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ITSS SOFTWARE DEVELOPMENT

## 1-2. VERSION CONTROL

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## Outline

1. Introduction
2. Models
3. Vocabulary
4. Tools

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### Why version control? (1/2)

- 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?

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### Why version control? (2/2)

- 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 (1/2)

- 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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## Tools: diff

- 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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## Version control for teams (2/2)

- 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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## Tools: 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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Tools: 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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- ## Outline
1. Introduction
  - 2. Versioning Models**
  3. Vocabulary
  4. Tools

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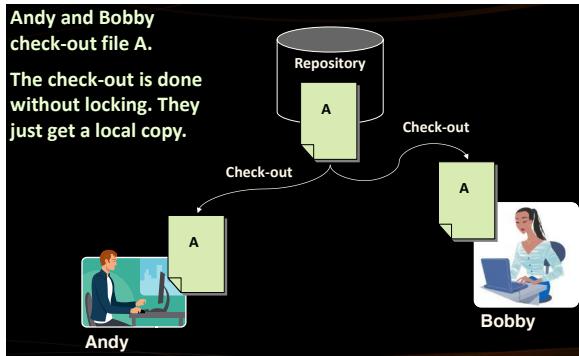
- ## 2. Versioning Models
- Lock-Modify-Unlock
  - Copy-Modify-Merge
  - Distributed Version Control

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## 2.1. The Lock-Modify-Unlock Model

Andy and Bobby check-out file A.

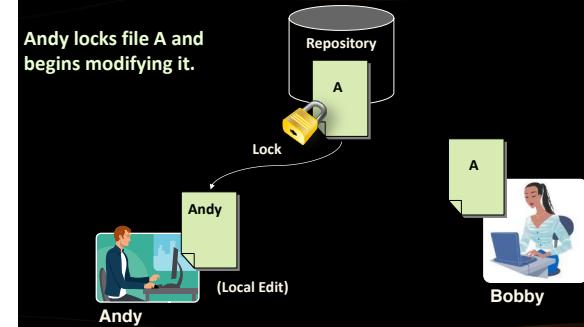
The check-out is done without locking. They just get a local copy.



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## 2.1. The Lock-Modify-Unlock Model (2)

Andy locks file A and begins modifying it.

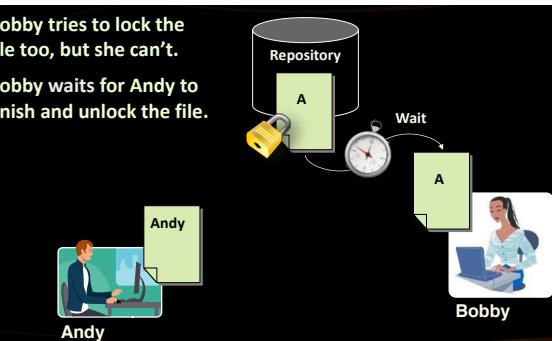


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## 2.1. The Lock-Modify-Unlock Model (3)

Bobby tries to lock the file too, but she can't.

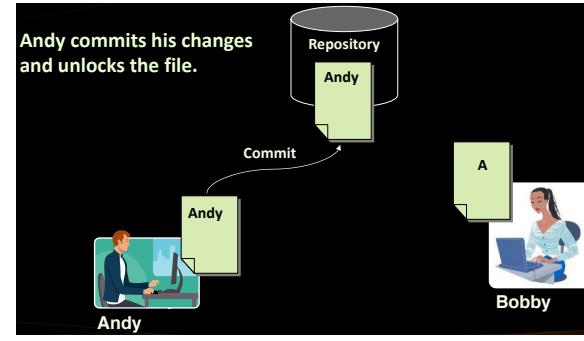
Bobby waits for Andy to finish and unlock the file.



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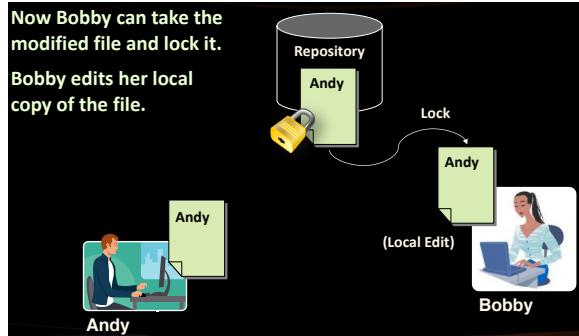
## 2.1. The Lock-Modify-Unlock Model (4)

Andy commits his changes and unlocks the file.



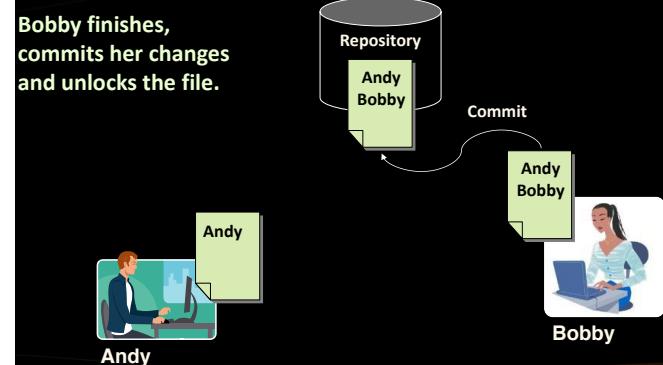
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## 2.1. The Lock-Modify-Unlock Model (5)



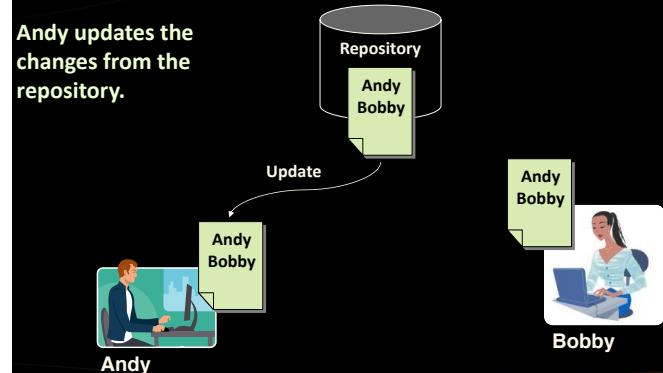
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## 2.1. The Lock-Modify-Unlock Model (6)



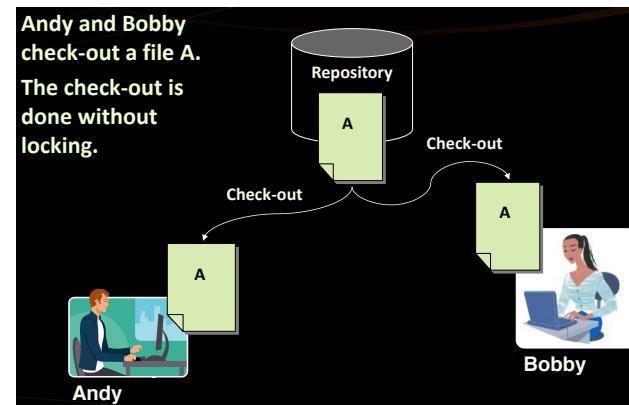
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## 2.1. The Lock-Modify-Unlock Model (7)

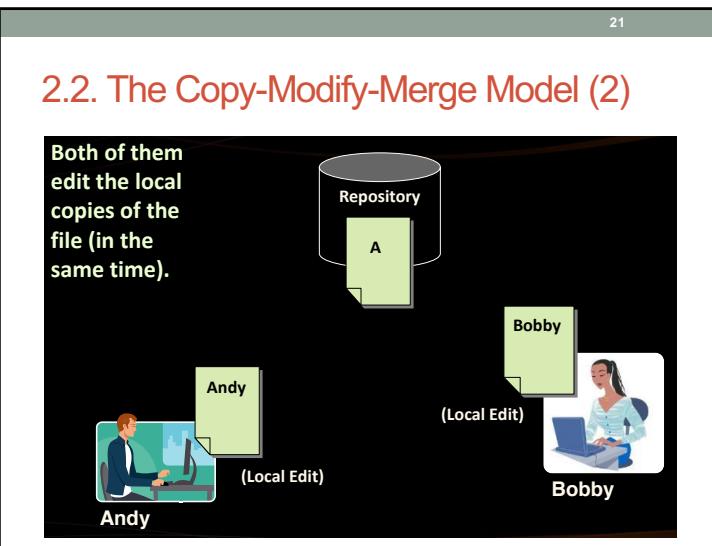


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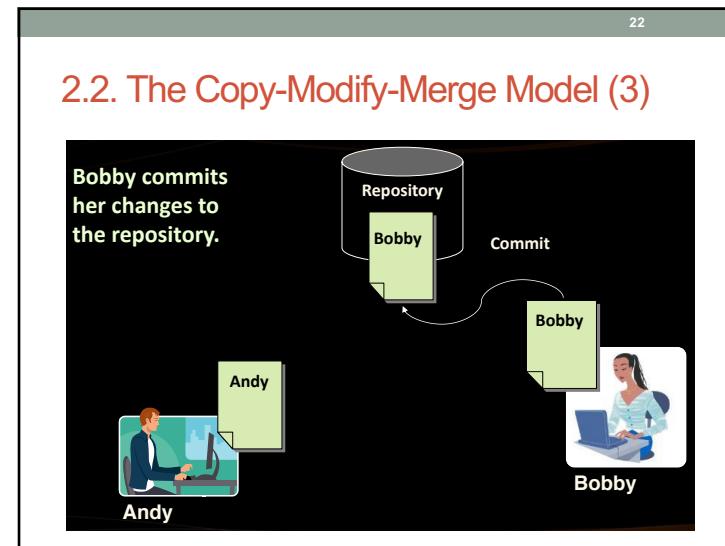
## 2.2. The Copy-Modify-Merge Model



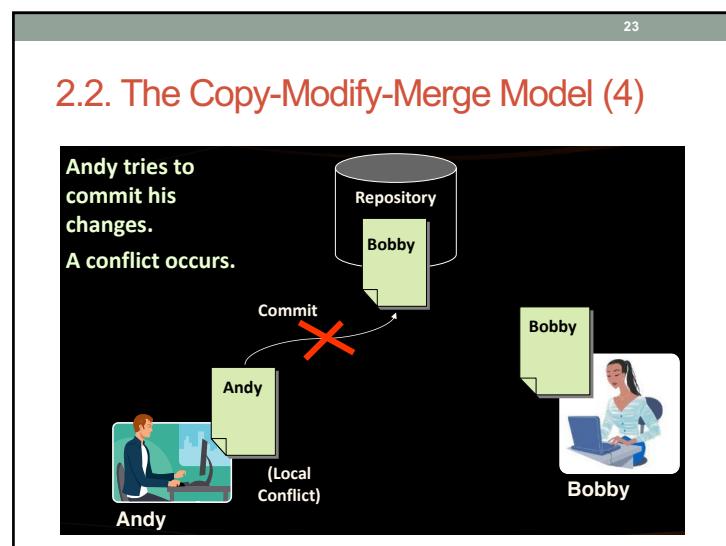
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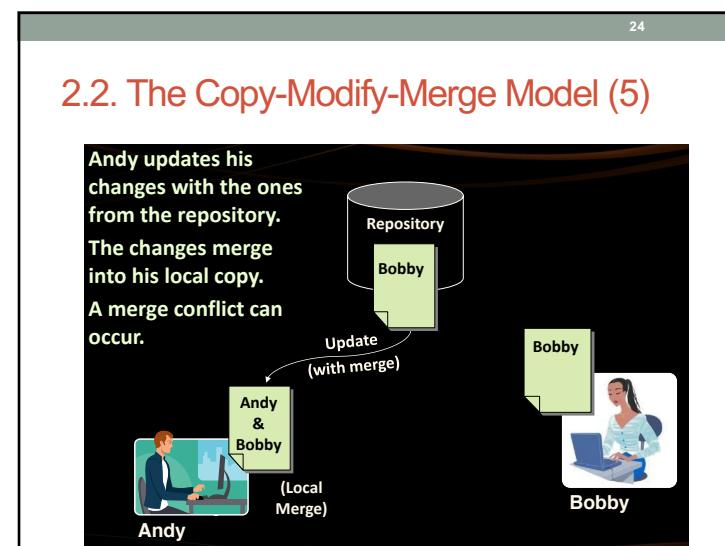
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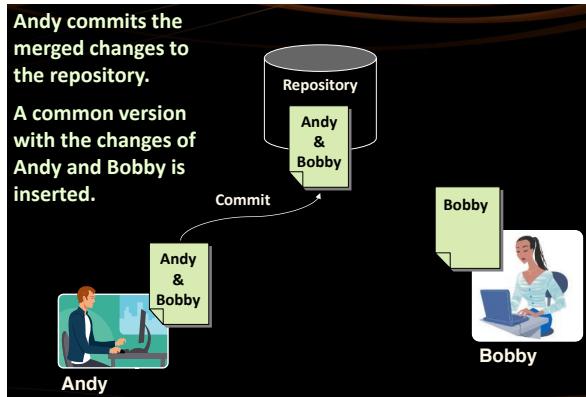


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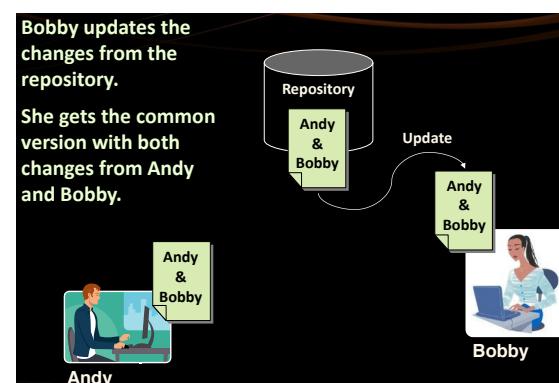
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## 2.2. The Copy-Modify-Merge Model (6)



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## 2.2. The Copy-Modify-Merge Model (7)

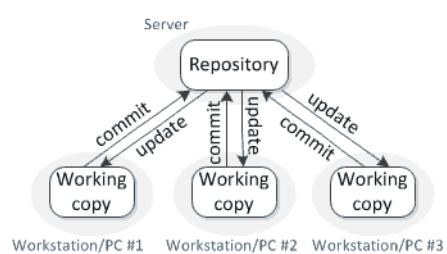


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## 2.3. Distributed version control

- Compared to Centralized version control
- Only one repository

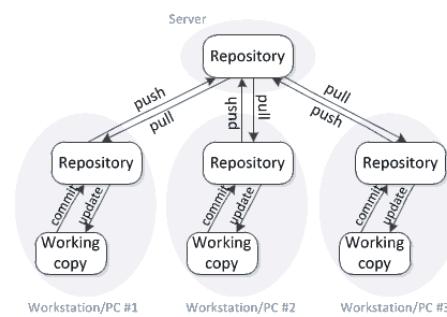
### Centralized version control



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## Distributed Version Control

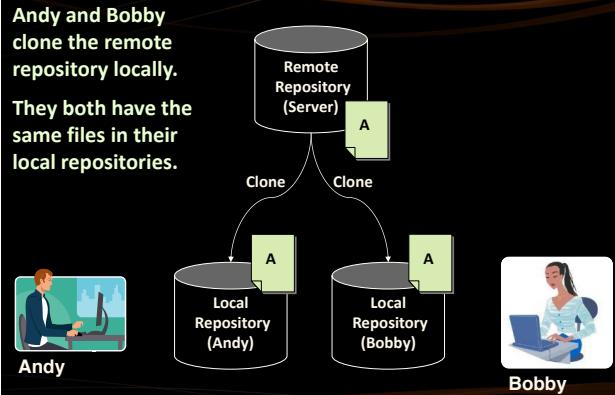
### Distributed version control



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## Distributed Version Control (1)

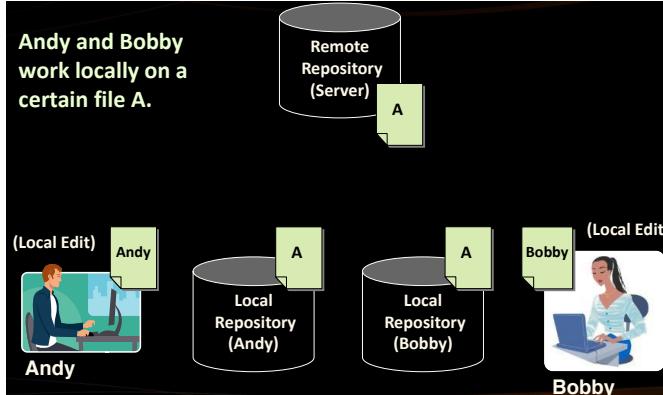
Andy and Bobby clone the remote repository locally.  
They both have the same files in their local repositories.



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## Distributed Version Control (2)

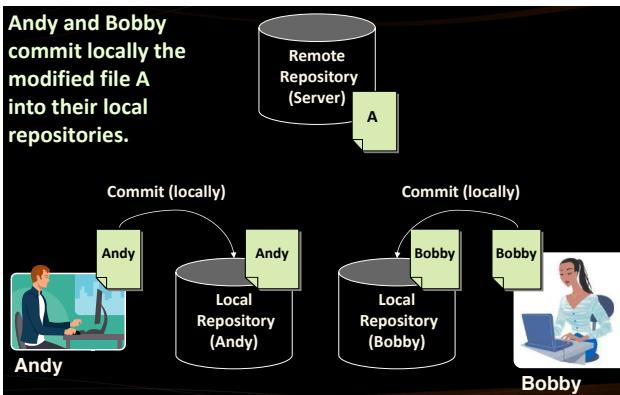
Andy and Bobby work locally on a certain file A.



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## Distributed Version Control (3)

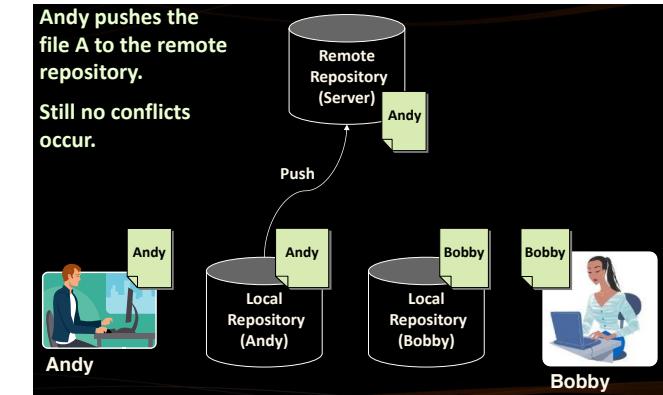
Andy and Bobby commit locally the modified file A into their local repositories.



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## Distributed Version Control (4)

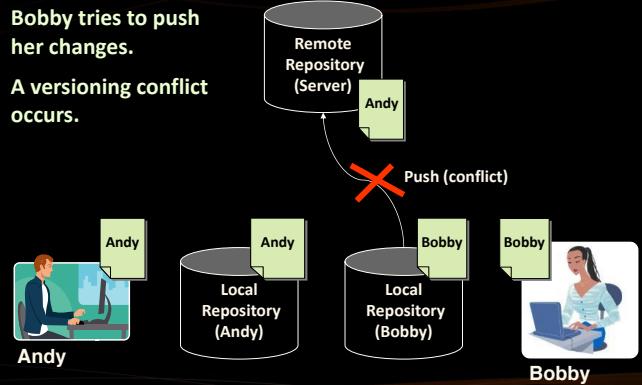
Andy pushes the file A to the remote repository.  
Still no conflicts occur.



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## Distributed Version Control (5)

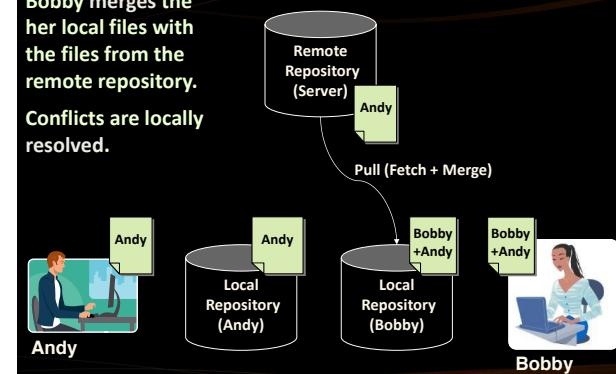
Bobby tries to push her changes.  
A versioning conflict occurs.



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## Distributed Version Control (6)

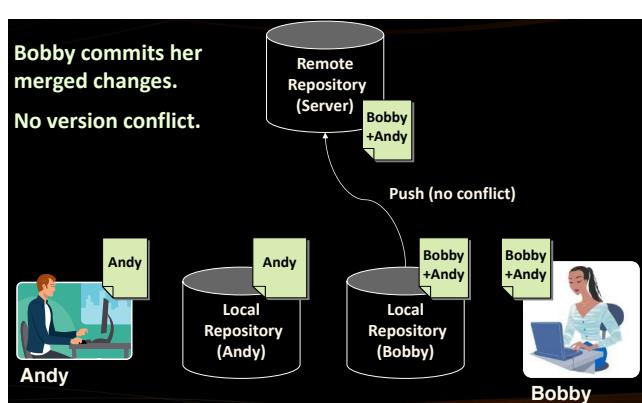
Bobby merges her local files with the files from the remote repository.  
Conflicts are locally resolved.



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## Distributed Version Control (7)

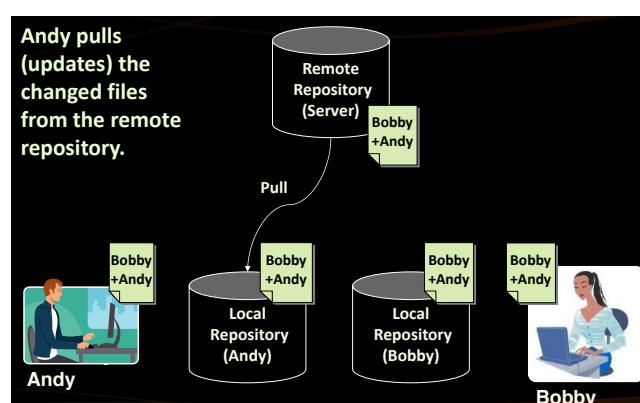
Bobby commits her merged changes.  
No version conflict.



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## Distributed Version Control (8)

Andy pulls (updates) the changed files from the remote repository.



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## 3. 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

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## 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!

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## 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

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## 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

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## Tools

- Central version control
  - SVN (Subversion)
  - TFS
  - Source safe (commercial)
- Distributed version control
  - Git
  - Mercurial

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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>

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## 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
```

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## 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]"
```

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## 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]
```

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## 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
```

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## 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

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## 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

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## 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

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