

CSIT214/CSCI814/HCSC814

IT Project Management



Change and version
control management

Acknowledgement: some materials are adapted from Chapter 25 - Ian Sommerville (2010), *Software Engineering*, 10th Edition, Addison-Wesley.₁

Configuration management

- ✧ Software systems are constantly changing during development and use.
- ✧ Configuration management (CM) is concerned with the **policies, processes** and **tools** for managing changing software systems.
- ✧ Why do we need CM?
 - ✧ It is easy to lose track of what changes and component versions have been incorporated into each system version.
- ✧ CM is essential for team projects to control changes made by different developers

CM activities

✧ Change management

- Keeping track of requests for changes to the software from customers and developers, working out the costs and impact of changes, and deciding the changes that should be implemented.

✧ Version management

- Keeping track of the multiple versions of system components and ensuring that changes made to components by different developers **do not interfere** with each other.

✧ System building

- The process of assembling program components, data and libraries, then compiling these to create an executable system.

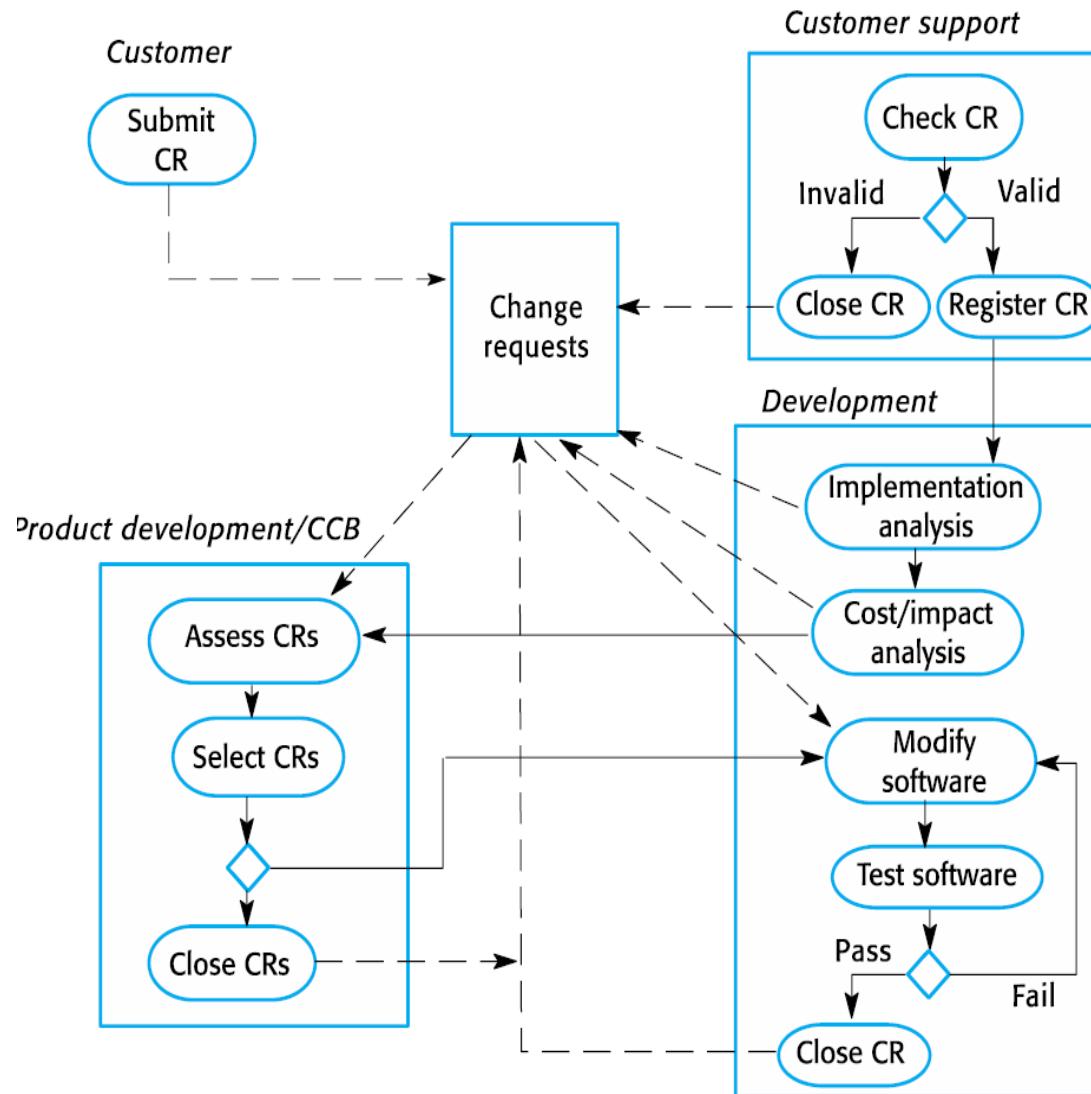
✧ Release management

- Preparing software for external release and keeping track of the system versions that have been released for customer use.

Change management

- Organizational needs and **requirements change** during the lifetime of a system, **bugs** have to be repaired and systems have to **adapt to changes in their environment**.
- Change management is intended to ensure that system evolution is a **managed process** and that priority is given to the most urgent and cost-effective changes.
- The change management process is concerned with:
 - analyzing the costs and benefits of proposed changes,
 - approving those changes that are worthwhile and
 - tracking which components in the system have been changed.

Change management process



Version management

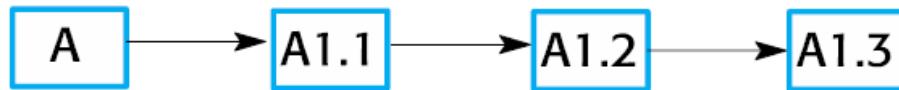
- ❖ Version management (VM) is the process of **keeping track of different versions** of software components or configuration items and the systems in which these components are used.
- ❖ It also involves ensuring that changes made by different developers to these versions **do not interfere** with each other.
- ❖ Therefore version management can be thought of as the process of managing **codelines** and **baselines**.

Codelines and baselines

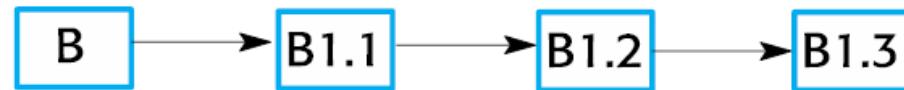
- ✧ A codeline is a **sequence of versions of source code** with later versions in the sequence derived from earlier versions.
 - ✧ Codelines normally apply to components of systems (e.g. a class or a file) so that there are different versions of each component.
- ✧ A baseline is a **definition of a specific system**.
 - ✧ The baseline therefore specifies the **component versions** that are included in the system plus a specification of the **libraries** used, **configuration files**, etc.

Codelines and baselines

Codeline (A)



Codeline (B)



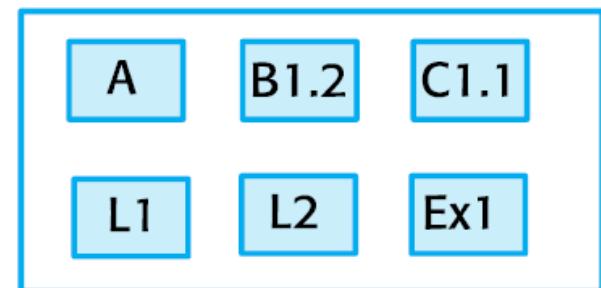
Codeline (C)



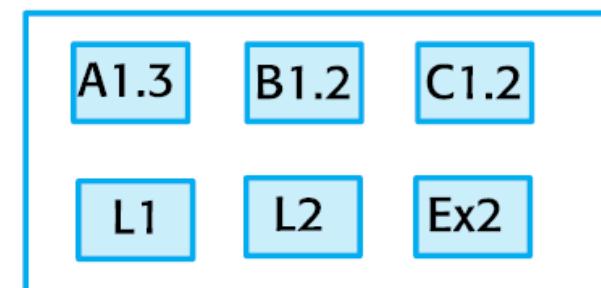
Libraries and external components



Baseline - V1



Baseline - V2



Mainline

Version control management systems

- Version control (VC) systems **identify, store** and **control access** to the different versions of components.
- There are two types of modern version control system:
 - **Centralized systems**, where there is a single master repository that maintains all versions of the software components that are being developed (e.g. Subversion and CVS)
 - **Distributed systems**, where multiple versions of the component repository exist at the same time. (e.g. Git)

Version management systems

Features

- ❖ Version and release identification
- ❖ Change history recording
- ❖ Support for independent development
- ❖ Project support
- ❖ Storage management

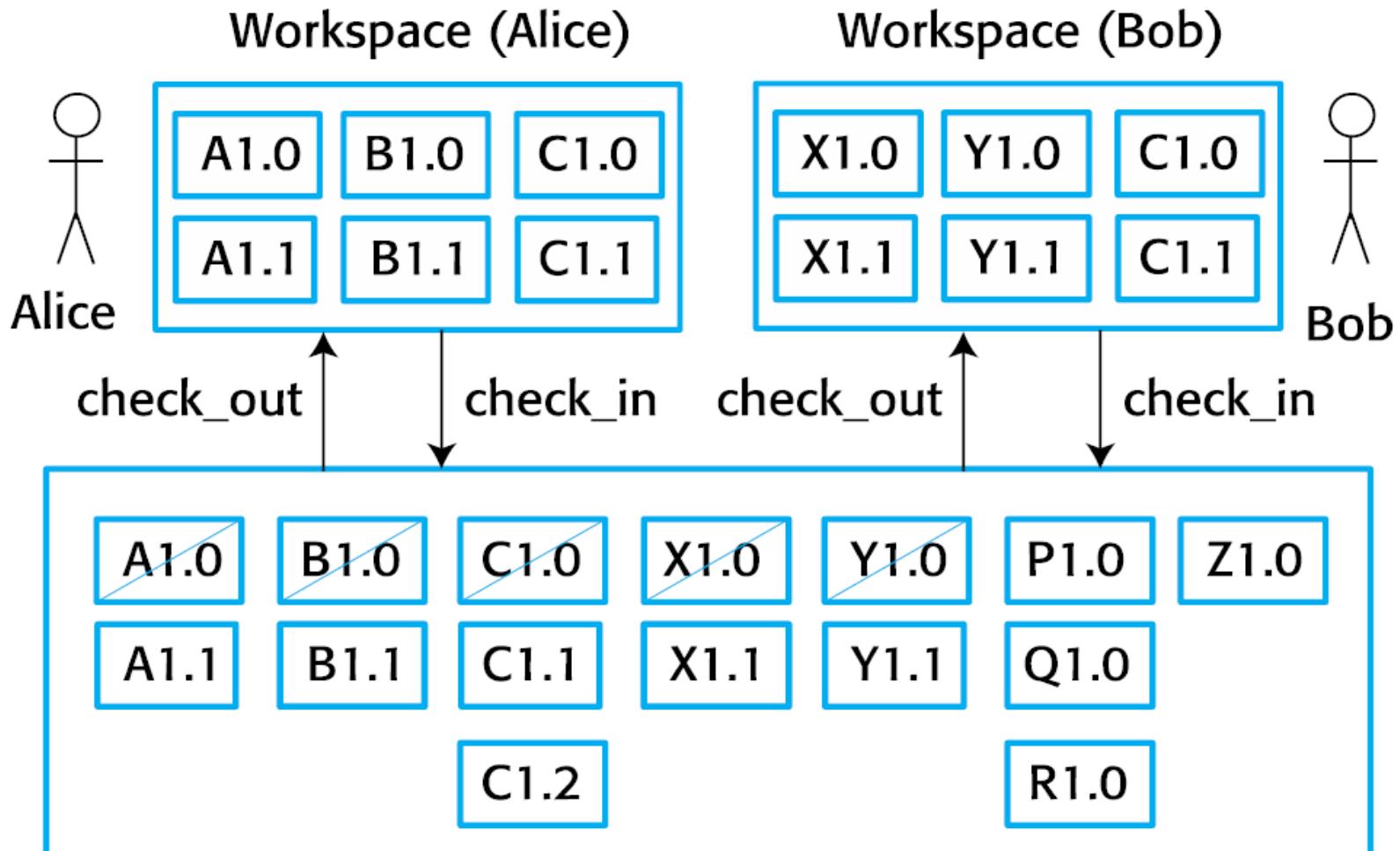
Public repository and private workspaces

- ❖ To support independent development without interference, version control systems use the concept of a **project repository** and a **private workspace**.
- ❖ The project repository maintains the '**master**' **version** of all components. It is used to create **baselines** for system building.
- ❖ When modifying components, developers copy (**checkout**) these from the repository into their private workspace and work on these copies.
- ❖ When they have finished their changes, the changed components are returned (**checked-in**) to the repository.

Centralized version control

- ▣ Developers **check out** components or directories of components from the project repository into their private workspace and work on these copies in their private workspace.
- ▣ When their changes are complete, they **check-in** the components back to the repository.
- ▣ If several people are working on a component at the same time, each check it out from the repository.
- ▣ If a component has been checked out, the VC system warns other users wanting to check out that component that it has been checked out by someone else.

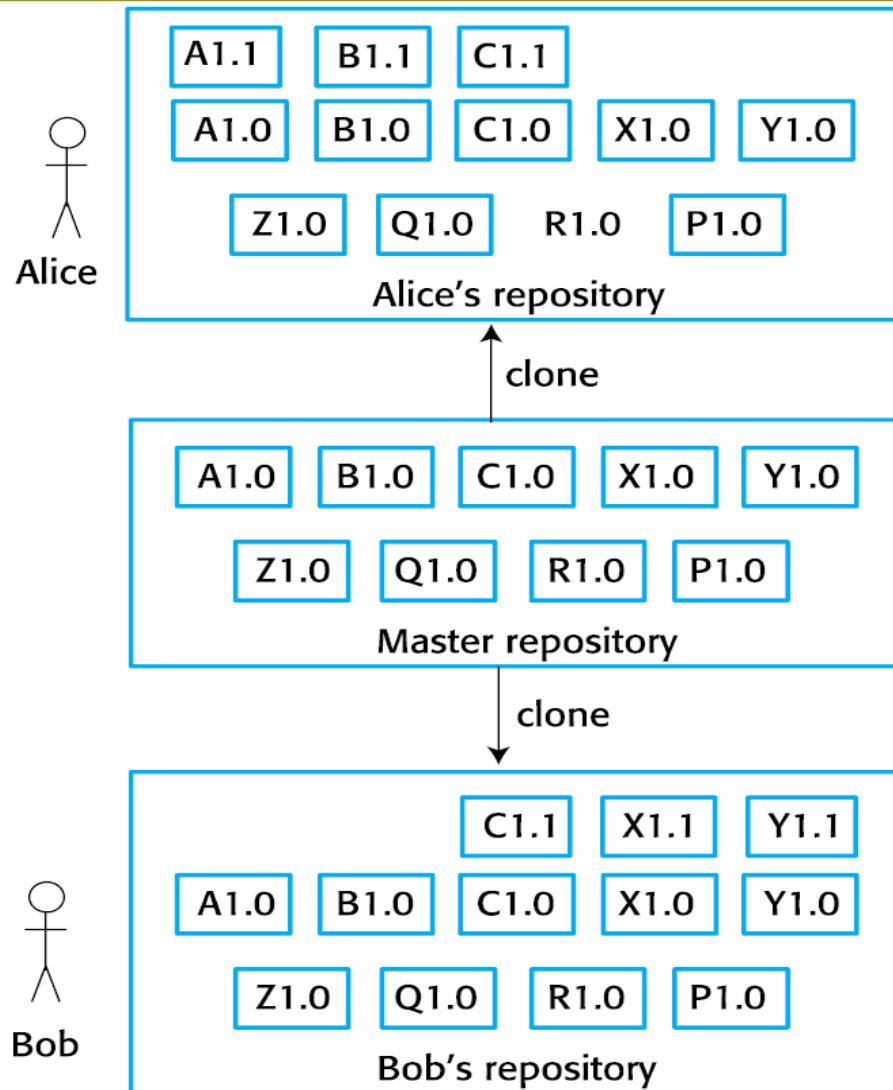
Repository Check-in/Check-out



Distributed version control

- ❖ A ‘master’ repository is created on a server that maintains the code produced by the development team.
- ❖ Instead of checking out the files that they need, a developer creates a **clone** of the project repository that is downloaded and installed on their computer.
- ❖ Developers work on the files required and maintain the new versions on their private repository on their own computer.
- ❖ When changes are done, they ‘**commit**’ these changes and update their private server repository. They may then ‘**push**’ these changes to the project repository.

Repository cloning



Benefits of distributed version control

- ✧ It provides a **backup** mechanism for the repository.
 - ✧ If the repository is corrupted, work can continue and the project repository can be restored from local copies.
- ✧ It allows for **off-line working** so that developers can commit changes if they do not have a network connection.
- ✧ **Project support** is the default way of working.
 - ✧ Developers can compile and test the entire system on their local machines and test the changes that they have made.

Branching and merging

- ✧ Rather than a linear sequence of versions that reflect changes to the component over time, there may be **several independent sequences.**
 - ✧ This is normal in system development, where different developers work independently on different versions of the source code and so change it in different ways (**branches**).
- ✧ At some stage, it may be necessary to **merge** codeline branches to create a new version of a component that **includes all changes** that have been made.
 - ✧ If the changes made involve different parts of the code, the component versions may be merged automatically by combining the deltas that apply to the code.

Branching and merging

