

Software Configuration Management

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1 Problems

Software Configuration Management

- Over time, a software system can exist in many versions:
 - *revisions* created as developers check in changes
 - *configurations* intended for different hardware, operating system, or application environments
 - *releases* issued to users
 - * which, if under continued support, may have separate tracks of revisions recording separate bug fixes
- *Software Configuration Management* (SCM) is concerned with all of these

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SCM Activities

- Version control
- Build management
- Environment management
- Change management

We have seen some tools oriented towards some of these.

- But the broader SCM context may alter how we use some of them

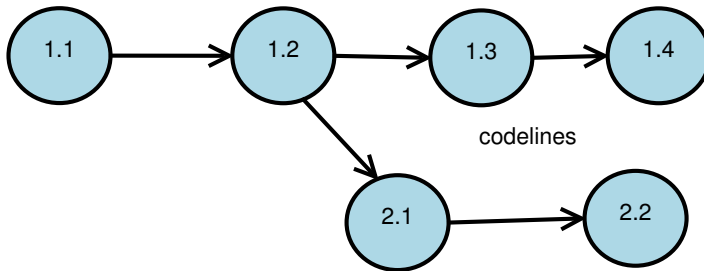
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Codelines and Baselines

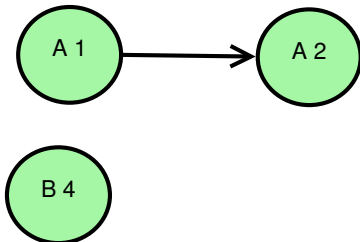
- A *codeline* is a sequence of revisions of a *configuration item*
 - In essence, a branch
- A *baseline* is a collection of component versions that make up a system.

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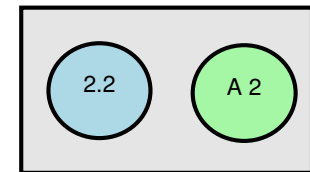
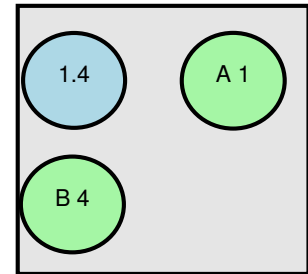
Codelines and Baselines: Example



External Libraries and components



Baseline: Windows Release 2



Baseline: Linux Release 3

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Baselines

- A major challenge of SCM is coping with multiple baselines that must
 - co-exist and
 - be actively maintained.
- Major issues are
 - deciding when to “freeze” on a version of an imported library
 - tracking the transitive closure of dependencies from libraries that we directly depend upon
 - finding a mutually compatible set of versions among all those external libraries

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Environment Management

Coping with the different environments in which the software may need to be installed and/or built.

- Strategies include
 - separate files
 - * Easier to manage in the C/C++ world than in Java
 - deltas (patches)
 - conditional compilation
 - * Favored in the C/C++ world
 - * Harder to support in Java world
 - dynamic loading
 - * Common in the Java world

- * Often controlled by “property files” that name modules to be employed for designated tasks in a given installation.
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Example: the ODU Extract Project

Metadata extraction system, needed to support

- One release version (thank the heavens)
- Windows, Linux, & Mac platforms
- Choice of 2 OCR programs (or none at all)
 - With local or network access to licensed copies
 - With or without caching of OCR results
- Statistical models trained on different document collections
- Varying client requirements for data post-processing

Problem was not so much the number of choices as the combinatorics.

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2 Common Practices

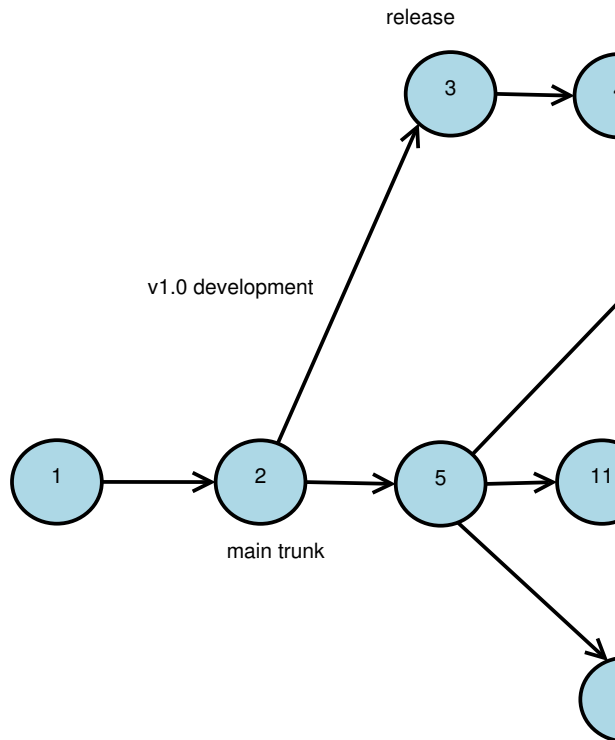
Baselines Managed by Build Manager

- Build manager is told what external libraries are needed
 - including desired versions
 - Build manager may be responsible for collecting desired versions of both external and internal code from version control.
 - Build files are managed as part of each version.
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Codelines == Branches

- Main trunk moves forward in time
- Each planned release is a branch from the trunk

- continues forward through its maintenance lifetime



Change Management

In large organizations, changes are approved by a Change Management Board.

E.g., the team working in an exploratory branch has demonstrated an attractive new feature.

- Should we adopt it?
 - If so, which of the version code lines should it be added to?

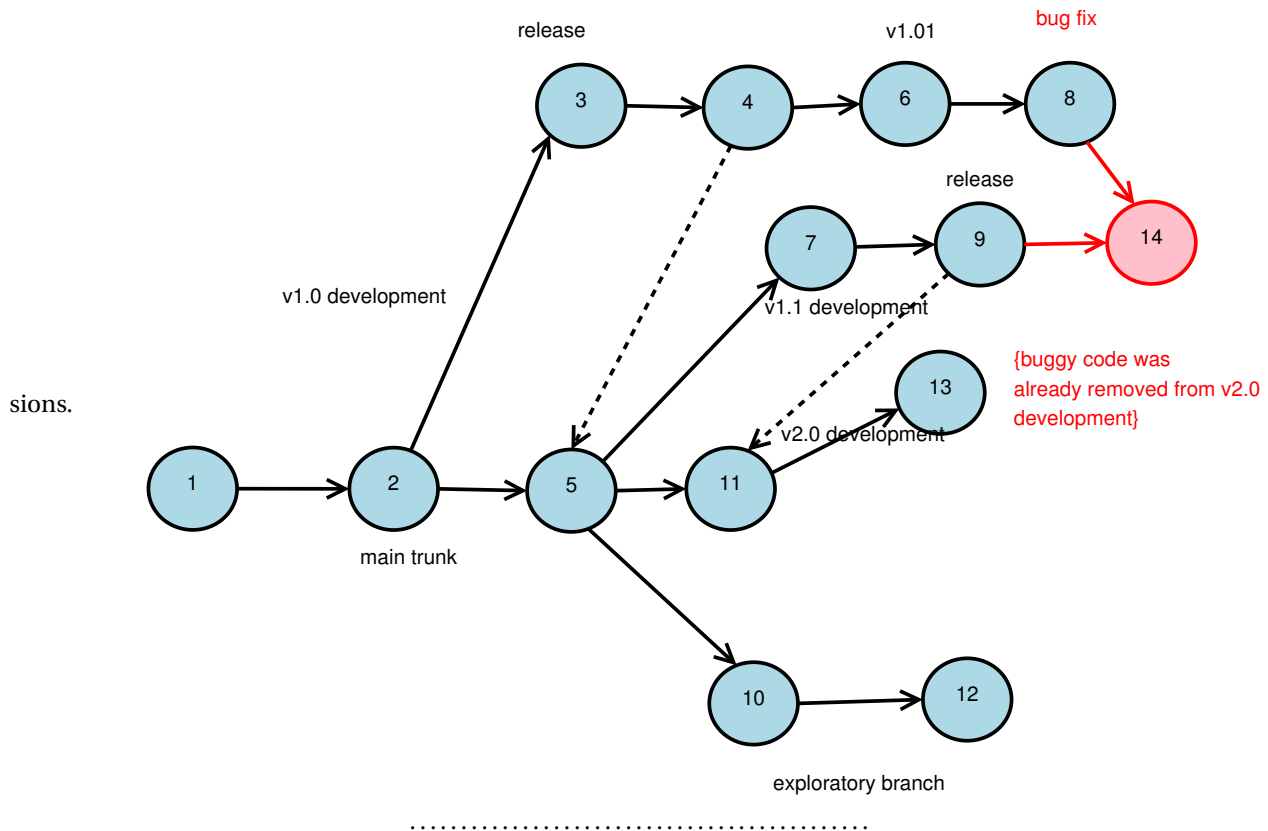
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Change Propagation

Even in smaller projects, the issue of *change propagation* across code lines needs to be kept in mind.

- The whole “main trunk moves forward” idea presumes that most release changes are synced into the trunk:

- As a practical matter, someone has to decide whether bug fixes in older versions can and should be merged into later ver-



Simpler Project Structure

In current practice,

- Large projects composed of multiple subprojects are discouraged

- in favor of smaller, independent projects (e.g., one per original subproject)
 - A common rule of thumb is that one project should produce one product (e.g., a single Jar file)
 - Plus, perhaps, a source distribution.
 - * and those are increasingly being replaced by centralized VC repositories

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