced by object
    - ex. data types
  - Realization – 'unit of text'

Identification of Objects

- Other features
  - 'part of' relationships
  - 'interrelated'
- Objects evolve throught software process
- Evolution graph describes change history of object
- Changes may be made to any version but not necessarily to all version
- Automated tools provide identification

Version Control

- Combines procedures and tools to manage different versions of configuration objects
- Alternative configuration of a software system can be made by selecting appropriate versions
- Accomplished by associating attributes with each version.
  - Version number, string of boolean variables

Version Control

- Example
  - UHSIS version 0.02 (0.01 is the baseline)
    - Composed of several SCI (source code, docs, data)
    - Has two main components/modules: Records and Cashier
    - Users of Record module has no direct access to Cashier module
  - A variant of version 0.02 for use by records personnel can be obtained by assigning an attribute to the Records module

Change Control

1)Need for change recognized

2)Change request from user

3)Developer evaluates

4)Change report generated

5)Change control authority decides

6)Request queued, ECO generated

7)Assign individual to configuration objects

8)Check-out configuration objects

Change Control

9)Make the change

10)Review (audit) the change

11)Check-in(commit) the configuration items changed

12)Establish baseline for testing

13)Perform QA and testing

14)Promote(merge) for inclusion in next release

Change Control

15) Rebuild new version

16) Review/audit changes in configuration items

17) Include changes in new version

18) Distribute new version

Configuration Audit

- Has the change in ECO been made?
- Has the formal technical review been conducted?
- Have software engineering standards been applied?
- Has the change been highlighted?
- Have SCM procedures followed?
- Hall all related SCIs properly updates?

Status Reporting

- What happened?
- Who did it?
- When did it happen?
- What else will be affected?

Summary

- SCM identifies, controls, audits, and reports modifications that invariably occur while software is being developed and after it has been release to the customer

Reference

- Roger S. Pressman.Software Engineering: A Practitioner's Approach, 4th Ed.McGraw-Hill,1997. Chapter 9