IT4490 - SOFTWARE DESIGN AND CONSTRUCTION

1. VERSION CONTROL

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Outline

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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?

3

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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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?

6

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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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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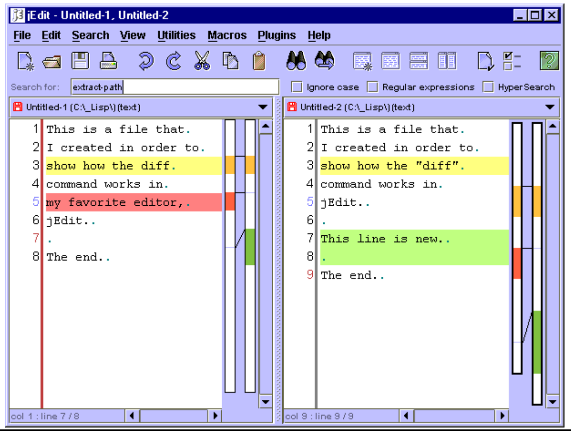
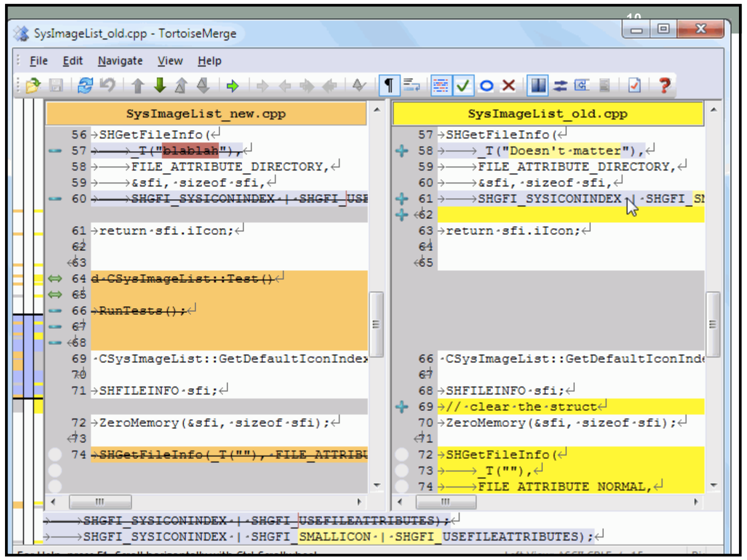
Tools: jDiff


jEdit - Untitled-1, Untitled-2
File Edit Search View Utilities Macros Plugins Help
Search for: extract-path
Ignore case
Regular expressions
HyperSearch
Untitled-1 (C:_Lisp\) (text)
Untitled-2 (C:_Lisp\) (text)
col 1 : line 7 / 8
col 9 : line 9 / 9

```
This is a file that.
I created in order to.
show how the diff.
command works in.
my favorite editor,.
jEdit..
.
The end..
```

```
This is a file that.
I created in order to.
show how the "diff".
command works in.
jEdit..
.
This line is new..
.
The end..
```


SysImageList_old.cpp - TortoiseMerge
File Edit Navigate View Help
SysImageList_new.cpp
SysImageList_old.cpp

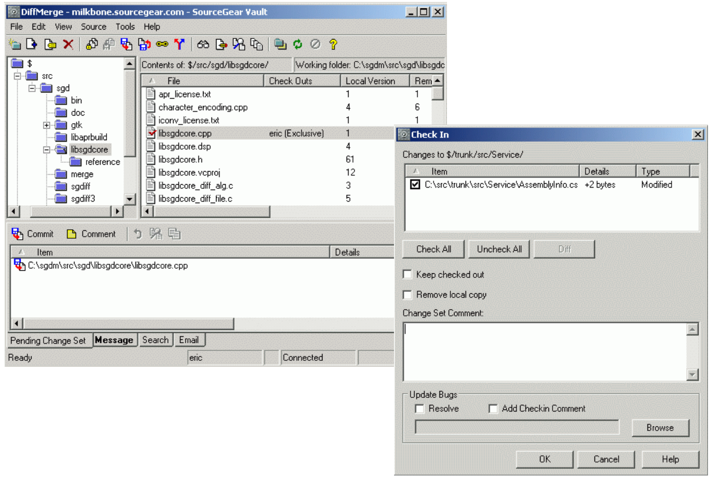
```
SHGetFileInfo(
        _T("blablah"),
        FILE_ATTRIBUTE_DIRECTORY,
        &sfi, sizeof sfi,
        SHGFI_SYSICONINDEX | SHGFI_USE

return sfi.iIcon;


d CSysImageList::Test()

RunTests();


CSysImageList::GetDefaultIconIndex

SHFILEINFO sfi;

ZeroMemory(&sfi, sizeof sfi);

SHGetFileInfo(_T(""), FILE_ATTRIBU
```

```
SHGetFileInfo(
        _T("Doesn't matter"),
        FILE_ATTRIBUTE_DIRECTORY,
        &sfi, sizeof sfi,
        SHGFI_SYSICONINDEX | SHGFI_SM

return sfi.iIcon;


CSysImageList::GetDefaultIconInde

SHFILEINFO sfi;
// clear the struct
ZeroMemory(&sfi, sizeof sfi);

SHGetFileInfo(
        _T(""),
        FILE_ATTRIBUTE_NORMAL,
```

```
        SHGFI_SYSICONINDEX | SHGFI_USEFILEATTRIBUTES);
        SHGFI_SYSICONINDEX | SHGFI_SMALLICON | SHGFI_USEFILEATTRIBUTES);
```

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



Contents of: $/src/sgd/libsgdcore/ Working folder: C:\sgdm\src\sgd\libsgdc

File	Check Outs	Local Version	Rem
apr_license.txt		1	1
character_encoding.cpp		4	6
iconv_license.txt		1	1
libsgdcore.cpp	eric (Exclusive)	1	
libsgdcore.dsp		4	
libsgdcore.h		61	
libsgdcore.vcproj		12	
libsgdcore_diff_alg.c		3	
libsgdcore_diff_file.c		5	

Item	Details
C:\sgdm\src\sgd\libsgdcore\libsgdcore.cpp	

Ready | eric | Connected

Changes to $/trunk/src/Service/

Item	Details	Type
☑ C:\src\trunk\src\Service\AssemblyInfo.cs	+2 bytes	Modified

☐ Keep checked out

☐ Remove local copy

Change Set Comment:

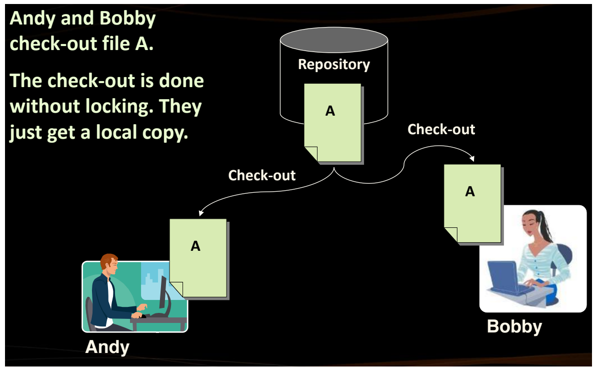
☐ Resolve ☐ Add Checkin Comment

Outline

2. Versioning Models

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

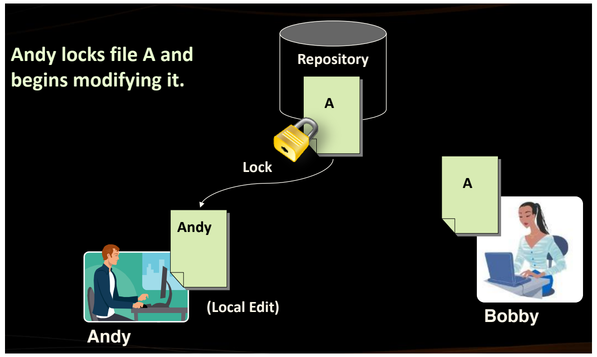
2.1. The Lock-Modify-Unlock Model



Andy and Bobby check-out file A.

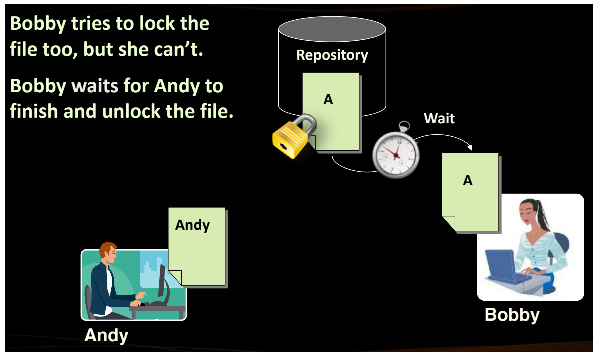
The check-out is done without locking. They just get a local copy.

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



Andy locks file A and begins modifying it.

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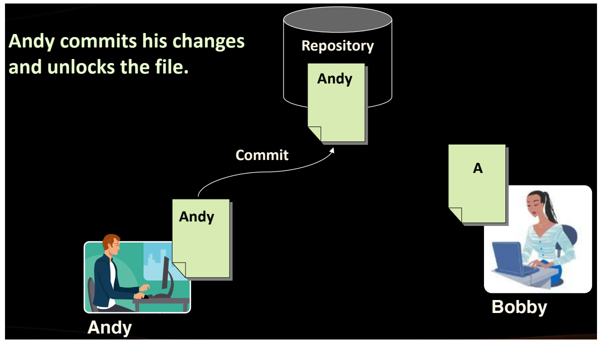
2.1. The Lock-Modify-Unlock Model (4)


Andy commits his changes and unlocks the file.

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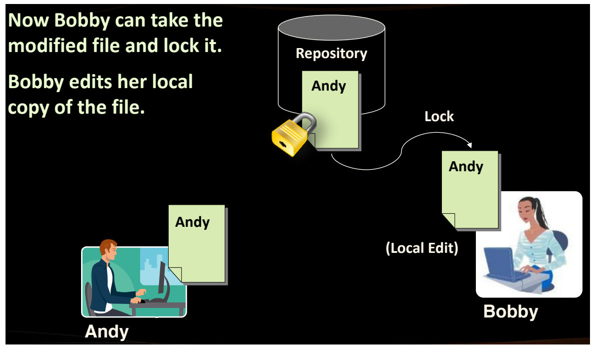
2.1. The Lock-Modify-Unlock Model (5)


Now Bobby can take the modified file and lock it.

Bobby edits her local copy of the file.

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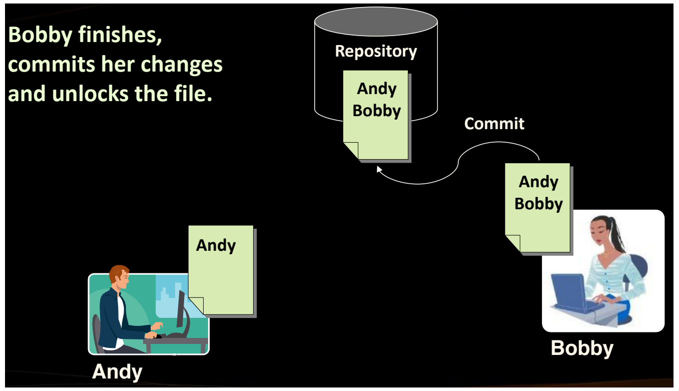
2.1. The Lock-Modify-Unlock Model (6)


Bobby finishes, commits her changes and unlocks the file.

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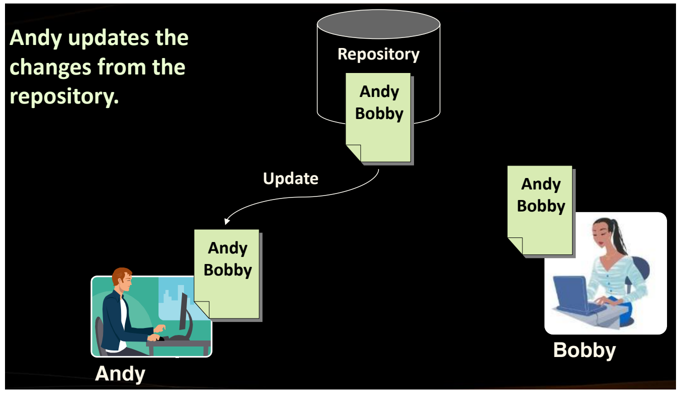
2.1. The Lock-Modify-Unlock Model (7)

Andy updates the changes from the repository.



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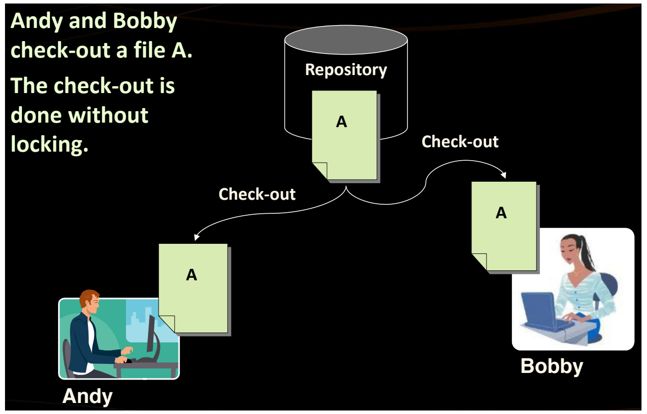
2.2. The Copy-Modify-Merge Model

Andy and Bobby check-out a file A.

The check-out is done without locking.



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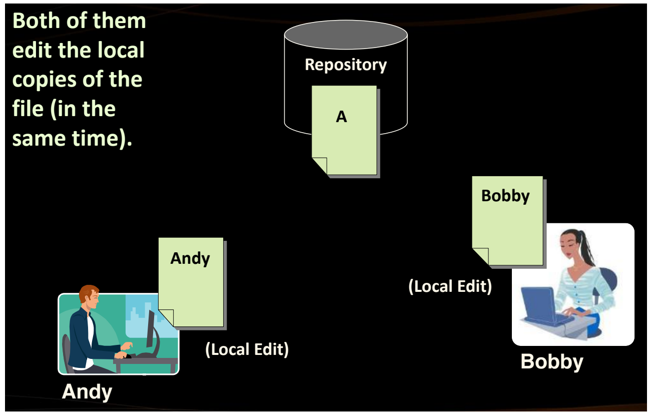
2.2. The Copy-Modify-Merge Model (2)

Both of them edit the local copies of the file (in the same time).



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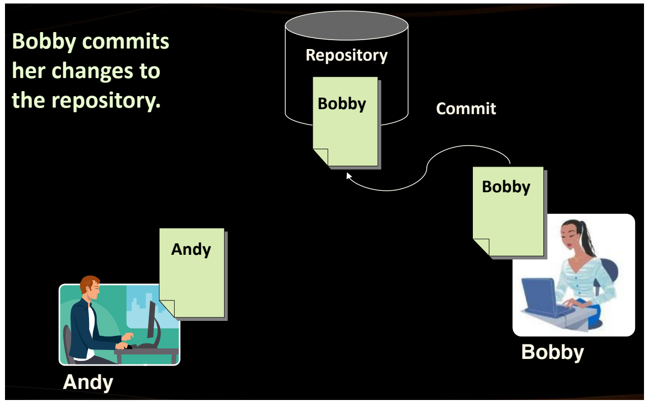
2.2. The Copy-Modify-Merge Model (3)

Bobby commits her changes to the repository.



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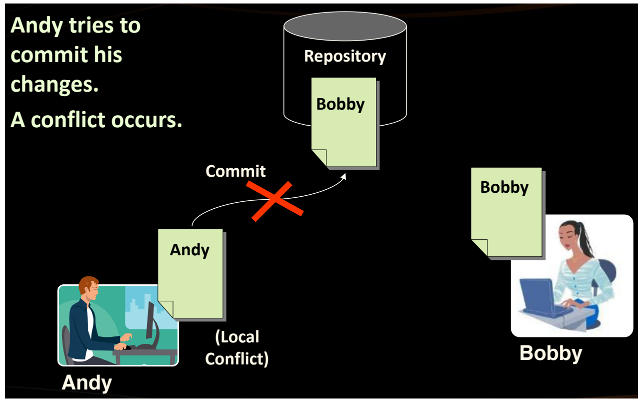
2.2. The Copy-Modify-Merge Model (4)



Andy tries to commit his changes.

A conflict occurs.

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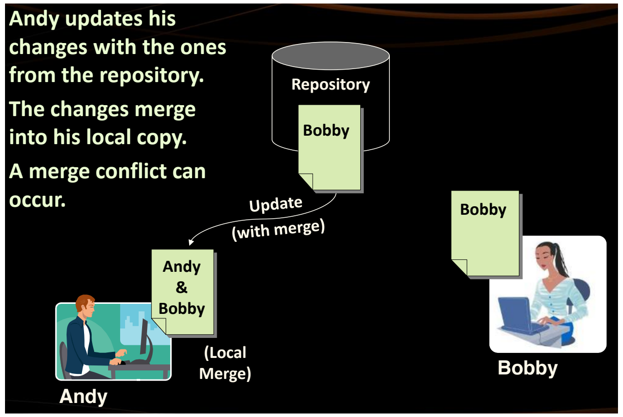
2.2. The Copy-Modify-Merge Model (5)



Andy updates his changes with the ones from the repository.

The changes merge into his local copy.

A merge conflict can occur.

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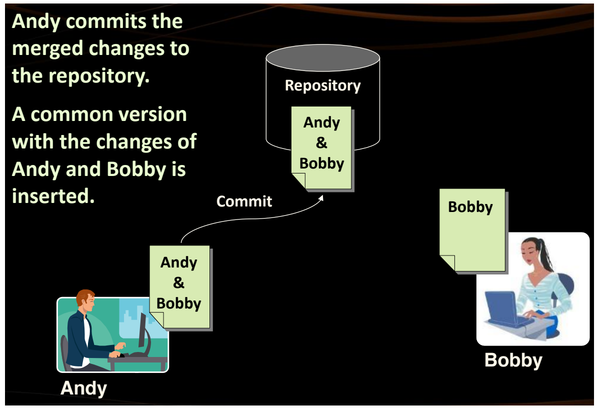
2.2. The Copy-Modify-Merge Model (6)



Andy commits the merged changes to the repository.

A common version with the changes of Andy and Bobby is inserted.

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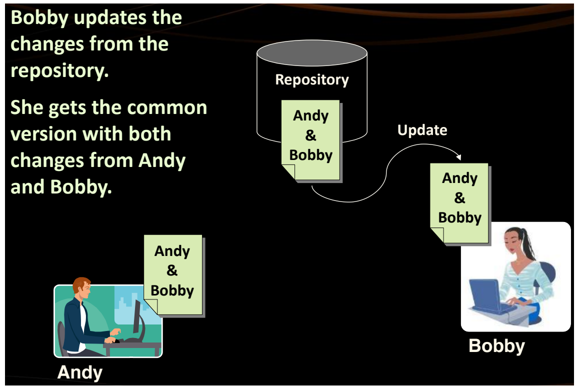
2.2. The Copy-Modify-Merge Model (7)



Bobby updates the changes from the repository.

She gets the common version with both changes from Andy and Bobby.

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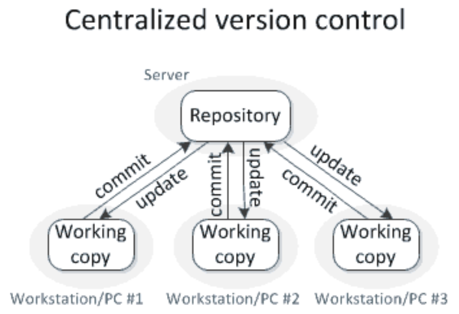
2.3. Distributed version control

- Compared to Central version control
  - Only one repository



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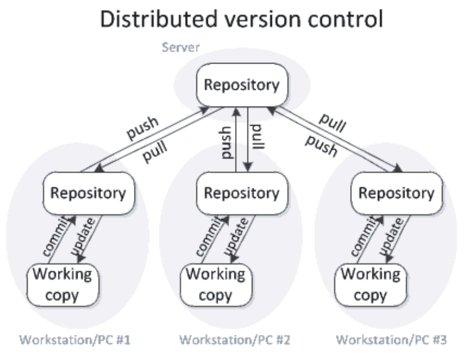
Distributed Version Control



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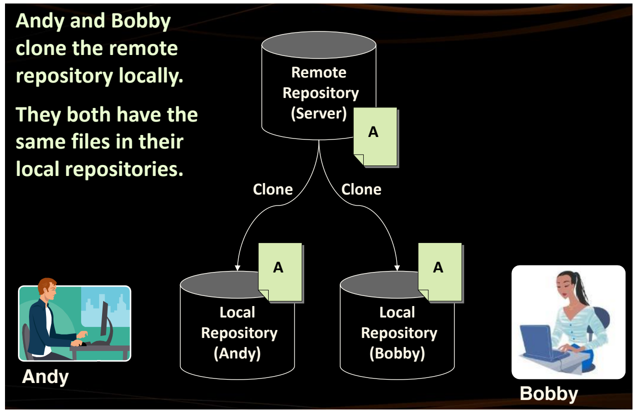
Distributed Version Control (1)



Andy and Bobby clone the remote repository locally.

They both have the same files in their local repositories.

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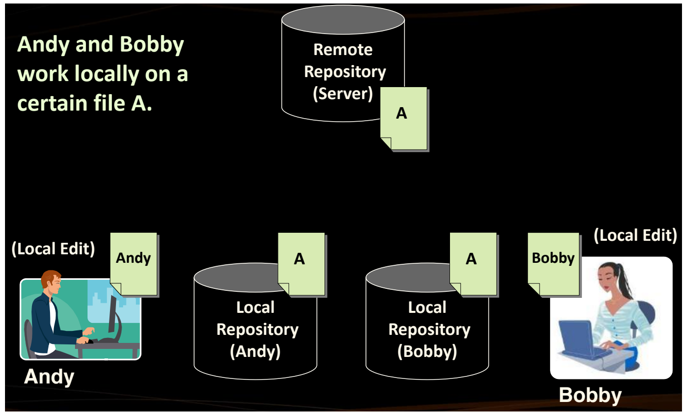
Distributed Version Control (2)



Andy and Bobby work locally on a certain file A.

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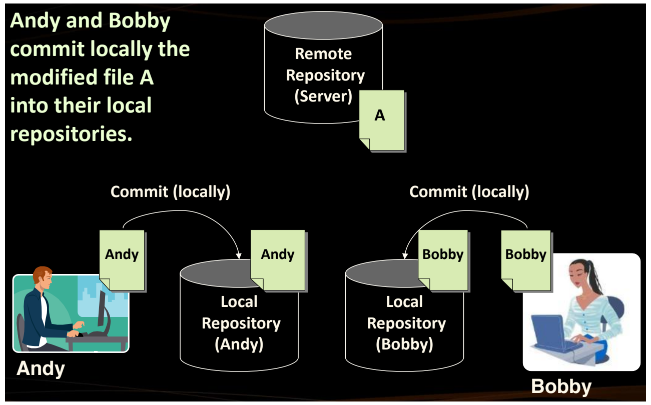
Distributed Version Control (3)


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

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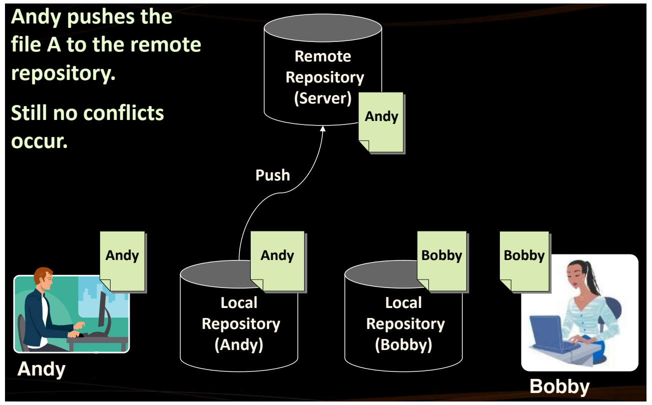
Distributed Version Control (4)


Andy pushes the file A to the remote repository.

Still no conflicts occur.

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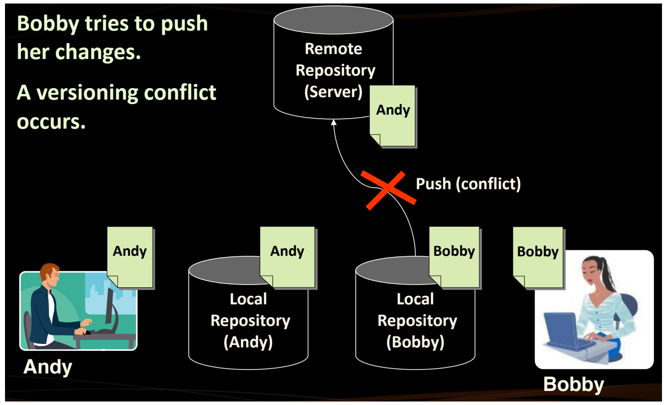
Distributed Version Control (5)


Bobby tries to push her changes.

A versioning conflict occurs.

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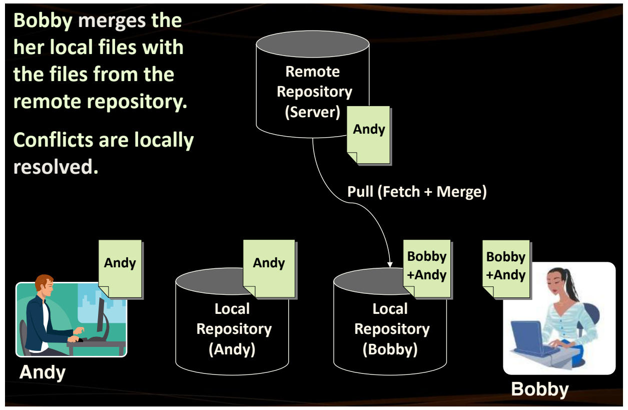
Distributed Version Control (6)


Bobby merges the her local files with the files from the remote repository.

Conflicts are locally resolved.

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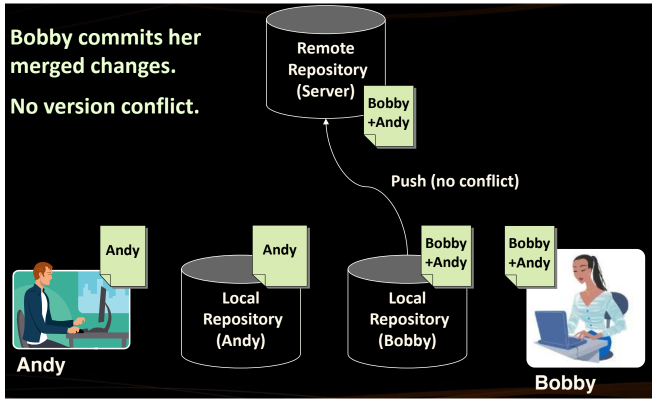
Distributed Version Control (7)



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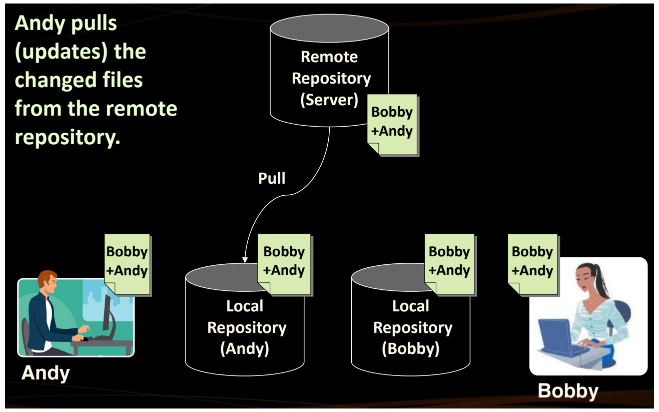
Distributed Version Control (8)



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Outline

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

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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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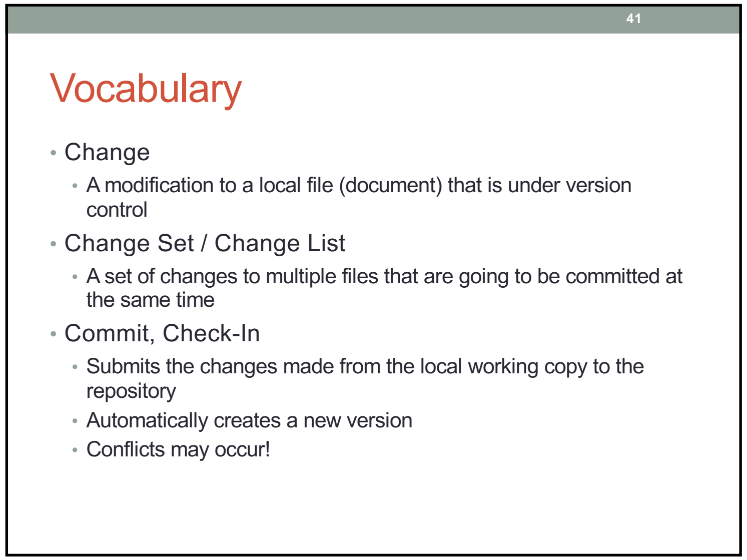

Vocabulary

- 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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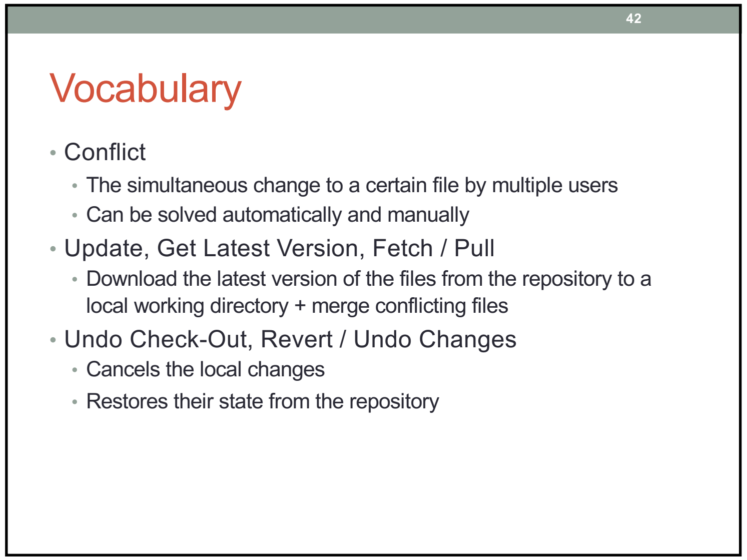

Vocabulary

- 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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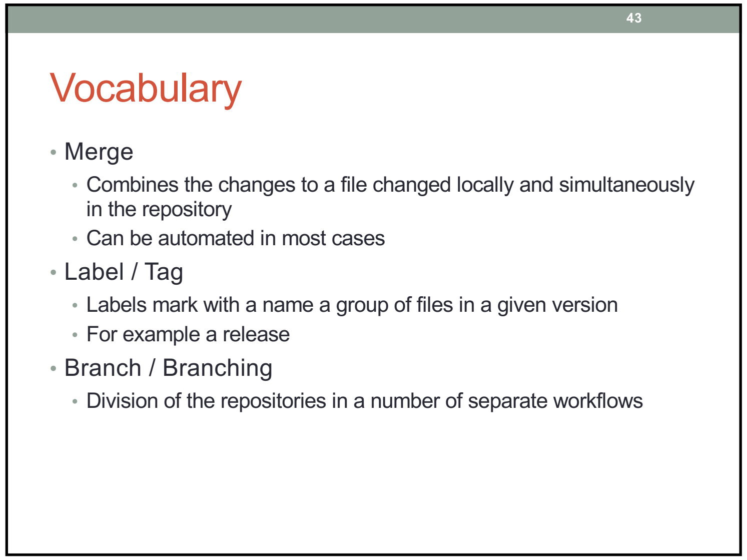

Vocabulary

- 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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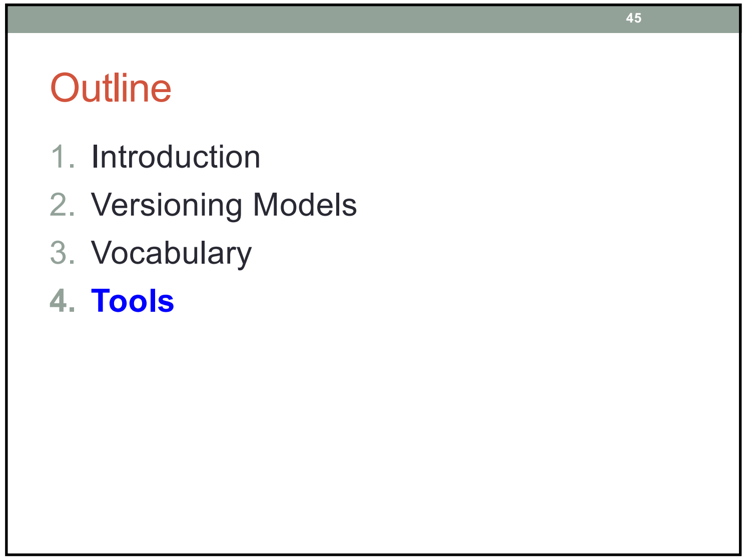

Outline

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

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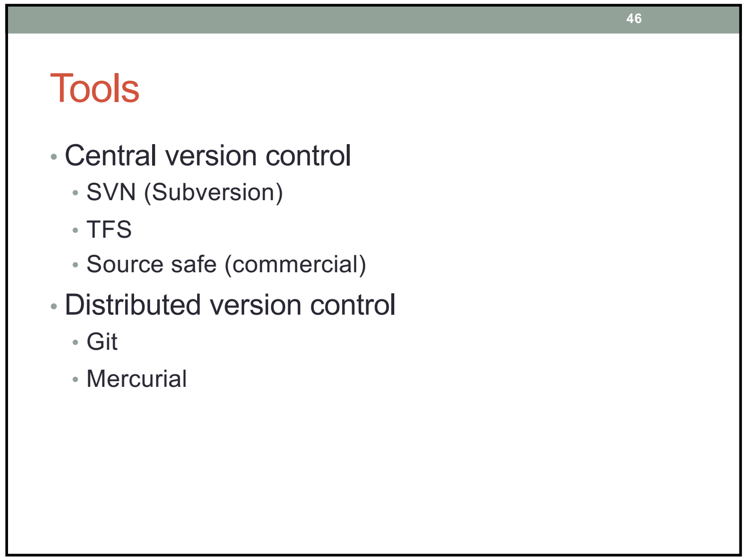
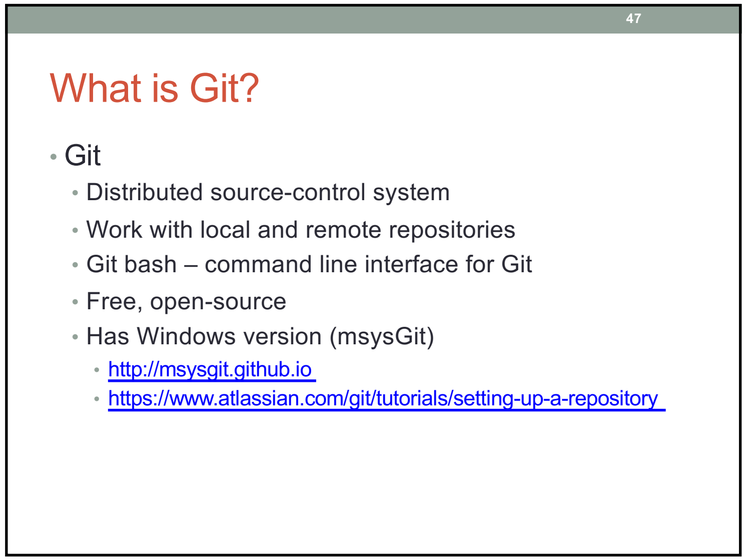


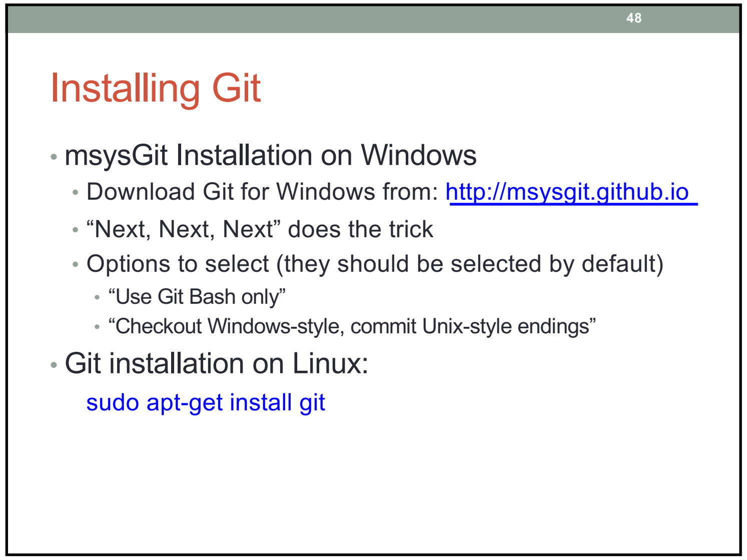
Tools

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



What is Git?

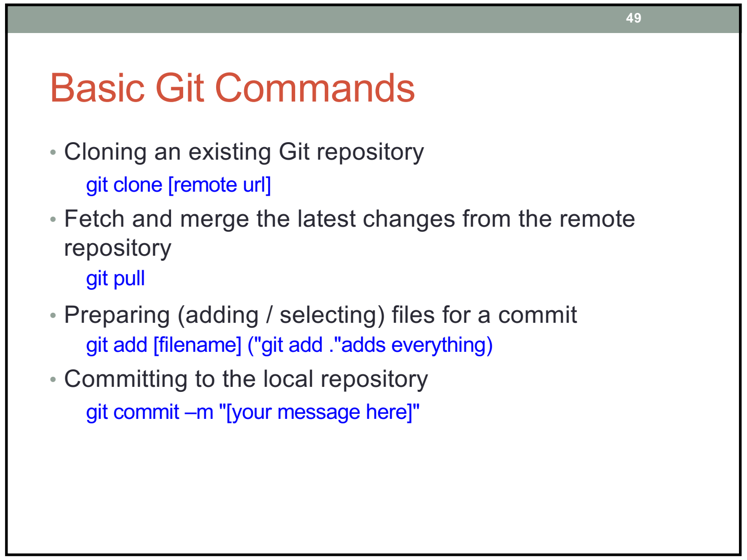
- Git
  - Distributed source-control system
  - Work with local and remote repositories
  - Git bash – command line interface for Git
  - Free, open-source
  - Has Windows version (msysGit)
    - http://msysgit.github.io
    - https://www.atlassian.com/git/tutorials/setting-up-a-repository



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

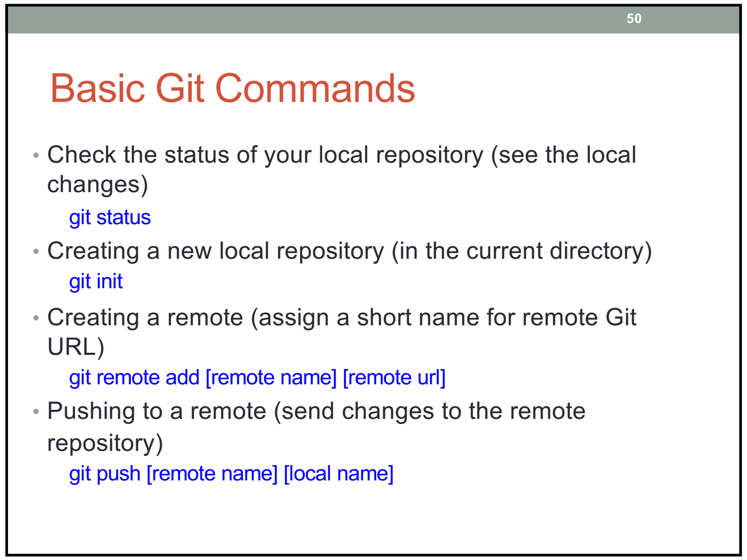
```
git pull
```

- Preparing (adding / selecting) files for a commit

```
git add [filename] ("git add ."adds everything)
```

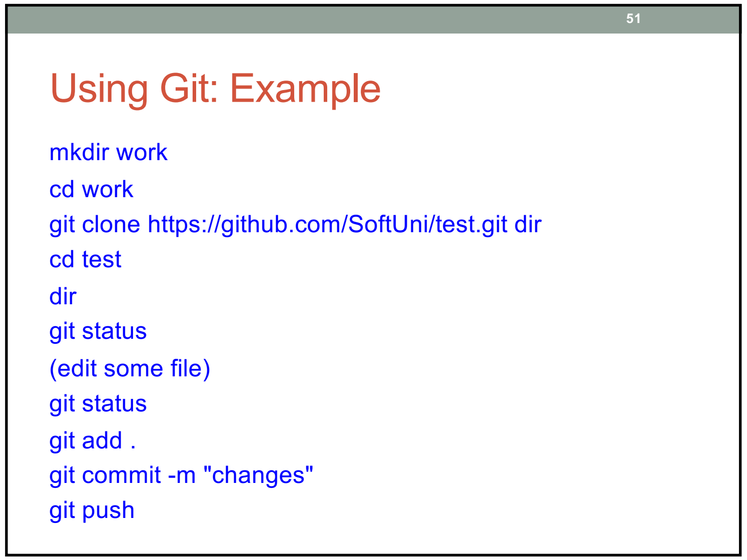
- Committing to the local repository

```
git commit –m "[your message here]"
```



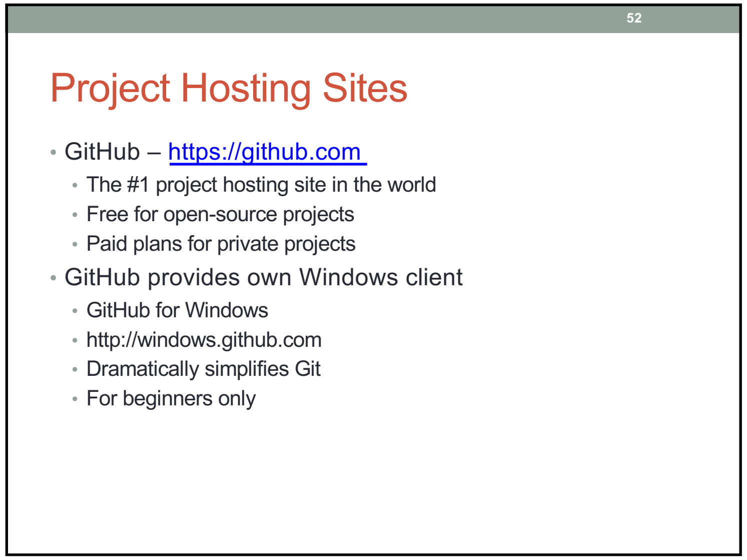
Basic Git Commands

- 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]



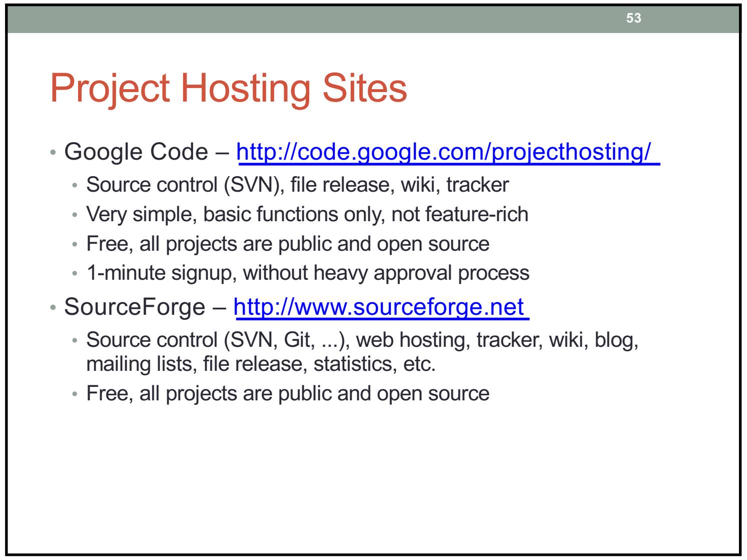
Using Git: Example

```
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
```



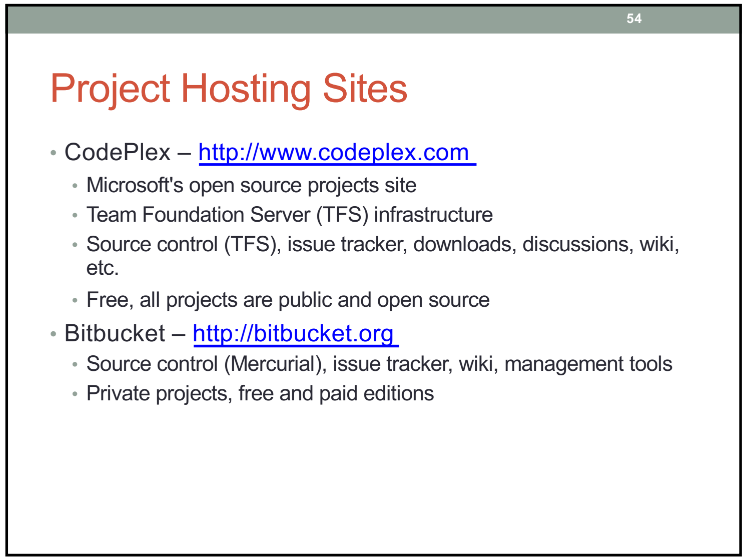
Project Hosting Sites

- 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

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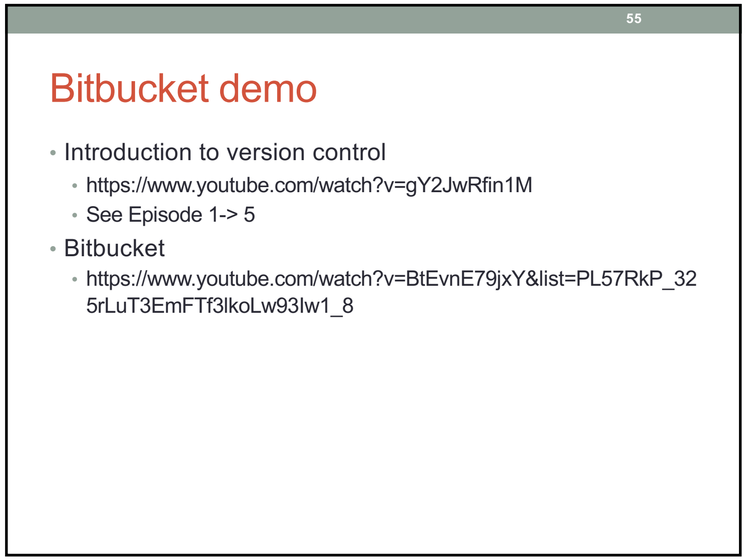

Bitbucket demo

- Introduction to version control
  - https://www.youtube.com/watch?v=gY2JwRfin1M
  - See Episode 1-> 5
- Bitbucket
  - https://www.youtube.com/watch?v=BtEvnE79jxY&list=PL57RkP_325rLuT3EmFTf3lkoLw93lw1_8

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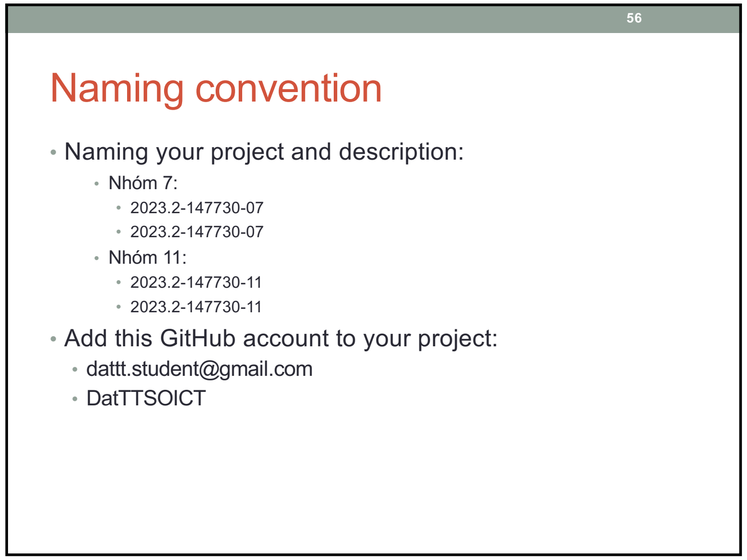

Naming convention

- Naming your project and description:
  - Nhóm 7:
    - 2023.2-147730-07
    - 2023.2-147730-07
  - Nhóm 11:
    - 2023.2-147730-11
    - 2023.2-147730-11
- Add this GitHub account to your project:
  - dattt.student@gmail.com
  - DatTTSOICT

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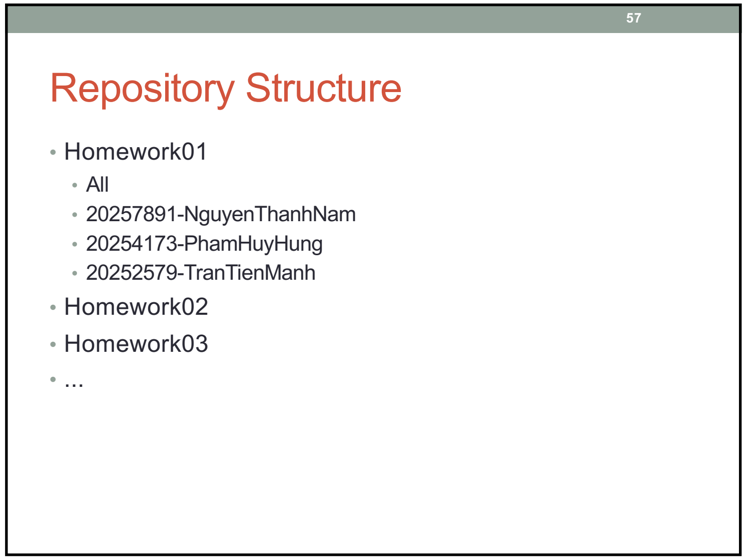

Repository Structure

- Homework01
  - All
  - 20257891-NguyenThanhNam
  - 20254173-PhamHuyHung
  - 20252579-TranTienManh
- Homework02
- Homework03
- ...

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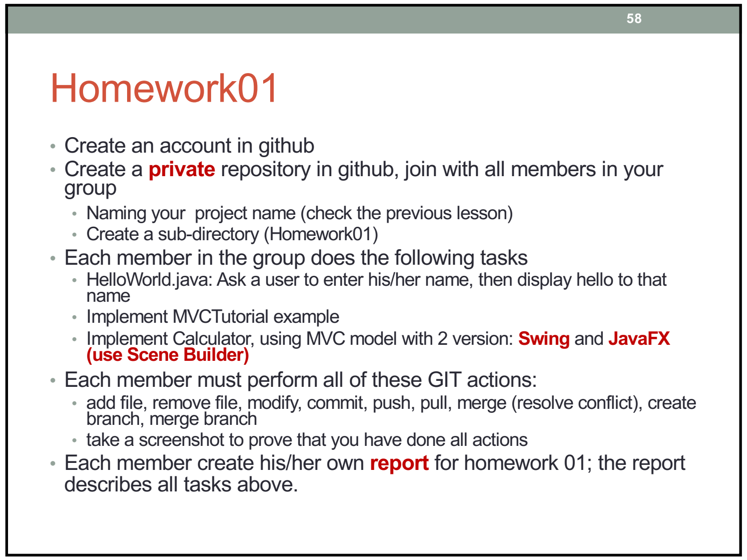

Homework01

- Create an account in github
- Create a **private** repository in github, join with all members in your group
  - Naming your project name (check the previous lesson)
  - Create a sub-directory (Homework01)
- Each member in the group does the following tasks
  - HelloWorld.java: Ask a user to enter his/her name, then display hello to that name
  - Implement MVCTutorial example
  - Implement Calculator, using MVC model with 2 version: **Swing** and **JavaFX (use Scene Builder)**
- Each member must perform all of these GIT actions:
  - add file, remove file, modify, commit, push, pull, merge (resolve conflict), create branch, merge branch
  - take a screenshot to prove that you have done all actions
- Each member create his/her own **report** for homework 01; the report describes all tasks above.

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