HUST

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HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

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HANOI UNIVERSITY
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IT3180 – Introduction to Software Engineering

16 – Configuration Management

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Content

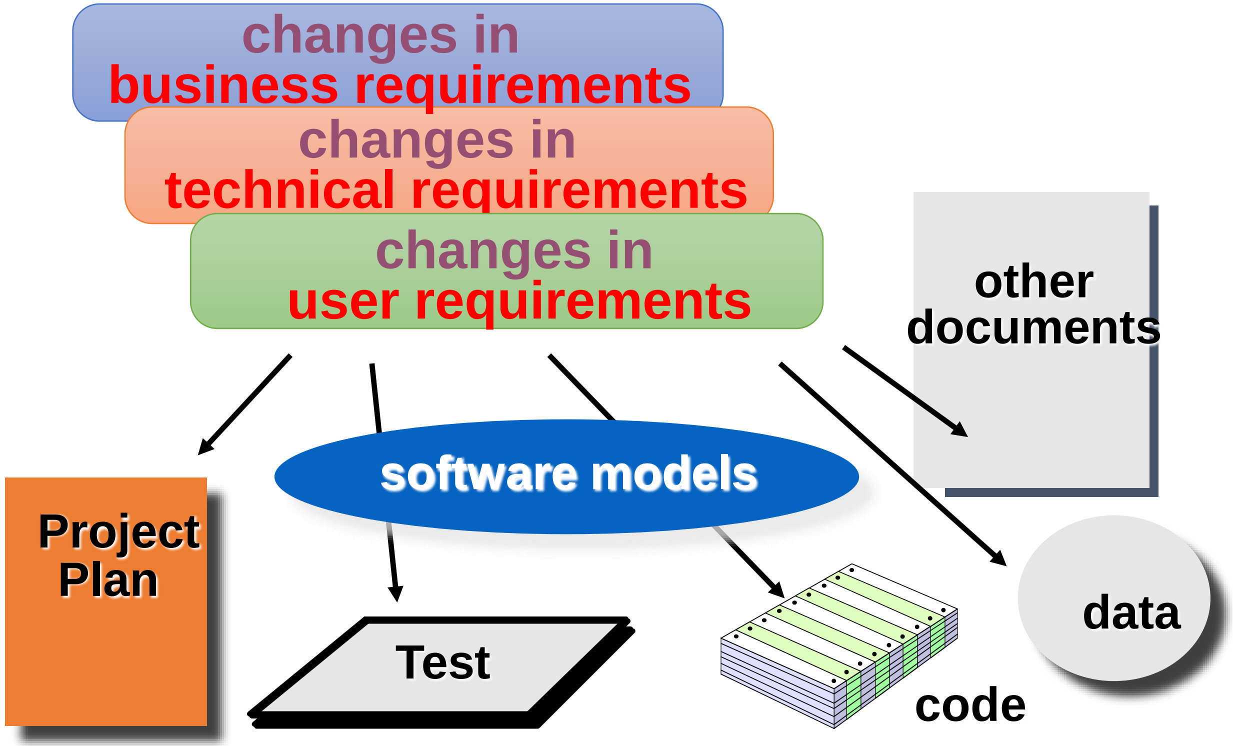
1. Changes and Software Configuration
2. Software Configuration Management
3. SCM Process
4. Version Control

The “First Law”

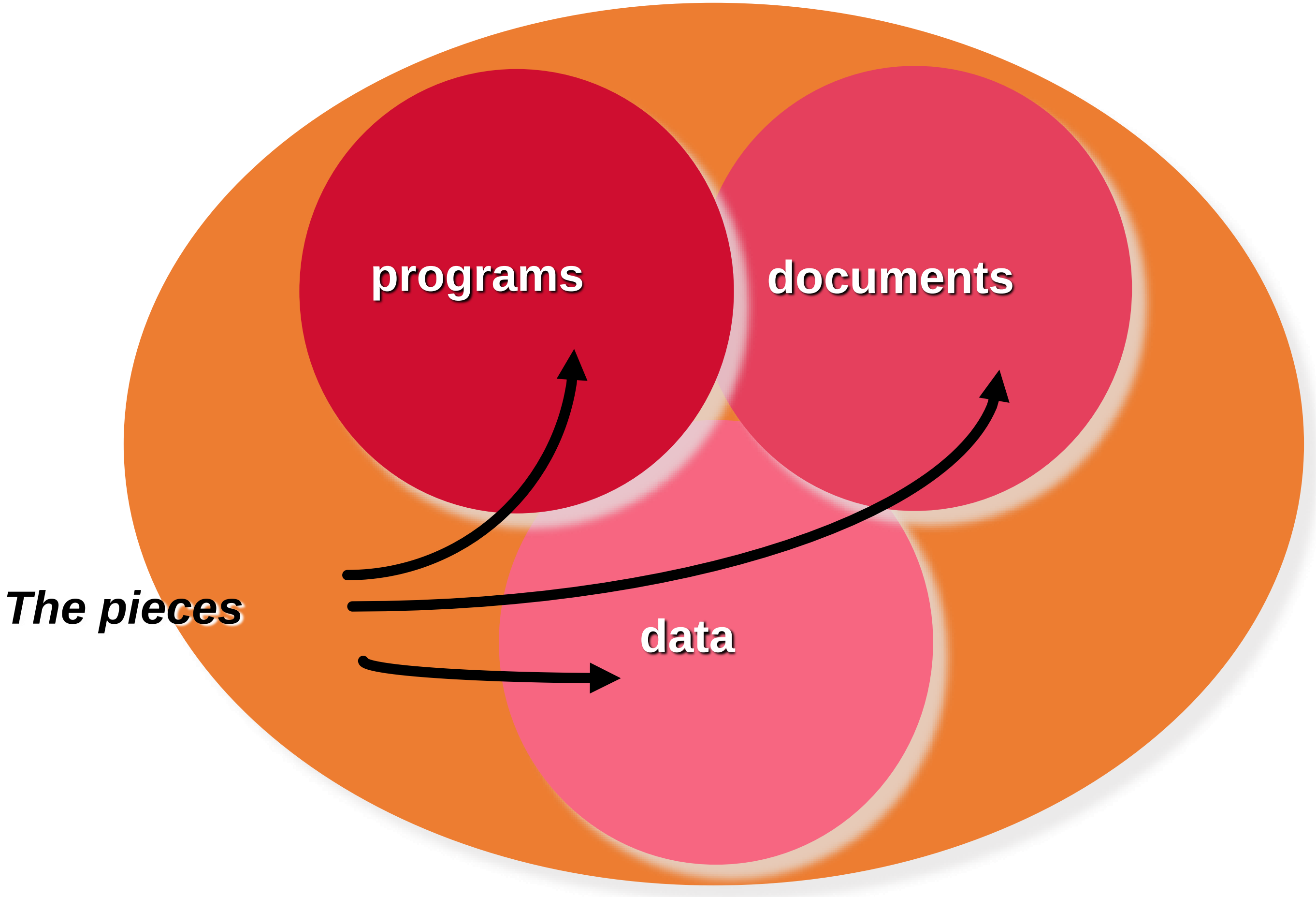
No matter where you are in the system life cycle, the system will change, and the desire to change it will persist throughout the life cycle.

Bersoff, et al, 1980

Where does changes come?



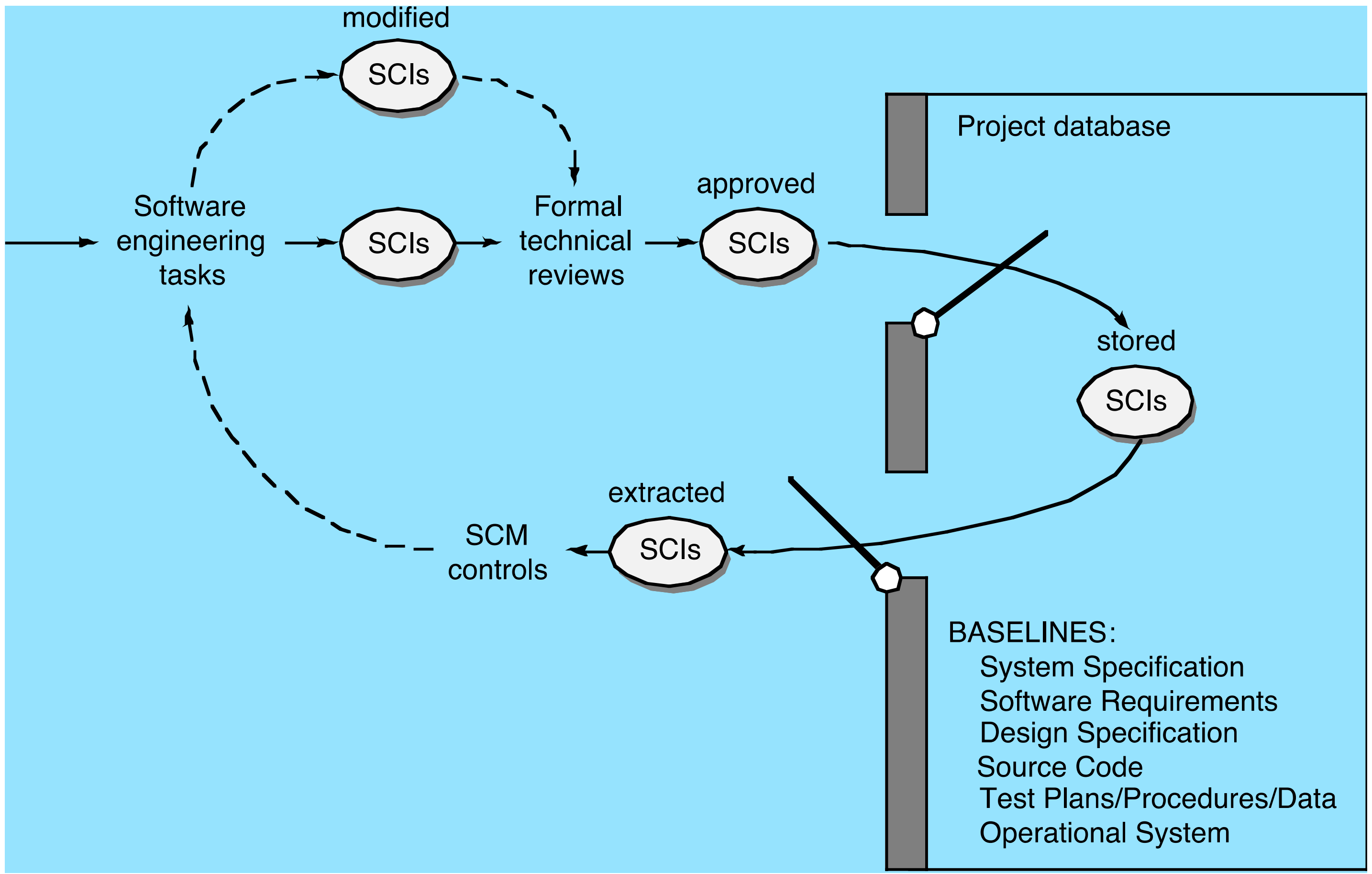
The software configuration



Baseline

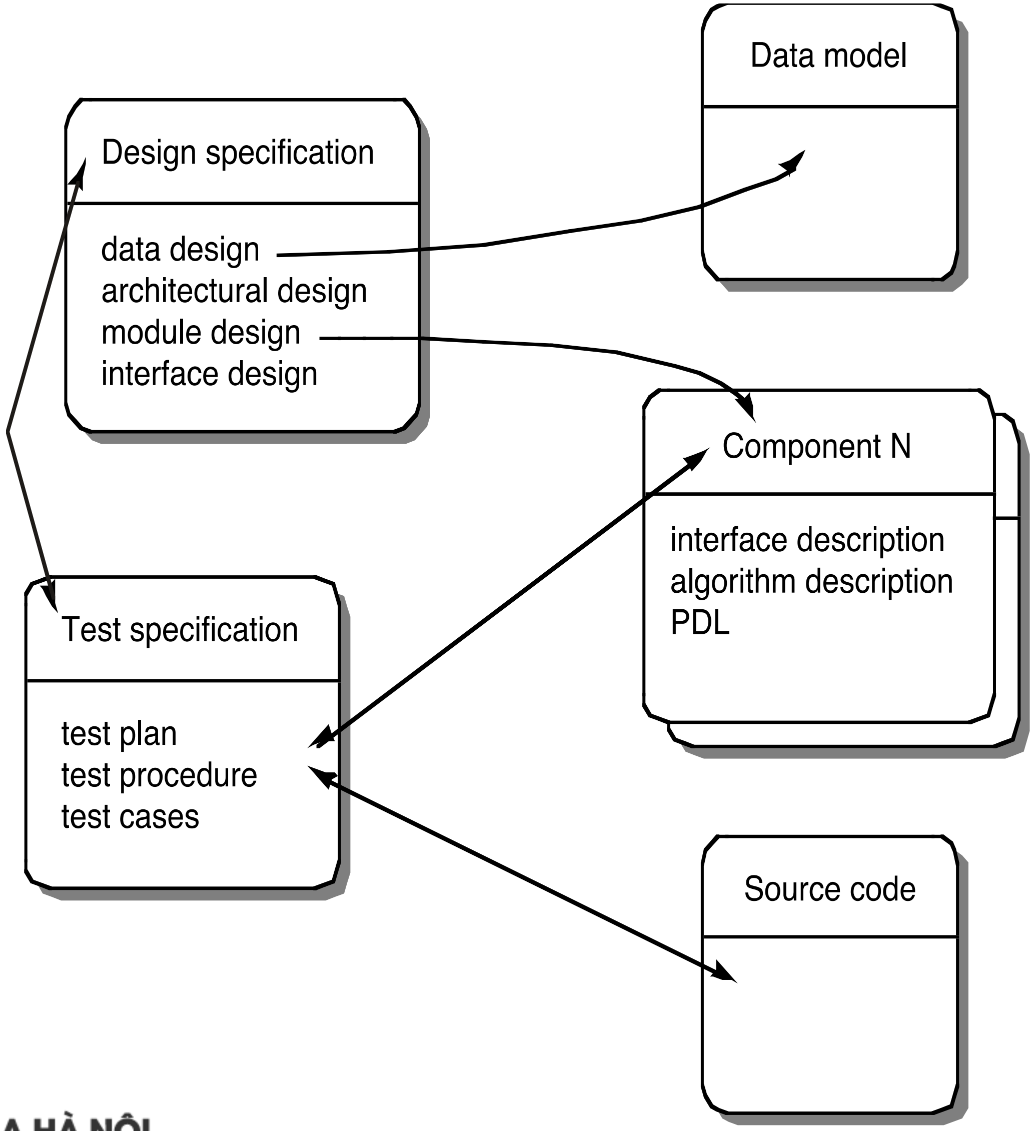
- The IEEE (IEEE Std. No. 610.12-1990) defines a **baseline** as:
    - A specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be changed only through formal change control procedures.
- A **baseline** is a milestone in the development of software that is marked by the delivery of one or more software configuration items and the approval of these SCIs that is obtained through a formal technical review
- SCIs: Software Configuration Items (software configuration objects)

How to change Baseline?



BASELINES:
System Specification
Software Requirements
Design Specification
Source Code
Test Plans/Procedures/Data
Operational System

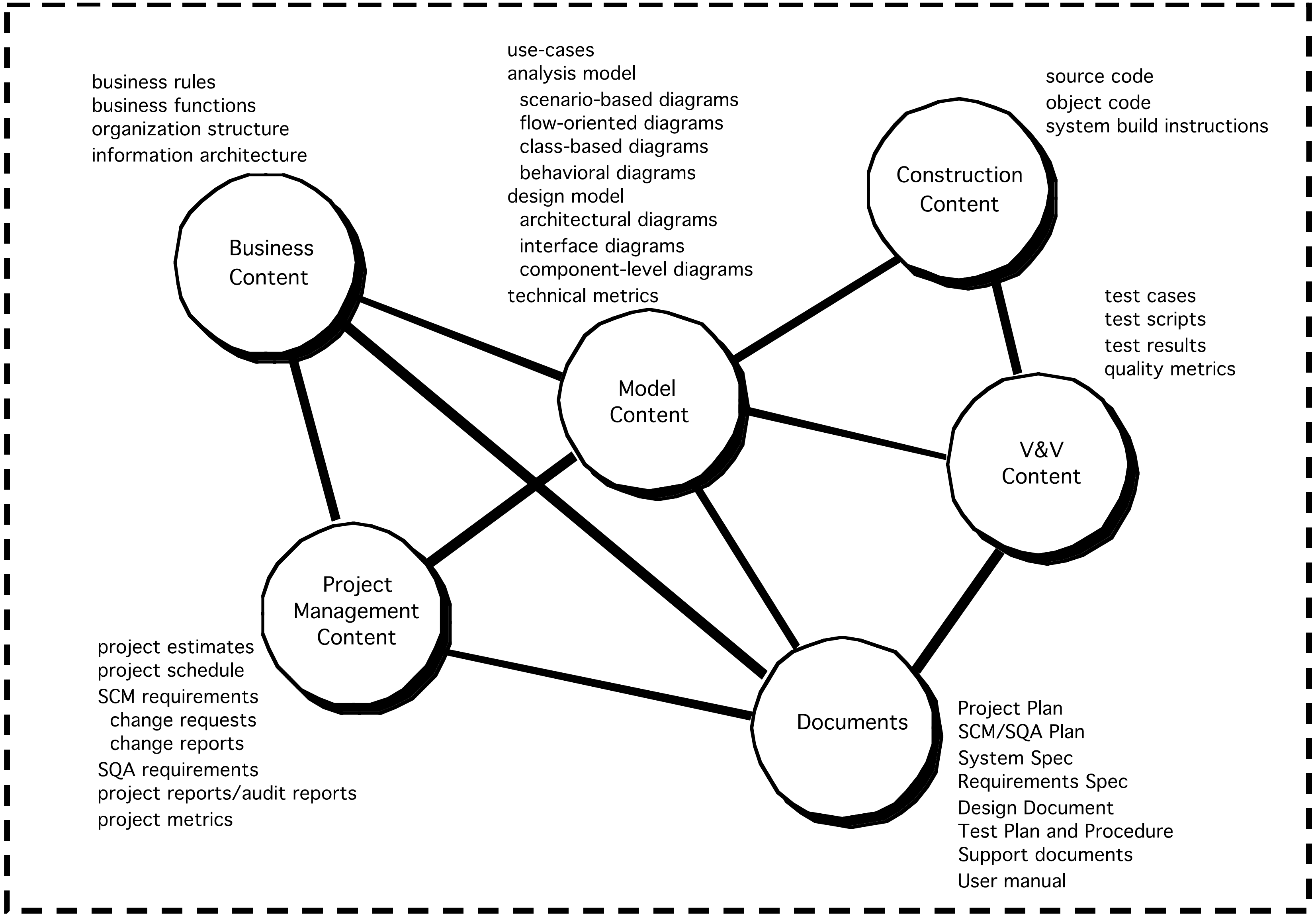
Software Configuration Objects



SCM Repository

- The SCM repository is the set of mechanisms and data structures that allow a software team to manage change in an effective manner
- The repository performs or precipitates the following functions [For89]:
  - Data integrity
  - Information sharing
  - Tool integration
  - Data integration
  - Methodology enforcement
  - Document standardization

Repository Content



Repository Features

- **Versioning.**
  - saves all of these versions to enable effective management of product releases and to permit developers to go back to previous versions
- **Dependency tracking and change management.**
  - The repository manages a wide variety of relationships among the data elements stored in it.
- **Requirements tracing.**
  - Provides the ability to track all the design and construction components and deliverables that result from a specific requirement specification
- **Configuration management.**
  - Keeps track of a series of configurations representing specific project milestones or production releases. Version management provides the needed versions, and link management keeps track of interdependencies.
- **Audit trails.**
  - establishes additional information about when, why, and by whom changes are made.

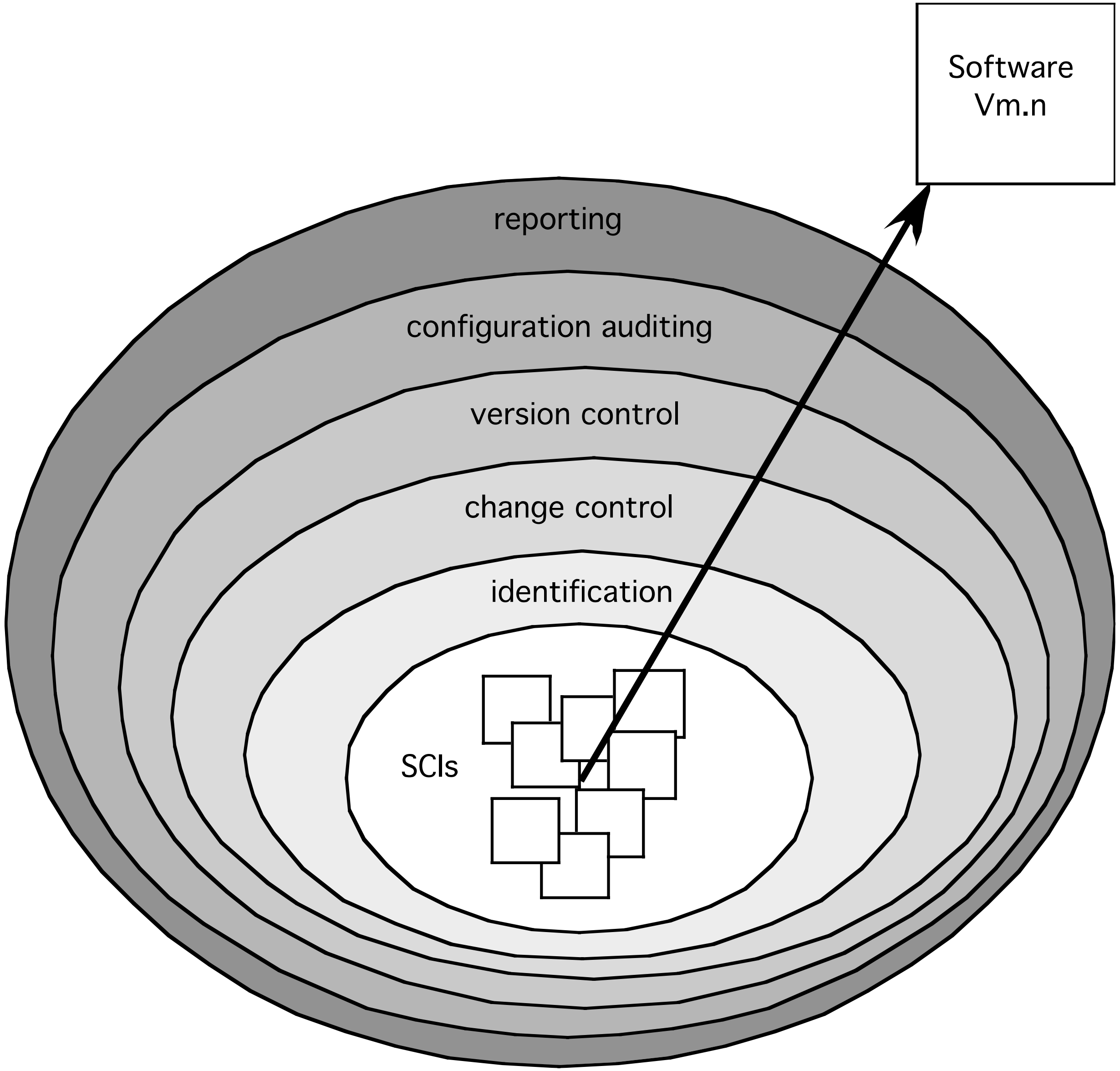
SCM Elements

- *Component elements*—a set of tools coupled within a file management system (e.g., a database) that enables access to and management of each software configuration item.
- *Process elements*—a collection of procedures and tasks that define an effective approach to change management (and related activities) for all constituencies involved in the management, engineering and use of computer software.
- *Construction elements*—a set of tools that automate the construction of software by ensuring that the proper set of validated components (i.e., the correct version) have been assembled.
- *Human elements*—to implement effective SCM, the software team uses a set of tools and process features (encompassing other CM elements)

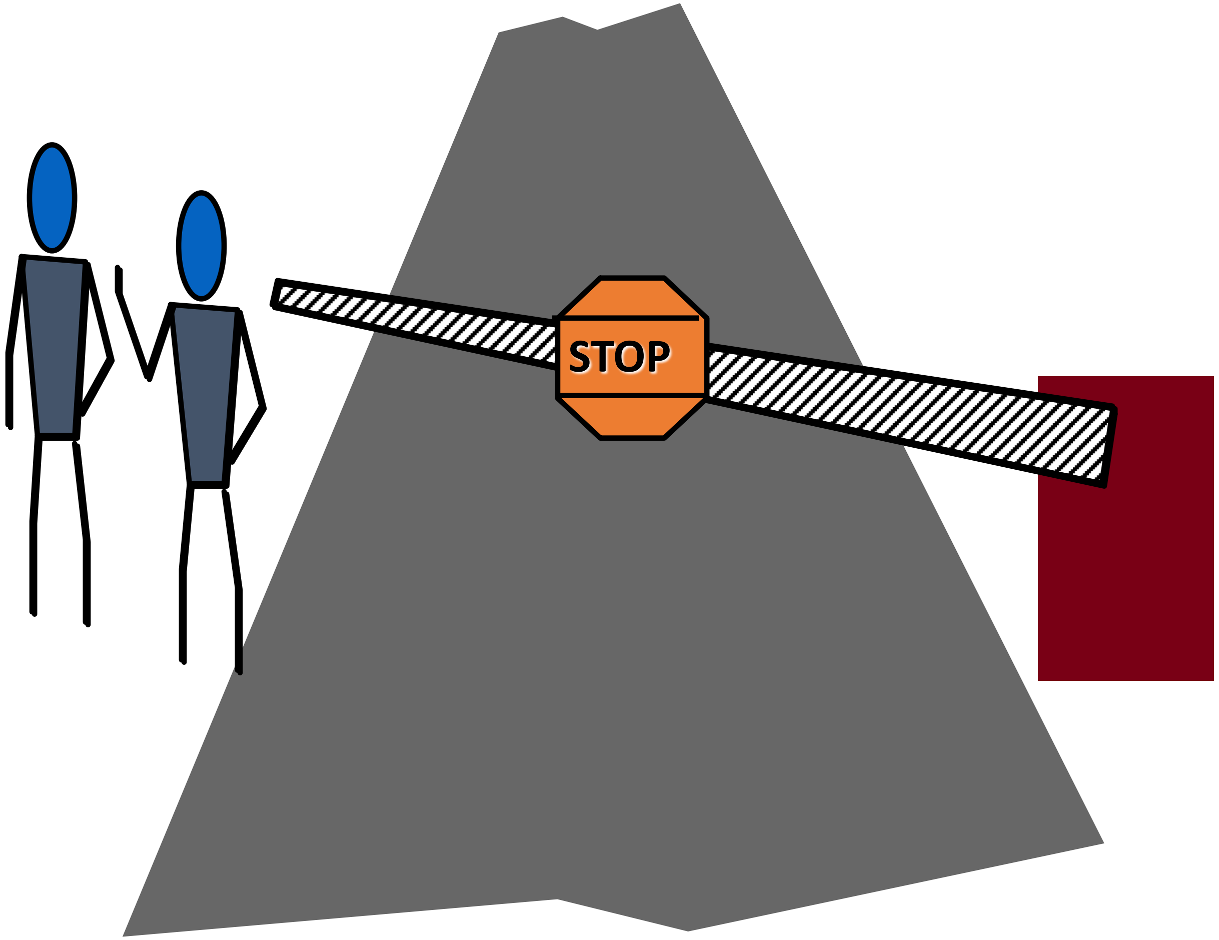
3. SCM Process

- How does a software team identify the discrete elements of a software configuration?
- How does an organization manage the many existing versions of a program (and its documentation) in a manner that will enable change to be accommodated efficiently?
- How does an organization control changes before and after software is released to a customer?
- Who has responsibility for approving and ranking changes?
- How can we ensure that changes have been made properly?
- What mechanism is used to appraise others of changes that are made?

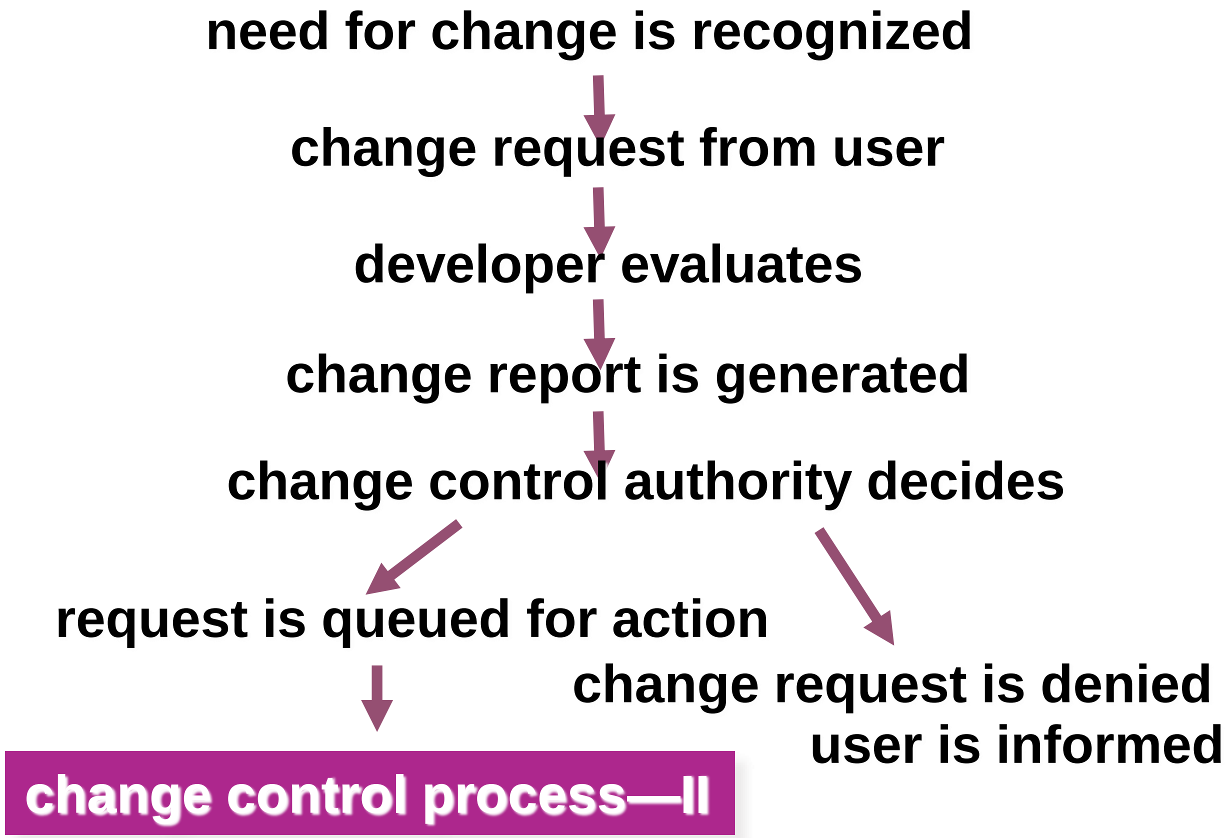
The SCM Process



Change Control Process



Change Control Process – Stage 1



need for change is recognized

change request from user

developer evaluates

change report is generated

change control authority decides

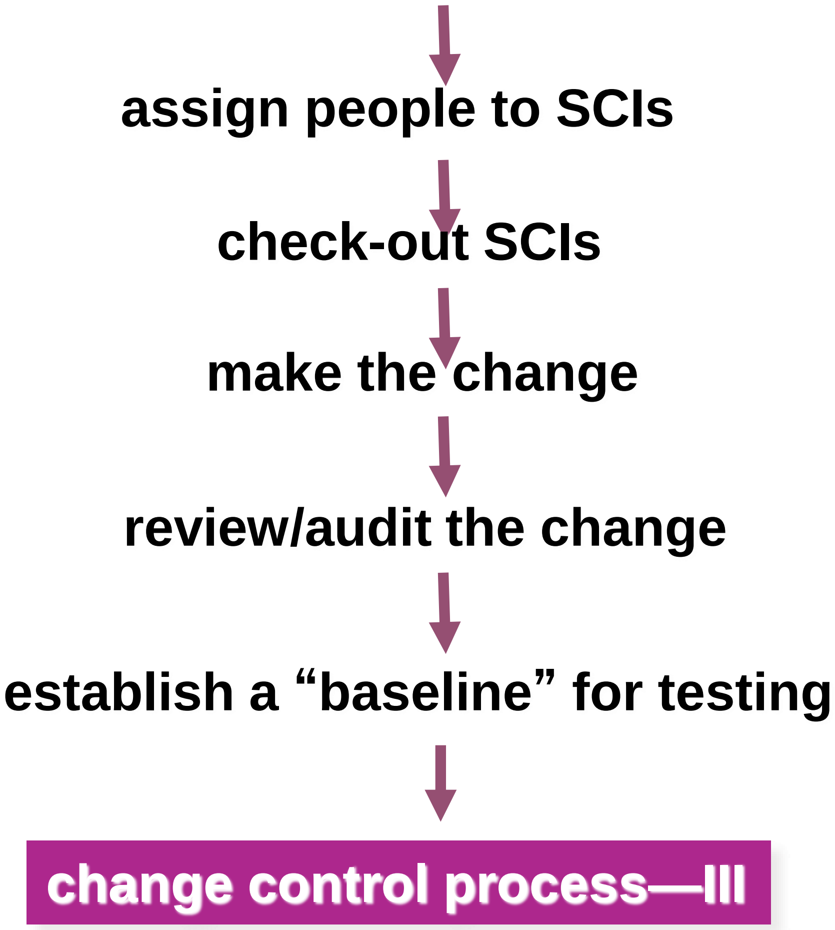
request is queued for action

change request is denied

user is informed

change control process—II

Change Control Process – Stage 2



assign people to SCIs

check-out SCIs

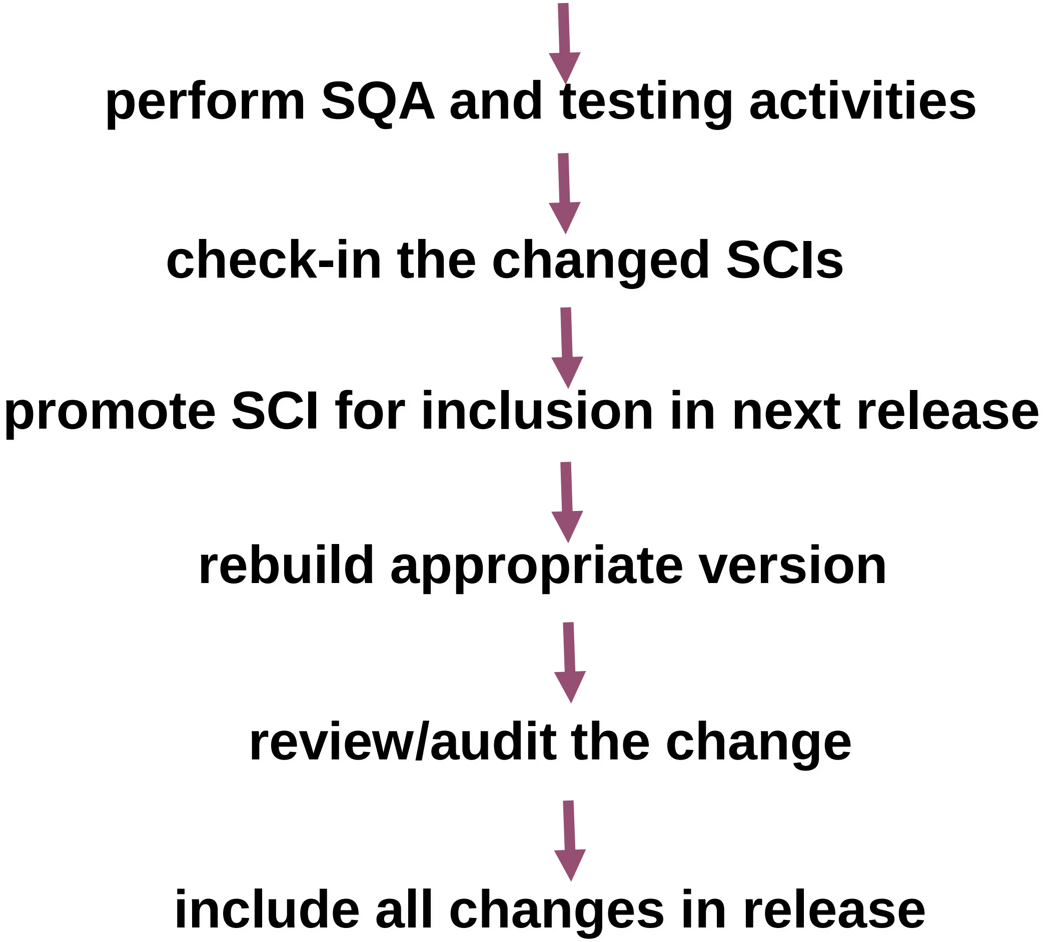
make the change

review/audit the change

establish a “baseline” for testing

change control process—III

Change Control Process – Stage 3



perform SQA and testing activities

check-in the changed SCIs

promote SCI for inclusion in next release

rebuild appropriate version

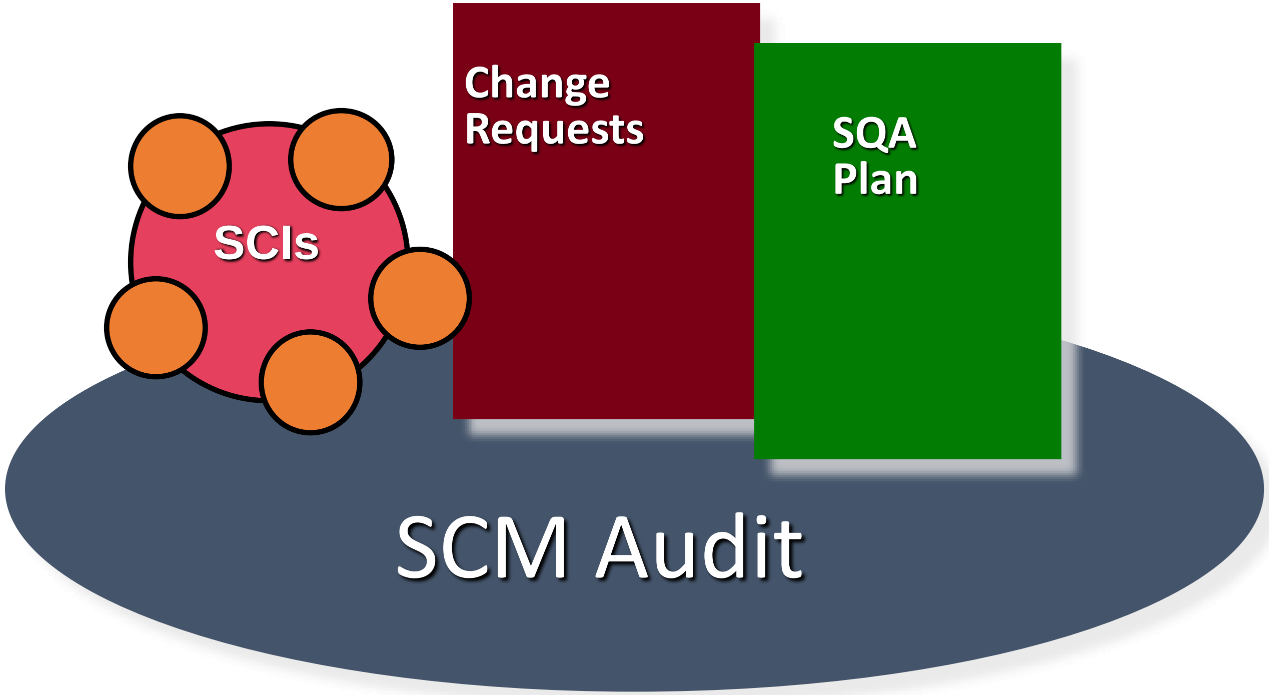
review/audit the change

include all changes in release

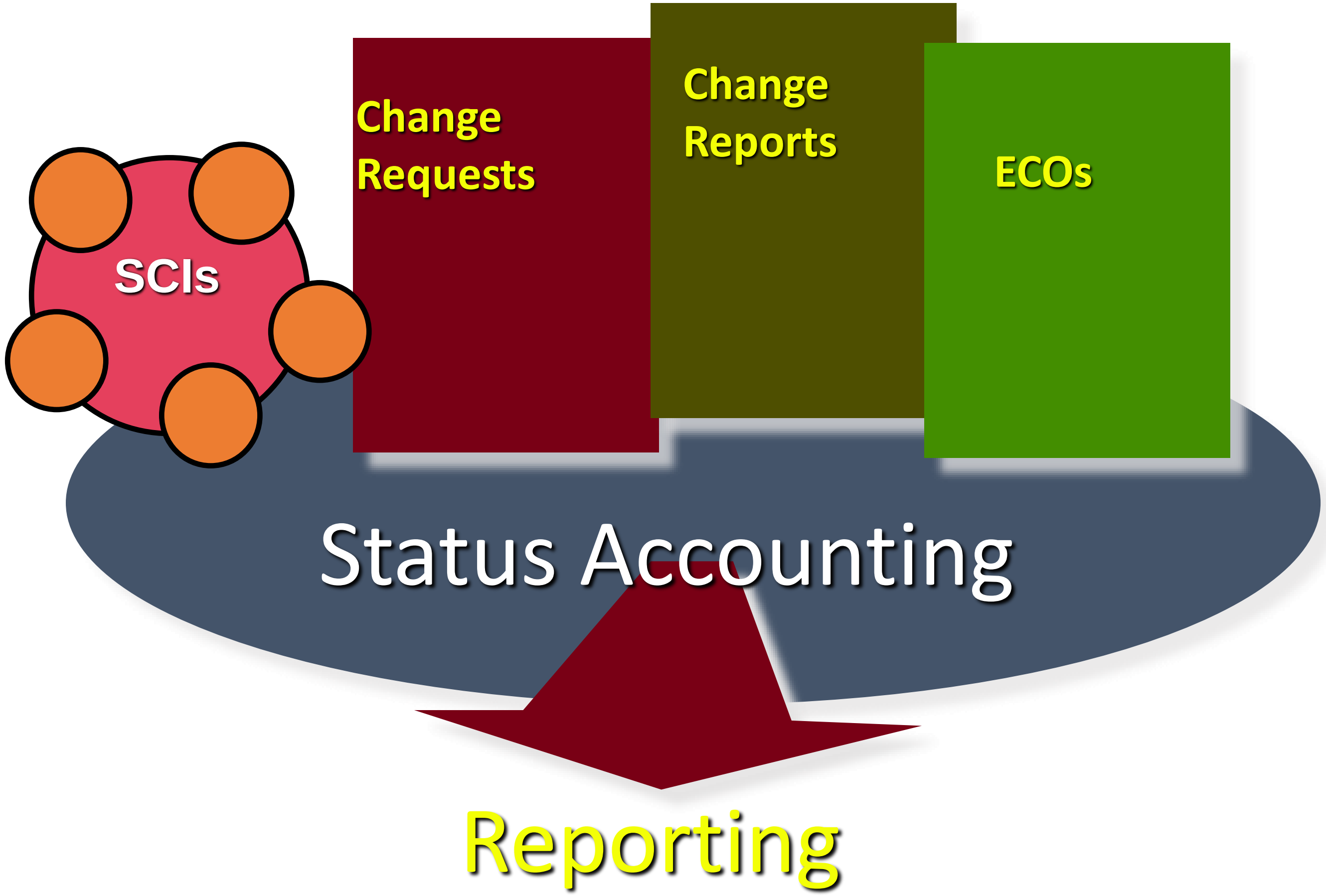
Version Control

- Version control combines procedures and tools to manage different versions of configuration objects that are created during the software process
- A version control system implements or is directly integrated with four major capabilities:
  - a *project database (repository)* that stores all relevant configuration objects
  - a *version management* capability that stores all versions of a configuration object (or enables any version to be constructed using differences from past versions);
  - a *make facility* that enables the software engineer to collect all relevant configuration objects and construct a specific version of the software.
  - an *issues tracking* (also called *bug tracking*) capability that enables the team to record and track the status of all outstanding issues associated with each configuration object.

Configuration Auditing



Status Accounting



4. Version Control

16 – Configuration Management

(end of lecture)

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