Lab, accounts(UCID, AFS), Programs, Linux

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Disclaimer: *These abbreviated notes DO NOT substitute the textbook for this class. They should be used IN CONJUNCTION with the textbook and the material presented in class. If there is a discrepancy between these notes and the textbook, ALWAYS consider the textbook to be correct. Report such a discrepancy to the instructor so that he resolves it. These notes are only distributed to the students taking this class with A. Gerbessiotis in Fall 2014 ; distribution outside this group of students is NOT allowed.*

0.0 ist.njit.edu Navigate around the IST web-page. A UCID account consists of a UCID login and its associated UCID password. You may be able to create a UCID account through link 0.1, or by going to the IST Support office at the basement of the parking deck, or may be by asking the HeldDesk next door from the lab. Nowadays AFS login and password means UCID.

0.1 UCID account creation. Go to `ist.njit.edu`, click on the Services link on the left, that then expands; then click on its first link `Accounts` that also expands. Then click on its first option `UCID`. Or just type in the browser
`http://ist.njit.edu/accounts/ucid.php`
and the main page that pops up is `University Computing ID (UCID)`. In the middle click on `create a UCID` or altenatively scroll to the bottom to hit and then click `UCID Support Page`, and follow option 3. If you created but never used a UCID and forgotten about it, this option 3 through its first link `Campus Directory Search` which is `directory.njit.edu` can tell you what your UCID is.

0.2 UCID password reset. NJIT passwords expire within four months since the last change. It is advisable that you change (i.e. reset) your password before or immediately after the first class of a semester.
(A) Go to `http://ist.njit.edu/cybersecurity/password/` and click on `Global Password Change` at If you remember your UCID password but want to change it,
(B) or from step 0.1 above `UCID Support Page` follow option 4 or 5 there,
(C) or the following may work as well, `http://afspassword.njit.edu/`

(D) If you don't remember the UCID password, you need `Unattended Password Reset`. Through the link of step (A) above, click on the right the option `Unattended` or `Password Reset(UPR)`. They point to the same location.

0.3 Summary of referenced URLs (URL stands for Uniform Resource Locator).

1 **NJIT IST Central:** `http://ist.njit.edu`

2 **NJIT UCID:** `http://ist.njit.edu/accounts/ucid.php`

3 **NJIT Software:** `http://ist.njit.edu/software/download.php`

4 **NJIT Password Management:** `http://ist.njit.edu/cybersecurity/password/`

5 **NJIT Password Alternative:** `http://afspassword.njit.edu/`

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0.4 Login screen preliminaries. In order to login on any of the lab machines, go through the checklist and provide your UCID login and password.

0.4.1 Numlock key?. Before you do anything, make sure that there is no light ON on the top of the keyboard. If the `Numlock` light is ON you may leave it as is, or switch it OFF by pressing once the `Numlock` key which is usually located in the numerical keypad on the right part of the keyboard (over `key 7` and to the left of `key /`).

0.4.2. CAPS LOCK key: OFF If the `CAPS LOCK` light is ON, it MUST BE TURNED OFF by pressing the `CAPS LOCK` key once (or if this does not work, the `SHIFT` key instead). The `CAPS LOCK` key is usually located on the left of the `A key`.

0.4.3 Login Option Selection. Before you type in the login or password, click on the left of two buttons located beneath the login/password textboxes. Select there the `Gnome Desktop` or `GNOME` option (one or both will be available). This is shown on pages 4/5, where the bottom left button allows you to select the third option named there `GNOME`.

0.4.4 Login Name and Password. The `login` field might look like the top textbox area of the left or right window on page 4 (or page 5). It prompts you to type in your UCID login and then to press the ENTER key. The second is the `Password` textbox that is ready to accept your password. Type in your UCID password, and then press ENTER. If you made a mistake and typed an incorrect password wait until a diagnostic message pops up after a few seconds with instructions to retype the password. Pages 5 and 6 provide an example.

0.5 Environment. After a while you will get logged on. The status bar is on the top of the screen as opposed to MS Windows that is usually located at the bottom. Click on the left of the three or four buttons at the top. Options of interest are `Internet` if you plan to start the Firefox browser, or `Mathematical/Scientific applications` for `Matlab`. Explore the environment if you are not familiar with it.

0.6 Screen Saver Headaches/Logout. Never leave the workstation idle for more than 10 minutes or so (the last page tells you how to disable YOUR screensaver). **ALSO, LOG OUT SOON AFTER THE CLASS ENDS BEFORE YOU LEAVE THE LAB**. Otherwise the screen saver will pop up and this usually means you will be typing your password to get in again! Or you sit in front of a workstation that a fellow student forgot to logout from. There is a simple solution to this: either press simultaneously the three keys CTRL ALT and backslash \ i.e. CTRL-ALT-\
and if this does not work, the three key sequence CTRL-ALT-Backspace. Also follows the steps of the last page of this Subject 0 (page 19?).

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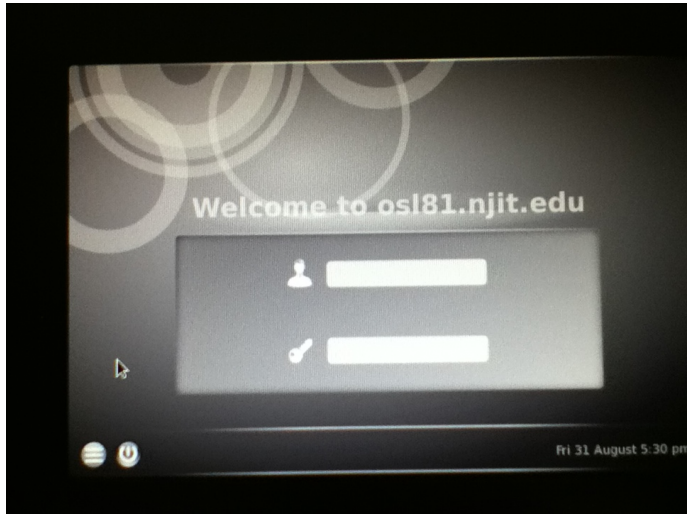


Figure 1: Login window

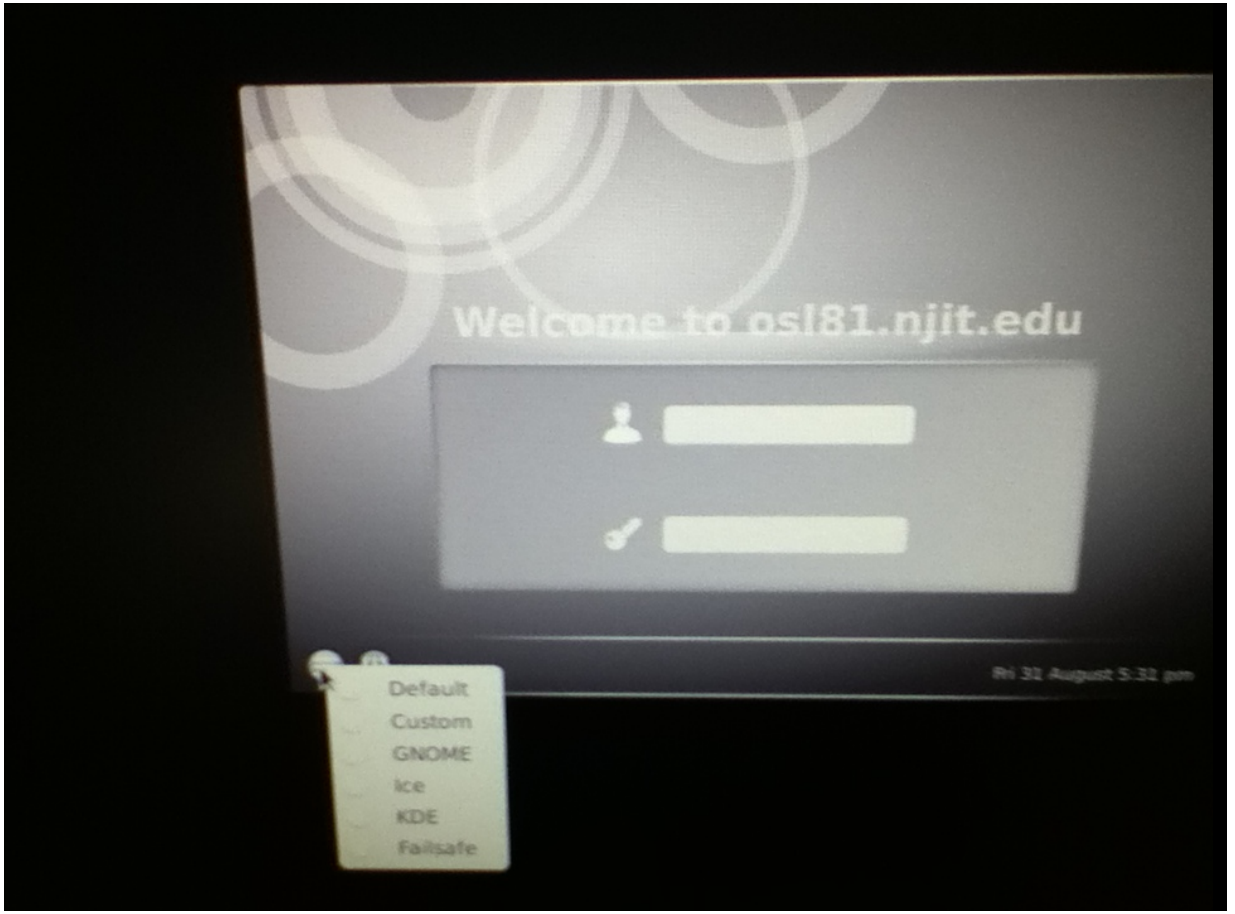


Figure 2: Selecting a Desktop (GNOME)

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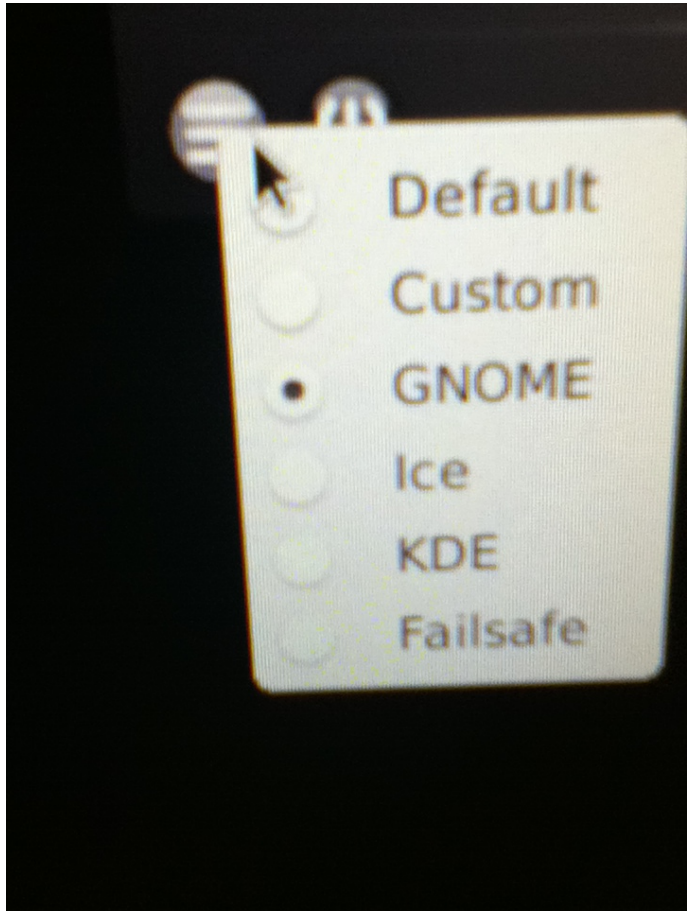


Figure 3: GNOME selected

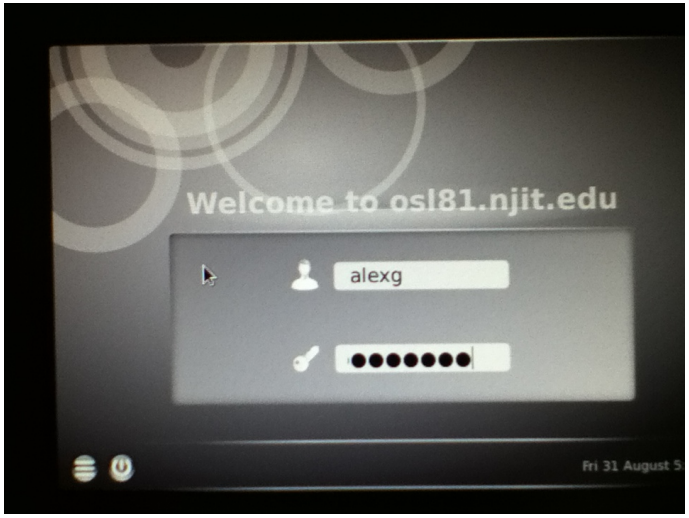


Figure 4: Ready to type in UCID login and password

0.7 Login screen(s) (previous two pages). With reference to Figures 1, 2 and Figures 3, 4 we highlight the following.

- Hit the ENTER key to obtain a Welcome screen such as the one in Figure 1. (OSL or osl means Open System Lab.)
- Click on the icon on the bottom left corner as shown in Figure 2 to activate the Desktop selection subwindow and click on GNOME as shown in Figure 3.
- Enter your UCID (in the example it is alexg), and then, type in the box beneath it the UCID password. Note that the password does not show on screen. After you press ENTER the login process commences.
- If authentication fails, an error message will be printed with a suggested action.

0.8. Software. Software downloading SHOULD BE DONE FROM WITHIN NJIT. From outside NJIT you need to activate a VPN client before you download software, which is OS-specific. You may complete all coursework at the Lab workstations or use any other lab machine at NJIT that has MATLAB. If you plan to work on your own machine (laptop or desktop) and your own OS (MS Windows, Linux, or OSX) then you might need to download, install and activate MATLAB yourselves. The URL for downloading software at NJIT is the Softare link, item 3 of 0.3 on page 2.

1. **Which Matlab?** Choose the appropriate and latest STUDENT version of MATLAB for your OS (Windows, Linux, OSX) and the type of your OS (32-bit unless you know that your computer can support the 64-bit version).
2. **SSH aka Secure Shell.** A version for MS Windows is available for download. OSX and Linux have one preinstalled (but it is command-line based). This allows command-line access to a LAB machine that is NOT ENCOURAGED and thus will not be discussed.
3. **VPN client.** In order to connect from outside of NJIT to a LAB machine or download software you need to download and install this program and activate it as needed. It makes your machine part of the NJIT network. VPN must be downloaded from within NJIT. Because different Windows operating systems have completely different requirements, we won't say anything more about VPN.

You may work with MATLAB in one of the following ways.

0.9 OPTION 1 (easiest): USE lab machines for programming. You may complete all required course work by sitting in front of any of the Lab machines at the classroom Lab or other Labs at NJIT that have MATLAB. You don't need to download or install anything.

0.10 OPTION 2 (easy): Download MATLAB on your own computer device. Alternatively, you may download and install MATLAB on your Windows, Linux, or MAC OSX PC or laptop. For this you need to do all of the following.

(a) Download MATLAB as explained in the previous page. The UCID login and UCID password would be needed. It is better if you complete this download step from within NJIT or you will need to install and activate a VPN client otherwise which is cumbersome.

(b) Register the downloaded copy with MathWorks, the company that owns MATLAB. Instructions are provided at the MATLAB download page at ist.njit.edu. Follow those instructions as needed; you might need to create an account with Mathworks using your NJIT email address. DO NOT USE FOR that account your UCID password. Use some other password instead but make sure you do not forget that password!

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0.11 Unix/Linux commands. If you open a terminal on a LAB machine, then you need to know how to navigate around a UNIX terminal. This is quite similar to navigating around a Windows command line prompt (known as `cmd` or `cmd.exe`). Below we provide an equivalent list between UNIX and Windows command line commands.

	Windows/Command Prompt	UNIX/Linux	Comment
%	dir	ls	List files in local directory
%	dir /?	man ls	Help for command
%	dir /S	ls -lR	Recursive listing (subdirectories)
%		ls -a	List hidden files+everything else
%	cd dirname1/dir2/dir3	cd dirname1/dir2/dir3	Go to dir3
%	cd C:\	cd	Return to home directory
%	cd ..	cd ..	
%	date	date	
%	time	time	
%	[Acrobat invocation]	acroread	
%	[Firefox invocation]	firefox	
%	[Matlab invocation]	matlab	
%	[ssh invocation]	ssh osl21.njit.edu -l UCID	Connect to Lab machine osl21 as USER UCID
%		scp FILE UCID@osl21:~/	Copy securely file FILE to the account UCID of osl21 at the top-directoy
%		who	Who is logged on
%		ps	Process Status
%		ps agux|egrep UCID	Check user's UCID processes
%		kill -9 PID	Kill a process with number (as shown with ps) PID
%		kill -9 9454	Will log you out (see bottom of next page)

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```
%    exit                    exit                    Terminate(and logout in UNIX)
%    exit                    logout                  Terminate(and logout in UNIX)
%                            pwd                     Print working directory
%    cat                     cat                     Catenate/Concatenat files
%                            cat x >y                "Copy file x to file y"
%                            cat x >>y               "Append x file to file y"
%    copy x y                cp x y                  "Copy file x to file y"
%    more                    cat, less, more         list contents of file
%                            cp -i                   copy and inquire to confirm
%                            cp -r                   copy recursively (directories)
%                            cp -r dir1  dir2        copy directory dir1 to dir2
%    mv                      mv                      move
%    del                     rm                      remove
%                            rm -r                   remove recursively a directory
%    md                      mkdir
%    rmdir                   rmdir
%    cls                     clear
%    echo                    echo
%    fc                      diff
%    find                    grep egrep
%    command /?              man command
%    chdir                   pwd

Sample Output of ps agux|egrep UCID
UCID      9454  0.0  0.3 3360 2640 pts/5    S 10:55:43  0:00 -tcsh
UCID      9484  0.0  0.1 1304 1056 pts/5    S 10:55:46  0:00 /bin/sh ./proxy.sh
UCID      9486  0.0  0.4 5488 3784 pts/5    S 10:55:46  0:00 ssh -N -v -D3000 l
```

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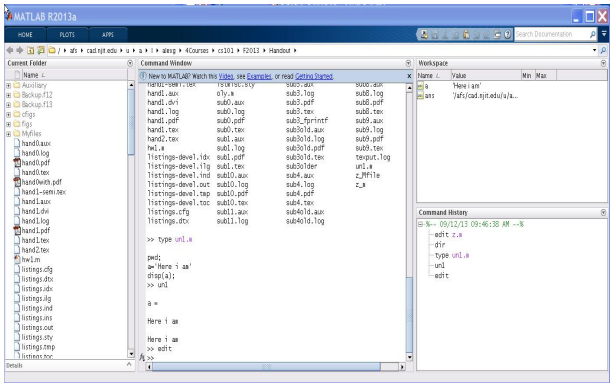


Figure 5: MATLAB Window view

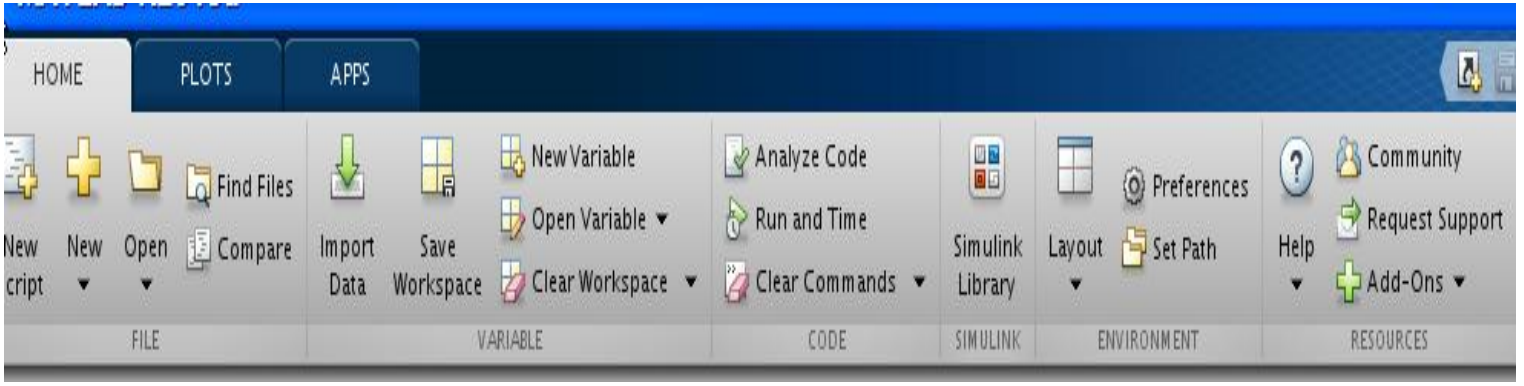


Figure 6: Toolstrip

0.12 Window view of MATLAB. A view of a MATLAB window for Matlab R2013a is shown in Figure 5. Behavior (default or otherwise) might be different in other recent versions of MATLAB and is definitely different from older versions of it.

The Top pane of MATLAB contains three tabs, `HOME`, `PLOTS` and `APPS`. If you click once or twice on HOME the toolstrip (Figure 6) will disappear or re-emerge. Sometimes the `Toolstrip` appears attached to the `HOME` tab. If it is not shown click on `HOME` once to make it appear or once more to make it disapper.

Somewhere in the middle to the right of the toolstrip you may find a button or tab called `Layout`: this determines among other things what windows are displayed i.e. it determines the layout shown in Figure 5 Next to `Layout` button you may find a `Preferences` button or tab. The Preference tab allows you to change fonts and font sizes.

0.12.1 MATLAB Command Window. The MATLAB `Command Window` is centrally located and it is the widest one.

0.12.2 MATLAB Current Folder. On the left of the command window there usually is a vertical window called `Current Folder` that lists the contents of the current working directory/folder. Any file created, modified or opened, exists in that space.

0.12.3 MATLAB Workspace. On the right of the command window there are two vertical windows usually named `Workspace` and `Command history`. The `Workspace` is the user's MATLAB workspace and can also be retrieved by typing `who` or `whos` from within the command window.

0.12.4 MATLAB Command History. The `Command History` includes all the commands the user has entered in MATLAB's command window, not only in the current session but since the last time the user cleared it. If you want to clear the command history on the right of the title area there is a circular button with an arrow pointing downwards. Click on it.

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0.13.1 MATLAB file types: An M-file. MATLAB recognizes and treats special filenames in a specific way. One such case is a filename ending with the suffix `.m` ; such a file might be `file.m`. The file-name is `file.m`, the prefix is `file` and the suffix (or sometimes called file extension) is `m` or `.m` This is known in MATLAB as an M-file. `m` or `.m` is its suffix. In MATLAB an M-file can contain a sequence or collection of MATLAB functions/commands. One can call such an M-file from within MATLAB by typing in the name of the prefix only, that is by typing `file` without the `.m`. Then the sequence of MATLAB functions in the M-file will be executed in the command window and when this completes control will pass back to the MATLAB command window and the MATLAB prompt will appear. (BTW the MATLAB prompt is two greater signs one after the other.)
MATLAB Reminder. When calling an M-file such as `myfile.m`, type `myfile` not `myfile.m`

0.13.2 MATLAB special M-files: startup.m and finish.m. There are two special M-files in MATLAB. The M-file `startup.m` is executed as soon as MATLAB loads up (and the command window appears), and `finish.m` that is invoked when the user is about to exit the command window by say, typing the MATLAB function `quit`. Note that those two files will be executed as long as they reside in the directory from which MATLAB will be invoked or from which MATLAB will be terminated. One way to see whether the execution of `startup.m` or `finish.m` has occurred or is to occur is to type in the command window the operating system-related command `dir` to get the directory listing of the current directory within the command window and confirm the existence of one or the other file there. The typing of the comand `type startup.m` or `type finish.m` will show the contents (i.e. MATLAB commands) of those two files.

0.13.3 dir,ls, type, pwd, cd

Function `dir` described in is an MSDOS/Windows command prompt relic equivalent to the UNIX command `ls`; either one can be invoked from within the MATLAB command window and both list the contents (files and directories/folders) of the current working directory of MATLAB. The word folder is equivalent and a synonym to the word directory and will be used interchangeably. What this current directory is can be revealed by typing `pwd` which are the initials for `print working directory`. You can view the contents of a file say `finish.m` by typing the MSDOS/Windows-style `type finish.m` command with a space separating the two. If you want to change directory, the `cd` command can be used appropriately (UNIX or Windows syntax as required). If you want to navigate to the top of your directory space type `cd` $\sim$. The last character is a tilde separated by a space from the `cd` preceding it.

0.13.4 Editing a file from within the Command Window or through Home/New. Note that in Matlab R2013a or in other variants the current working directory appears on a long line over the Command Window window (and its title/label). In fact on the left of the command window there usually is a vertical window called `Current Folder` that lists the contents of the current working directory/folder. A user can edit (i.e. create, save) a MATLAB M-file by typing the word `edit` in the Command Window. If no argument follows the user will be given the opportunity to save the work in a file (M-file) later on through the opened window related to the Editor that has just been invoked. Of course one can type `edit myfile.m` and if `myfile.m` exists it will be opened, or a new file named `myfile.m` will be opened for writing.

An alternative way is to use MATLAB's toolstrip that is attached to the `HOME` tab (top of the window). It has a button (second from left, with a huge plus sign) that is called `New`. (Even the left-most button called `New Script` would also work.) One can create a New M-file by clicking on that button `New` that is attached to the `HOME` tab, and then choose its first option or option `Script` if it happens not to be the first option. An M-file is a script file that contains MATLAB commands.

0.13.5 Diary keeping with `diary, diary on, diary off`. If you want to keep track of the activity in the command prompt (both the MATLAB commands you type, but also MATLAB's output), you can use the command `diary`. For example `diary('myd.txt')` will use file `myd.txt` to store diary-related information/output. When you type in MATLAB this command it also initiates a `diary on`. All the commands you type, and MATLAB's output are to be saved into the designated file. However you need to type a `diary off` for this to be committed/saved into the file. You can then view the contents of it with `type myd.txt`. You can then issue `diary on` to go on saving additional information, as needed (also requiring a `diary off` eventually). The new material is added to (appended) the existing contents.

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MATLAB M-file and diary example

```
%  Filename is        myfile.m
%  Prefix of it is    myfile
%  Suffix of it is    .m  or sometimes m   (m is also called the file extension)
%  File Extension of myfile.m is m

%  An M-file is a file with suffix .m i.e. extension m
%  Special M-files are  startup.m and finish.p

>> ls ~/startup.m ~/finish.m
% If they exist they serve a special purpose
% All the MATLAB command in startup.m are executed before the command windows returns to the user the
% promptt >>
%
% When the user exits the command window, all the MATLAB commands in finish.m are executed
% before the windows closes (with a slight delay)
% The instructor startup.m file contains
   disp('HELLO. This is startup.m');
   diary(['CS101_alexg_' , datestr(now,'yyyymmdd_HHMMSS') ]);
   pause(2);
% The middle line is not obvious: it creates a diary file that keeps track of MATLAB commands
% typed in the command window
% If you don't have one type in a MATLAB command window
% diary('fname.txt');   create a diary with name  fname,txt (also does diary on)
% diary on              start it or restart it
%  diary off            stop and commit changes

>> edit ~/startup.m  % to create or edit one
>> edit ~/finish.m
% You can execute M-file myfile.m from within a command window by typing its prefix
>> myfile
```

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From within MATLAB's command window we may create an M-file myp.m by typing `edit myp.m`. Or from HOME, we follow the steps outlined in 0.13.4. We may execute this M-file by typing `myp` in the Command window (the matlab prompt appears as ≫). Any variable created will appear in the Workspace and the name of the M-file under Command History. The percent sign is the MATLAB comment; the rest of the line is ignored.

```
>> a=10;   % a variable a is created. Its value set to 10 but display is suppressed (semicolon at the end)
>> b=20    % a variable b is created. Its value set to 20 but no semicolon follows variable/value is output
   b = 20
>> a+b     % an expression is evaluate a+b is 10+20. The result is stored in MATLAB variable ans
  ans=30   % ans is a MATLAB reserved word for answer; it stores values of expressions
>> i * i   % i is the sqrt of -1 , so is j. They are also reserved
 ans = -1  % ans now contains the result of i*i; previously it held the result of a+b
>> j * j
 ans = -1
>> who    % who gives you the variable defined by the user directly or not (eg ans)
  a b ans
>> whos ;   % whos = who + size information
>> clear   % clears Workspace all variables and their values get wiped out
>>a
Undefined function or variable  'a'.
>> 1+2+       % I want to type 1+2+3  . Use dieresis i.e. ... to split an expression over
       |      % multiple lines. See below
Error: Expression or statement is incomplete or incorrect.
>> 1+2+...
3
ans = 6
>> pi             % pi is the well known constant
ans = 3.1416      % By default (format short) MATLAB prints few decimal digits of a real number
>> format long    % You must explicitly ask for more  (format long)
>> pi
ans = 3.141592653589793
>> format short   % If it is too much , go back to the default
>> pi
ans = 3.1416
>> 2+3-4*5
ans = -15
>> 10 / 5
ans = 2
>> 10 \ 5  % this means 5 / 10 ie a  \ b is  b / a
ans = 0.5000
>> sin(pi)  % watchout ! pi has finite precision in MATLAB !
```

Connect to a AFS machine from a Windows machine with Secure Shell (ssh)

0.14 Connect with Secure Shell. On a Windows machine, click on a Secure-Shell icon if available or invoke Secure-Shell through the Start button. The window of Figure 7 will pop, click on the pane(area) `QuickConnect` to get a smaller popped up window also shown in Figure 7. Type in the field `Host Name` the afs machine you will be connected to (`afs12.njit.edu`) and in the `UserName` field, type in your `UCID` and be ready to provide the password, after you click `Connect`. The first time you connect to `osl21.njit.edu`, the window in Figure 8 might pop-up (and click on Yes in such a case), or otherwise you get the Password prompt in Figure 9. Lab machines now bear names starting with `osl` as in `osl12.njit.edu`.

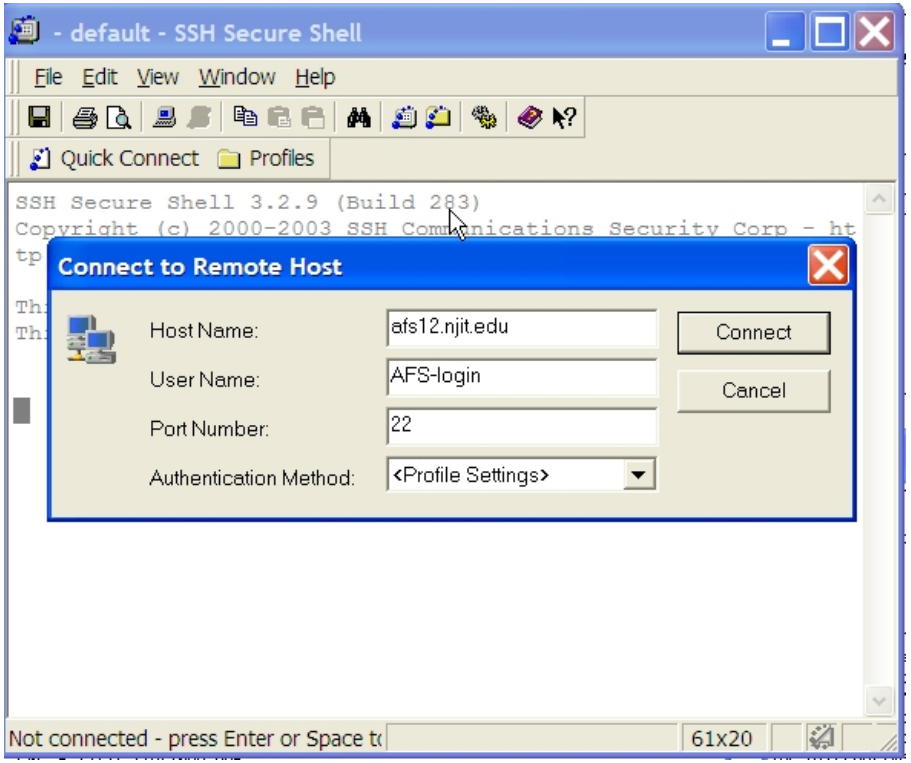


Figure 7: Secure Shell Window and Connect to Remote Host prompt.

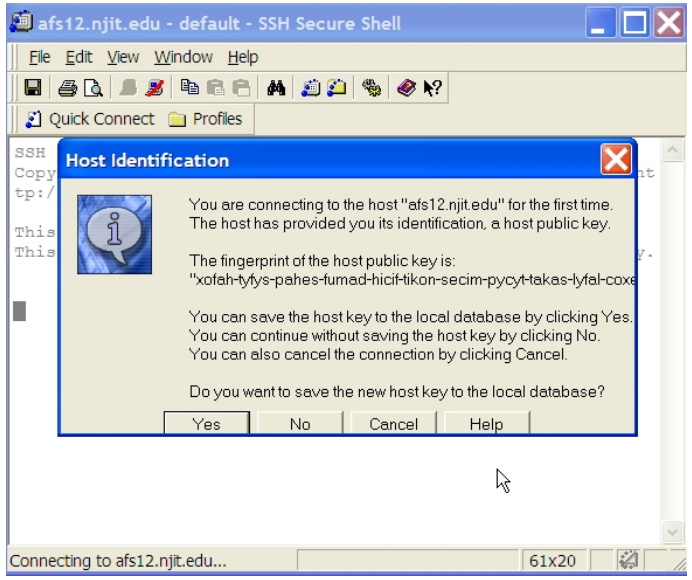


Figure 8: First time window

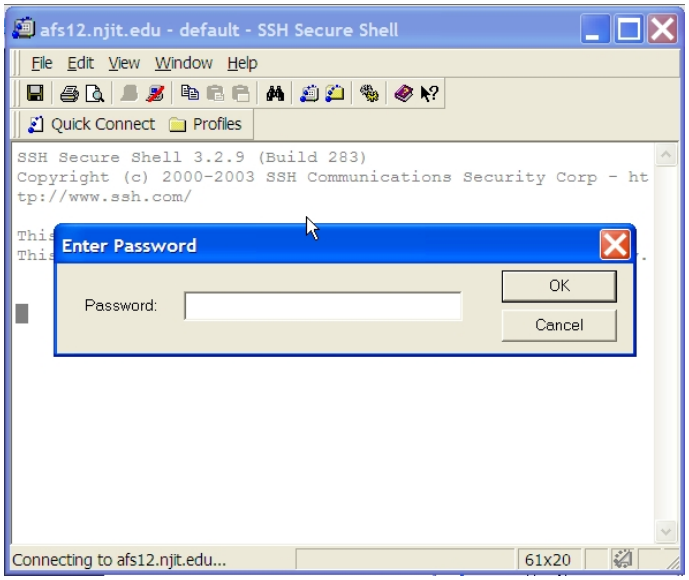


Figure 9: Password Prompt

0.15 Use command-line ssh. If you are already logged on a UNIX machine such as an Apple OS/X desktop or laptop, it is very likely that you will use a command-line version of ssh (secure shell) that does not involve the graphical interface of Figure 7.

In such a case we type in the invocation on a single line such as

```
ssh osl21.njit.edu -l UCID
```

and the password prompt appears in the line immediately after. This is also how you may connect from a MAC OSX after you open a terminal there.

1. If you cannot login to a Lab machine or you login and then you are logged out, or cannot do useful work, it means you have reached your disk quota (or in plain English you viewed too many movies or Firefox used up too much of the disk space allocated to you). You might also be getting strange messages such as `Call to Inusertemp failed Check your installation` or `Could not update ICEauthority` .

2. To periodically clean up the disk and avoid this problem do the followin. Open a terminal window: go to Application on the top left corner, click it and pick second option for a Terminal Window of any color choice. You then get the command prompt which is a percent sign. The do one of the following.

2a. **Check quota with fslq.** Type in the following command in a terminal (excluding the percent sign). Note that there is a space between the tilde and the q of fslq. This gives you information about your system quota (how much space you have.

```
% fslq ~
```

2b. **clean.home or purge.cache.** Clean up your disk. It cleans up the cache of the Firefox browser.

```
% purge.cache
```

or

```
% clean.home
```

3. You login and you get something like the following. It means your UCID password has expired. Change it/reset it.

```
% ls
#UCS            afs             devices         lib             opt             tmp
AFS_PATCH_LEVEL awk             etc             lost+found      platform        usr
LAB             bin             export          mnt             proc            var
SOLARIS         core            home            net             root            vol
admin           dev             kernel          nohup.out       sbin            xfn
```

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Screensavers, Lock screen

1. To avoid screensaver issue (or power saving problems).

```
On GNOME
 System --> Preferences ---> ScreenSaver

      Regard the computer as idle after 2hours (maximum)
      Uncheck Activate screensaver when computer is idle

 System --> Preferences ---> PowerManagement
                                                 Action
      Put computer to sleep when inactive for    NEVER
      Put display  to sleep when inactive for    NEVER
```

2. To logoff another student's screensaver, press the following three keys.

```
CTRL - ALT - BACKSPACE
```

3. The link `http://web.njit.edu/info/linux.classrooms/` contains useful information as well.

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