Lecture25

Configuration Management

Outline of the Lecture

- Purpose of Software Configuration Management (SCM)
  - **Motivation: Why software configuration management?**
  - **Definition: What is software configuration management?**
  - **Activities and roles in software configuration management**
- Some Terminology
  - **Configuration Item, Baseline, SCM Directory, Version, Revision Release.**
- Software Configuration Management Activities
  - **Promotion Management, Release Management, Change Management**
- Outline of a Software Configuration Management Plans
  - **Standards (Example: IEEE 828-1990)**
  - **Basic elements of IEEE 828-1990**
- Configuration Management Tools

Why Software Configuration Management ?

- The problem:
  - **Multiple people have to work on software that is changing**
  - **More than one version of the software has to be supported:**
    - **Released systems**
    - **Custom configured systems (different functionality)**
    - **System(s) under development**
  - **Software must run on different machines and operating systems**

↙ *Need for coordination*

- Software Configuration Management
  - **manages evolving software systems**
  - **controls the costs involved in making changes to a system**

What is Software Configuration Management?

- Definition:
  - **A set of management disciplines within the software engineering process to develop a baseline.**

- Description:
  - **Software Configuration Management encompasses the disciplines and techniques of initiating, evaluating and controlling change to software products during and after the software engineering process.**

- Standards (approved by ANSI)
  - **IEEE 828: Software Configuration Management Plans**
  - **IEEE 1042: Guide to Software Configuration Management**

Software Configuration Management is a Project Function

- SCM is a Project Function (as defined in the SPMP) with the goal to make technical and managerial activities more effective.
- Software Configuration Management can be administered in several ways:
  - **A single software configuration management team for the whole organization**
  - **A separate configuration management team for each project**
  - **Software Configuration Management distributed among the project members**
  - **Mixture of all of the above**

Configuration Management Activities

- Software Configuration Management Activities:
  - **Configuration item identification**
  - **Promotion management**
  - **Release management**
  - **Branch management**
  - **Variant management**
  - **Change management**

- No fixed rules:
  - **Activities are usually performed in different ways (formally, informally) depending on the project type and life-cycle phase (research, development, maintenance).**

Configuration Management Activities (continued)

- Configuration item identification
  - **modeling of the system as a set of evolving components**
- Promotion management
  - **is the creation of versions for other developers**
- Release management
  - **is the creation of versions for the clients and users**
- Change management
  - **is the handling, approval and tracking of change requests**
- Branch management
  - **is the management of concurrent development**
- Variant management
  - **is the management of versions intended to coexist**

This lecture

Reading

Configuration Management Roles

- Configuration Manager
  - **Responsible for identifying configuration items. The configuration manager can also be responsible for defining the procedures for creating promotions and releases**
- Change control board member
  - **Responsible for approving or rejecting change requests**
- Developer
  - **Creates promotions triggered by change requests or the normal activities of development. The developer checks in changes and resolves conflicts**
- Auditor
  - **Responsible for the selection and evaluation of promotions for release and for ensuring the consistency and completeness of this release**

Terminology

- We will define the following terms
  - **Configuration Item**
  - **Baseline**
  - **SCM Directories**
  - **Version**
  - **Revision**
  - **Release**

- The definition of the terms follows the IEEE standard.
- Different configuration management systems may use different terms.
  - **Example: CVS configuration management system used in our projects uses terms differeing from the IEEE standard.**

Terminology: Configuration Item

"An aggregation of hardware, software, or both, that is designated for configuration management and treated as a single entity in the configuration management process."

- Software configuration items are not only program code segments but all type of documents according to development, e.g
  - **all type of code files**
  - **drivers for tests**
  - **analysis or design documents**
  - **user or developer manuals**
  - **system configurations (e.g. version of compiler used)**

- In some systems, not only software but also hardware configuration items (CPUs, bus speed frequencies) exist!

Tasks for the Configuration Managers

Define configuration items

Finding Configuration Items

- Large projects typically produce thousands of entities (files, documents, data ...) which must be uniquely identified.
- Any entity managed in the software engineering process can potentially be brought under configuration management control
- But not every entity needs to be under configuration management control all the time.
- Two Issues:
  - **What: Selection of Configuration Items**
    - **What should be under configuration control?**
  - **When: When do you start to place entities under configuration control?**
- Conflict for the Project Manager:
  - **Starting with CIs too early introduces too much bureaucracy**
  - **Starting with CIs too late introduces chaos**

Finding Configuration Items (continued)

- Some items must be maintained for the lifetime of the software. This includes also the phase, when the software is no longer developed but still in use; perhaps by industrial customers who are expecting proper support for lots of years.
- An entity naming scheme should be defined so that related documents have related names.

- Selecting the right configuration items is a skill that takes practice
  - **Very similar to object modeling**
  - **Use techniques similar to object modeling for finding Cis!**
    - **Find the CIs**
    - **Find relationships between CIs**

Which of these Entities should be Configuration Items?

- Problem Statement
- Software Project Management Plan (SPMP)
- Requirements Analysis Document (RAD)
- System Design Document (SDD)
- Project Agreement
- Object Design Document (ODD)
- Dynamic Model
- Object model
- Functional Model
- Unit tests
- Integration test strategy
- Source code
- API Specification
- Input data and data bases
- Test plan
- Test data
- Support software (part of the product)
- Support software (not part of the product)
- User manual
- Administrator manual

Possible Selection of Configuration Items

- Problem Statement
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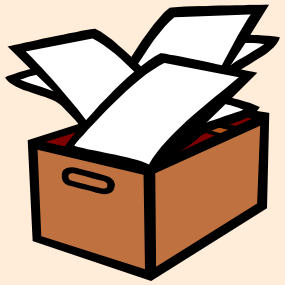
Once the Configuration Items are selected, they are usually organized in a tree

Configuration Item Tree (Example)

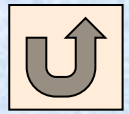


“The project”

Terminology: Version

- The initial release or re-release of a configuration item associated with a complete compilation or recompilation of the item. Different versions have different functionality.

Terminology: Baseline



"*A specification or product that has been formally reviewed and agreed to by responsible management, that thereafter serves as the basis for further development, and can be changed only through formal change control procedures*."

Examples:

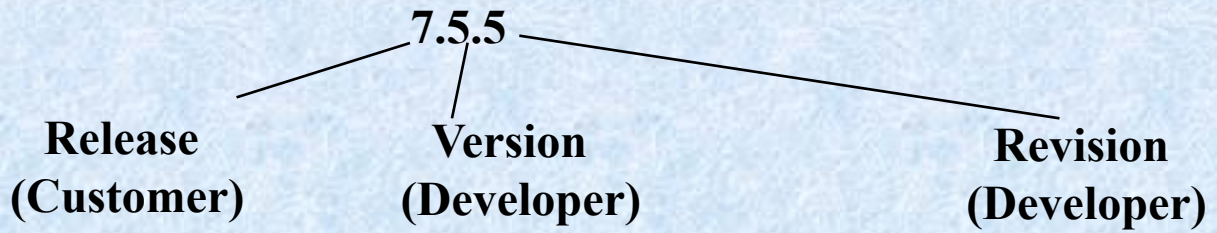
Baseline A: All the API have completely been defined; the bodies of the methods are empty**.**

Baseline B: All data access methods are implemented and tested**.**

Baseline C: The GUI is implemented.

More on Baselines

- As systems are developed, a series of baselines is developed, usually after a review (analysis review, design review, code review, system testing, client acceptance, ...)
  - ***Developmental baseline*** **(RAD, SDD, Integration Test, ...)**
    - **Goal: Coordinate engineering activities.**
  - ***Functional baseline*** **(first prototype, alpha release, beta release)**
    - **Goal: Get first customer experiences with functional system.**
  - ***Product baseline*** **(product)**
    - **Goal: Coordinate sales and customer support.**
- Many naming scheme for baselines exist (1.0, 6.01a, ...)
- A 3 digit scheme is quite common:



Baselines in SCM