Topics covered

- ✧ Change management
- ✧ Version management

Configuration management

- Because software changes frequently, systems, can be thought of as a set of versions, each of which has to be maintained and managed.
- Versions implement proposals for change, corrections of faults, and adaptations for different hardware and operating systems.
- Configuration management (CM) is concerned with the policies, processes and tools for managing changing software systems. You need CM because it is easy to lose track of what changes and component versions have been incorporated into each system version.

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 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.

CM terminology

Term	Explanation
Configuration item or software configuration item (SCI)	Anything associated with a software project (design, code, test data, document, etc.) that has been placed under configuration control. There are often different versions of a configuration item. Configuration items have a unique name.
Configuration control	The process of ensuring that versions of systems and components are recorded and maintained so that changes are managed and all versions of components are identified and stored for the lifetime of the system.
Version	An instance of a configuration item that differs, in some way, from other instances of that item. Versions always have a unique identifier, which is often composed of the configuration item name plus a version number.
Baseline	A baseline is a collection of component versions that make up a system. Baselines are controlled, which means that the versions of the components making up the system cannot be changed. This means that it should always be possible to recreate a baseline from its constituent components.
Codeline	A codeline is a set of versions of a software component and other configuration items on which that component depends.

CM terminology

Term	Explanation
Mainline	A sequence of baselines representing different versions of a system.
Release	A version of a system that has been released to customers (or other users in an organization) for use.
Workspace	A private work area where software can be modified without affecting other developers who may be using or modifying that software.
Branching	The creation of a new codeline from a version in an existing codeline. The new codeline and the existing codeline may then develop independently.
Merging	The creation of a new version of a software component by merging separate versions in different codelines. These codelines may have been created by a previous branch of one of the codelines involved.
System building	The creation of an executable system version by compiling and linking the appropriate versions of the components and libraries making up the system.

Factors in change analysis

- ✧ The consequences of not making the change
- ✧ The benefits of the change
- ✧ The number of users affected by the change
- ✧ The costs of making the change
- ✧ The product release cycle

Change management and agile methods

- In some agile methods, customers are directly involved in change management.
- The propose a change to the requirements and work with the team to assess its impact and decide whether the change should take priority over the features planned for the next increment of the system.
- Changes to improve the software improvement are decided by the programmers working on the system.
- Refactoring, where the software is continually improved, is not seen as an overhead but as a necessary part of the development process.

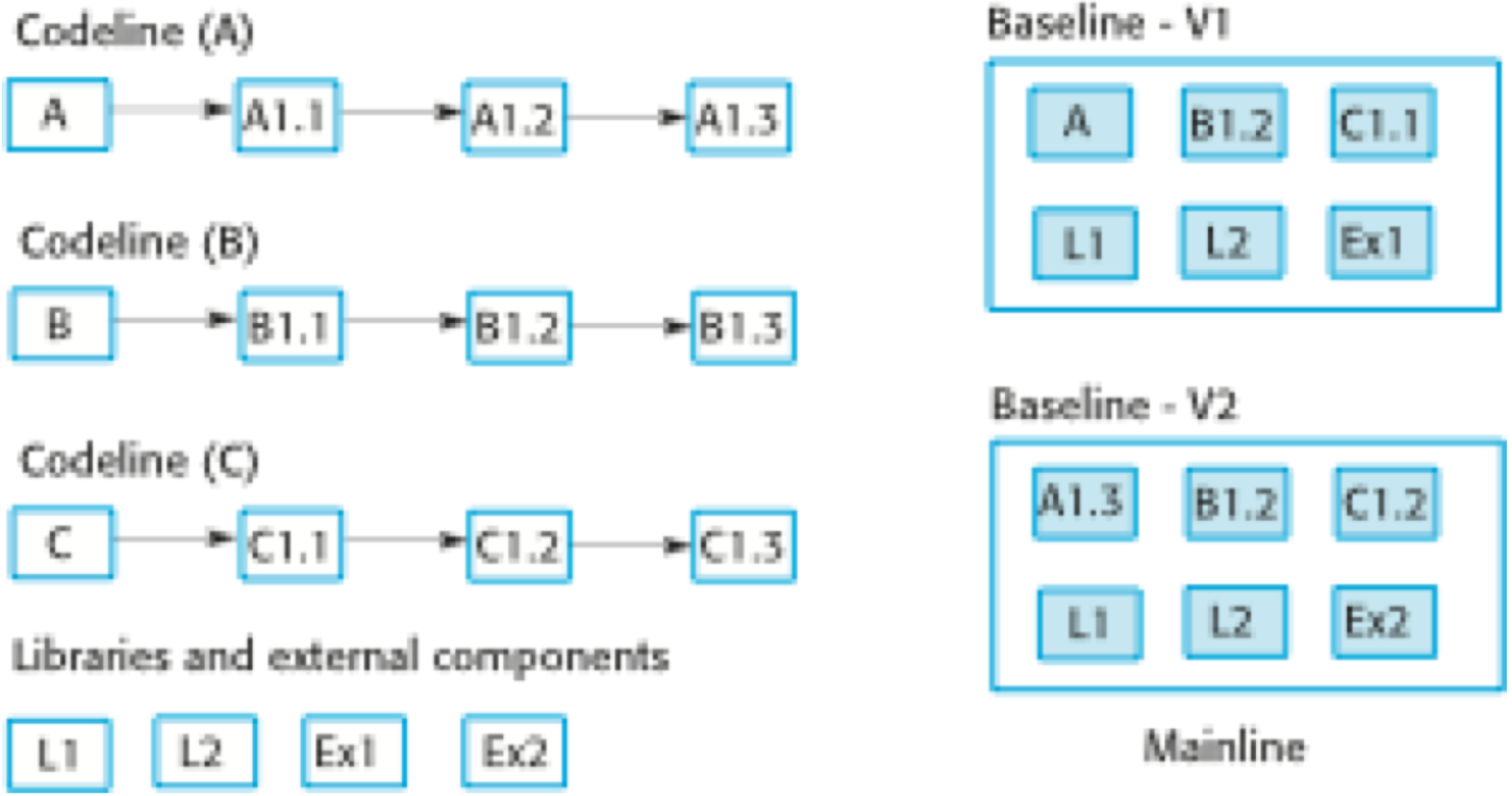
Version management

- 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 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



Baselines

- Baselines may be specified using a configuration language, which allows you to define what components are included in a version of a particular system.
- Baselines are important because you often have to recreate a specific version of a complete system.
  - For example, a product line may be instantiated so that there are individual system versions for different customers. You may have to recreate the version delivered to a specific customer if, for example, that customer reports bugs in their system that have to be repaired.

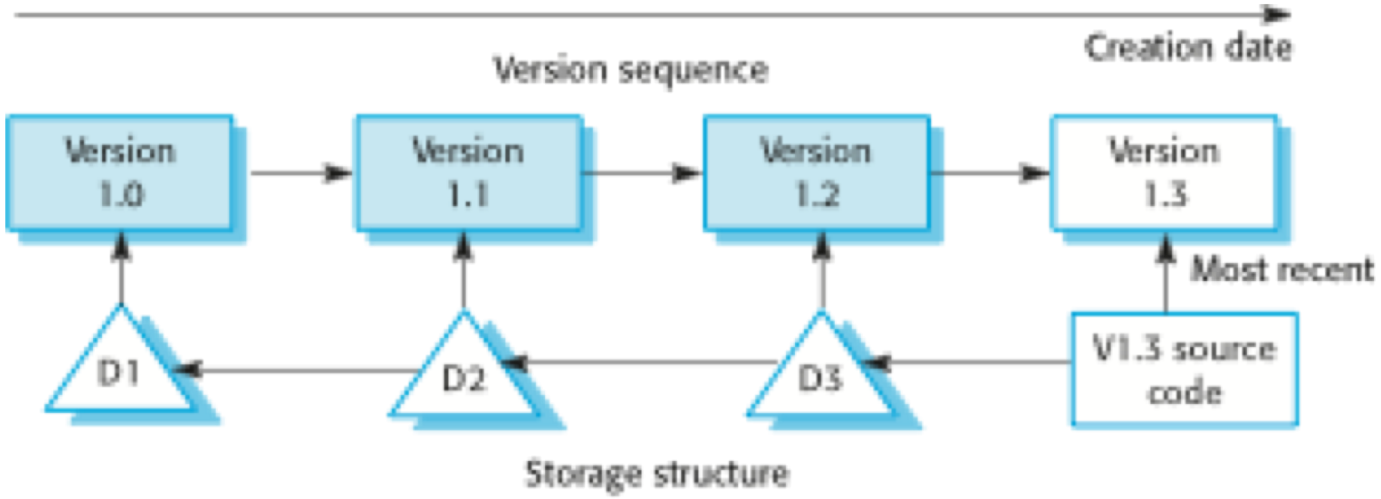
Version management systems

- ✧ Version and release identification
  - Managed versions are assigned identifiers when they are submitted to the system.
- ✧ Storage management
  - To reduce the storage space required by multiple versions of components that differ only slightly, version management systems usually provide storage management facilities.
- ✧ Change history recording
  - All of the changes made to the code of a system or component are recorded and listed.

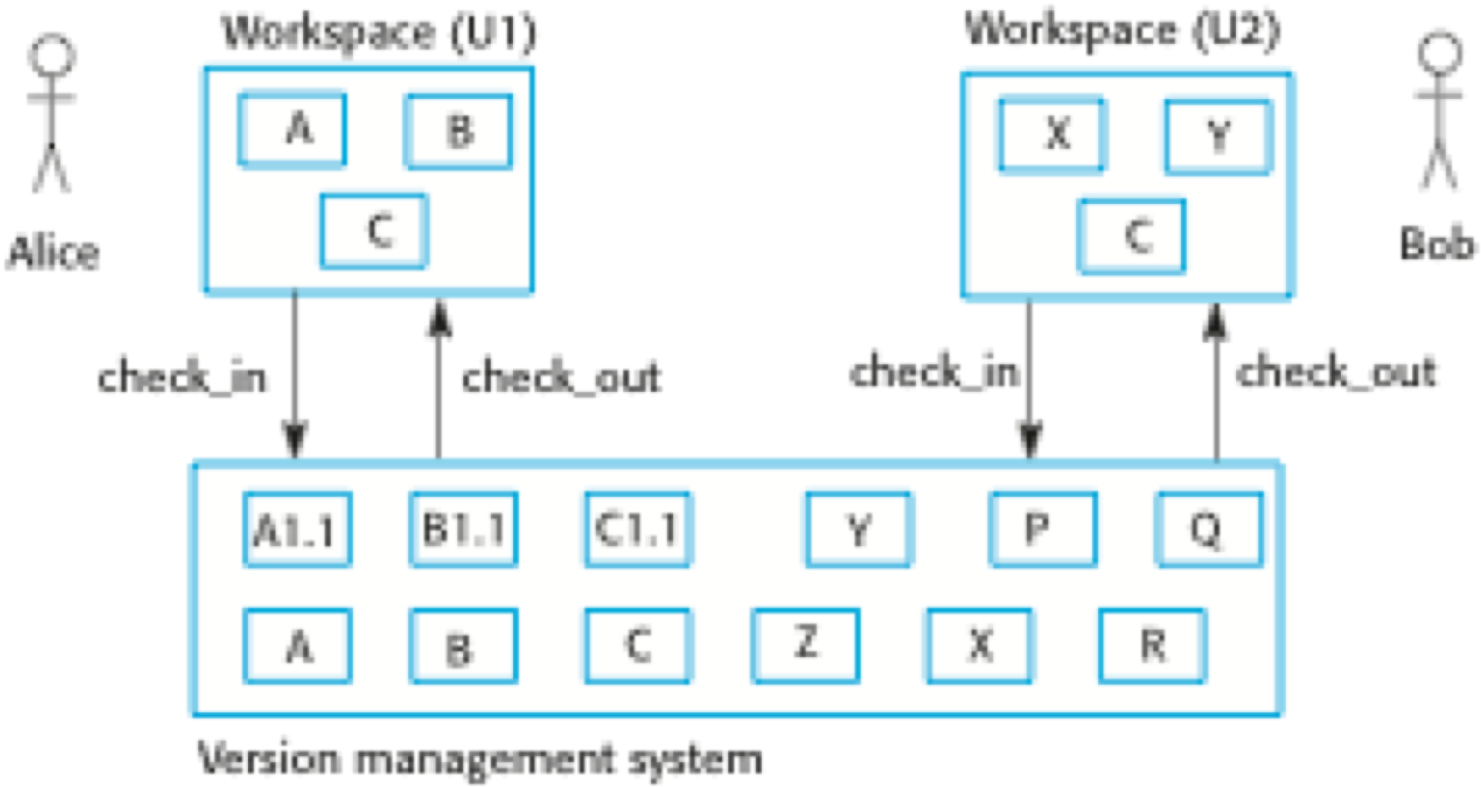
Version management systems

- Independent development
  - The version management system keeps track of components that have been checked out for editing and ensures that changes made to a component by different developers do not interfere.
- Project support
  - A version management system may support the development of several projects, which share components.

Storage management using deltas



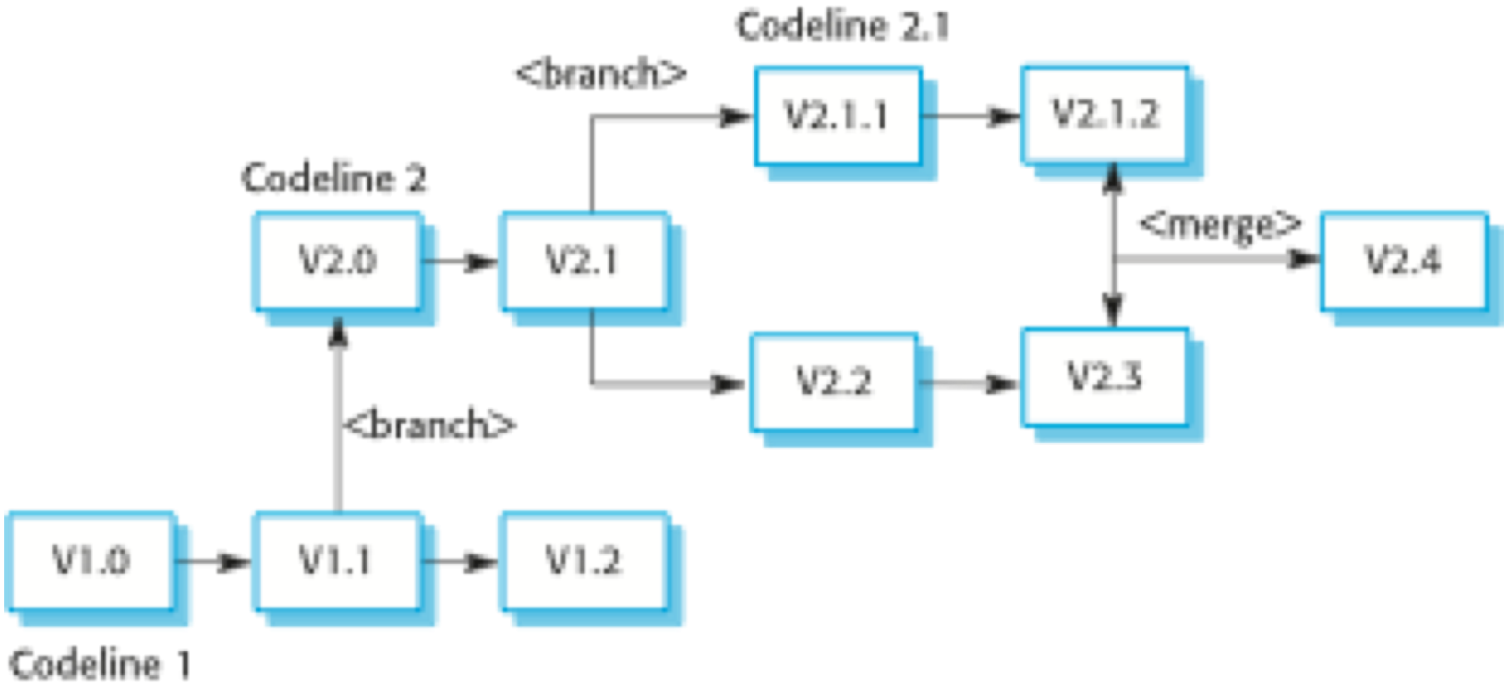
Check-in and check-out from a version repository



Codeline branches

- 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.
- 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



Key points

- Configuration management is the management of an evolving software system. When maintaining a system, a CM team is put in place to ensure that changes are incorporated into the system in a controlled way and that records are maintained with details of the changes that have been implemented.
- The main configuration management processes are change management, version management, system building and release management.
- Change management involves assessing proposals for changes from system customers and other stakeholders and deciding if it is cost-effective to implement these in a new version of a system.
- Version management involves keeping track of the different versions of software components as changes are made to them.