# **Software Engineering**

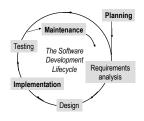
Modern Approaches



Eric Braude and Michael Bernstein

# Chapter 6: Configuration Management

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Phase most relevant to this chapter is shown in bold Learning goals of this chapter

- What is the purpose of software configuration management?
- What activities does it consist of?
- How do you plan for configuration management?
- What tools are available to support it?
- How is configuration management handled in large projects, in practice?

### **Software Configuration Management (SCM)**

- Process of identifying, tracking and storing all the artifacts on a project
- Each artifact referred to a Configuration Item (CI)

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#### **Configuration Management Goals**

#### Baseline Safety

Ensure that new or changed Cl's are safely stored in a repository and can be retrieved when necessary

#### Overwrite Safety

Ensure that engineer's changes to the same CI are applied correctly

#### Reversion

Ensure ability to revert to earlier version

#### Disaster Recovery

Retain backup copy in case of disaster

#### **SCM Activities**

- · Configuration identification
- · Baselines
- · Change control
- Version control
- Configuration audits
- Configuration status reporting
- · Release management and delivery

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## **Configuration Identification**

- · First step in SCM
- Candidate Cl's include:
  - source and object code
  - project specifications
  - user documentation
  - test plans and data
  - supporting software such as compilers, and editors
  - any artifact that will undergo modification or need to be retrieved at some time after its creation

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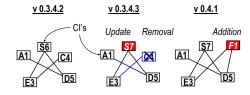
#### **Baseline Uses**

- 1. Reproducibility
- 2. Traceability

## 3. Reporting -

### **Baseline**

- -- is an individual or group of Cl's labeled at a key project milestone
- -- each version below is a baseline



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## **Change Control**

- Set of activities to request, evaluate, approve or disapprove, and implement changes to baselined Cl's
- Steps:
  - identification and documentation
  - analysis and evaluation
  - approval or disapproval
  - verification, implementation and release

### **Identification and Documentation**

- · Name of requester
- Description and extent of the change
- Reason for the change (e.g. defects fixed)
- Urgency
- Amount of time required to complete change
- Impact on other CI's or impact on the system

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## **Analysis and Evaluation**

- Reason for the change (e.g. bug fix, performance improvement, cosmetic)
- · Number of lines of code changed
- Complexity
- · Other source files affected
- Amount of independent testing required to validate the change

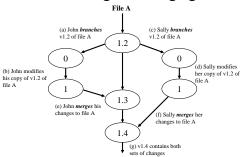
#### **Version Control**

- Repository
- · Checkin/Checkout
- Branching and merging
- · Builds
- · Version labeling

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## **Branching and Merging**



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#### **Configuration Audits**

- Verify proper procedures are followed, such as formal technical reviews
- Verify SCM policies, such as those defined by change control, are followed
- Determine whether a software baseline is comprised of the correct configuration items
  - for example, are there extra items included?
     Are there items missing? Are the versions of individual items correct?
- Typically conducted by quality assurance group

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## **Configuration Status Reporting**

- Extraction, arrangement and formation of configuration reports
  - Name and version of CI's
  - Approval history of changed Cl's
  - Software release contents and comparison between releases
  - Number of changes per CI
  - Average time taken to change a CI

#### **Release Management and Delivery**

 Policies to ensure that once software and documentation is released it is archived safely and reliably, and can always be retrieved for future use

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#### IEEE 828-2005 SCMP Table of Contents

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3.4. SCM schedules

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ins 5.6. SOM plan maintenance

#### File Status Possibilities in CVS

Up-to-date

identical with the latest revision in the repository.

Locally Modified

- File has been edited but has not replaced latest revision

· Needing Patch

- Someone else has committed newer revision to the repository.

· Needs Merge

 You have modified the file but someone else has committed a newer revision to the repository, and.

• Unknown

- A temporary file or never added

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### **SCM Systems**

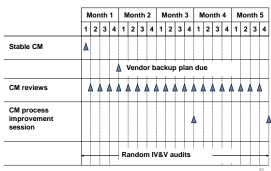
- Git and GitHub
- Subversion
- **CVS**

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- Rational Clearcase
- Microsoft's SourceSafeTM
- Perforce
- www.cmtoday.com/yp/commercial.html

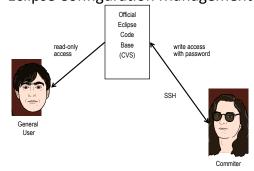
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#### Configuration Management Schedule



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# **Eclipse Configuration Management**



# **Eclipse Plug-in Version Numbering**

First development stream

- 1.0.0

Second development stream

- 1.0.100 (indicates a bug fix) - 1.1.0 (a new API has been introduced)

The plug-in ships as 1.1.0

Third development stream

- 1.1.100 (indicates a bug fix) - 2.0.0 (indicates a breaking change) The plug-in ships as 2.0.0

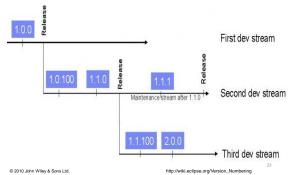
Maintenance stream after 1.1.0

The plug-in ships as 1.1.1

http://wiki.eclipse.org/Version\_Numbering

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# **Eclipse Plug-in Version Numbering**



### Planning Configuration Management

- 1. Roughly sketch out your SCMP
  - Determine procedures for making changes
  - Omit tool references unless already identified one
  - See the case study for an example
- 2. Specify what you need from a CM tool
  - For class use, maybe only locking and backup
- 3. Evaluate affordable tools against needs and budget
  - Commercial tools are in wide use
  - For class use, try free document storage web sites; simple method of checking out, e.g. renaming, can be too simple
- 5. Finalize your SCMP

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