Unix Programming

Version Control

Why version control?

- **Scenario 1:**
  - Your program is working
  - You change "just one thing"
  - Your program breaks
  - You change it back
  - Your program is still broken--*why?*
- **Has this ever happened to you?**

Why version control? (part 2)

- **Your program worked well enough yesterday**
- **You made a lot of improvements last night…**
  - …but you haven't gotten them to work yet
- **You need to turn in your program *now***
- **Has this ever happened to you?**

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Version control for teams

- **Scenario:**
  - You change one part of a program--it works
  - Your co-worker changes another part--it works
  - You put them together--it doesn't work
  - Some change in one part must have broken something in the other part
  - What were all the changes?

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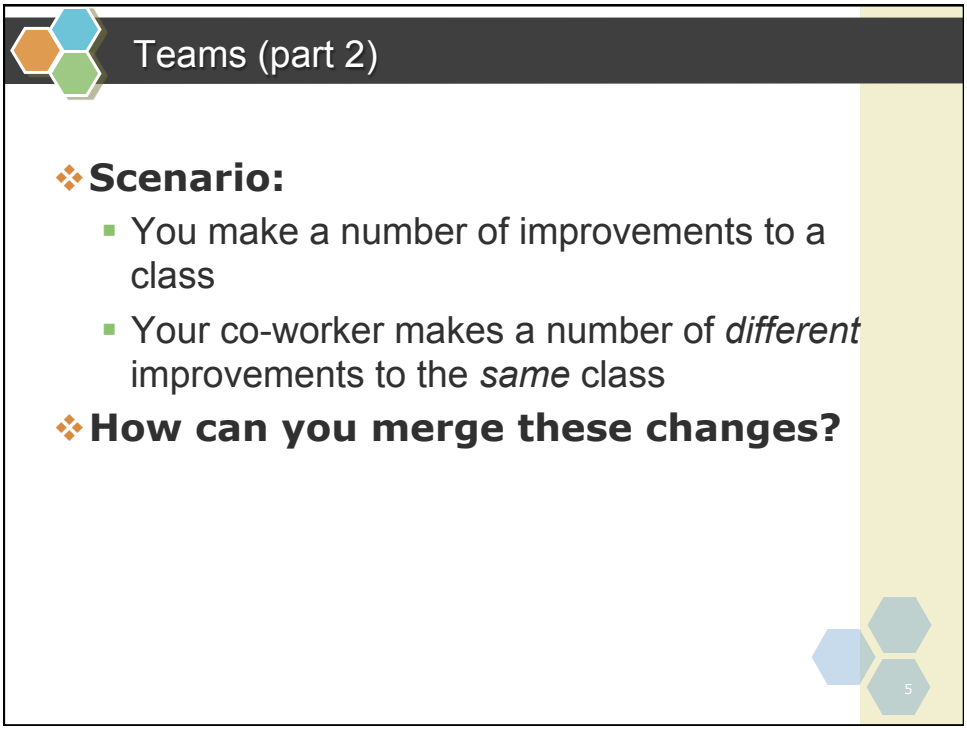
Teams (part 2)
Scenario:
You make a number of improvements to a class
Your co-worker makes a number of different improvements to the same class
How can you merge these changes?
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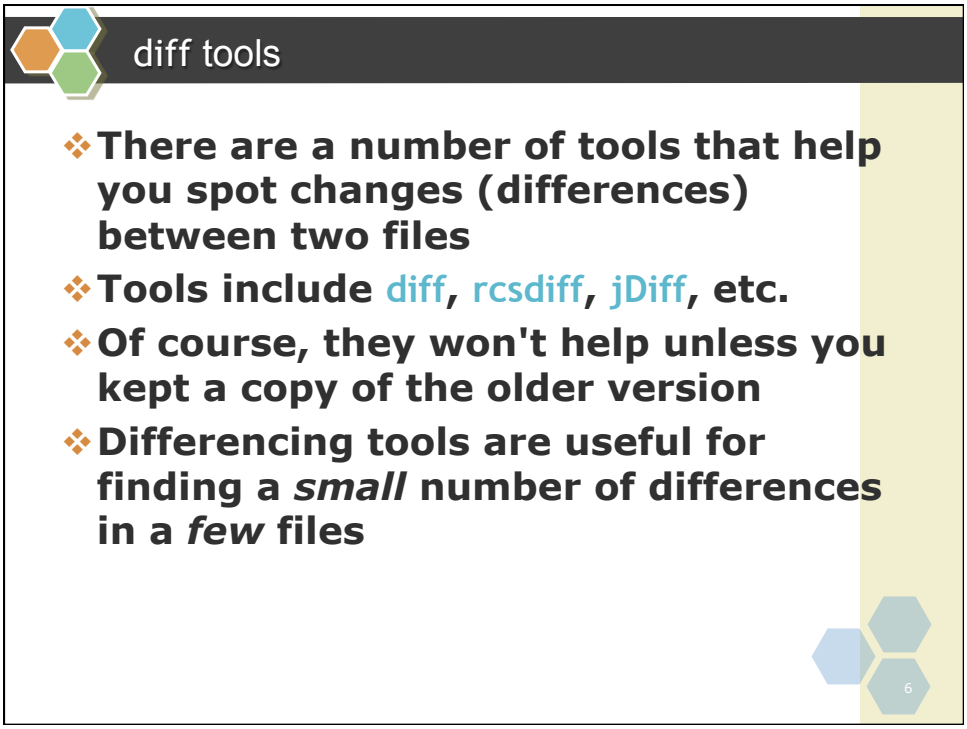
diff tools
There are a number of tools that help you spot changes (differences) between two files
Tools include diff, rcsdiff, jDiff, etc.
Of course, they won't help unless you kept a copy of the older version
Differencing tools are useful for finding a small number of differences in a few files
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jDiff

- **jDiff is a plugin for the jEdit editor**
- **Advantages:**
  - Everything is color coded
  - Uses synchronized scrolling
  - It's inside an editor--you can make changes directly
- **Disadvantages:**
  - Not stand-alone, but must be used within jDiff
  - Just a diff tool, not a complete solution

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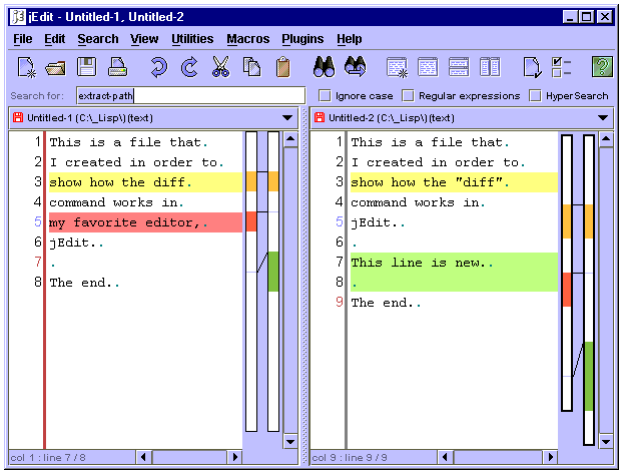
jDiff



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Version control systems

- **A version control system (often called a source code control system) does these things:**
  - Keeps multiple (older and newer) versions of everything (not just source code)
  - Requests comments regarding every change
  - Allows "check in" and "check out" of files so you know which files someone else is working on
  - Displays differences between versions

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Vocabulary

- Repository (source control repository)
  - A server that stores the files (documents)
  - Keeps a change log
- Revision, Version
  - Individual version (state) of a document that is a result of multiple changes
- Check-Out, Clone
  - Retrieves a working copy of the files from a remote repository into a local directory
  - It is possible to lock the files

Vocabulary

- Change
  - A modification to a local file (document) that is under version control
- Change Set / Change List
  - A set of changes to multiple files that are going to be committed at the same time
- Commit, Check-In
  - Submits the changes made from the local working copy to the repository
  - Automatically creates a new version
  - Conflicts may occur!

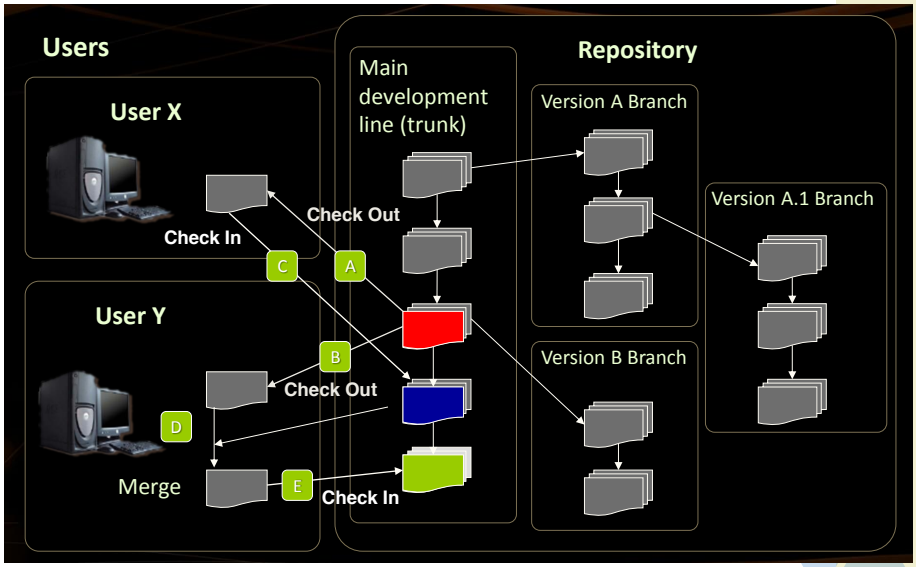
Vocabulary

- Conflict
  - The simultaneous change to a certain file by multiple users
  - Can be solved automatically and manually
- Update, Get Latest Version, Fetch / Pull
  - Download the latest version of the files from the repository to a local working directory + merge conflicting files
- Undo Check-Out, Revert / Undo Changes
  - Cancels the local changes
  - Restores their state from the repository

Vocabulary

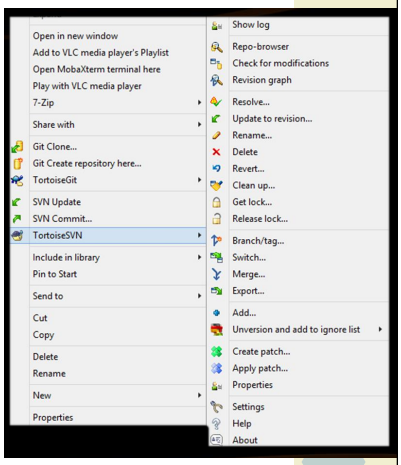
- Merge
  - Combines the changes to a file changed locally and simultaneously in the repository
  - Can be automated in most cases
- Label / Tag
  - Labels mark with a name a group of files in a given version
  - For example a release
- Branch / Branching
  - Division of the repositories in a number of separate workflows

Version Control: Typical Scenario



Subversion (SVN)

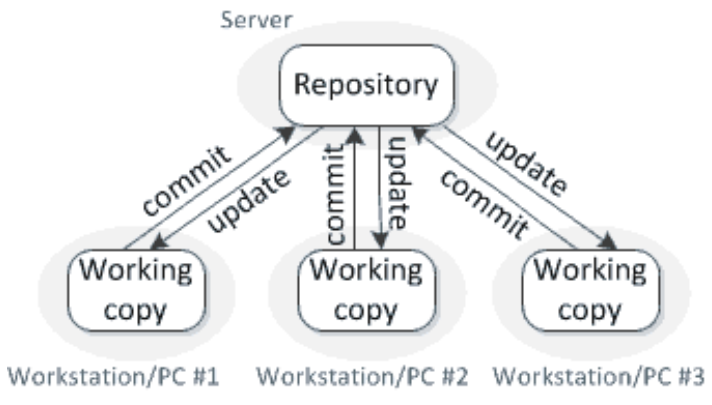
- Subversion (SVN)
  - Open source SCM repository
  - http://subversion.tigris.org
  - Runs on Linux, Windows, Mac OS
- Console client
  - Svn
- GUI client – TortoiseSVN
  - http://tortoisesvn.tigris.org
- Visual Studio / Eclipse plug-ins



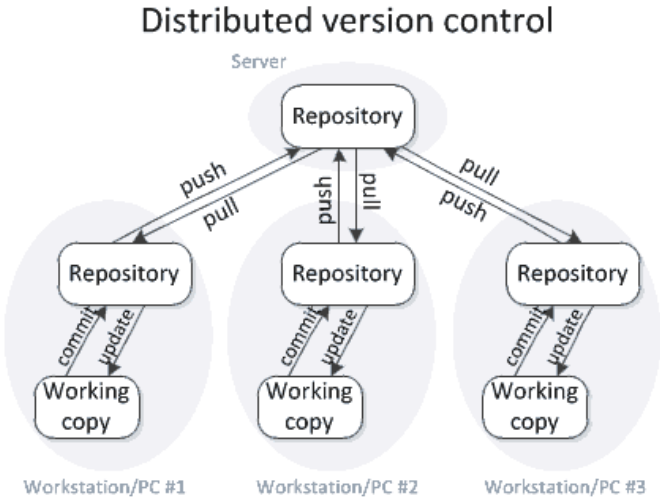
Versioning Models

- **Lock-Modify-Unlock**
- **Copy-Modify-Merge**
- **Distributed Version Control**

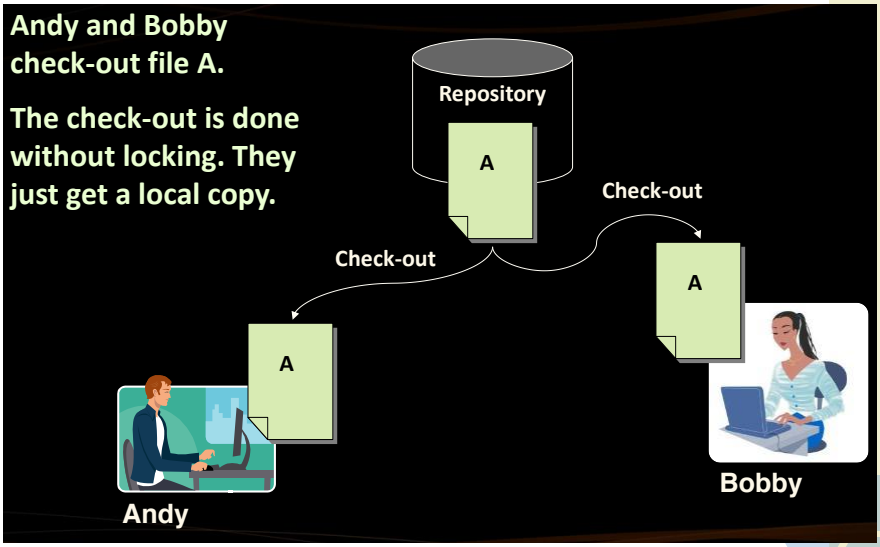
Centralized Version Control



Distributed Version Control



The Lock-Modify-Unlock Model



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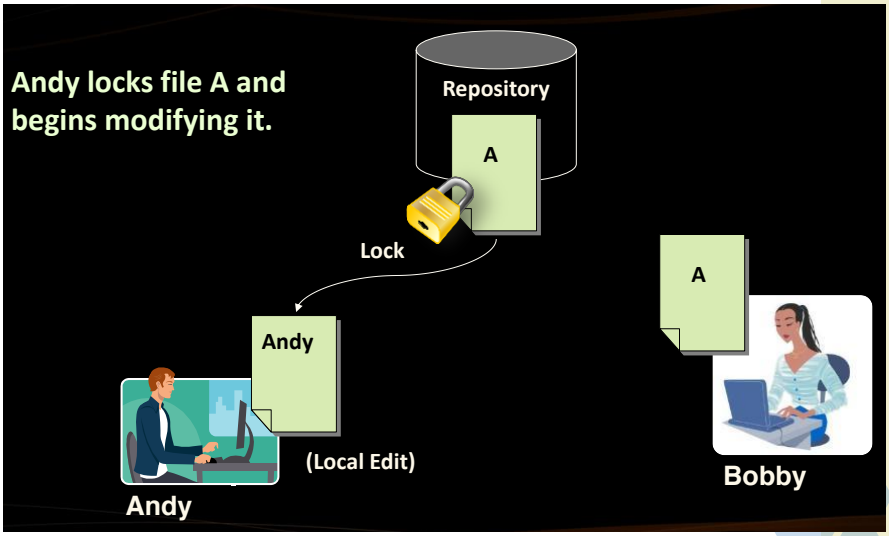

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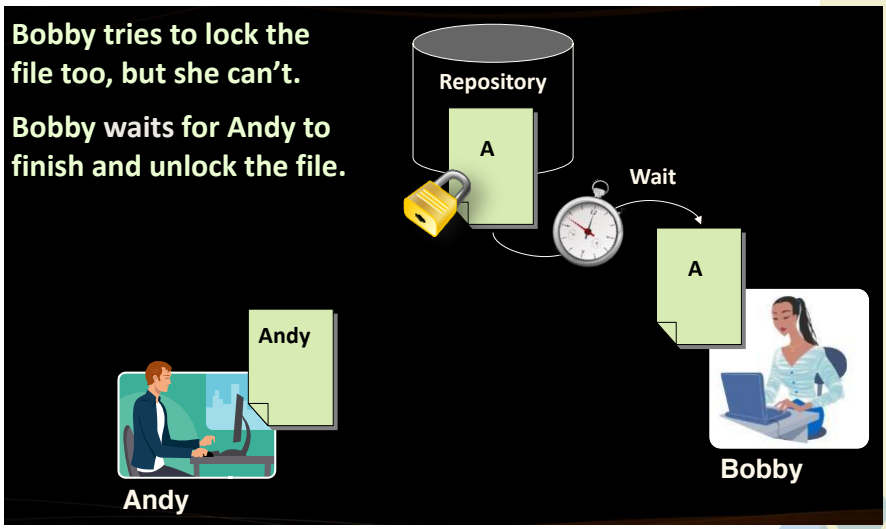
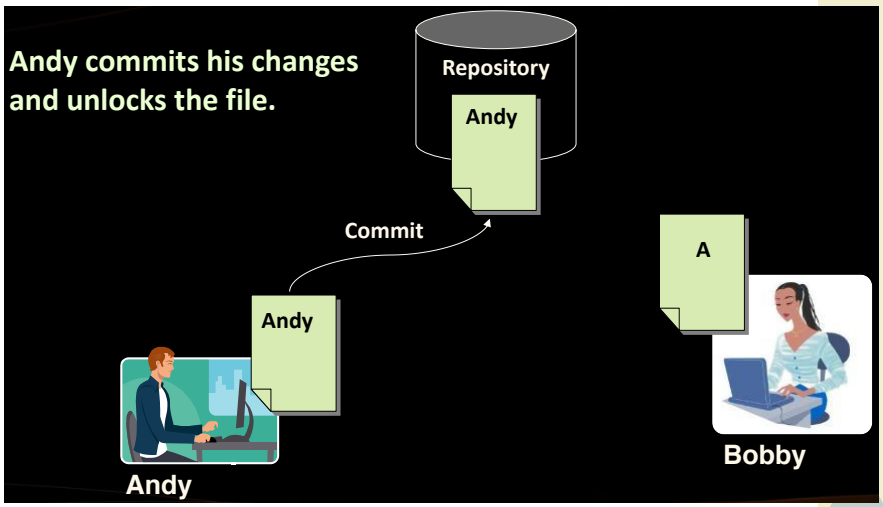
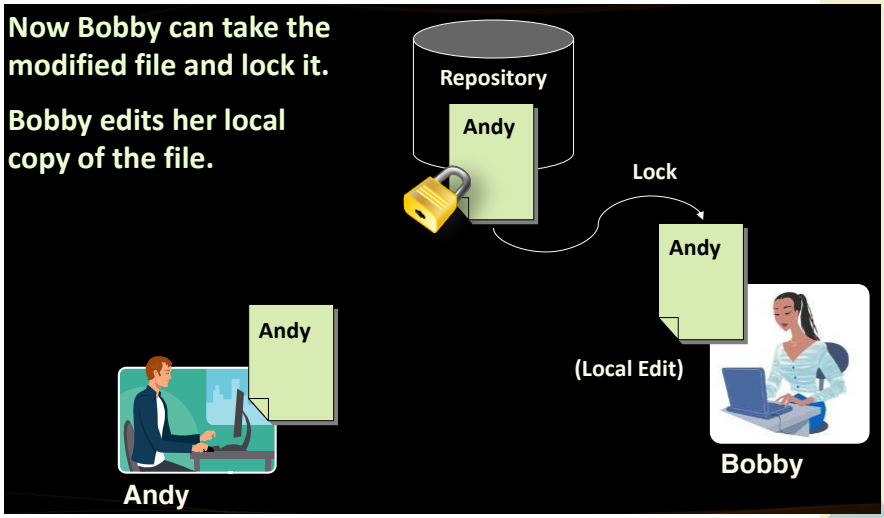


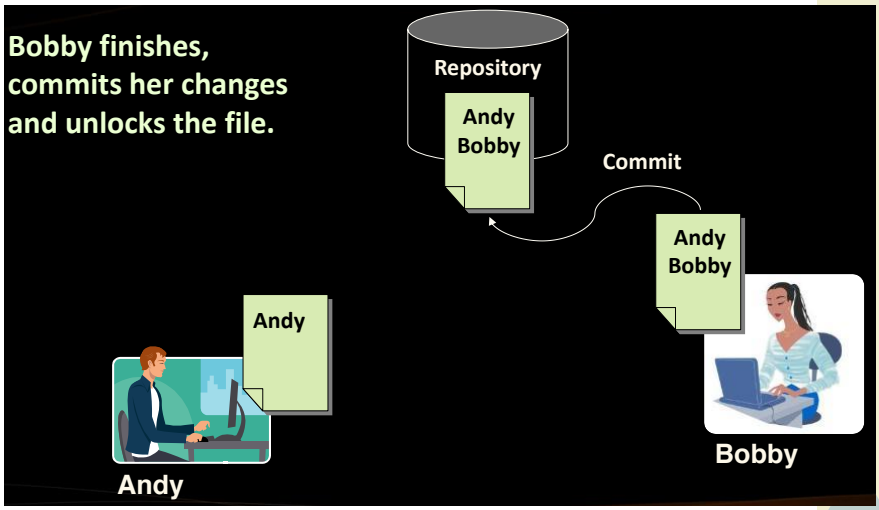
The Lock-Modify-Unlock Model (4)



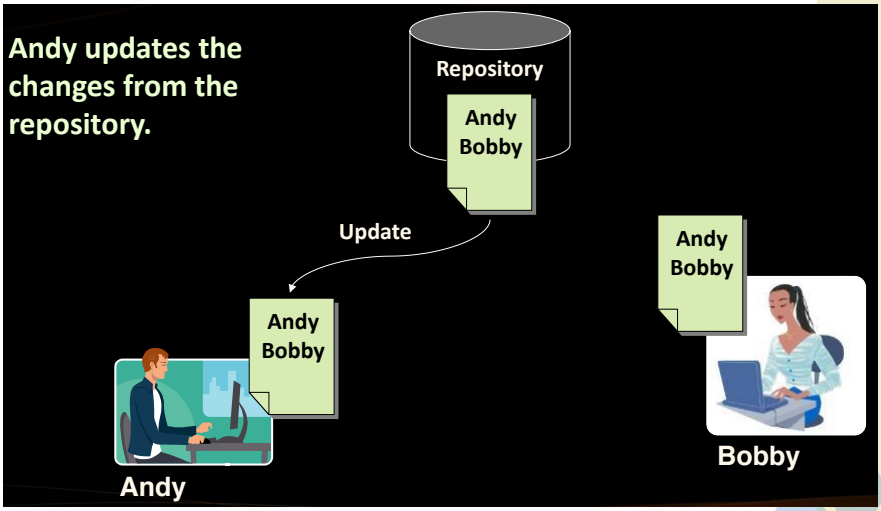
The Lock-Modify-Unlock Model (5)



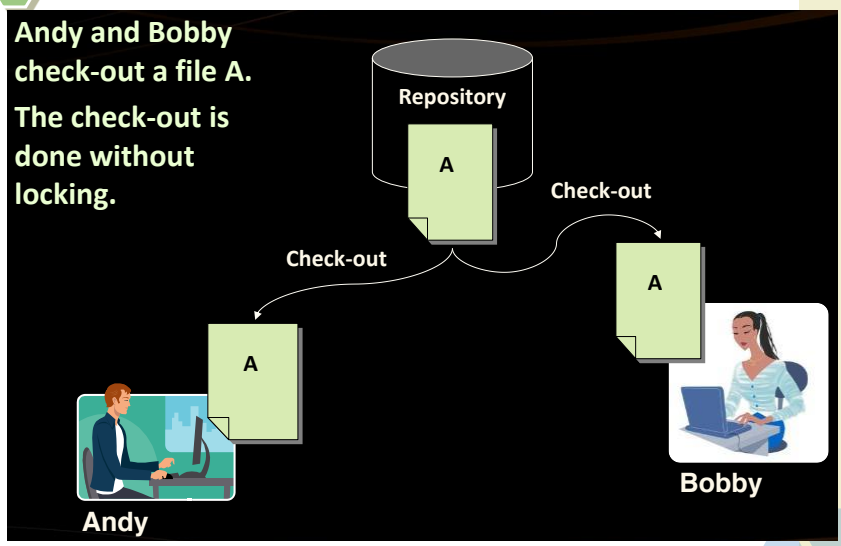
The Lock-Modify-Unlock Model (6)



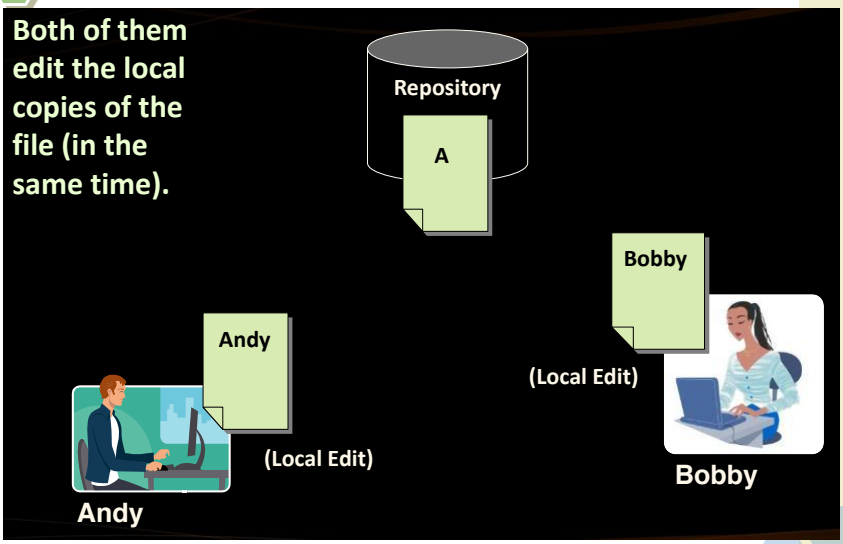
The Lock-Modify-Unlock Model (7)



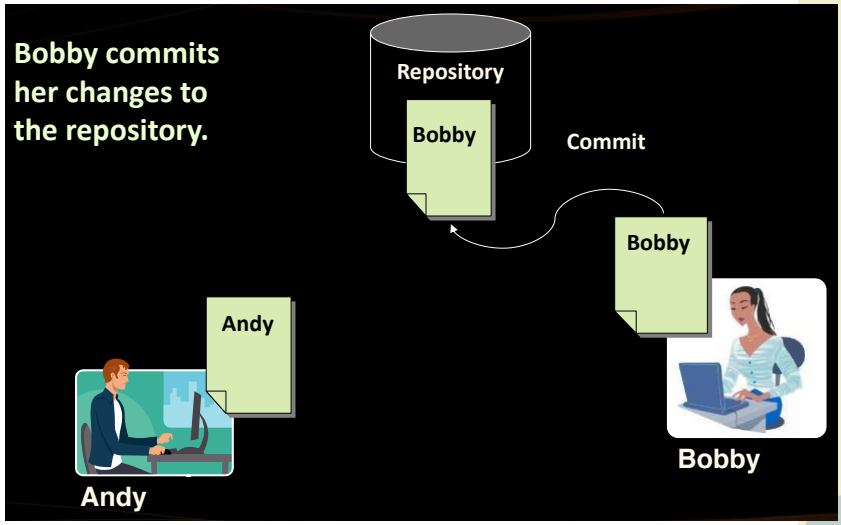
The Copy-Modify-Merge Model (1)



The Copy-Modify-Merge Model (2)



The Copy-Modify-Merge Model (3)



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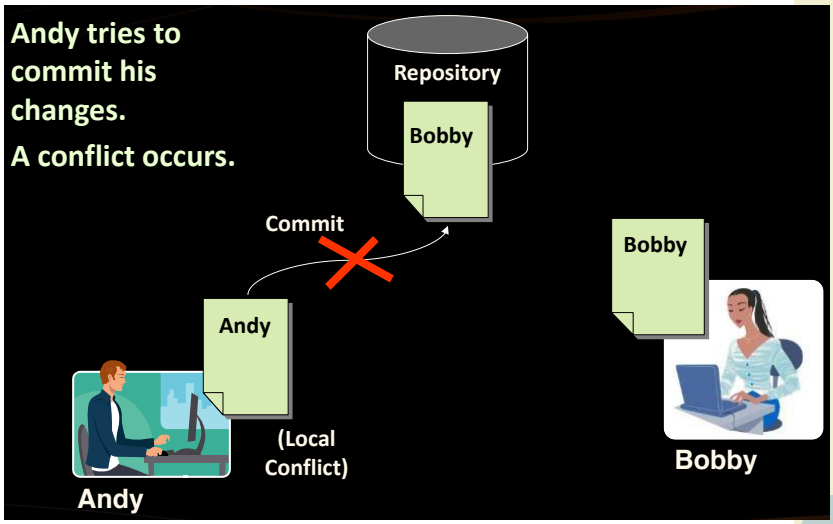

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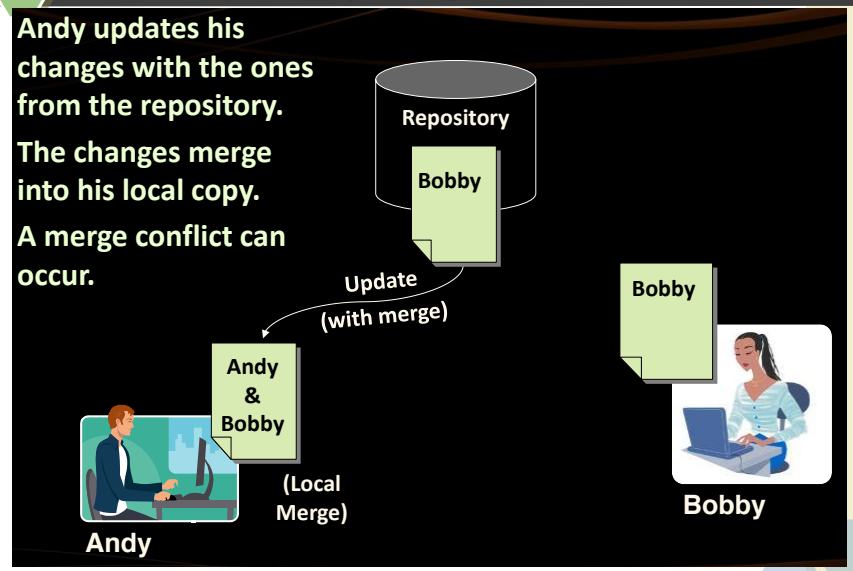

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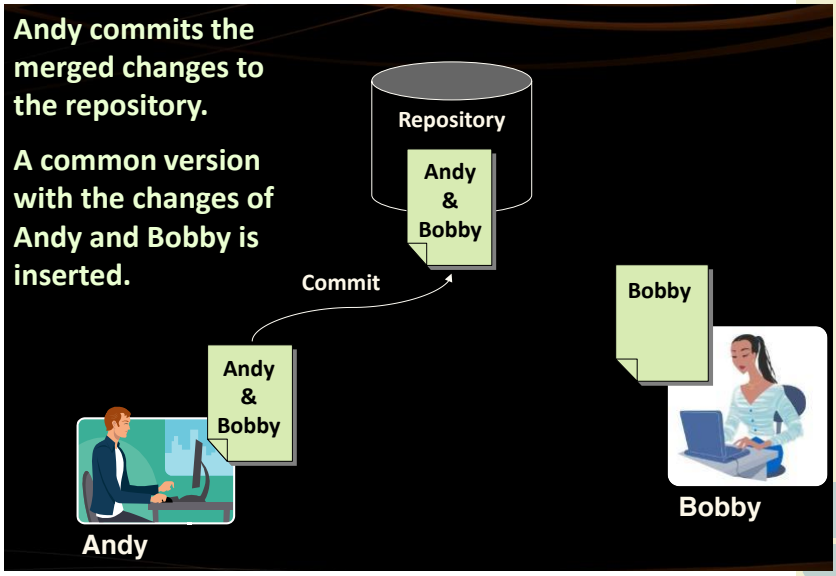

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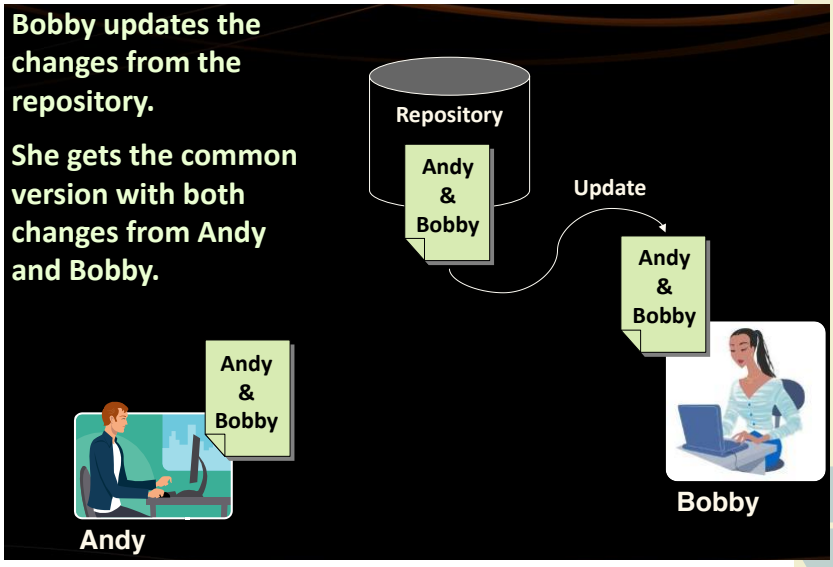
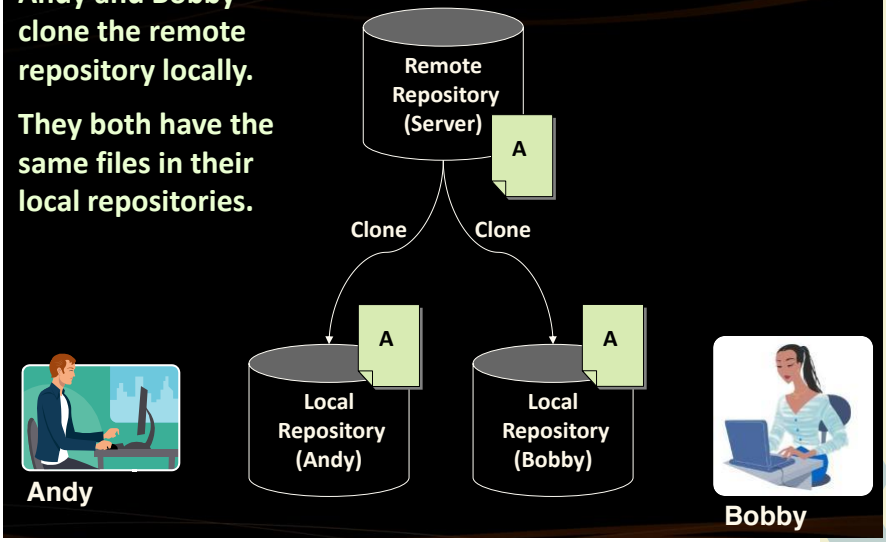


Distributed Version Control (1)

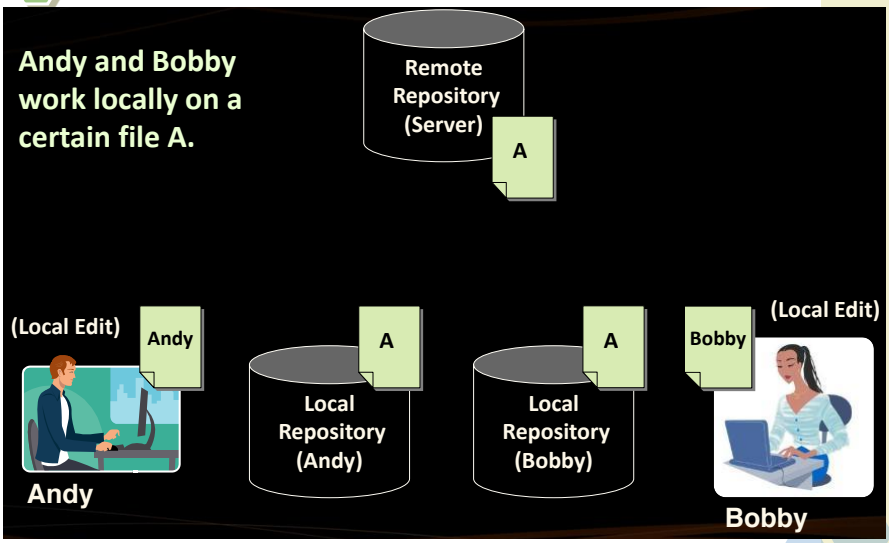
Andy and Bobby clone the remote repository locally.

They both have the same files in their local repositories.



Distributed Version Control (2)

Andy and Bobby work locally on a certain file A.



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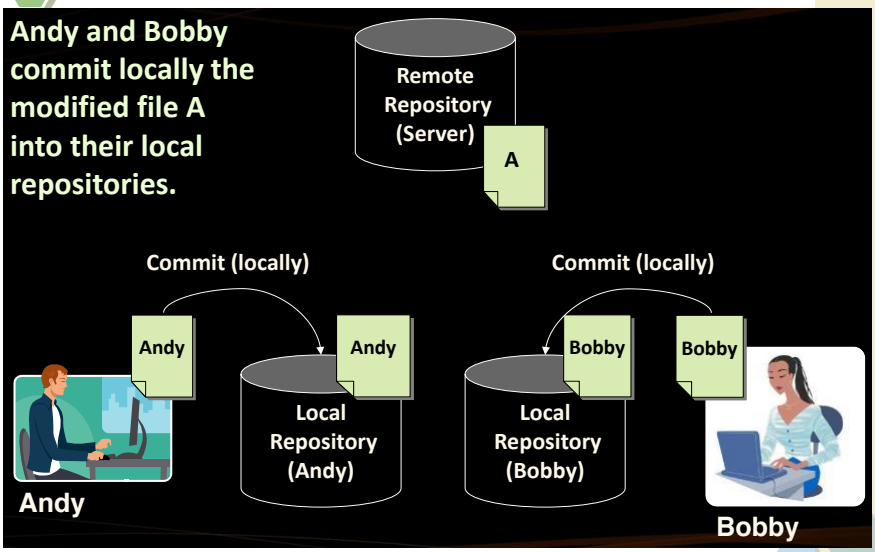

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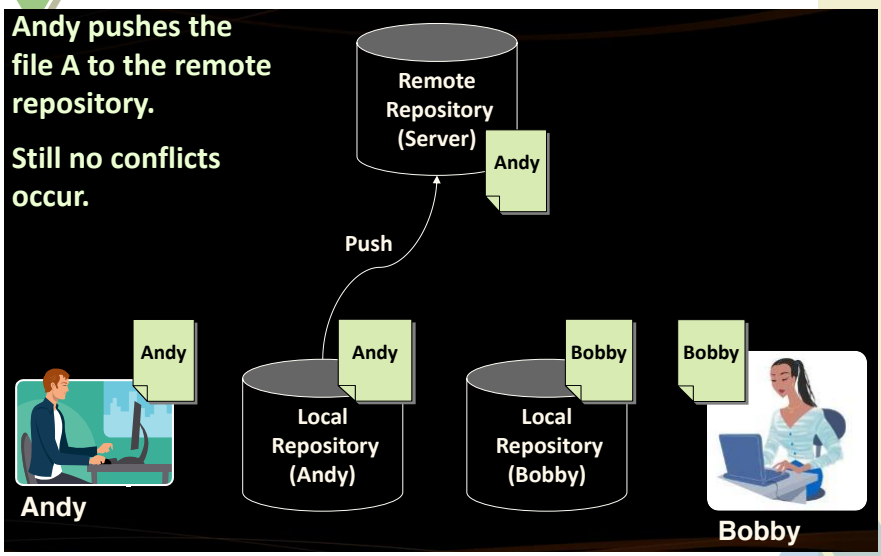

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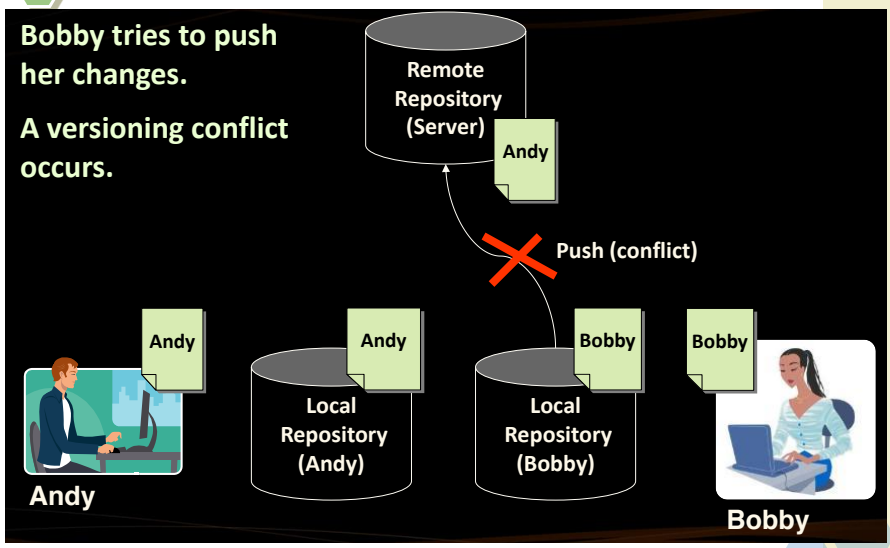

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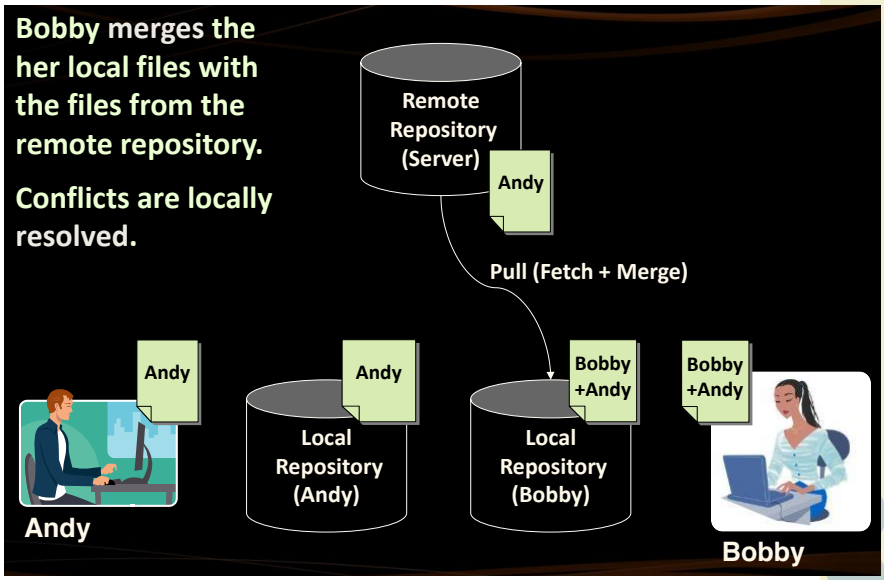

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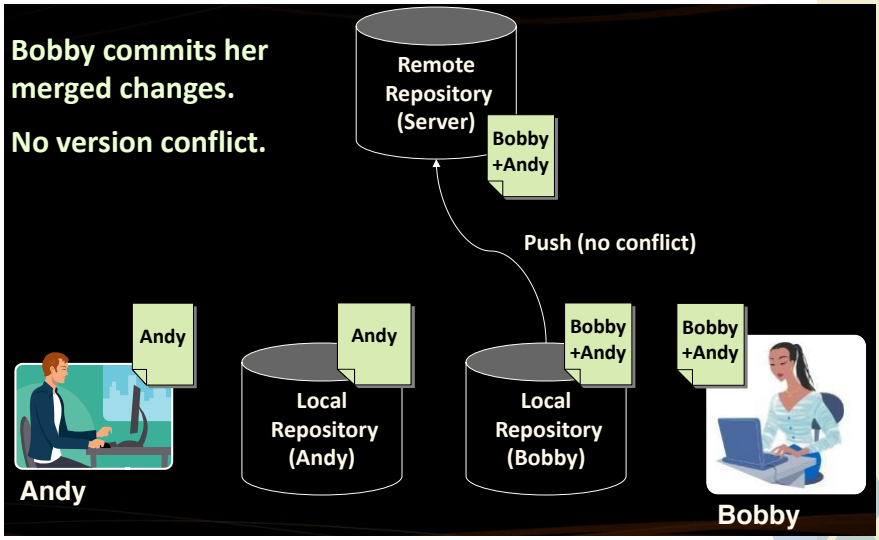

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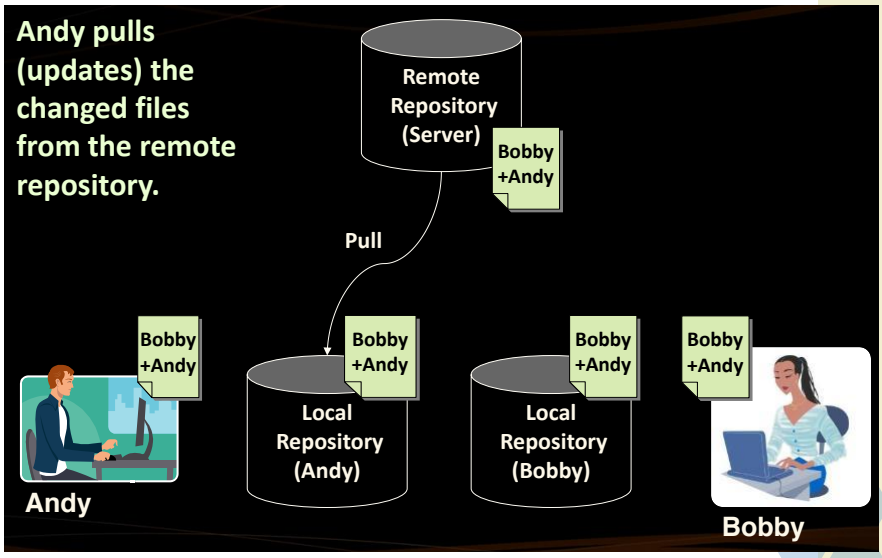


What is Git?

- Git
  - Distributed source-control system
  - Work with local and remote repositories
  - Git bash – command line interface for Git
  - Free, open-source
  - Has Windows version (msysGit)
    - http://msysgit.github.io
    - https://www.atlassian.com/git/tutorials/setting-up-a-repository

Installing Git

- msysGit Installation on Windows
  - Download Git for Windows from: http://msysgit.github.io
  - "Next, Next, Next" does the trick
  - Options to select (they should be selected by default)
    - "Use Git Bash only"
    - "Checkout Windows-style, commit Unix-style endings"
- Git installation on Linux:

  sudo apt-get install git

Basic Git Commands

- Cloning an existing Git repository
  git clone [remote url]
- Fetch and merge the latest changes from the remote repository
  git pull
- Preparing (adding / selecting) files for a commit
  git add [filename] ("git add ."adds everything)
- Committing to the local repository
  git commit –m "[your message here]"

Basic Git Commands

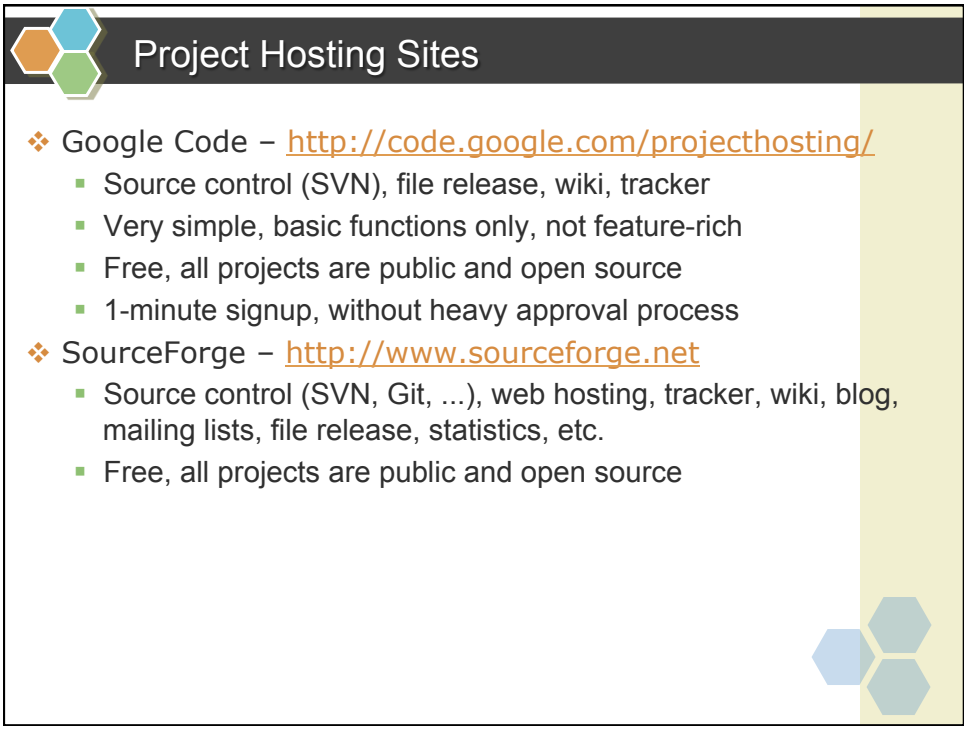
- Check the status of your local repository (see the local changes)
  git status
- Creating a new local repository (in the current directory)
  git init
- Creating a remote (assign a short name for remote Git URL)
  git remote add [remote name] [remote url]
- Pushing to a remote (send changes to the remote repository)
  git push [remote name] [local name]

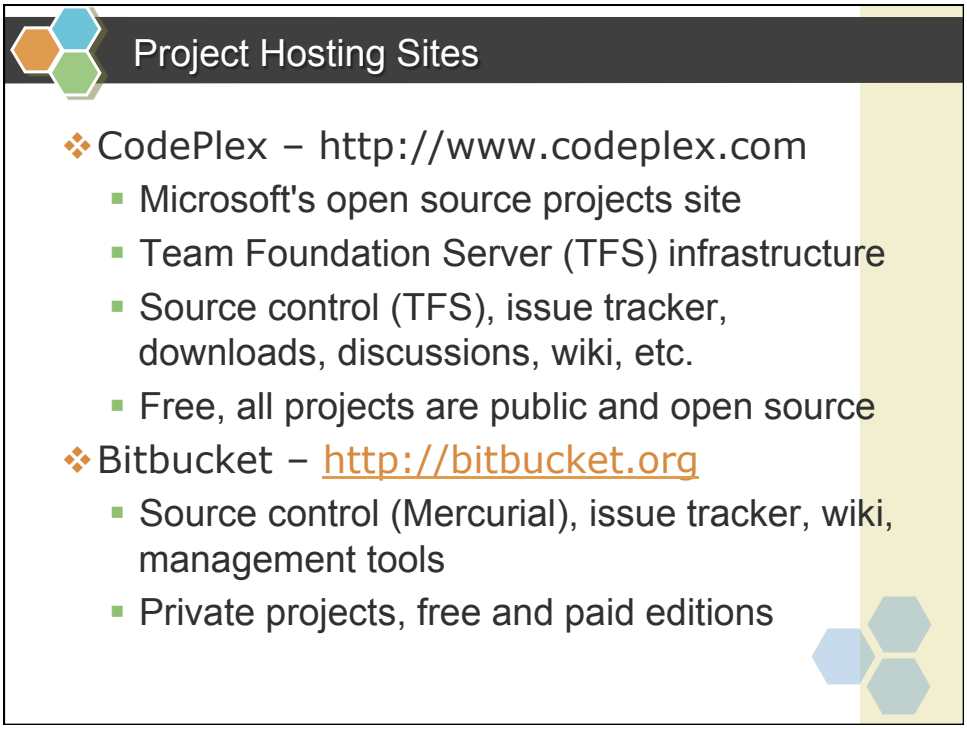
Using Git: Example

```
mkdir work
cd work
git clone https://github.com/SoftUni/test.git dir
cd test
dir
git status
(edit some file)
git status
git add .
git commit -m "changes"
git push
```


Project Hosting Sites

- GitHub – https://github.com
  - The #1 project hosting site in the world
  - Free for open-source projects
  - Paid plans for private projects
- GitHub provides own Windows client
  - GitHub for Windows
  - http://windows.github.com
  - Dramatically simplifies Git
  - For beginners only


Project Hosting Sites
Google Code – http://code.google.com/projecthosting/
Source control (SVN), file release, wiki, tracker
Very simple, basic functions only, not feature-rich
Free, all projects are public and open source
1-minute signup, without heavy approval process
SourceForge – http://www.sourceforge.net
Source control (SVN, Git, ...), web hosting, tracker, wiki, blog, mailing lists, file release, statistics, etc.
Free, all projects are public and open source


Project Hosting Sites
CodePlex – http://www.codeplex.com
Microsoft's open source projects site
Team Foundation Server (TFS) infrastructure
Source control (TFS), issue tracker, downloads, discussions, wiki, etc.
Free, all projects are public and open source
Bitbucket – http://bitbucket.org
Source control (Mercurial), issue tracker, wiki, management tools
Private projects, free and paid editions