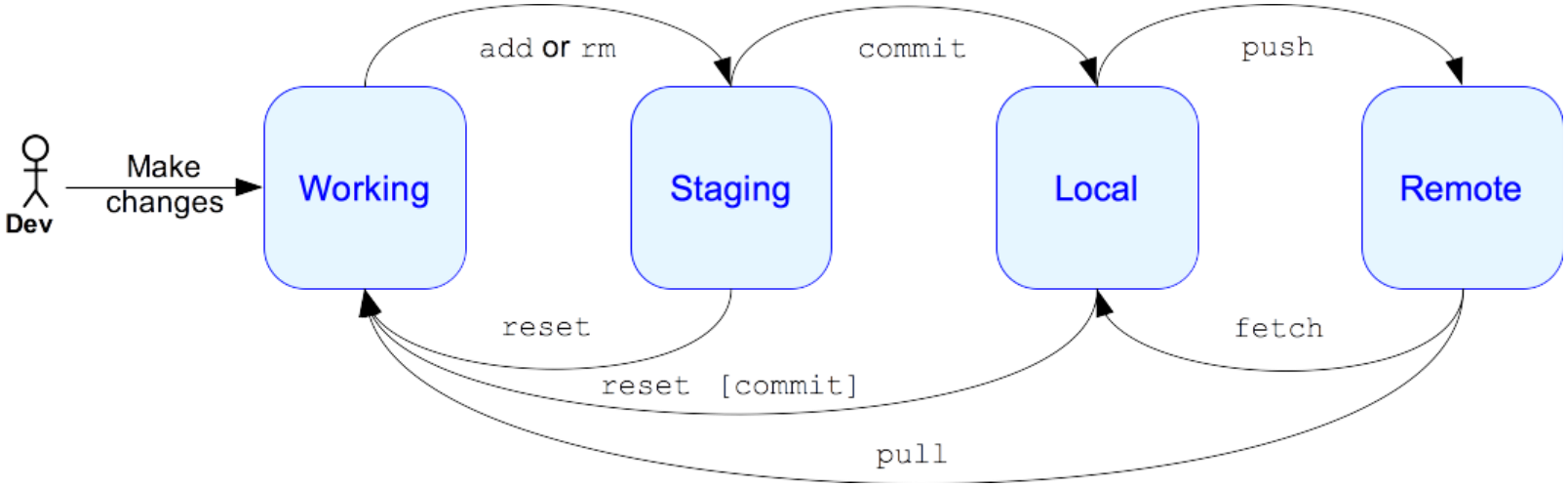
Review Version Control Concepts



SWEN-261 Introduction to Software Engineering

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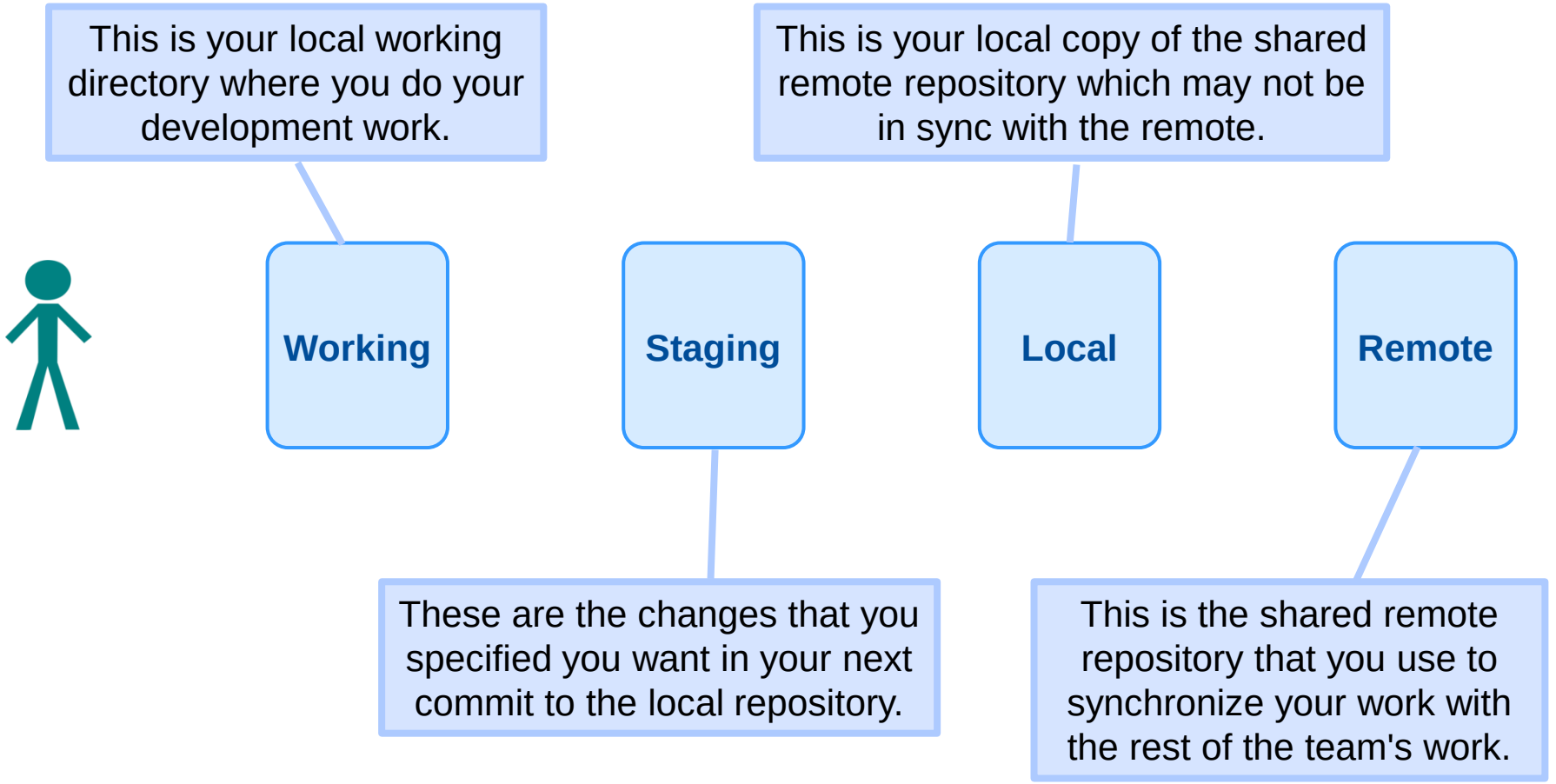
Managing change is a constant aspect of software development.

- The Product and Sprint backlogs represent the upcoming changes.
- A software release is a snapshot of code at a certain time.
  - ***Capturing a certain set of user stories***
  - ***Multiple releases may be done so the team needs to keep track of multiple snapshots (aka versions)***
- Version control systems (VCS) are used to manage changes made to software and tag releases.

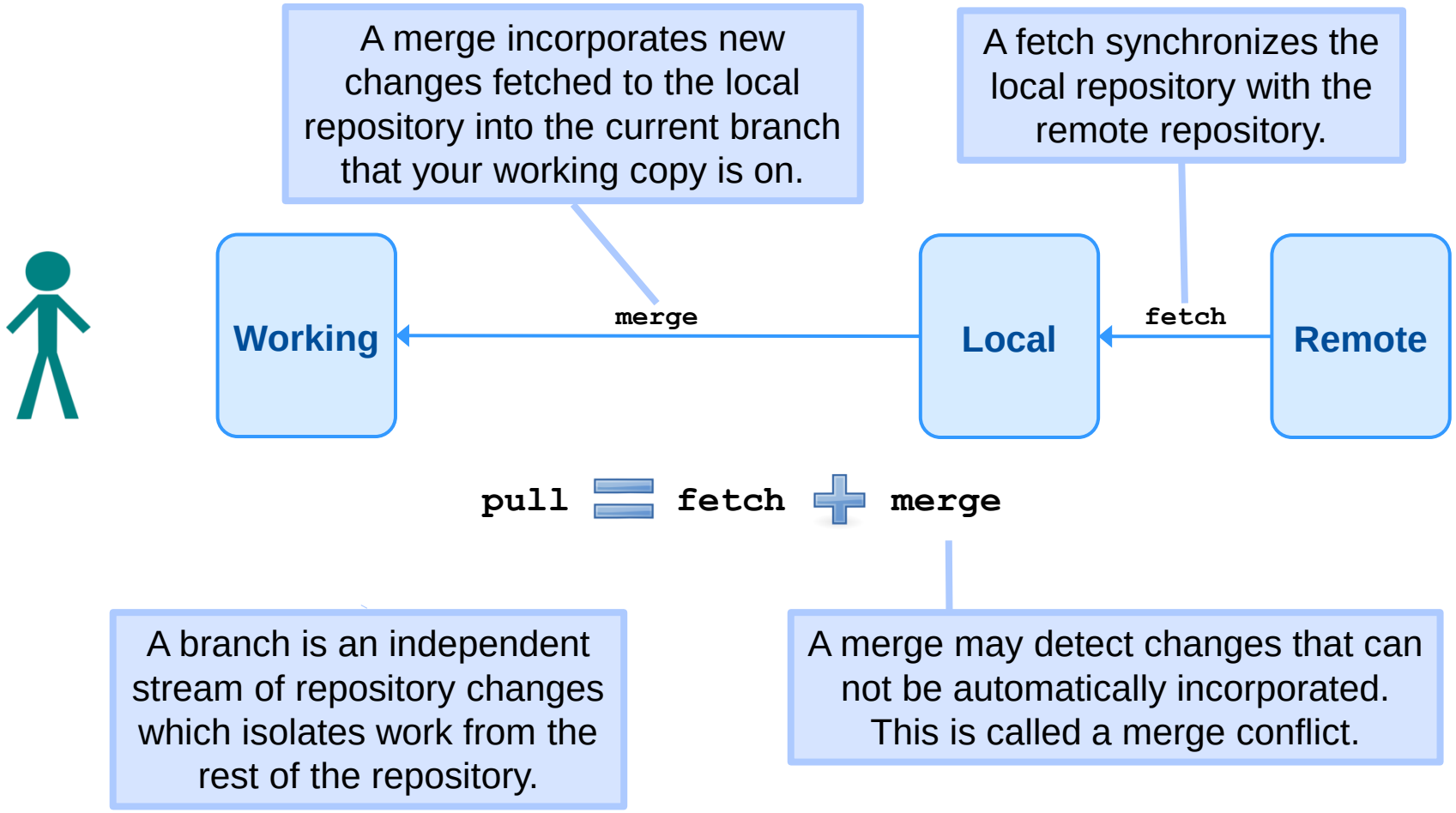
There are a few fundamental activities of change management that every VCS supports.

- Directories and files are tracked in a *repository*.
  - ***Each developer has their own workspace.***
  - ***But share a common remote repository.***
- You can
  - ***Make changes in your workspace***
    - Add files or directories
    - Remove files or directories
    - Modify or move files
    - Binary files are tracked as a single unit
  - ***Commit the changes to a repository.***
  - ***Sync your workspace with a repository.***
  - ***Create branches to track user stories.***
  - ***Explore the history and changes to a repository.***

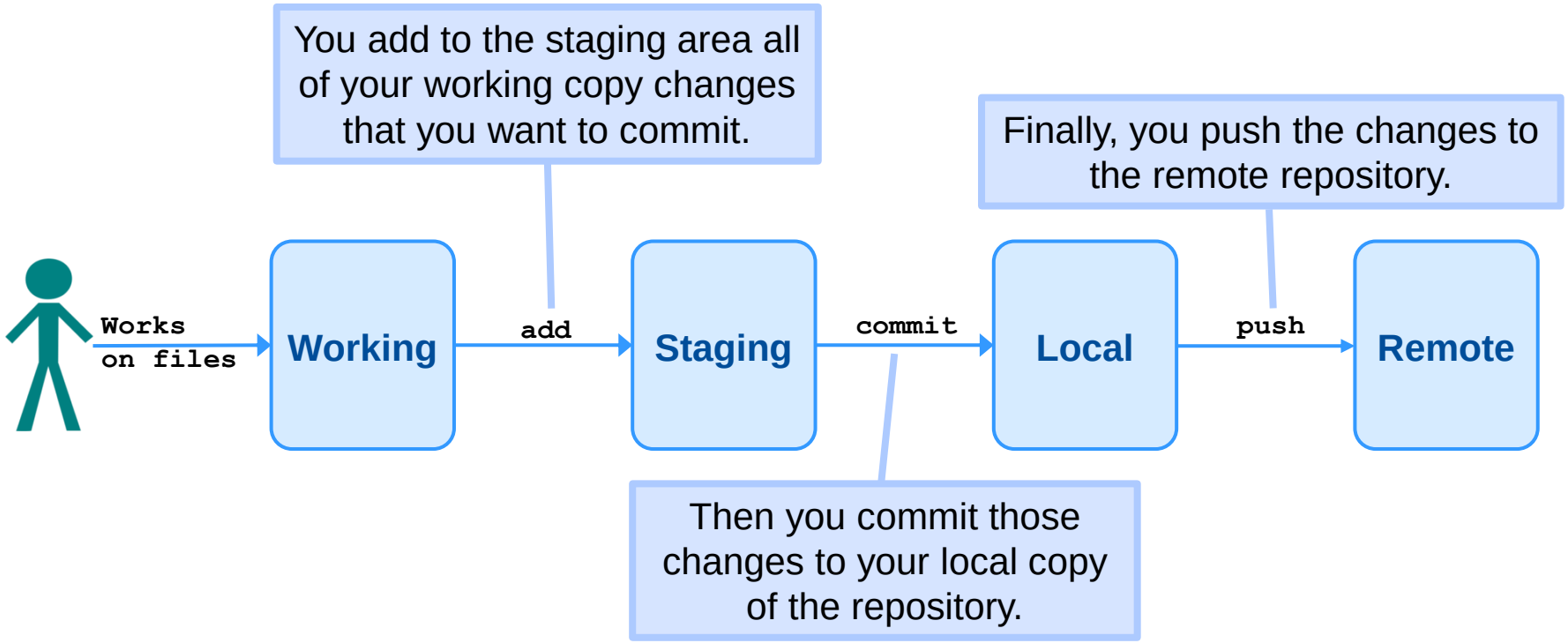
Git has four distinct areas that your work progresses through.



Your local repository and working copy do not automatically stay in sync with the remote.



When you make local changes, those changes must pass through all four areas.

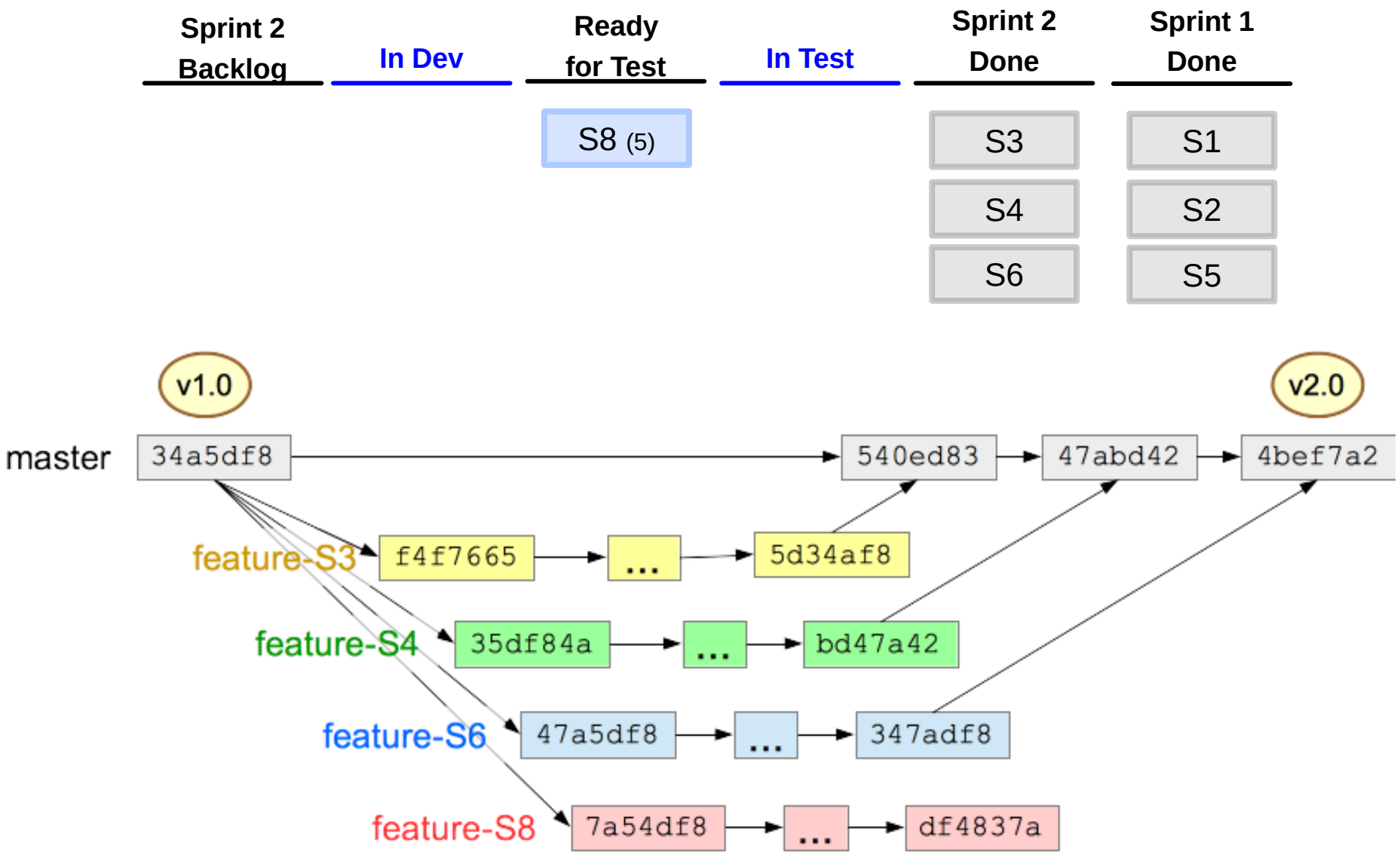


The default behavior for git will not allow you to push to the remote repository if your local repository is not up-to-date with remote. Getting in sync may create merge conflicts with your local changes that you will have to fix.

Version control branching supports the ability to manage software releases.

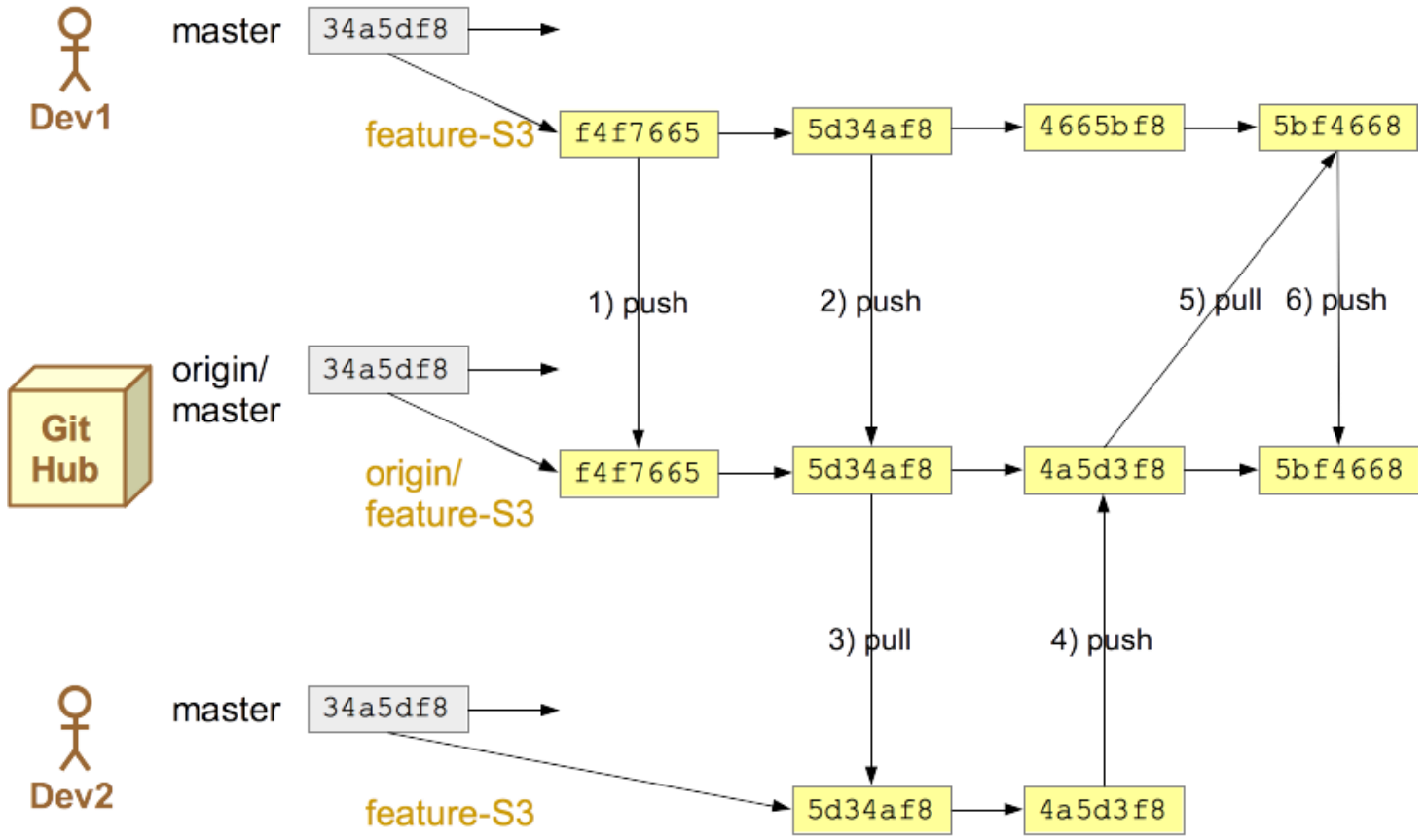
- At the end of a sprint, the team will want to include *done* stories but exclude incomplete stories.
- This cannot be done when all of the stories are developed in the master branch.
- Feature branching is a technique that creates a branch for each story during development.
  - ***Changes are isolated in specific branches.***
  - ***When the story is done, the feature branch is merged into the master branch.***
  - ***The master branch never receives incomplete work.***
  - ***Thus master is always the most up-to-date, working increment.***

An example sprint at the end.



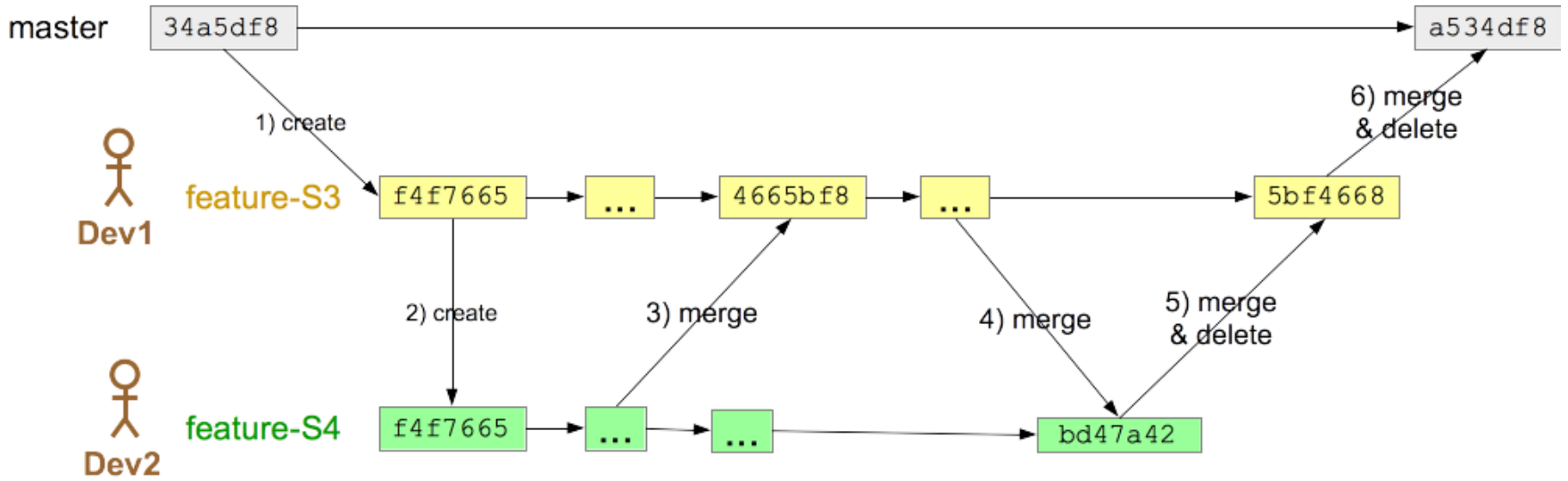
Two developers collaborate on a story by working on the same feature branch.

- The developers share code on a story by syncing to the same remote feature branch.



Two interdependent stories can share changes across two branches.

- The first story branch is created from master and the second branch is created from the first.



Not shown are the coordinating remote branches

Merging happens a lot and usually goes well; other times *not so much*.

- Every time you sync with the remote repository a merge occurs.
- A *merge conflict* occurs when there is at least one file with overlapping changes that can not be automatically resolved.

Here's an example of a merge conflict.

- Consider Betty and Sam independently fix this bug.

```
/**
 * Calculate a half-off discount.
 */
public float calculateDiscount(final float cost) {
  return cost * 2;
}
```

- Betty did this: `return cost / 2;`
- Sam did this: `return cost * 0.5f;`
- When Sam merges in the code from Betty:

➔ `git merge dev1`

```
Auto-merging src/main/java/com/example/model/Promotion.java
CONFLICT (content): Merge conflict in src/main/java/com/example/model/Promotion.java
Automatic merge failed; fix conflicts and then commit the result.
```

Resolving a simple text conflict is often easy.

- When a conflict occurs git reports the affected files.

```
  public float calculateDiscount(final float cost) {
<<<<<<< HEAD
     return cost * 0.5f;
=======
     return cost / 2;
>>>>>>> dev1
   }
```

The HEAD in Sam's workspace.

This is the code from Betty's branch.

- Determine the best solution, and remove the other solution and the marker text.
- Then follow through with an add, commit, and push.

To minimize the number of times when conflicts will not resolve easily, follow several guidelines.

1. Keep code lines short; break up long calculations.
2. Keep commits small and focused.
3. Minimize stray edits.
4. If multiple developers are collaborating on a feature, each developer should sync with the remote feature branch regularly.
   - ***Merge in the remote feature branch and then push to it, if you have changes.***
5. If development of a feature is taking a long time, back merge master to sync completed features for this sprint into the feature branch.

Using feature branches will be a standard part of your development workflow.