

Unit - 7 - Software Configuration Management

Software Configuration Management (SCM) is a process to systematically manage, organize, and control the changes in the documents, codes, and other entities during the Software Development Life Cycle. The primary goal is to increase productivity with minimal mistakes.

Whenever a software is built, there is always scope for improvement and those improvements bring changes in picture. Changes may be required to modify or update any existing solution or to create a new solution for a problem. Requirements keeps on changing on daily basis and so we need to keep on upgrading our systems based on the current requirements and needs to meet desired outputs. Processes involved in SCM – Configuration management provides a disciplined environment for smooth control of work products.

Software Configuration Management (SCM) is essential for any software development project. It's a set of processes, tools, and policies used to manage and control changes to software artifacts throughout their lifecycle.

Requirement and Elements of Software Configuration Management:

1. Identification
2. Control
3. Audit
4. Status Accounting

- 1. Identification:** Each software part is labeled so that it can be identified. Furthermore, there will be different versions of the software parts as they evolve over time, so a version or revision number will be associated with the part. The key is to be able to identify all objects that compose a released configuration item.

Identifying the configuration items from products that compose baselines at given points in time (A baseline is a set of mutually consistent Configuration Items, which has been formally reviewed and agreed upon, and serves as the basis of further development). Establishing relationships among items, creating a mechanism to manage multiple levels of control and procedure for change management system.

- 2. Control:** In the context of configuration management, “control” means that proposed changes to be reviewed and, if approved, included into the software configuration. The goal is to make informed decisions and to acknowledge the results associated with a change to the system. These changes may impact budgets, schedules, and associated changes to other components. If a problem is reported in a released product, software engineers must act quickly to evaluate impacts. The control inherent in an SCM system shows each version in which the defective component appears.
- 3. Auditing:** Auditing in SCM system means that approved requested changes have been implemented. The audits allow managers to determine whether software evolution is proceeding both logically and in conformance with requirements for the software. The SCM system should document changes, versions, and release information for all components of each configuration item. When such documentation is in place, auditing becomes a straightforward analysis task.
- 4. Status accounting:** Reports and documentation produced by the status accounting function are the auditable entries. All approved parts of a software configuration must be accounted

for, and the software parts list must reflect the change from part to part. This accounting provides historical information to determine both what happened and when on the software project. Status accounting enables the auditing requirement of the SCM. As a project manager, the status accounting holds a wealth of information on the amount of effort required throughout the life cycle of the product in its development and maintenance. This is critical to the software project manager in making estimates for new systems based on historical information. The SCM can be used as one of the key components of the project managers' metrics system.

Tasks in SCM process

1. Configuration Identification
2. Baselines
3. Change Control
4. Configuration Status Accounting
5. Configuration Audits and Reviews

1. Configuration Identification: Configuration identification is a method of determining the scope of the software system. With the help of this step, you can manage or control something even if you don't know what it is. It is a description that contains the CSCI type (Computer Software Configuration Item), a project identifier and version information.

Activities during this process:

1. Identification of configuration Items like source code modules, test case, and requirements specification.
2. Identification of each CSCI in the SCM repository, by using an object-oriented approach
3. The process starts with basic objects which are grouped into accumulated objects. Details of what, why, when and by whom changes in the test are made.
4. Every object has its own features that identify its name that is explicit to all other objects.
5. List of resources required such as the document, the file, tools, etc.

Example: Instead of naming a File `login.php` it should be named `login_v1.2.php` where v1.2 stands for the version number of the file

2. Baseline: A baseline is a formally accepted version of a software configuration item. It is designated and fixed at a specific time while conducting the SCM process. It can only be changed through formal change control procedures.

Activities during this process:

1. Facilitate construction of various versions of an application
2. Defining and determining mechanisms for managing various versions of these work products
3. The functional baseline corresponds to the reviewed system requirements.
4. Widely used baselines include functional, developmental, and product baselines
5. In simple words, baseline means ready for release.

- 3. Change Control:** Change control is a procedural method which ensures quality and consistency when changes are made in the configuration object. In this step, the change request is submitted to the software configuration manager.

Activities during this process:

1. Control ad-hoc change to build stable software development environment. Changes are committed to the repository.
2. The request will be checked based on the technical merit, possible side effects and overall impact on other configuration objects.
3. It manages changes and makes configuration items available during the software lifecycle.
- 4. Configuration Status Accounting:** Configuration status accounting tracks each release during the SCM process. This stage involves tracking what each version has and the changes that lead to this version.

Activities during this process:

1. Keeps a record of all the changes made to the previous baseline to reach a new baseline
2. Identify all items to define the software configuration.
3. Monitor status of change requests
4. Complete listing of all changes since the last baseline
5. Allows tracking of progress to next baseline
6. Allows to check previous releases/versions to be extracted for testing.
- 5. Configuration Audits and Reviews:** Software Configuration audits verify that all the software product satisfies the baseline needs. It ensures that what is built is what is delivered.

Activities during this process:

1. Configuration auditing is conducted by auditors by checking that defined processes are being followed and ensuring that the SCM goals are satisfied.
2. To verify compliance with configuration control standards. auditing and reporting the changes made.
3. SCM audits also ensure that traceability is maintained during the process.
4. Ensures that changes made to a baseline comply with the configuration status reports
5. Validation of completeness and consistency