SOFTWARE PROJECT
&
CONFIGURATION MANAGEMENT
MANP 1433

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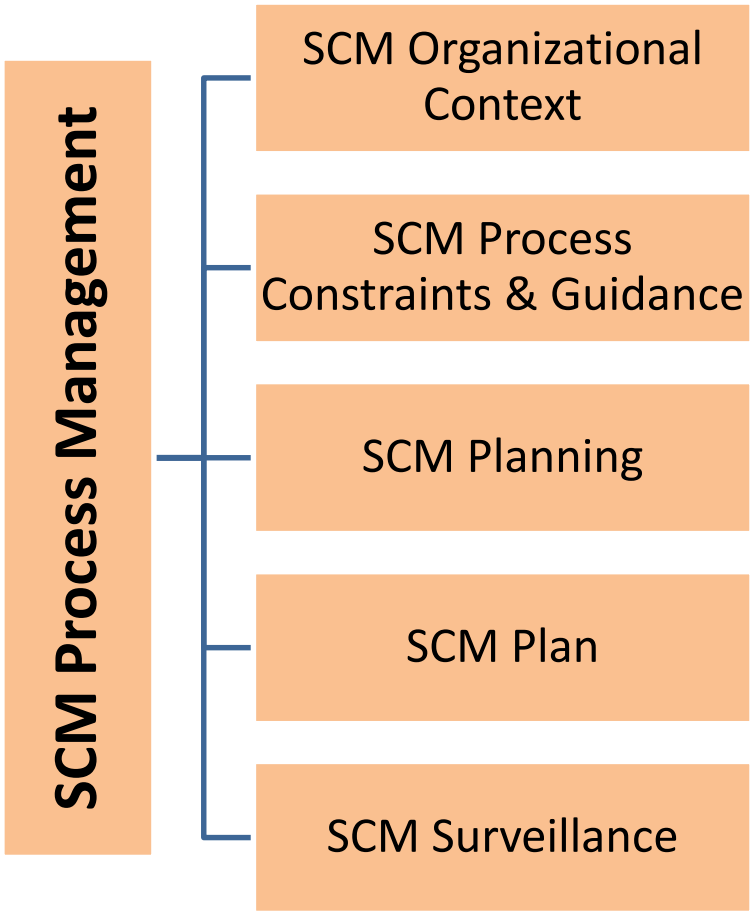
Software Configuration Management (SCM)

Course Contents

- Software configuration management (SCM) overview
- Management of SCM process
- Software configuration identification
- Software configuration control
- Software configuration status accounting
- Software configuration auditing
- Software release management and delivery
- Creating usage model using configuration management tool

Recapitulation



Configuration Identification

- The selection of configuration items within a CSCI
- The numbering of these items
- The numbering of the associated documentation
- The identification of links between items and documents
- The establishment of configuration baselines

All this information will be part of the

Software Development Library (SDL)

Configuration Identification

- Identifies items to be controlled.
- Establishes identification schemes for the items and their versions.
- Establishes the tools and techniques to be used in acquiring and managing controlled items.
- It is about being able to find and identify the correct version of any project artifact quickly and easily.
- Ineffective configuration identification system is measured in terms of lost time and quality.

Identifying Items to Be Controlled

- Identify the software items to be controlled.
  - understanding the software configuration within the context of the system configuration
  - selecting software configuration items
  - developing a strategy for labeling software items
  - and describing their relationships, and identifying both the baselines to be used and the procedure for a baseline's acquisition of the items.

Software Configuration

- Software configuration is the functional and physical characteristics of hardware or software exposed in a technical documentation or reached in a product.
- It can be viewed as part of an overall system configuration.

Software 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 Item

- They are not only program code segments but all type of documents according to development:
  - All type of code files
  - Drivers for tests
  - Analysis or design documents
  - User or developer manuals
  - System configurations (e.g.: version of compiler used)
  - Even a commercial product used in the system
- CI divide a complex product or system into manageable segments and components

Software Configuration Item

- Selecting CI:
  - Large projects with thousands of entities (files, documents, data, etc) which must be uniquely identified.
  - Any entity managed in the software engineering process can potentially be brought under configuration management control
  - Not every entity needs to be under configuration management control all the time.

Software Configuration Item

- Selecting CI:
  - Two issues:
    - What: Selection of CI
      - What should be under CI
    - When: When do you start to place entities under configuration control?
  - Conflict of Project Manager
    - Starting with CIs too early introduces too much bureaucracy
    - Starting with CIs too late introduces chaos

Software Configuration Item

- An approved and acceptable deliverable, changes have to be made through formal procedure.
- Examples:
  - Management plan
  - Requirement
  - Design Specification
  - Source code and executable code
  - Test specification, data and records
  - Log information
  - User documentation etc.

Configuration identification Rules

- CSCI numbering

- Document numbering

Software Configuration Item Relationships

- Structural relationships among the selected CIs and their constituent parts, affect other SCM activities or tasks, such as software building or analyzing the impact of proposed changes.
- Proper tracking of these relationships is also important for supporting traceability.
- The design of the identification scheme for CIs should consider the need to map identified items to the software structure and the need to support the evolution of the software items and their relationships.

Software Version

- Software items evolve as a software project proceeds.
- A version of a software item is an identified instance of an item.
- It can be thought of as a state of an evolving item.
- A variant is a version of a program resulting from the application of software diversity.

Baseline

- A software baseline is a formally approved version of a configuration item (regardless of media) that is formally designated and fixed at a specific time during the configuration item's life cycle.
- The term is also used to refer to a particular version of a CI that has been agreed on.
- In either case, the baseline can only be changed through formal change control procedures.
- A baseline, together with all approved changes to the baseline, represents the current approved configuration.

Baseline

- Commonly used baselines include functional, allocated, and product baselines.
- The functional baseline corresponds to the reviewed system requirements.
- The allocated baseline corresponds to the reviewed software requirements specification and software interface requirements specification.
- The product baseline corresponds to the completed software product delivered for system integration.

Baseline

- The baselines to be used for a given project, along with the associated levels of authority needed for change approval, are typically identified in the SCMP.

Acquiring Software Configuration Items

- Software configuration items are placed under SCM control at different times - they are incorporated into a particular baseline at a particular point in the software life cycle.
- The triggering event is the completion of some form of formal acceptance task, such as a formal review.
- In acquiring an SCI, its origin and initial integrity must be established.

Acquiring Software Configuration Items

- Following the acquisition of an SCI, changes to the item must be formally approved as appropriate for the SCI and the baseline involved, as defined in the SCMP.
- Following approval, the item is incorporated into the software baseline according to the appropriate procedure.

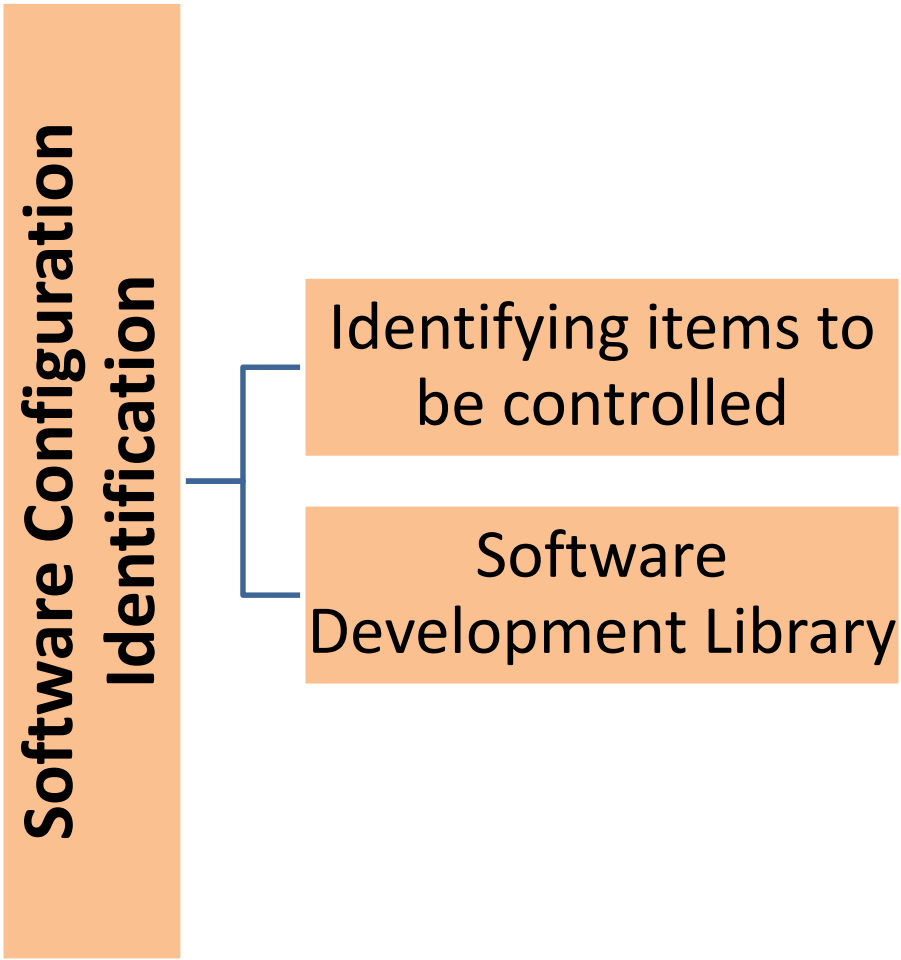
Software Development Library

- A controlled collection of software and related documentation designed to aid in software development, use or maintenance.
- It is also instrumental in software release management and delivery activities.
- Several types of libraries might be used, each corresponding to the software item's particular level of maturity.

Software Development Library

- An appropriate level of SCM control (associated baseline and level of authority for change) is associated with each library.
- Security, in terms of access control and the backup facilities, is a key aspect of library management.
- These libraries are also an important source of information for measurements of work and progress.

Recapitulation



Configuration control

The process to make sure that versions of systems and components are recorded and maintained so that changes are managed and a versions of components are identified and stored for the lifetime of the system

Configuration control

- Focuses on managing changes to a CSCI, with the help of three tools:
  - Documentation such as administrative forms for defining a proposed change to the software (PCR)
  - Procedures, logical series of steps by which these changes are processed
  - Organizational body for formally evaluating and approving/disapproving a proposed change (SCCB)

Requesting, Evaluating, and Approving Software Changes

- Software change request process provides formal procedures for:
  - submitting and recording change requests
  - evaluating the potential cost and impact of a proposed change
  - accepting, modifying, deferring, or rejecting the proposed change
- A problem/change request (PCR) is a request to:
  - expand or reduce the project scope
  - modify policies, processes, plans, or procedures
  - modify costs or budgets
  - revise schedules

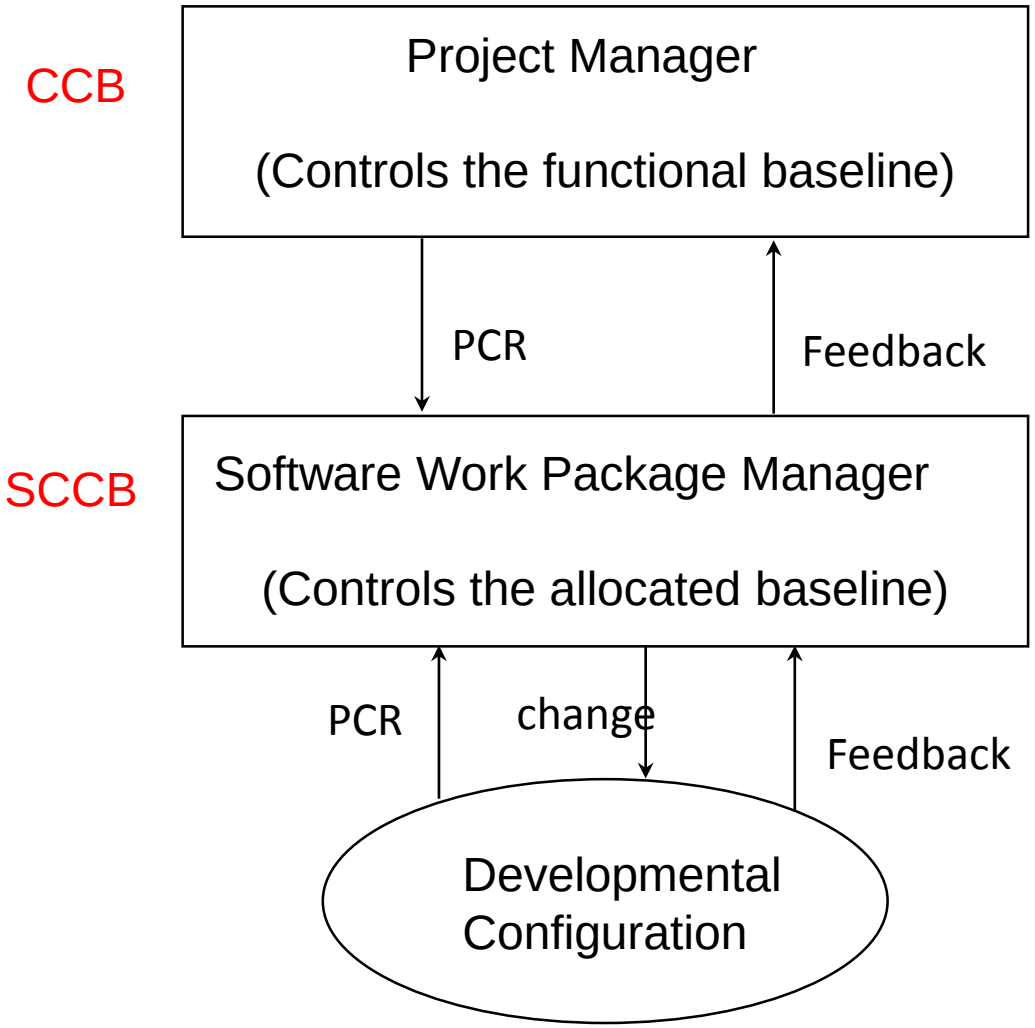
Requesting, Evaluating, and Approving Software Changes

- Anyone can request for changes to software configuration items at any point in the SDLC
- The type of change (defect or enhancement) is recorded on the PCR
- This is an opportunity for tracking defects and collecting change activity measurements by change type
- Impact analysis is performed to determine the extent of the modifications that would be necessary should the change request be accepted
- An established authority will evaluate the technical and managerial aspects of the change request to accept, modify, reject or defer the proposed change.

Software Configuration Control Board (SCCB)

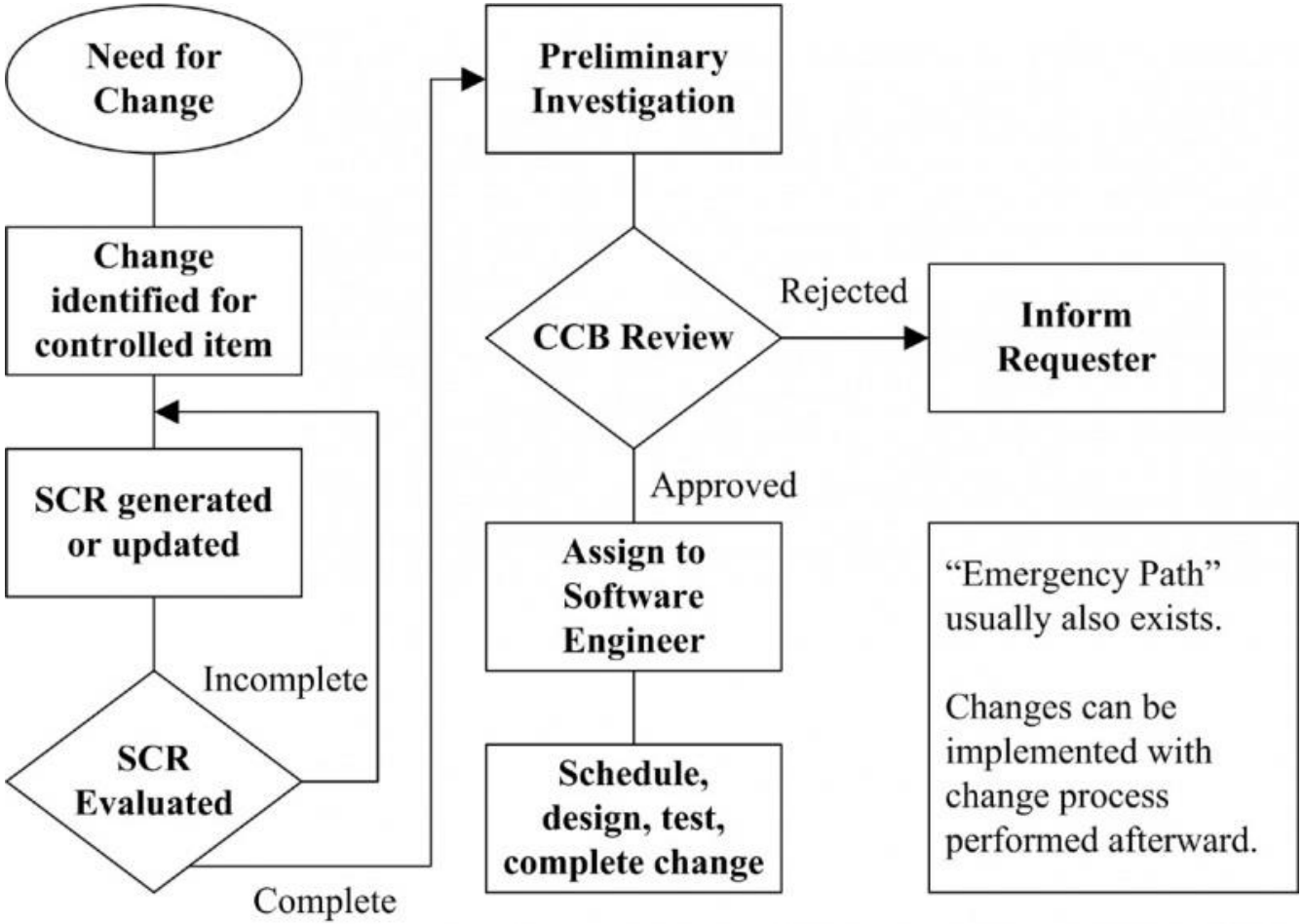
- Configuration Control Board (CCB) is the authority for accepting or rejecting proposed changes
- Can be an assigned individual or a multi-person board
- Multiple levels of change authority depends on a variety of criteria (criticality of the item involved, the nature of the change like impact on budget and schedule) or the project's current point in the life cycle.
- When the scope is strictly software, we call it Software Configuration Control Board (SCCB)
- The activities of the SCCB are typically subject to software quality audit or review.

Configuration control



PCR status:
- rejected
- accepted
- waiting
- solved

Flow of a Change Control Process (SWEBOK V3)



Software Change Request Process

- An effective PCR process requires the use of supporting tools and procedures for:
  - originating change requests
  - enforcing the flow of the change process
  - capturing CCB decisions
  - reporting change process information
- A link between this tool capability and the problem reporting system can facilitate the tracking of solutions for reported problems

Implementing Software Changes

- Implement approved PCR using the defined software procedures in accordance with the applicable schedule requirements
- A number of approved SCRs might be implemented simultaneously, so they must be incorporated into particular software versions and baselines
- As part of the closure of the change process, completed changes may undergo configuration audits and software quality verification—this includes ensuring that only approved changes have been made.

Implementing Software Changes

- The software change request process documents the SCM approval information for the change.
- Changes may be supported by source code version control tools
- These tools allow a team of software engineers, or a single software engineer, to track and document changes to the source code
- They provide a single repository for storing the source code, can prevent more than one software engineer from editing the same module at the same time, and record all changes made to the source code.

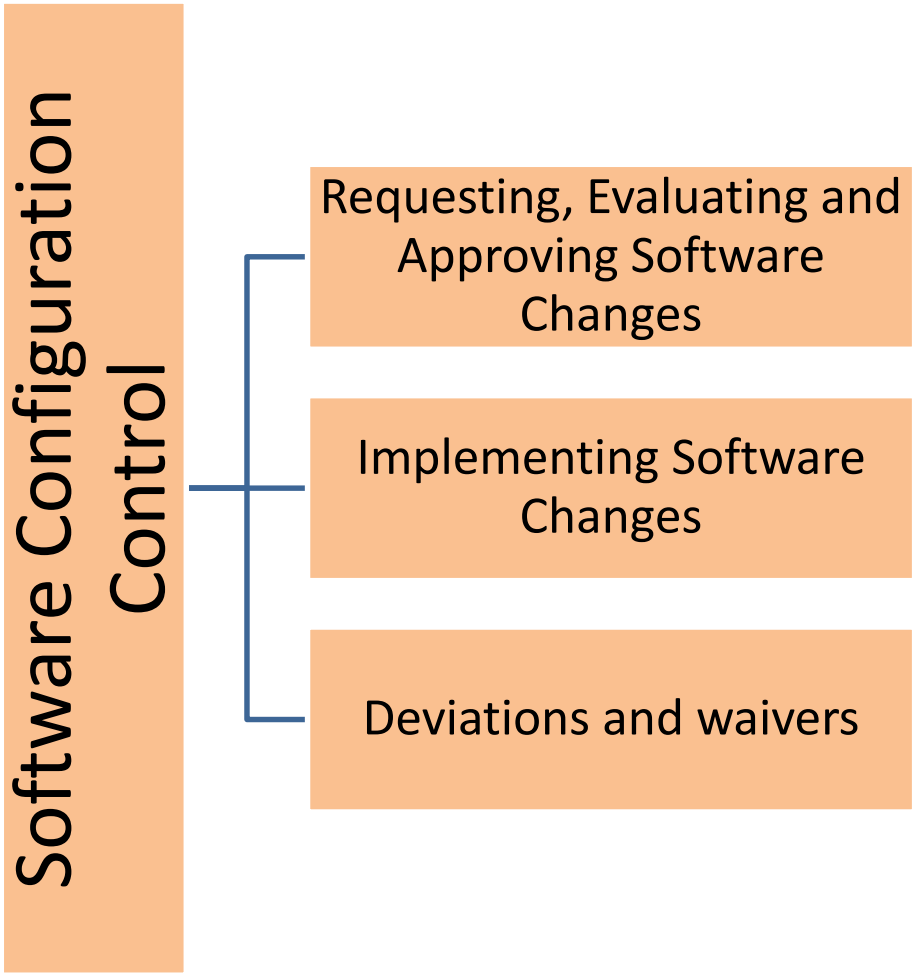
Implementing Software Changes

- Software engineers check modules out of the repository, make changes, document the changes, and then save the edited modules in the repository
- If needed, changes can also be discarded, restoring a previous baseline

Deviations and Waivers

- A deviation is a written authorization, granted prior to the manufacture of an item, to depart from a particular performance or design requirement for a specific number of units or a specific period of time
- A waiver is a written authorization to accept a configuration item or other designated item that is found, during production or after having been submitted for inspection, to depart from specified requirements but is suitable for use as-is or after rework by an approved method.

Recapitulation



Configuration status accounting

- Provides the administrative tracking and reporting of all software items formally identified and controlled by:
  - Descriptive information about each CSCI
  - PCR status
  - (S)CCB minutes
- Software configuration status accounting is the means by which the outputs of the other configuration management functions is recorded
- This database is the foundation for scheduled reporting, history for evaluation purposes and future project estimates

Software Configuration Status Information

- Designs and operates a system to record and report necessary information as the life cycle proceeds
- The configuration status information to be managed for the evolving configurations must be identified, collected, and maintained
- Various information and measurements are needed to support the SCM process and to meet the configuration status reporting needs of management, software engineering and other related activities

Software Configuration Status Information

- The types of information available include the approved configuration identification and the identification and current implementation status of changes, deviations and waivers
- Automated tool support is necessary to accomplish the data collection and reporting tasks
- This could be a database capability, a stand-alone tool or a capability of a larger, integrated tool environment.

Software Configuration Status Reporting

- Reporting can take the form of ad hoc queries to answer specific questions or the periodic production of predesigned reports
- Some information produced by the status accounting activity during the course of the life cycle might become quality assurance records and serve as a basis of various measurements

Recapitulation