

Git for Dr. Wartell's Courses

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1. Prerequisites

This document assumes the reader has the following prerequisite knowledge:

- Basic knowledge of Unix style shell (for a 5 page primer see [1])
- Knowledge of environment variables, what they are and how to set them (see [3])

2. Installing Git and OpenSSH

Git is a command-line program. The BitBucket server uses OpenSSH for secure access and authorization. Therefore a workstation must have OpenSSH as well as the Git command-line program installed. GUI versions of Git are also available. TortoiseGit is the recommended GUI (Microsoft Windows only).

Woodward Labs: Computers in Woodward labs have both the command-line Git, OpenSSH and TortoiseGit installed. If you are working in this lab, you can skip 2.1.1, 2.2 and 2.3, but do 2.1.2 before moving on to Section 3.

Folks working elsewhere need to install Git, OpenSSH and TortoiseGit.

2.1. *Installation and Setup of OpenSSH*

The Git server, BitBucket, uses the SSH public-key mechanism for security and authorization.

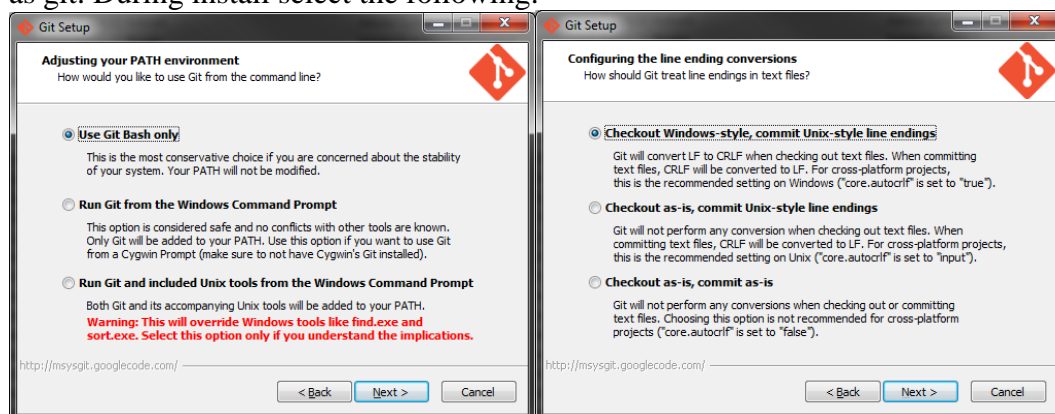
2.1.1. Download and Install OpenSSH

If you are working from a UNCC lab computer that already has Msysgit and Putty installed you can skip this section.

Windows:

1. Download and Install msysgit <http://msysgit.github.io/>.

This installs a minimal Unix style shell (called 'git-bash'), the basic OpenSSH tools as well as git. During install select the following:



(Note: If you are an expert with cygwin tools, you can alternatively install OpenSSH via cygwin setup, but see caveat¹).

2. Download and install PuTTY. Specifically:

- a. Download and Install the Windows installer, putty-x.xx-installer.exe, from <http://www.putty.org/>.
- b. Modify the PATH environment variable (see [3]) to include the path to where PuTTY is installed. Typically this is "C:\Program Files (x86)\PuTTY"
- c. To verify the PATH setting:
 - i. Open a `git-bash` shell via Start Menu→Git→Git Bash
 - ii. In the shell run `plink`:

```
$ plink
PuTTY Link: command-line connection utility
Release 0.63
Usage: plink [options] [user@]host [command]
("host" can also be a PuTTY saved session name)
[...misc additional output will appear...]
```

Linux:

Generally this OS already has OpenSSH installed; if not see <http://www.openssh.org/>.

Mac:

Download and Install OpenSSH: <http://www.openssh.org/>

2.1.2. Create an SSH private and public key

This section applies to **all** operating systems

If you are already familiar with SSH private and public keys and you already have a public SSH key that you use regularly, then skip to step 4, but still do Section 2.1.3 if you are using Windows.

Key creation has to be done only once. Afterwards, you can re-use your private key file for authorized access to BitBucket Git server from multiple computers.

The instructions below are fairly generic to any Unix like shell [1].

1. Open a shell prompt

Windows: Run: Start => All Programs => Git => Git Bash

¹ ZJW: Circa August 2013, cygwin git doesn't play nicely with TortoiseGit (see 8.1). A possible solution is `ssh-pageant`.

Linux/Mac: open a terminal window

Check for SSH Keys

```
$ cd ~/.ssh  
$ ls  
[This is list files in your .ssh directory]
```

Check the directory listing for a file named `id_rsa.pub`. This file should *not* exist, unless you must have previously created a public/private key pair. If you already created one, goto step 4. Otherwise proceed with step 3.

3. Generate a new SSH Key

```
$ ssh-keygen -t rsa -C "your_email@uncc.edu" [You must use you UNCC email]  
Generating public/private rsa key pair.  
Enter file in which to save the key (/home/Zachary/.ssh/id_rsa): [Press Enter]
```

Now you need to enter a passphrase. Enter one and write it down in a safe place. When using Git, you will have to enter this each time you login to your computer.

```
Enter passphrase (empty for no passphrase): [Type a passphrase]  
Enter same passphrase again: [Type the passphrase again]
```

You will see output similar to this:

```
Your identification has been saved in id_rsa.  
Your public key has been saved in id_rsa.pub.  
The key fingerprint is:  
60:4d:47:66:9e:98:d7:26:1d:de:b0:9a:d3:30:3d:00 your_email@uncc.edu  
[...additional output maybe displayed...]
```

This creates two files a private key file `id_rsa` and a public key file `id_rsa.pub`. The private key file must be kept in a secure directory and must be available on any computer from which you plan to access BitBucket.

Securing Your Private Key:

Best practices for private key management are that you never store the private key on a public computer or in shared home directories (H: drive, etc.). Rather you store them on your personal computer(s) and on a USB device used solely as a SSH key backup device. A reasonable way to transfer the private key to another personal computer is using a USB device.

If you intend to use Git on multiple, different public or shared computers on campus, keeping the private key on a USB stick or drive that you regularly carry is a reasonable compromise. (If you are *certain* you will never use this key again outside of one particular course, it's

acceptable to store it on your H: drive since the course TA will disable your Git account at the end of the semester.)

4. Submit Your Public Key

a. If using git-viscenter:

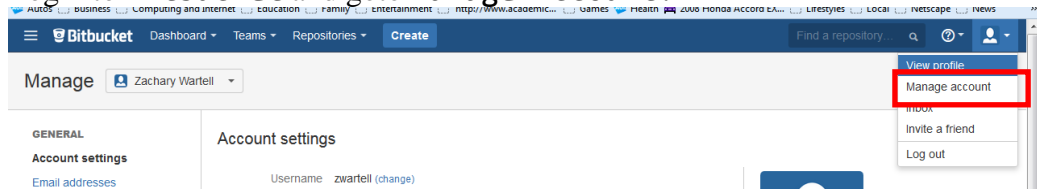
The file you submit *must* be renamed from `id_rsa.pub` to `your_uncc_id.pub` where your standard UNCC email is `your_uncc_id@uncc.edu`.

You submit your `your_uncc_id.pub` file via a Moodle assignment indicated by your instructor.

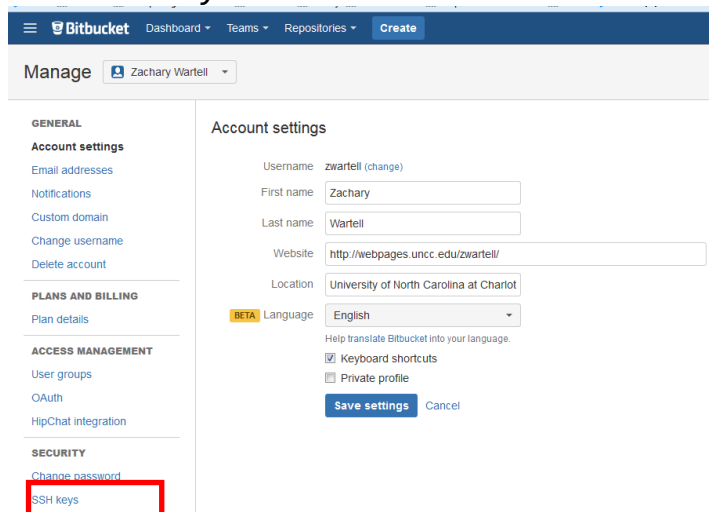
b. If using Bitbucket:

i. Create a Bitbucket account as described in Section 5.2 *Bitbucket* Repository URL.

ii. Login to Bitbucket and goto Manage Account:



iii. Select SSH keys:



iv. Follow the Bitbucket's instructions to Add key

5. For Windows you also need to also perform the next section, 2.1.3 Windows – Create PuTTY Private Key.

2.1.3. Windows – Create PuTTY Private Key

This section is for Windows only where PuTTY usage is required.

After:

- installing PuTTY (Section 2.1.1, Step #2)
- and after following the general key generation instructions in 2.1.2 Create an SSH private and public key

the following is required to generate PuTTY compatible version of you private key.

1. Run PuTTYgen:

General: Start Menu→Putty→PuTTYgen

1. Select MenuBar→Conversions and then Import Key on the drop-down menu.
This pop's up dialog: Load Private Key.
2. In Load Private Key find the private key file you created in Section 2.1.2 and open it.
You will be prompted for your passphrase.
3. In the PuTTY Key Generator window select Save Private Key.
 - a. Save the key to a file named `id_rsa.ppk` in the same directory as where you stored your standard private key file.

You should keep the PuTTY private key and the standard private key safe as described in Section 2.1.2.

2.2. Installation and Setup of Git

Windows: If you did not download and install msysgit to install OpenSSH in the previous section then do so now to install Git (<http://msysgit.github.io/>).

(Note: If you and only if are an **expert** with Cygwin tools, you can install git using cygwin setup).

Linux: Download and install Git as described at <http://git-scm.com/>.

Mac: Download and Install Git: <http://git-scm.com/>

2.3. Installation and Setup of TortoiseGit

If you are working from a UNCC computer that already has TortoiseGit installed you can skip this section.

Windows:

Download and install TortoiseGit from <https://code.google.com/p/tortoisegit/>.

Mac/Linux:

TortoiseGit is Windows only. Other GUIs are found here <http://git-scm.com/downloads/guis>

3. Full Git Tutorial

Read the following chapters from the ProGit book by Scott Chacon available on-line [2]. Do the exercises in the outline below. You can perform 99% of the exercises even without access to the BitBucket server, but to complete exercises you must submit (`git push`) the final results to BitBucket (Step 4).

Anywhere below that says Exercise: you should actually do what the book instructs and save your work which you will submit with a final `git push`.

1. Create `git-tutorial` directory

- a. Open a shell prompt as described earlier (see Section 1, Step #1)
- b. Create a directory called 'git-tutorial' for performing and saving the exercises.

```
$ cd path_to_a_directory_where_you_can_save_your_work
$ mkdir git-tutorial
$ cd git-tutorial
```

2. ProGit - Chapter 1:

- a. Read 1.1 – 1.3
- b. Skip 1.4 (this was covered in 2 Installing Git and OpenSSH).
- c. Read 1.5 and do all the exercises with command-line git, but with the following substitutions:
 - i. Exercise: “[Your Editor](#)”
Note: use whatever simple editor you prefer (notepad.exe perhaps)
 - ii. Exercise: “[Your Diff Tool](#)”
Note: replace vimdiff with TortoiseMerge.exe
- d. Read 1.6, 1.7

3. ProGit - Chapter 2:

- a. Read 2.1:
 - i. From the class website download `HelloWorld.tar.gz` to `git-tutorial` and uncompress it.

```
$ tar -xf HelloWorld.tar.gz
$ ls -R
.:
HelloWorld HelloWorld.tar.gz

./HelloWorld:
HelloWorld.sln HelloWorld.vcxproj
HelloWorld.vcxproj.filters HelloWorld.vcxproj.user
main.c README
$ cd HelloWorld
```

- ii. Exercise: “[Initializing a Repository in an Existing Directory](#)”
Perform the instructions inside the directory `HelloWorld`. This will add the provided files to a new local repo. Go ahead and `git add` all the provided files to this repo.

- iii. Exercise: [“Cloning an Existing Repository”](#)

Return to your **git-tutorial** directory:

```
$ cd ..
```

Perform the book’s exercises. This will create various clones of the remote repo mentioned in the book.

- b. Read 2.2:

- i. From the class website, download `ProGit_Chapter_2_2.tar.gz` to your `git-tutorial` directory and uncompress it. Perform the exercises from this chapter in that directory:

```
$ cd git-tutorial
$ tar -xf ProGit_Chapter_2_2.tar.gz
$ cd ProGit_Chapter_2_2
```

- ii. Exercise: [“Checking the Status of Your Files”](#)

Notes: Use whatever text file editor you are familiar with instead of vim for the “\$ vim README” examples in the ProGit chapter.

- iii. Exercise: [Tracking New Files](#)

- iv. TortoiseGit Exercise:

Open an Explorer window and goto the `ProGit_Chapter_2_2` directory. Right-click to see the TortoiseGit shell extension commands. Test and explore the following TortoiseGit operations from the menu: Show Log, Check for Modifications, Repo-Browser and Diff, Diff with previous and Help.

TortoiseGit Help “Chapter 3. Daily Use Guide” discusses TortoiseGit (the earlier TortoiseGit Help chapters are largely redundant with the ProGit book)

- v. Exercise: [Staging Modified Files](#)
- vi. Exercise: [Ignoring Files](#)
- vii. Exercise: [Viewing Your Staged and Unstaged Changes](#)

Note: When the book discusses making changes to various files, just make any small change to each file.

- viii. Exercise: [Committing Your Changes](#)
- ix. Exercise: [Skipping the Staging Area](#)
- x. Exercise: [Removing Files](#)
- xi. Exercise: [Moving Files](#)

- c. Read 2.3

- i. Exercise: Viewing the Commit History

Do the first two exercises cloning `simplegit` into `git-tutorial/simplegit`. Stop at the example “\$ git log -p -2” and skip to the next sub-section.

ii. Exercise: [Using a GUI to Visualize History](#)

Do this exercise. `gitk` is generally less powerful than TortoiseGit but it worth knowing that `gitk` is available on nearly all OS's.

4. **git-push your git-tutorial**

This step can only be done after you submitted your public key (Section 2.1.2, Step #4 of this document to the BitBucket server).

- a. Read Section 5 in this document.
- b. Perform Section 5.3.1 or 5.3.2 as appropriate. Then use the shell you opened to perform the following.
- c. Compress `git-tutorial`

```
$ cd parent_directory_of_git-tutorial
$ tar -zcf git-tutorial.tar.gz git-tutorial
[This compresses the directory to a .tar.gz file]
$ tar -tf git-tutorial.tar.gz
[This will just list the .tar.gz file contents to verify them]
```

Note, in real world git usage you would **never** create a `.tar.gz` file. But to simplify the TA's grading of this tutorial, we put all the tutorial files (local git repo's) into one `.gz` file and then you submit the single `.gz` file to a proper remote repo on BitBucket.

- d. Create a new remote repo for submission:

[git-viscenter]

```
$ git clone git-viscenter@cci-
subv.uncc.edu:wartell/ITCS_XXXX/students/John_Doe/git-full-tutorial
Cloning into 'git-full-tutorial'...
Initialized empty Git repository in /home/git-
viscenter/repositories/wartell/ITCS_4120/students/John_Doe/git-micro-tutorial.git/
warning: You appear to have cloned an empty repository
[ ... your output will differ slightly..]
$ rm -rf git-full-tutorial
[yes, this is a bit silly, but to simplify common instructions with Bitbucket delete
the local repo now]
```

[Bitbucket] Create new remote repo on Bitbucket called:
git-full-tutorial

Review 5.2 *Bitbucket* Repository URL and see Section 5.3.3 Git Operations repo creation instructions. Make sure to **share** it with the TA and Dr. Wartell's Bitbucket accounts.

- e. Create local repo and link to the new remote repo:

```
$ mkdir git-full-tutorial
$ cd git-full-tutorial
$ git init
Initialized empty Git repository in git-micro-tutorial/.git/
$ git remote add origin git@bitbucket.org:/your_uid git-full-tutorial.git
Cloning into 'git-micro-tutorial'...
Initialized empty Git repository in /home/git-
viscenter/repositories/wartell/ITCS_4120/students/John_Doe/git-micro-tutorial.git/
warning: You appear to have cloned an empty repository
[ ... your output will differ slightly..]
```

- f. Copy to `git-tutorial.tar.gz` to the new local repo directory.

```
$ mv ../git-tutorial.tar.gz git-full-tutorial
```

- g. add, commit and push to the BitBucket remote repo.

```
$ git add .
$ git commit -a -m "-submitted git-full-tutorial assignment"
$ git push -u origin master
```

- h. Verify your BitBucket remote repository. (See below, Section 6.3 Verify Your Remote Repository).

4. Micro Git Tutorial

This section is only for students who are **granted permission** to skip Section 3 Full Git Tutorial. This tutorial just verifies that you have full read/write access to your BitBucket remote repository.

This section can only be done after you submit to the TA your public key (Section 2.1.2, Step #4 of this document) and after you have received confirmation that your key is installed on BitBucket.

1. Start git and an ssh-agent:
 - a. Read Section 5 in this document.
 - b. Perform Section 5.3.1 or 5.3.2 (of this document) as appropriate. Use the shell you opened to perform remaining steps.

2. Create a new remote repo:

[git-viscenter]

```
$ git clone git-viscenter@cci-
subv.uncc.edu:wartell/ITCS_XXXX/students/John_Doe/git-micro-tutorial
Cloning into 'git-micro-tutorial'...
Initialized empty Git repository in /home/git-
viscenter/repositories/wartell/ITCS_4120/students/John_Doe/git-micro-tutorial.git/
warning: You appear to have cloned an empty repository
$ rm -rf git-micro-tutorial
```

[**Bitbucket**] Create new remote repo on Bitbucket called:
`git-micro-tutorial`

Review 5.2 *Bitbucket* Repository URL and see Section 5.3.3 Git Operations remote repo creation instructions Item #3. Make sure to share it with the TA and Dr. Wartell's Bitbucket accounts.

3. Create local repo and link to the new remote repo:

```
$ mkdir git-micro-tutorial
$ cd git-micro-tutorial
$ git init
Initialized empty Git repository in git-micro-tutorial/.git/
$ git remote add origin git@bitbucket.org:/your_uidgit-micro-tutorial.git
Cloning into 'git-micro-tutorial'...
Initialized empty Git repository in /home/git-
viscenter/repositories/wartell/ITCS_4120/students/John_Doe/git-micro-tutorial.git/
warning: You appear to have cloned an empty repository
[ ... your output will differ slightly..]
```

4. Create a new file:

```
$ cd git-micro-tutorial
$ echo Hello > Test.txt
```

5. add, commit and push to the BitBucket remote repo.

```
$ git add .
$ git commit -a -m "-submitted git-micro-tutorial assignment"
$ git push -u origin master
```

6. Verify your BitBucket remote repository. (See below, Section 6.3 Verify Your Remote Repository).

5. Git Server Access

5.1. `git-viscenter` Repository URL

This section is only for using `git-viscenter@cci-subv.uncc.edu`.

Each student (and/or team) in class has already had a repository directory created for them. The URL of a student's Git repository directory is as follows.

Assume your UNCC email address is:

johndoe@uncc.edu

and your first and last name as it appears in the UNCC BANNER system is:

John Doe

Then your Git username is johndoe and your course Git repository URL is:

```
git-viscenter@cci-subv.uncc.edu:wartell/ITCS XXXX/students/John_Doe
```

Throughout this document, the text ITCS XXXX would be replaced by appropriate string for the class you are taking. This will be given to you in class.

Note, if your UNCC BANNER name contains an initial, the initial is removed when creating the directory name of your course Git repository URL. If your UNCC BANNER first or last name contains multiple words, the spaces are removed from between the multiple words in your first or last name when creating the directory name. For example, if your UNCC BANNER name is:

Smith, Jim B.

Then your SVN repository URL is:

```
.../students/Jim_Smith
```

If your UNCC BANNER name is:

Van Winkle, Jim Bob

Then your Git repository URL is:

```
.../students/JimBob_VanWinkle
```

For team projects, all members of the team will be given access to a team directory with a name like:

```
git-viscenter@cci-subv.uncc.edu:wartell/ITCS XXXX/students/TeamName
```

Only the Professor and TA can adjust access permissions for repo's in **git-viscenter**.

5.2. Bitbucket *Repository URL*

This section is only for using Bitbucket
--

1. Each team member: Create an academic account for yourself on <https://bitbucket.org/> (If you do not already have one, of course).
 - a. <https://bitbucket.org/account/signup/>
 - b. Details on their Academic Account Policy are at this [Link](#). It is much better than the non-academic account!
2. One team member should create a Private Repository for your Project then share that repo with:
 - a. all other team members
 - b. Dr. Wartell (Bitbucket UserID: zwartell) and TA's Bitbucket UserID:
3. Instructions for setting access permission ("sharing") your Bitbucket repo are found the Bitbucket Website and briefly reviewed in Section 5.3.3 Git Operations, Item #3.

Note, you will access Bitbucket using the ssh protocol. This means the Bitbucket URL you should use will be something like:

```
git@bitbucket.org:your_userid/your_reponame.git
```

The course repo's and material will be found at URL's such as:

```
git@bitbucket.org:zwartell/reponame.git
```

5.3. Accessing Git Server Using SSH Keys

These section's steps only work after you submit you public key to BitBucket.

This section covers:

1. Starting and logging into an `ssh-agent` daemon in a command-line.
(Mac/Linux 5.3.1; Windows 5.3.2.)
2. Example Git operations using the BitBucket server

5.3.1. Linux/Mac - Starting the ssh-agent daemon

These steps much be done each time you login into a computer if you want to access BitBucket. They start the `ssh-agent` daemon process which manages Git's authentication to BitBucket.

These steps will only work after you submit you public key to the TA and he has confirmed that it has been added to the Git server.

1. Start your command-line shell

2. Start the `ssh-agent` daemon process

```
$ ssh-agent bash --login
```

This starts a `ssh-agent` daemon and a new bash shell that is setup to communicate with the `ssh-agent` daemon.

3. Load your private key into the `ssh-agent` daemon.

```
$ ssh-add .ssh/id_rsa
Enter passphrase for h:My Documents/cygwin_home/.ssh/id_rsa.uncc: [Enter
Password]
Identity added: ~/.ssh/ id_rsa ([...misc output...])
```

4. To verify `ssh-agent` access:

[git-viscenter]

```
$ ssh git-viscenter@cci-subv.uncc.edu
The authenticity of host 'cci-subv.uncc.edu' (10.18.203.162)' can't be
established.
RSA key fingerprint is e2:6f:ac:ff:a3:30:a2:0e:c2:d6:98:f4:78:55:c5:7f.
Are you sure you want to continue connecting (yes/no)? [type yes]
Warning: Permanently added 'cci-subv.uncc.edu,10.18.2013.162' (RSA) to
the list of known hosts.
[...the above will appear the first time you connect to
the git-viscenter ...]

hello johndoe, this is git-viscenter@cci-subv running gitolite3 v3.5.2-
3-g2515992 on git 1.7.5

R W    Repository_Usage
R W    sandbox
R W    wartell/ITCS_XXXX/John.Doe
R      wartell/ITCS_XXXX/public
[...other output may appear as well...]
Connection to cci-subv.uncc.edu closed.
```

This

lists the repositories you have access to.

Possible Errors: If you are prompted for a password here, your public key has not been registered yet.

[bitbucket]

```
$ ssh git@bitbucket.org:zwartell/welcome.git
Using username "git".
Server refused to allocate pty
logged in as zwartell.
[zwartell will be your bitbucket id]
You can use git or hg to connect to Bitbucket. Shell access is disabled.
```

The

above verifies your `ssh-agent` is successfully passing your key through `ssh` to Bitbucket.

5. To verify read-access to the `welcome` repo:

```
$ git clone git@bitbucket.org:zwartell/welcome.git
The authenticity of host 'cci-subv.uncc.edu' (10.18.203.162) can't be
established.
RSA key fingerprint is e2:6f:ac:ff:a3:30:a2:0e:c2:d6:98:f4:78:55:c5:7f.
Are you sure you want to continue connecting (yes/no)? [type yes]
Warning: Permanently added 'cci-subv.uncc.edu,10.18.203.162' (RSA) to
the list of known hosts.
[...the above will only appear the first time you
connect to the git-viscenter ...]
Cloning into 'welcome'...
remote: Counting objects: 6, done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 6 (delta 0), reused 0 (delta 0)
Receiving objects: 100% (6/6), 5.50 KiB | 0 bytes/s, done.
```

Possible Errors: If you are prompted for a password here, either the `ssh-agent` daemon is not setup right or your public key has not been registered yet.

5.3.2. Windows - Starting the `ssh-agent` daemon

When you login into a computer from which want to connect to BitBucket, you must perform these steps once. The steps start the `ssh-agent` daemon which manages Git's authentication to BitBucket.

These steps will only work after you submit your public key to BitBucket.

These instructions allow both TortoiseGit and command-line Git to use the same `ssh-agent` daemon.

Start Pageant

1. Run Pageant:
General: Start Menu→Putty→Pageant
This will create a Pageant system tray icon.
2. On the Pageant system tray icon, right-click and select Add Keys from the menu. This will open a dialog box.
3. Using the dialog, open your `id_rsa.ppk` file. You will be prompted for your passphrase.

This starts PuTTY's version of the `ssh-agent` daemon. The `ssh-agent` will continue to run until you log off your computer.

Start and Use the Command-Line Shell

4. Start the Git-Bash shell: **Start Menu→Git→Git-Bash**
5. To tell **git** to use the ssh client compatible with TortoiseGit type the following:

General:

```
$ export GIT_SSH=plink.exe
```

Optionally to avoid the requirement of setting the GIT_SSH variable each time you run Git-Bash, add the above line to the .bash_profile file (see Appendix 8.2).

6. To verify the Pagent **ssh-agent** daemon is working:

[git-viscenter]

```
$ plink git-viscenter@cci-subv.uncc.edu info
The authenticity of host 'cci-subv.uncc.edu' (10.18.203.162)' can't be
established.
RSA key fingerprint is e2:6f:ac:ff:a3:30:a2:0e:c2:d6:98:f4:78:55:c5:7f.
Are you sure you want to continue connecting (yes/no)? [type yes]
Warning: Permanently added 'cci-subv.uncc.edu,10.18.2013.162' (RSA) to
the list of known hosts.
[...the above will only appear the first time you
connect to the git-viscenter ...]

hello johndoe, this is git-viscenter@cci-subv running gitolite3 v3.5.2-
3-g2515992 on git 1.7.5

R W    Repository_Usage
R W    sandbox
R W    wartell/ITCS_XXXX/John_Doe
R      wartell/ITCS_XXXX/public
[...other output may appear as well...]
Connection to cci-subv.uncc.edu closed.
```

This

lists the repositories you have access to.

Possible Errors: If you are prompted for a password here, either the **ssh-agent** daemon is not setup right or your public key has not been registered yet.

[bitbucket]


```
$ plink git@bitbucket.org:zwartell/welcome.git
Using username "git".
Server refused to allocate pty
logged in as zwartell.
[zwartell will be your bitbucket id]
You can use git or hg to connect to Bitbucket. Shell access is disabled.
```

The above verifies your `ssh-agent` is successfully passing your key through `ssh` to Bitbucket.

7. To verify read-access to the `welcome` repo:

```
$ git clone git@bitbucket.org:zwartell/welcome.git
The authenticity of host 'cci-subv.uncc.edu' (10.18.203.162) can't be
established.
RSA key fingerprint is e2:6f:ac:ff:a3:30:a2:0e:c2:d6:98:f4:78:55:c5:7f.
Are you sure you want to continue connecting (yes/no)? [type yes]
Warning: Permanently added 'cci-subv.uncc.edu,10.18.203.162' (RSA) to
the list of known hosts.
[...the above will only appear the first time you
connect to the git-viscenter ...]
Cloning into 'welcome'...
remote: Counting objects: 6, done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 6 (delta 0), reused 0 (delta 0)
Receiving objects: 100% (6/6), 5.50 KiB | 0 bytes/s, done.
```

Possible Errors: If you are prompted for a password here, either the `ssh-agent` daemon is not setup right or your public key has not been registered yet.

5.3.3. Git Operations

This section assumes you already open a command-line shell and started your `ssh-agent` daemon (Section 5.3.1 or 5.3.2). This section describes several operations referenced in the tutorial sections of this document.

Basic Git Operations

1. To clone one of your already existing repositories:

```
$ git clone git@bitbucket.org:/your_uidRepoName.git
Cloning into 'RepoName'...
remote: Counting objects: 13, done.
remote: Compressing objects: 100% (13/13), done.
remote: Total 13 (delta 6), reused 0 (delta 0)
Receiving objects: 100% (13/13), 347.17 KiB | 0 bytes/s, done.
Resolving deltas: 100% (6/6), done.
```

2. [`git-viscenter`] To create a new repository:

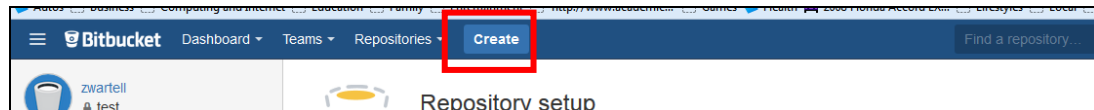
```
$ git clone git-viscenter@cci-subv.uncc.edu:wartell/.....NewRepoName
Cloning into 'NewRepoName'...
Initialized empty Git repository in /home/git-viscenter/repositories/wartell/
ITCS_XXXX/students/John_Doe/NewRepoName.git
warning: You appear to have cloned an empty repository
[ ... your output will differ slightly..]
```

The above works as long as you were give “Create” permissions under the indicated

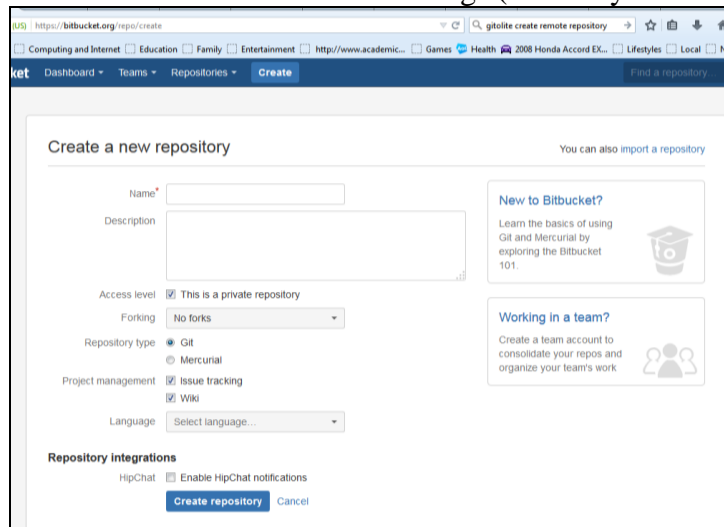
git-viscenter uses the gitolite server which has a special feature that creates a remote repo if it does not already exist when you attempt to clone it. git-viscenter access permissions are managed by the TA and generally already set-up for the course.

3. [Bitbucket] To create a new empty, remote repository:

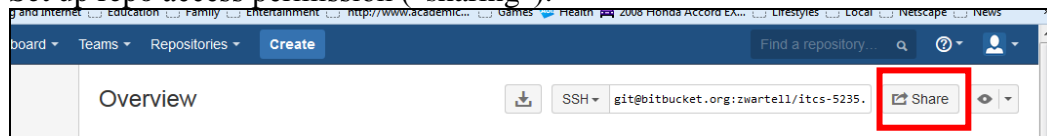
- Select create:



- Here are some recommended settings (assume you name the repo MyRepoName)



- Set up repo access permission (“sharing”):



- add your team members
- add the course TA and Professor

Dr. Wartell	zwartell
TA	????

- In general the steps to populate the remote repo is by creating a local repo and performing a `git push` as follows:

```
$ mkdir MyRepoName
$ cd MyRepoName
$ git init
Initialized empty Git repository in git-micro-tutorial/.git/
$ git remote add origin git@bitbucket.org:your.uid/MyRepoName.git
Cloning into 'git-micro-tutorial'...
Initialized empty Git repository in /home/git-
viscenter/repositories/wartell/ITCS_4120/students/John_Doe/git-micro-tutorial.git/
warning: You appear to have cloned an empty repository
[ ... your output will differ slightly..]

$ git add .
$ git commit
$ echo "John Doe" >> contributors.txt
$ git add contributors.txt
$ git commit -m 'Initial commit with contributors'
$ git push -u origin master
```

4. To delete a remote repo

[git-viscenter]

```
$ ssh git-viscenter@cci-subv.uncc.edu D
[ ... help documentation will be displayed..]
```

[bitbucket] See Bitbucket Website.

Other Git Operations

5. To open a second shell window that uses the an already running `ssh-agent` daemon.

- a. **Windows [Git-Bash]:**

Just start another Git-Bash shell (Start Menu→Git→Git-Bash) and repeat instructions in 5.3.2 in the new shell.

Windows [Cygwin running without Pageant]:

In the first command shell window:

```
$ start sh --login
```

Mac &

Linux:

In the first command shell window:

You want to enter the command that starts the GUI command-line shell that you prefer to use, for example: `xterm`.

- b. **All:**

In the second shell window, verify connection to your `ssh-agent` daemon:

```
$ ssh-add -l
2048 a3:c5:ec:be:c6:df:fa:80:3c:77:01:09:c0:af:7d:52 /h/My
Documents/cygwin_home
/.ssh/id_rsa.uncc (RSA)
```

6. Course Git Policies

6.1. *Submitting Class Assignments*

Submit all your assignments by using Git add, commit and push to upload your code to your Git repository subdirectory.

Your projects will be graded based on the version of your code that is **git-push'ed to BitBucket at the time of the due date for the project.**

6.2. *Keep the repository clean!!!*

It is standard practice when using version control software to not commit intermediate or output files generated by the compiler into the repository. Intermediate or output compilation files are all regenerated when someone else checkout's the source code and recompiles it. Like all compilers MSVS 20xx generates lots of these (*.ncb, *.ilk, *.exe, *.obj, etc.).

Rule: Do not commit such intermediate files to your Git repository!

Fortunately, you can automate this process using the **.gitignore** mechanism (see [2]).

By convention, the following files should be put in the repository:

- source code files (.cpp, .h, etc.)
- compilation scripts or project files
 - Under MSVS 2010 for C++:
 .vcxproj, .sln, .vcxproj.user
 - Under earlier MSVS versions:
 .vcproj, .sln, .vcproj.<username>.<machinename>.user
- a .txt file or .doc file describing what parts of the project you completed or left incomplete, etc.
- any input files such as image files or other data files required by your program
- any subdirectories containing the above files

When adding subdirectories, be careful not to blindly submit their entire contents because often they contain additional automatically generated files.

Reasoning:

Adding intermediate auto-generated files to the repository is wasteful, messy and can create subtle problems. Many intermediate files will create compilation problems if they are copied between different computers. Putting them in the repository is equivalent to such copying.

6.3. *Verify Your Remote Repository*

The TA only sees your remote BitBucket repo's.

Rule: Always make sure your assignment appears as you expect in the remote repo.

The Ultimate Verification:

The ultimate way to verify the remote repo contains the files you think it does is to clone it into to another directory and check that second cloned copy for completeness. You should do this when you are completely done with your assignment.

Some Safety Checks:

Performing The Ultimate Verification while you are developing code is tedious. During software development the following are good practices to keep track of your commit's and push's.

- `git-status`

Good Result:

```
$ git status
# On branch master
nothing to commit, working directory clean
```

The above indicates everything is good. You have no file changes that have not been committed to the local repo and no local repo commits that have not been pushed to the remote repo.

Maybe Bad:

If you get messages like:

```
$ git status
# On branch master
# Untracked files:
#   (use "git add <file>..." to include in what will be
#   committed)
#
#       junk_or_important.txt
```

then you have untracked files (but you have push'ed all your commits). This maybe ok as long as these files aren't files that belong in a repo. Optionally, you might consider adding to the .gitignore file (see [2]).

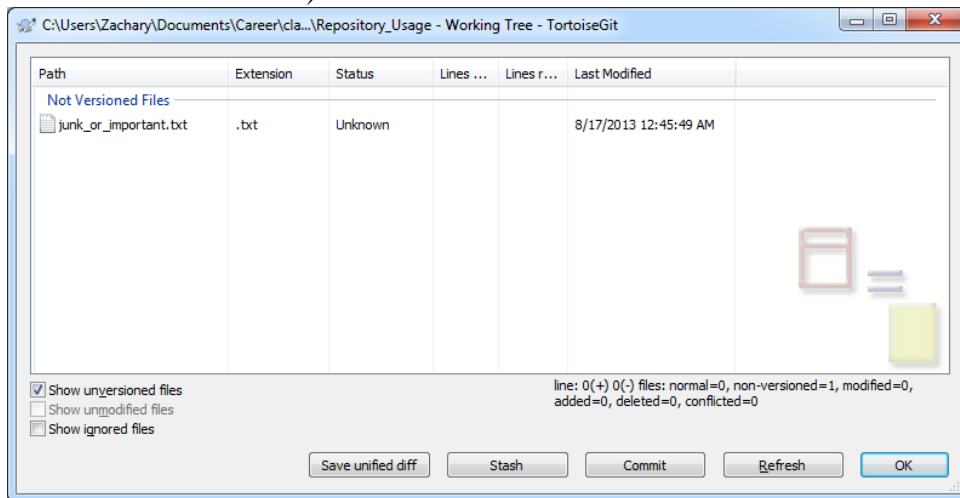
Bad:

If you get a message like:

```
$ git status
# On branch master
# Your branch is ahead of 'origin/master' by 1 commit.
#   (use "git push" to publish your local commits)
#
nothing to commit, working directory clean
```

then you have ***not*** pushed all your latest changes to the remote repo. Do a `git-push` before the final assignment deadline.

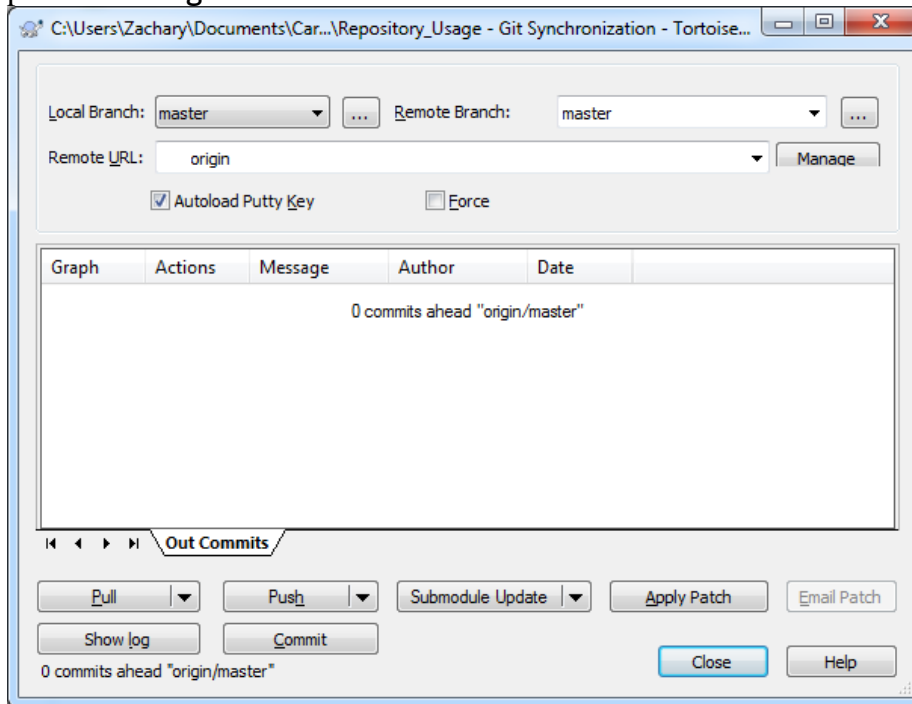
- **TortoiseGit** – Optionally, another good way to check with the TortoiseGit shell extension is using **Check for Modifications**. This will show you whether you have any changes not committed to the local repo (but make sure to check the box, **Show Unversioned Files**). Below we see one file is untracked.



However, **Check for Modifications** will not tell you whether you have pushed all your commits to the remote repo.

For that use the TortoiseGit shell extension and select **Git Sync**. The following **Git Sync** dialog box would indicate your local repo has committed changes that you have not

pushed to the `git-viscenter` remote:



However, Git Sync does not show you if you have changes to local files that you have not committed to the local repo!

6.4. **Tips**

This section will be populated as more students use the Git and the TA gets feedback.

6.5. **Common Error Messages**

This section will be populated as more students use the Git and the TA gets feedback.

6.6. **Common Errors**

1. **Escape Characters – Especially for Spaces:** HTML escape character (e.g. `%20`) is not the shell escape character

Be careful with escape sequences in strings representing file names and paths. For example the HTML standard for URLs uses the `%` symbol as an escape character, so `http:\\www.no%20spaces%20here.com` is translated as

`http:\\www.no spaces here.com`

However, general file systems (Windows/Mac/Unix) and command-line shells for these OS do not use `%` as an escape sequence when creating file names or directory names. So if you did the following at the Windows `cmd.exe` prompt:

```
c:\ mkdir "no%20space%20here"
```

you will actually get a directory with a nutty looking name including the %'s, and the file system commands, command-line tools, and MSVS compiler components will probably fail in some fashion when processing that directory name.

7. Citations

- [1] Unix Primer - Basic Commands In the Unix Shell,
<http://www.ks.uiuc.edu/Training/Tutorials/Reference/unixprimer.html>
- [2] Scott Chacon, Pro Git, Apress, <http://git-scm.com/book>.
- [3] How To Manage Environment Variables in Windows XP,
<http://support.microsoft.com/kb/310519>.
- [4] Bash Reference Manual,
http://www.gnu.org/software/bash/manual/html_node/index.html

8. Appendix

8.1. *TortoiseGit - MsysGit Incompatibility*

TortoiseGit works best with PuTTY and Pageant rather than using Git Base (MsysGit)'s default command-line ssh-agent. Here is why:

Every Windows Explorer window runs within the same Explorer.exe process. Consequently, executing "\$ explorer ." from a command-line shell, *S*, creates an Explorer window, *W*, whose Explorer.exe process never sees the environment variables created by that shell process *S*; Explorer.exe only sees the environment variables that existed when Explorer.exe started at login. Therefore, TortoiseGit commands executed from the new Explorer window, *W*, cannot see the environment variables of the command-line shell (because these commands are executed within the sole Explorer.exe process).

An ssh-agent uses an environment variable, SSH_AUTH_SOCKET, to tell an ssh process what socket that ssh process connects to talk to the ssh-agent. Therefore, it is not possible for TortoiseGit commands executed from the window *W* to know on which socket any ssh-agent started in the original command-line shell *CLS* is communicating.

Options:

1. Login twice, once using Putty's pageant.exe with TortoiseGit (set to use tortoiseplink instead of ssh) and using ssh-agent for the msysgit bash shell. (This is what Dr. Wartell does; but this adds complications to the instructions, so I don't recommend it to students).
2. Set up msysgit bash shell to use pageant & tortoiseplink instead of ssh-agent & ssh (This is currently what the instructions in this document do)
3. <http://cuviper.github.io/ssh-pageant/>

8.2. **.bash_profile, GIT_SSH**

.bash_profile is a bash script that is executed by bash each time you start a new bash shell [4]. It is located in your bash shell's home directory for your user account. Locate and edit it as follows:

```
$ cd ~
$ ls -la .bash_profile
[usually this file will already be exist, if not we'll create it]
$ notepad .bash_profile
```

Generally, the safest place to add the export command is the last line of the script (or add it wherever you see other export commands in the script). Add the line:

```
export GIT_SSH=NameOfYourSSHClient
```

NameOfYourSSHClient is the name ssh client listed for your OS in Section 5.3.