Evolutionary Design: Configuration Management

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Configuration Management

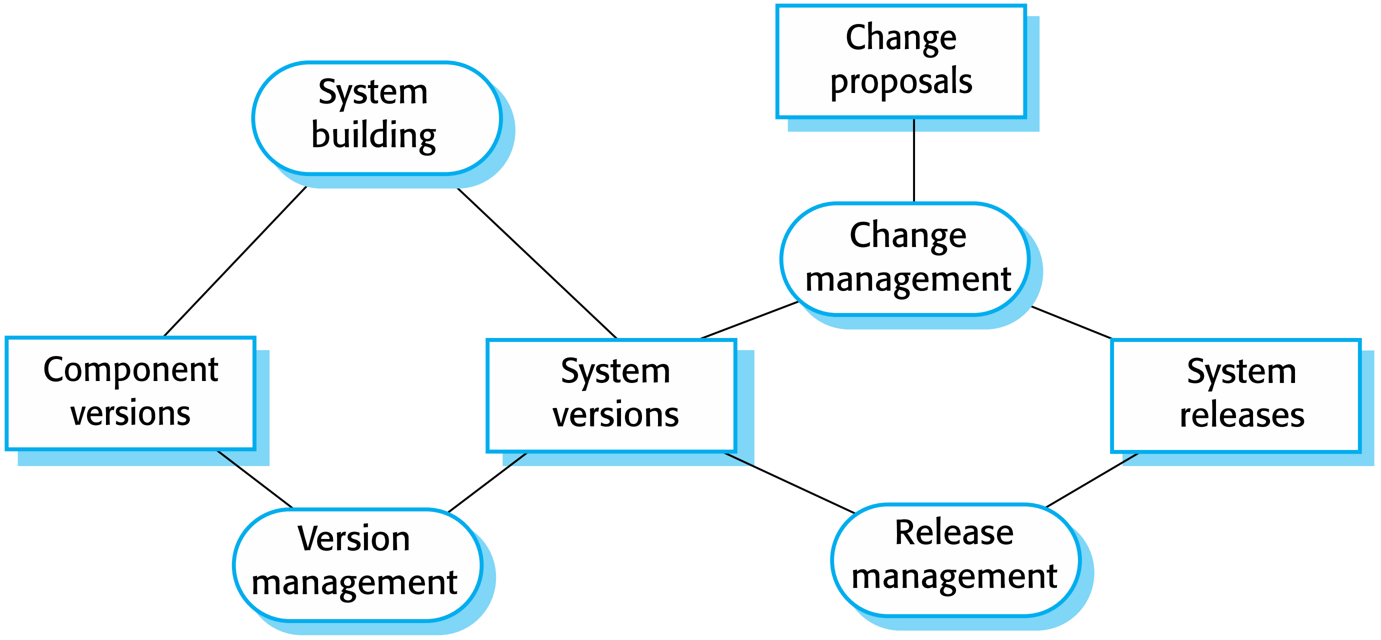
Version control

System building

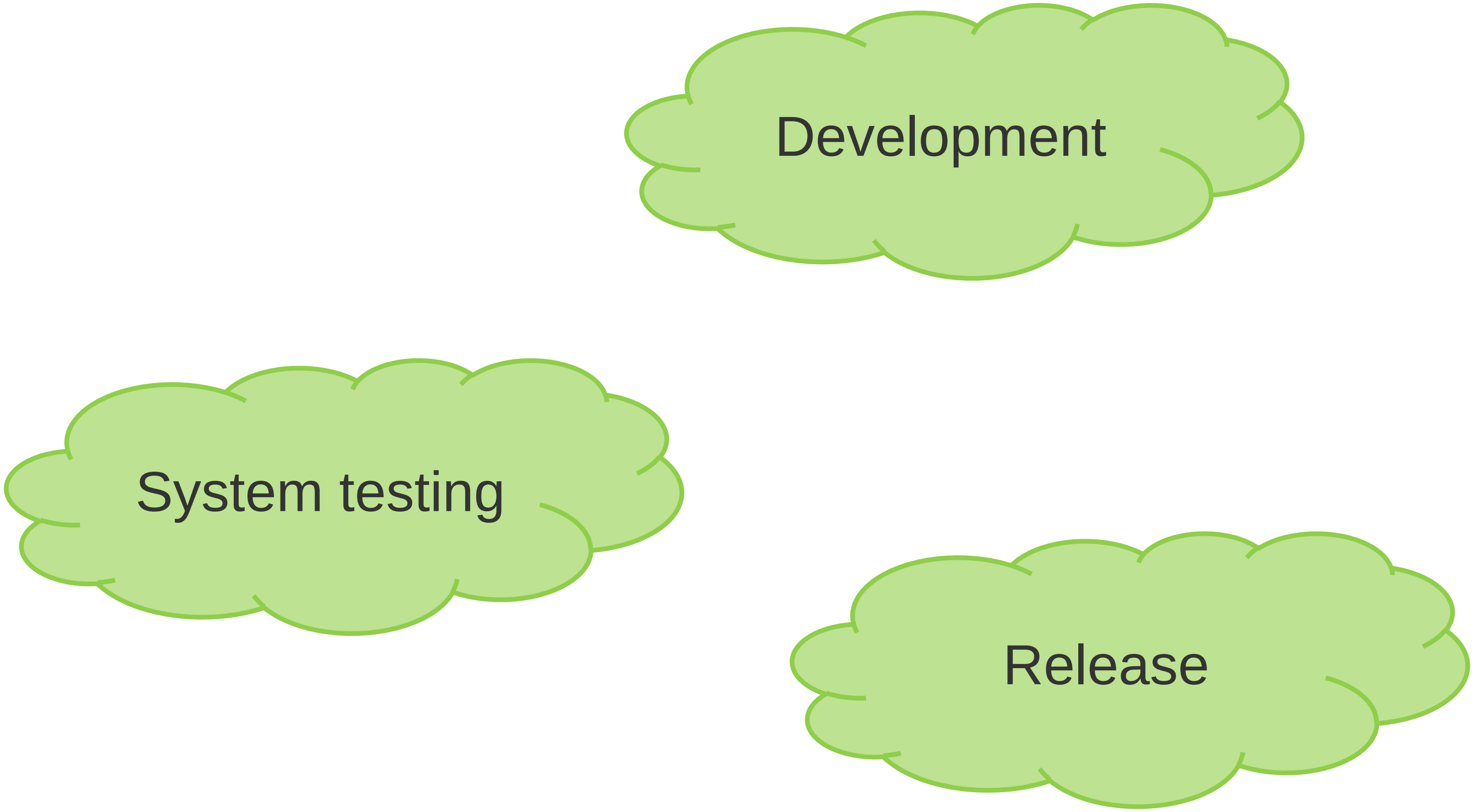
Change management

Release management

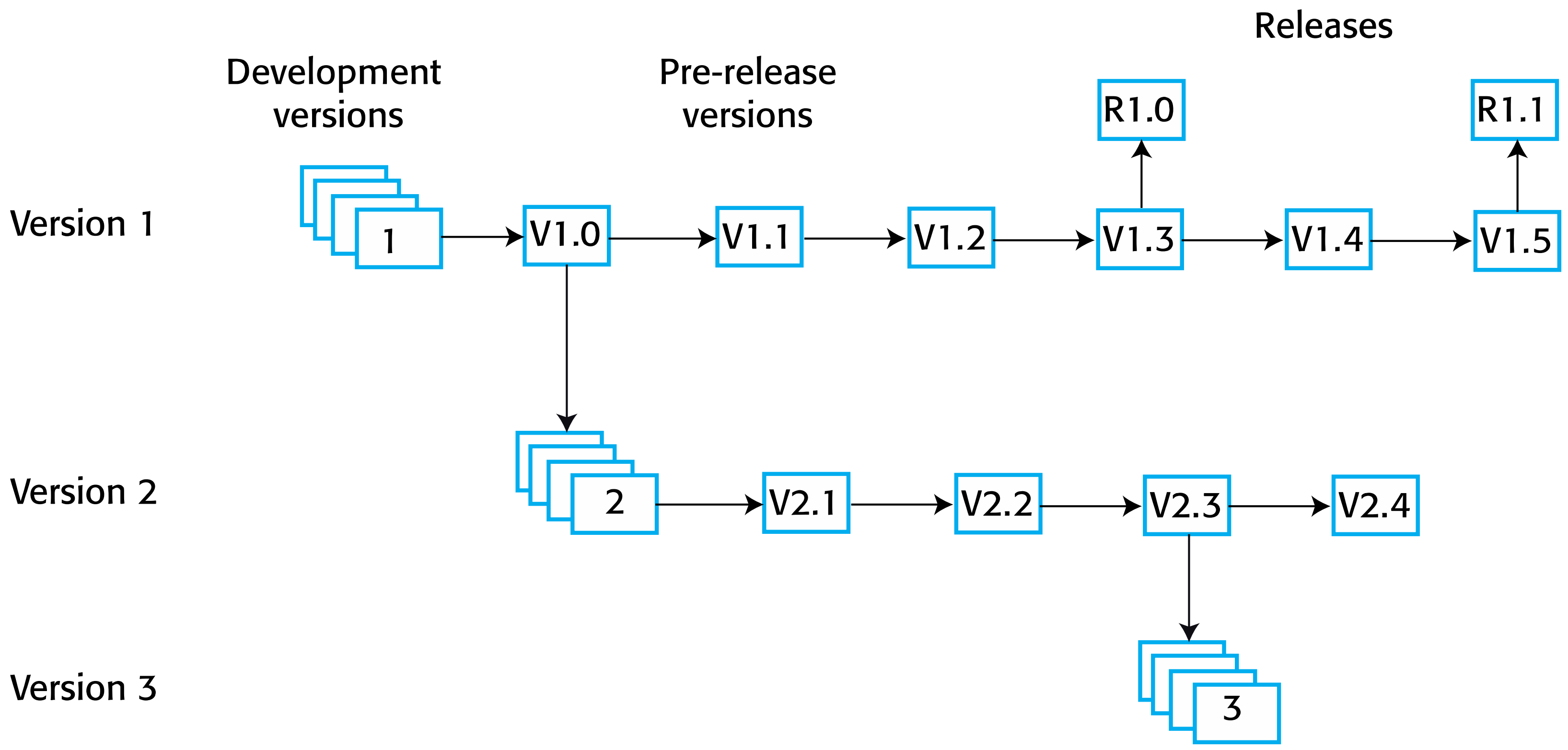
Configuration management activities



Development Phases



"Working Version"



CM Terminology

Term	Explanation
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 is always possible to recreate a baseline from its constituent components.
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.
Codeline	A codeline is a set of versions of a software component and other configuration items on which that component depends.
Configuration (version) 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.
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.
Mainline	A sequence of baselines representing different versions of a system.

CM Terminology

Term	Explanation
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.
Release	A version of a system that has been released to customers (or other users in an organization) for use.
Repository	A shared database of versions of software components and meta-information about changes to these components.
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.
Version	An instance of a configuration item that differs, in some way, from other instances of that item. Versions always have a unique identifier.
Workspace	A private work area where software can be modified without affecting other developers who may be using or modifying that software.

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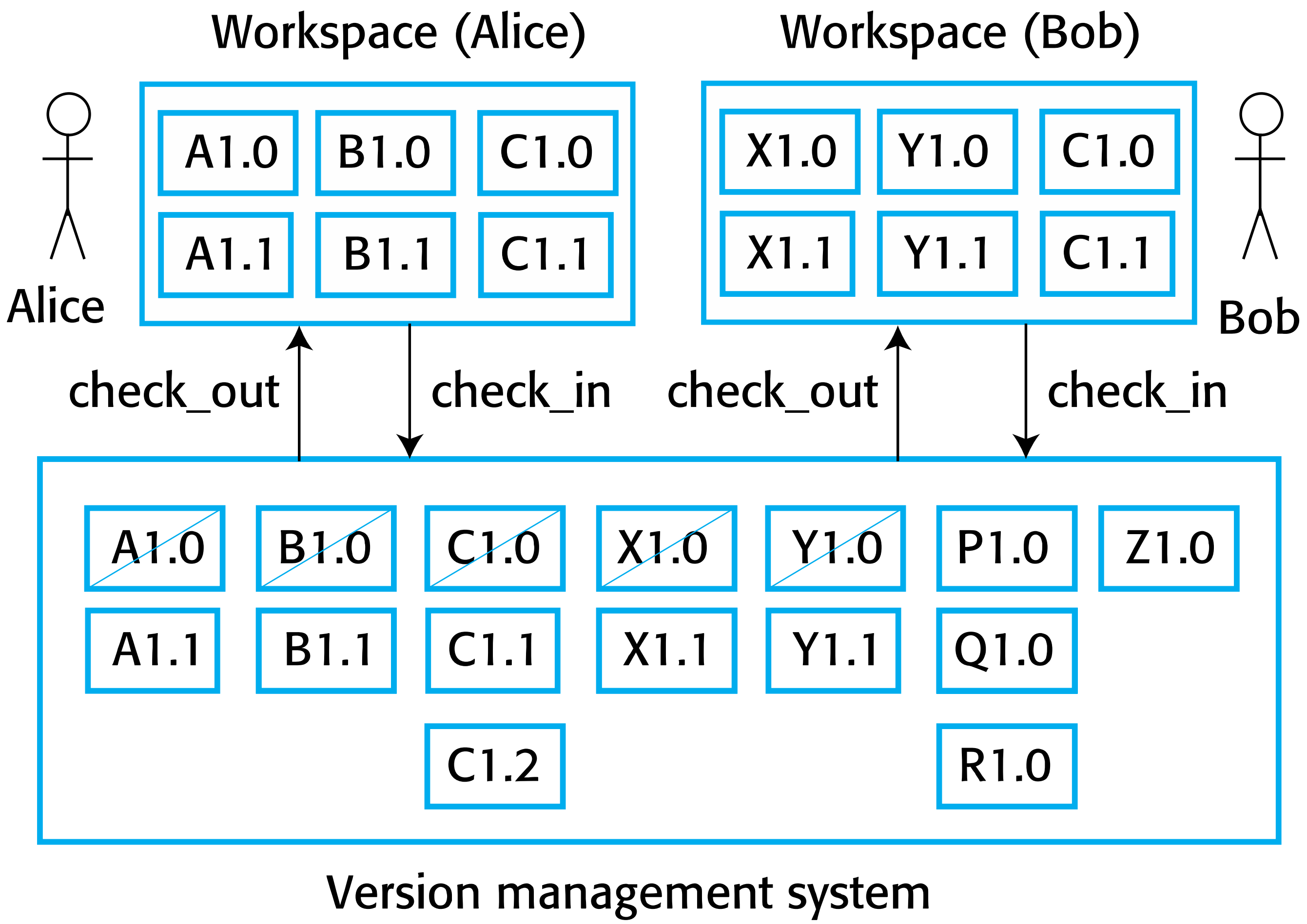
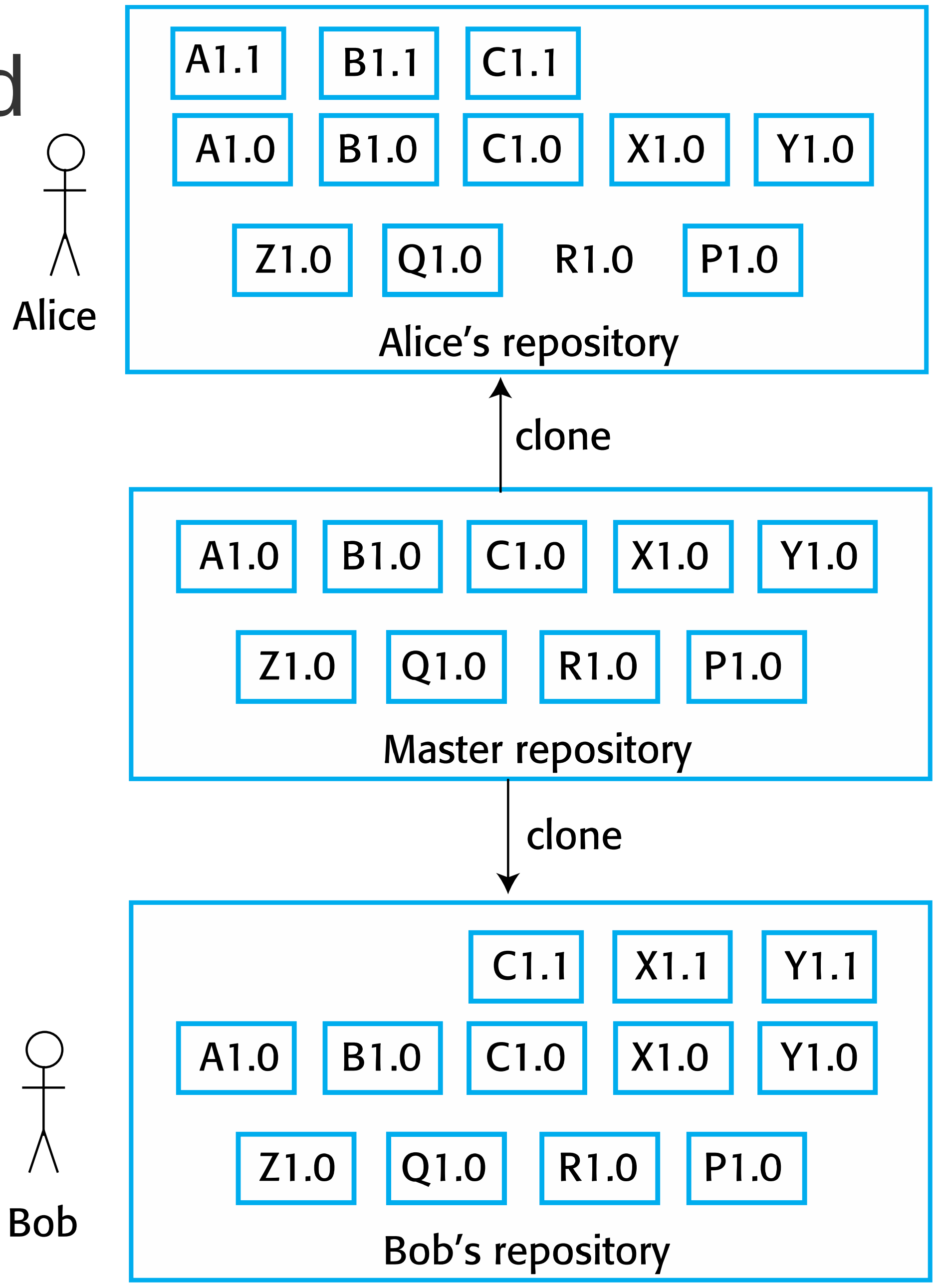
Version Management

- Version and release identification
- Change history recording
- Support independent development
- Project support
- Storage management
- Centralized
- Distributed

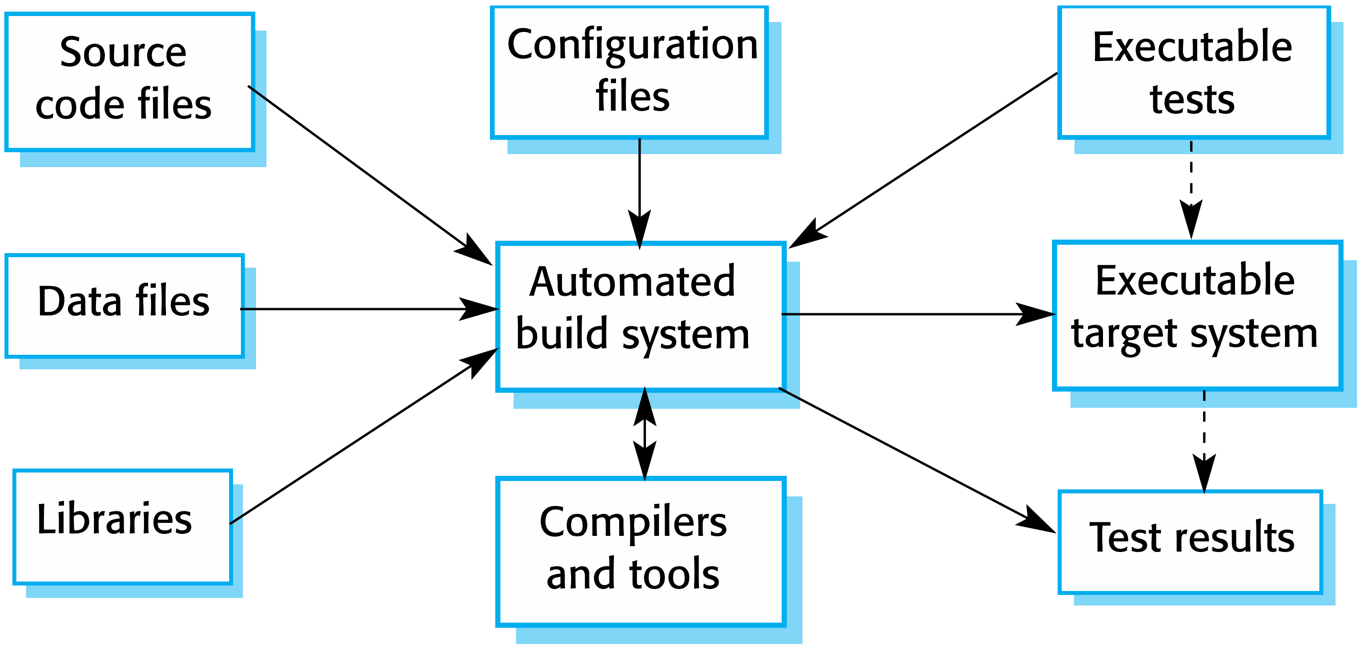
Centralised Repositories



Distributed



System building



Build system functionality

Build script generation

Version management system integration

Minimal re-compilation

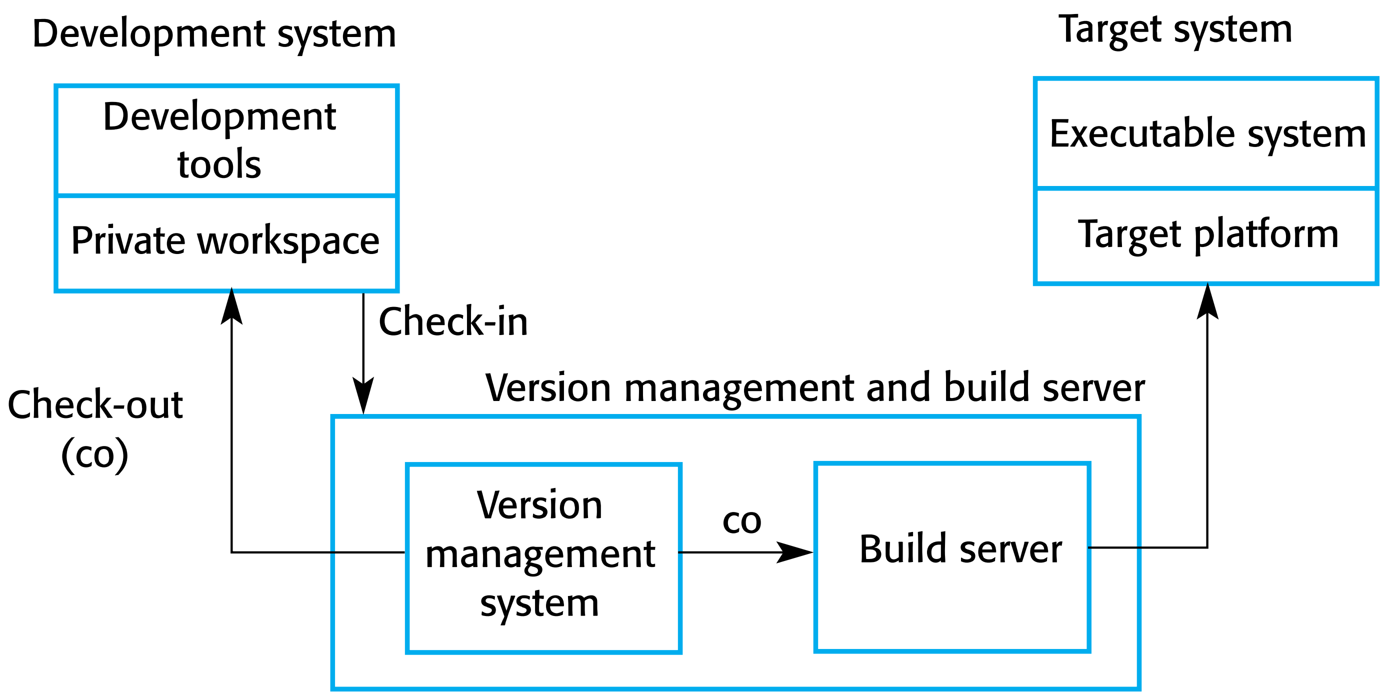
Executable system creation

Test automation

Reporting

Documentation generation

System platforms



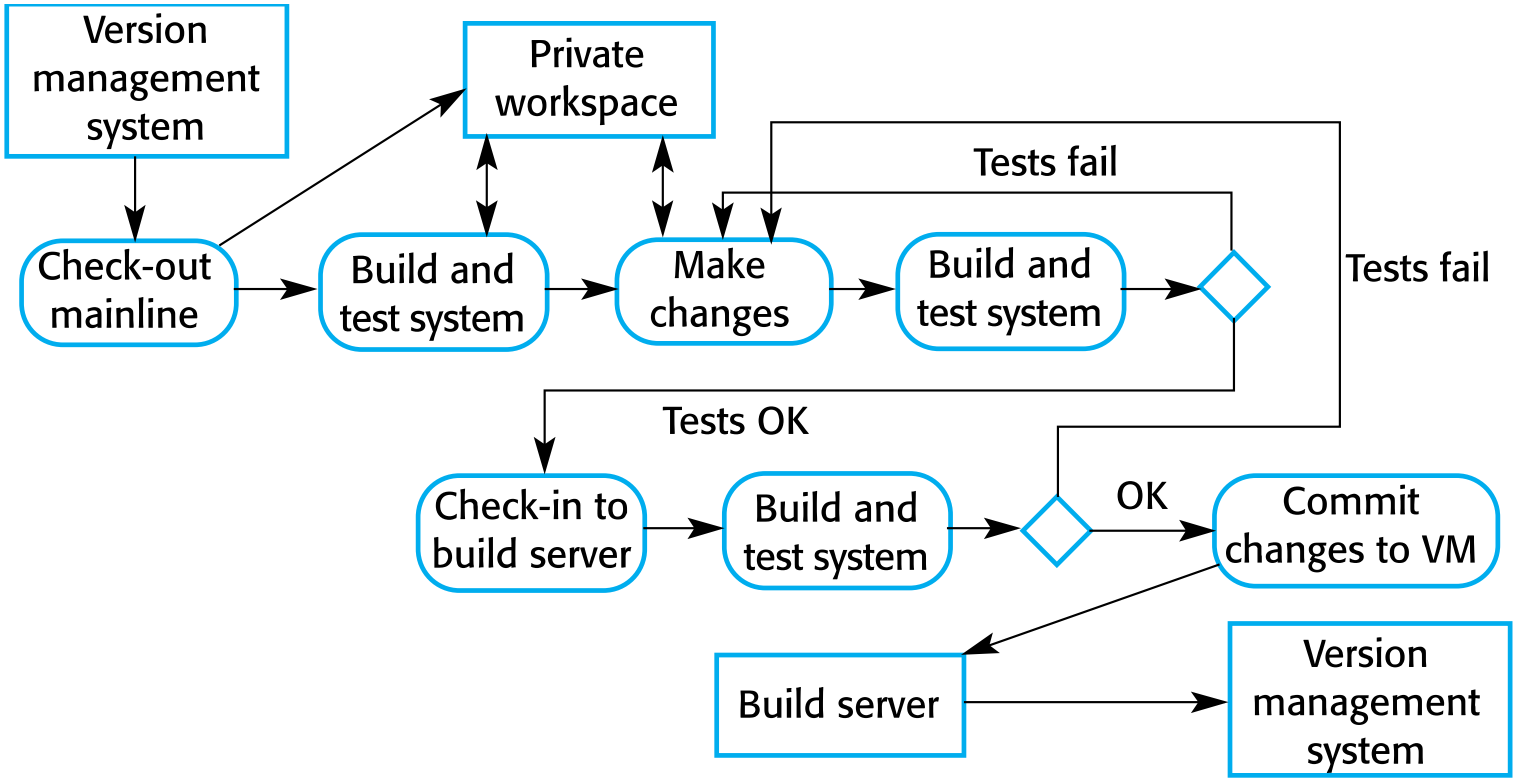
Agile building

- Check out the mainline system from the version management system into the developer’s private workspace.
- Build the system and run automated tests to ensure that the built system passes all tests. If not, the build is broken and you should inform whoever checked in the last baseline system. They are responsible for repairing the problem.
- Make the changes to the system components.
- Build the system in the private workspace and rerun system tests. If the tests fail, continue editing.

Agile building

- Once the system has passed its tests, check it into the build system but do not commit it as a new system baseline.
- Build the system on the build server and run the tests. You need to do this in case others have modified components since you checked out the system. If this is the case, check out the components that have failed and edit these so that tests pass on your private workspace.
- If the system passes its tests on the build system, then commit the changes you have made as a new baseline in the system mainline.

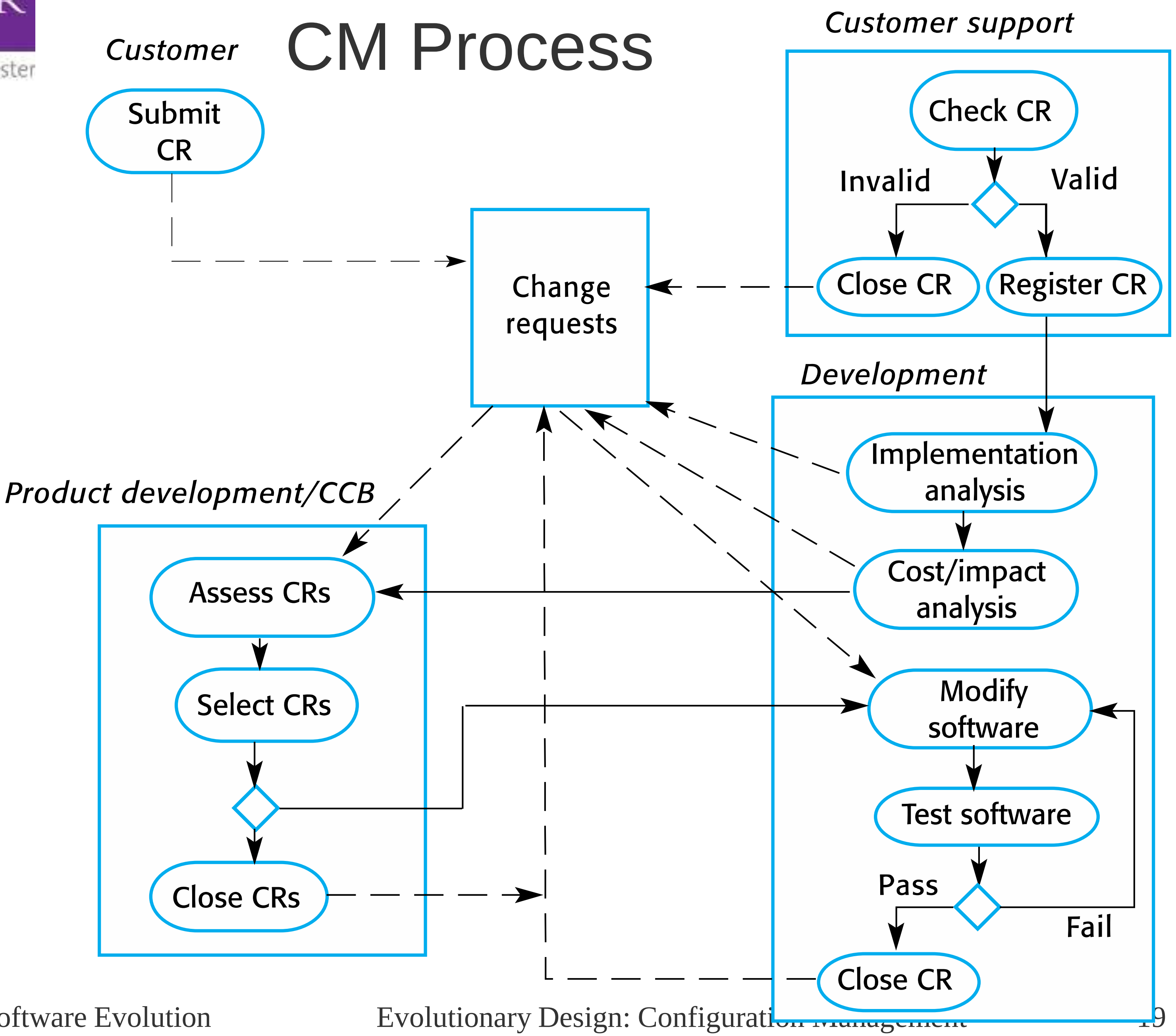
Continuous integration



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.

CM Process



Customer
Submit CR
Customer support
Check CR
Invalid
Valid
Close CR
Register CR
Change requests
Development
Implementation analysis
Cost/impact analysis
Modify software
Test software
Pass
Fail
Close CR
Product development/CCB
Assess CRs
Select CRs
Close CRs

change request form

Change Request Form

Project: SICSA/AppProcessing **Number:** 23/02
Change requester: I. Sommerville **Date:** 20/07/12
Requested change: The status of applicants (rejected, accepted, etc.) should be shown visually in the displayed list of applicants.

Change analyzer: R. Looek **Analysis date:** 25/07/12
Components affected: ApplicantListDisplay, StatusUpdater

Associated components: StudentDatabase

change request form

Change Request Form

Change assessment: Relatively simple to implement by changing the display color according to status. A table must be added to relate status to colors. No changes to associated components are required.

Change priority: Medium
Change implementation:
Estimated effort: 2 hours
Date to SGA app. team: 28/07/12 **CCB decision date:** 30/07/12
Decision: Accept change. Change to be implemented in Release 1.2
Change implementor: **Date of change:**
Date submitted to QA: **QA decision:**
Date submitted to CM:
Comments:

Factors in change analysis

Consequences of not doing

The number of users affected by the change

The benefits of 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.

Release management

- A system release is a version of a software system that is distributed to customers.
- For mass market software, it is usually possible to identify two types of release: major releases which deliver significant new functionality, and minor releases, which repair bugs and fix customer problems that have been reported.
- For custom software or software product lines, releases of the system may have to be produced for each customer and individual customers may be running several different releases of the system at the same time.

Release components

- As well as the executable code of the system, a release may also include:
  - configuration files defining how the release should be configured for particular installations;
  - data files, such as files of error messages, that are needed for successful system operation;
  - an installation program that is used to help install the system on target hardware;
  - electronic and paper documentation describing the system;
  - packaging and associated publicity that have been designed for that release.

Factors influencing system release planning

Factor	Description
Competition	For mass-market software, a new system release may be necessary because a competing product has introduced new features and market share may be lost if these are not provided to existing customers.
Marketing requirements	The marketing department of an organization may have made a commitment for releases to be available at a particular date.
Platform changes	You may have to create a new release of a software application when a new version of the operating system platform is released.
Technical quality of the system	If serious system faults are reported which affect the way in which many customers use the system, it may be necessary to issue a fault repair release. Minor system faults may be repaired by issuing patches (usually distributed over the Internet) that can be applied to the current release of the system.

Release Creation

- The executable code of the programs and all associated data files must be identified in the version control system.
- Configuration descriptions may have to be written for different hardware and operating systems.
- Update instructions may have to be written for customers who need to configure their own systems.
- Scripts for the installation program may have to be written.
- Web pages have to be created describing the release, with links to system documentation.
- When all information is available, an executable master image of the software must be prepared and handed over for distribution to customers or sales outlets.

Release Tracking

- In the event of a problem, it may be necessary to reproduce exactly the software that has been delivered to a particular customer.
- When a system release is produced, it must be documented to ensure that it can be re-created exactly in the future.
- This is particularly important for customized, long-lifetime embedded systems, such as those that control complex machines.
  - Customers may use a single release of these systems for many years and may require specific changes to a particular software system long after its original release date.

Release Reproduction

- To document a release, you have to record the specific versions of the source code components that were used to create the executable code.
- You must keep copies of the source code files, corresponding executables and all data and configuration files.
- You should also record the versions of the operating system, libraries, compilers and other tools used to build the software.

Release Planning

- As well as the technical work involved in creating a release distribution, advertising and publicity material have to be prepared and marketing strategies put in place to convince customers to buy the new release of the system.
- Release timing
  - If releases are too frequent or require hardware upgrades, customers may not move to the new release, especially if they have to pay for it.
  - If system releases are too infrequent, market share may be lost as customers move to alternative systems.

Software as a service

- Delivering software as a service (SaaS) reduces the problems of release management.
- It simplifies both release management and system installation for customers.
- The software developer is responsible for replacing the existing release of a system with a new release and this is made available to all customers at the same time

Summary

- 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 concerned with version management, system building, change management, and release management.