SOFTWARE CONFIGURATION MANAGEMENT (SCM)

SOFTWARE CONFIGURATION MANAGEMENT

- The output of the software process is information that may be divided into three broad categories:

(1) computer programs (both source level and executable forms);

(2) documents that describe the computer programs (targeted at both technical practitioners and users), and

(3) data.

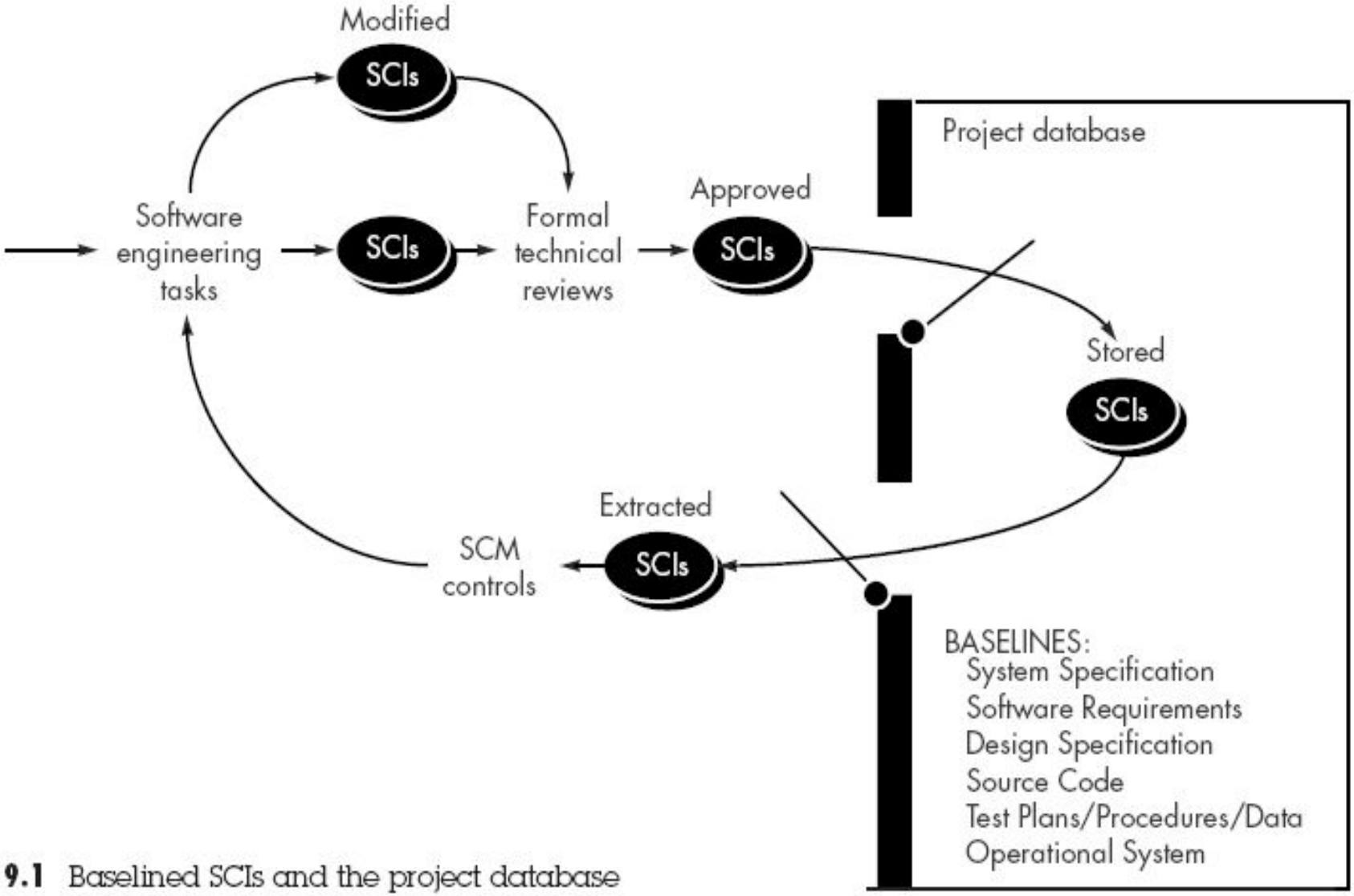
There are four fundamental sources of change:

- New business or market conditions dictate changes in product requirements or business rules.
- New customer needs demand modification of data produced by information systems,
- Reorganization or business growth/downsizing causes changes in project priorities or software engineering team structure.
- Budgetary or scheduling constraints.

- Free software tools that help in SCM are:
  - Concurrent Versions System (CVS)
  - Revision Control System (RCS)
  - Source Code Control System (SCCS)
- Commercial Tools:
  - Rational Clear Case
  - PVCS
  - Microsoft Visual SourceSafe

Baselines

- A *baseline is a software configuration management concept that helps us to control.*
- Change without seriously impeding justifiable change.



URE 9.1 Baselined SCIs and the project database

Five SCM tasks

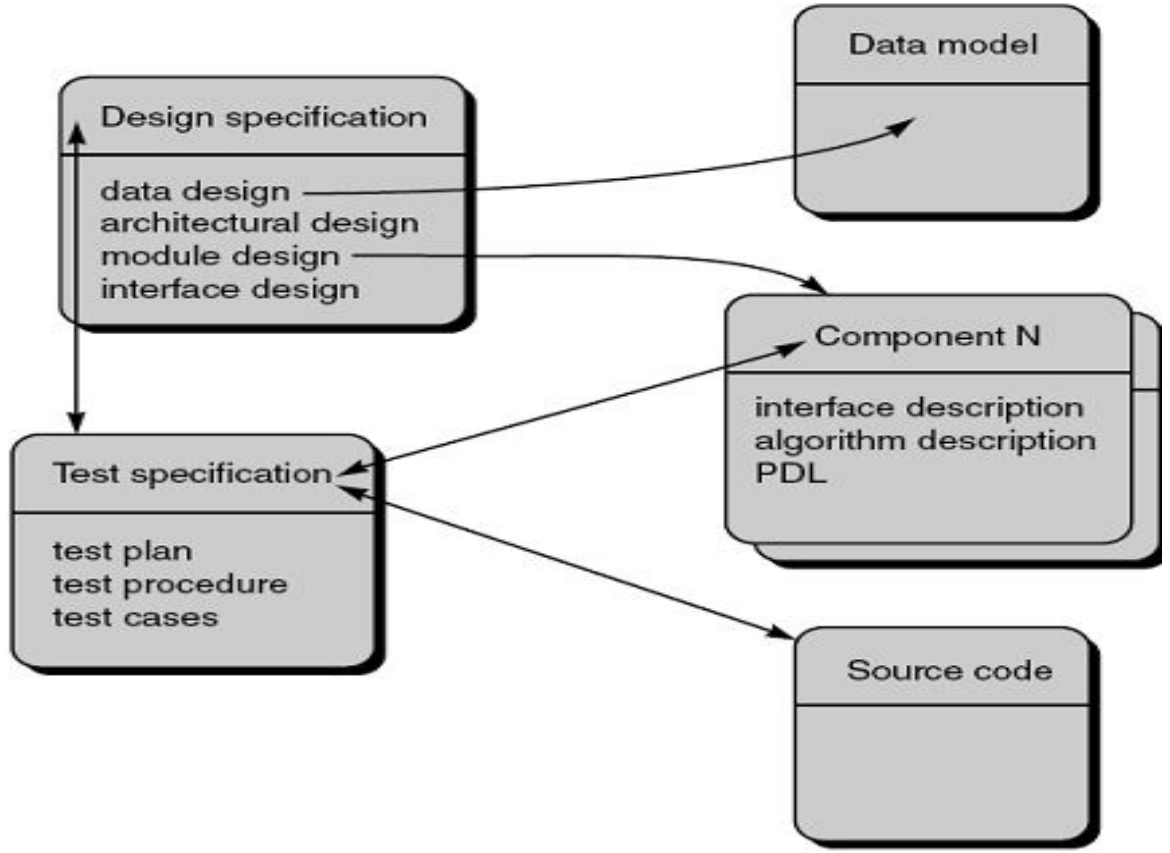
- Identification (tracking multiple versions to enable efficient changes)
- Version control (control changes before and after release to customer)
- Change control (authority to approve and prioritize changes)
- Configuration auditing (ensure changes made properly)
- Reporting (tell others about changes made)

Difference between SCM and Software Support (Maintenance)

- Support is a set of software engineering activities that occur after software has been delivered to the customer and put into operation.
- Software configuration management is a set of tracking and control activities that begin when a software engineering project begins and terminate only when the software is taken out of operation.

- A configuration object has a name, attributes, and is "connected" to other objects by relationships.

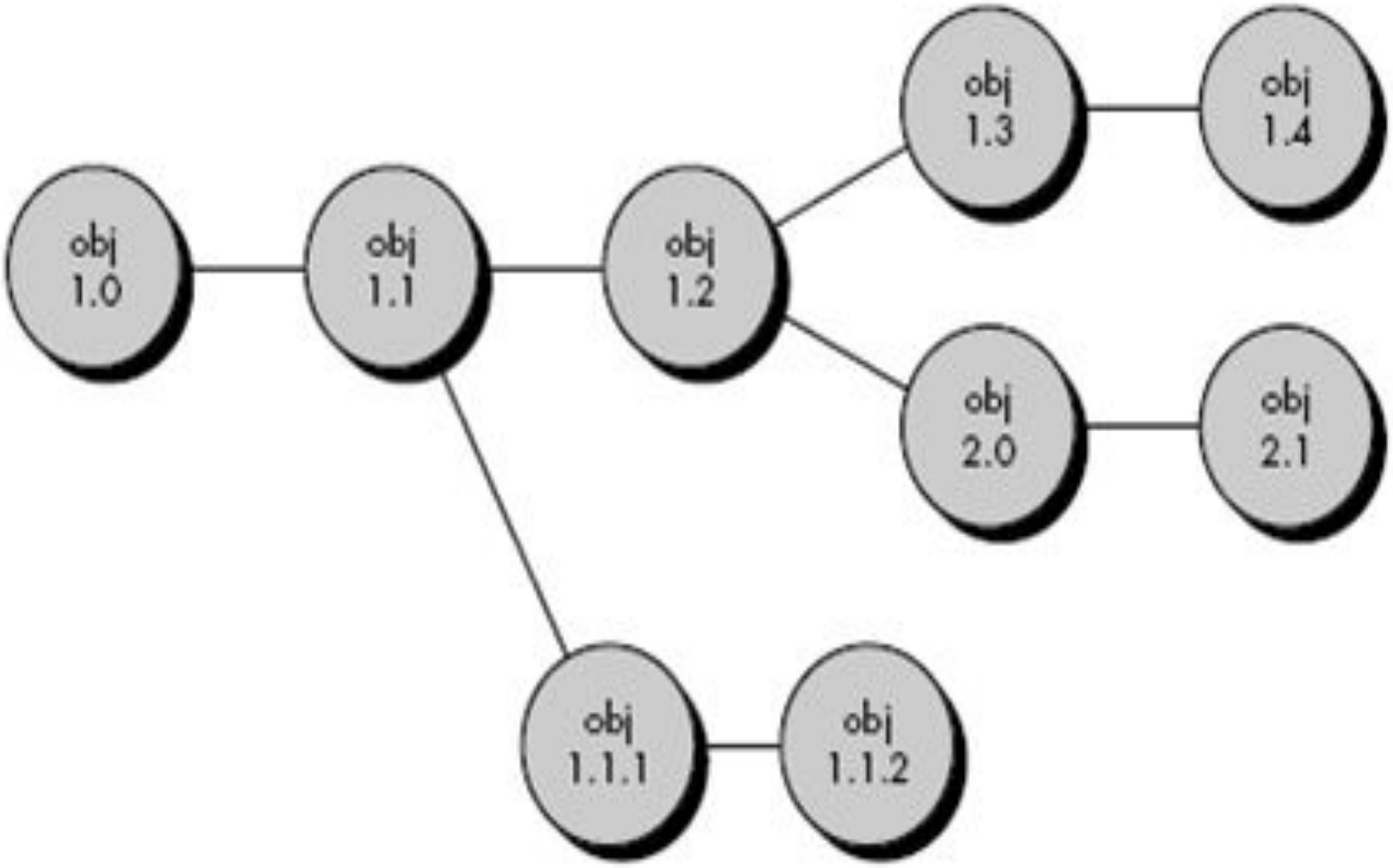
FIGURE
Configuration objects



Version Control

- Configuration management allows a user to specify alternative configurations of the software system through the selection of appropriate versions
- This is supported by associating attributes with each software version, and then allowing a configuration to be specified [and constructed] by describing the set of desired attributes.
- These "attributes" mentioned can be as simple as a specific version number that is attached to each object or as complex as a string of Boolean variables

FIGURE
Evolution graph



Change Control

- Change request is submitted and evaluated to assess technical merit and impact on the other configuration objects and budget.
- Change report contains the results of the evaluation.
- Change control authority (CCA) makes the final decision on the status and priority of the change based on the change report.
- Engineering change order (ECO) is generated for each change approved .
- Object to be changed is checked-out of the project database subject to access control parameters for the object.
- Modified object is subjected to appropriate SQA and testing procedures.
- Modified object is checked-in to the project database and version control mechanisms are used to create the next version of the software.
- Synchronization control is used to ensure that parallel changes made by different people don’t overwrite one another.

FIGURE
The change control process

Configuration Audit

- To ensure that the change has been properly implemented we conduct :
  - formal technical reviews and
  - the software configuration audit.
- The **formal technical review** focuses on the technical correctness of the configuration object that has been modified.
- A **software configuration audit** complements the formal technical review by assessing a configuration object for characteristics that are generally not considered during review.

- The audit asks and answers the following questions:
    - Has the change specified in the ECO (Engineering change order) been made? Have any additional modifications been incorporated?
    - Has a formal technical review been conducted to assess technical correctness?
    - Has the software process been followed and have software engineering standards been properly applied?
    - Has the change been "highlighted" in the SCI? Have the change date and change author been specified? Do the attributes of the configuration object reflect the change?
    - Have SCM procedures for noting the change, recording it, and reporting it been followed?
    - Have all related SCIs been properly updated?

Status Reporting

- Configuration status reporting (sometimes called status accounting) is an SCM task that answers the following questions:
  - What happened?
  - Who did it?
  - When did it happen?
  - What else will be affected?
    - Each time an SCI is assigned new or updated identification, a CSR entry is made.
    - Each time a configuration audit is conducted, the results are reported as part of the CSR task.
    - Output from CSR may be placed in an on-line database.

- https://www.guru99.com/software-configuration-management-tutorial.html