Programming at Home

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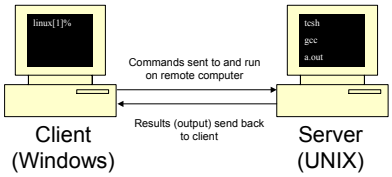
UMBC
AN HONORS UNIVERSITY IN MARYLAND

SSH Overview

- SSH stands for Secure SHell
- Secure alternative to telnet/rsh
- Provides secure terminal or shell access to some remote computer



Overview

- Telnet/FTP
- SSH
- SCP
- X Windows
- AFS Clients
- XEmacs
- TRAMP
- Cygwin
- Bootable Linux Distributions
- Conclusions

SSH Clients

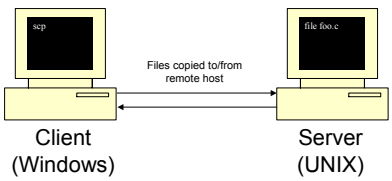
- There are many SSH clients
  - Tera Term SSH - what OIT distributes
  - PuTTY – my personal favorite
  - SSH.com
  - OpenSSH

Telnet/FTP Overview

- Telnet and FTP are basic network utilities used for remote tasks
  - Connecting to a remote computer
  - Copying a file to/from a remote computer
- Telnet and FTP are inherently insecure
- Username, password and other potentially sensitive information are broadcast in clear text
- Even more dangerous now due to proliferation of wireless networks

SCP Overview

- SCP stands for Secure CoPy
- Secure alternative to FTP/rcp
- Provides secure copy mechanism to/from some remote computer



SCP Clients

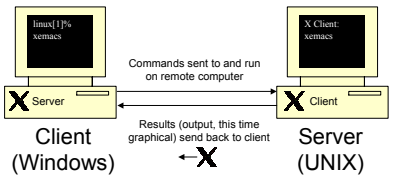
- Likewise, there are many SCP Clients
  - WinSCP – what OIT distributes, also my favorite
  - CuteFTP – can also do secure copying
  - SSH.com – also acts an SCP client

X Servers

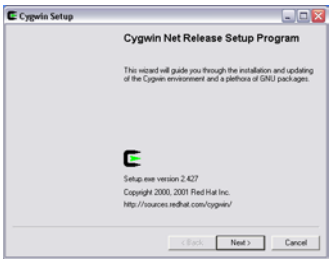
- Again, there many choices when it comes to X Servers for Windows
  - Cygwin/X – my favorite
  - Exceed – most widely used
  - X-Deep/32 – recently released as Freeware
  - X-Win32/64

X Windows Overview

- The X Window System (X for short) is the standard GUI on UNIX systems
- X provides framework for drawing, moving and interacting with windows
- X features network transparency
  - the machine where program (the client application) runs need not be the local machine (the display server)



Cygwin/X Installation

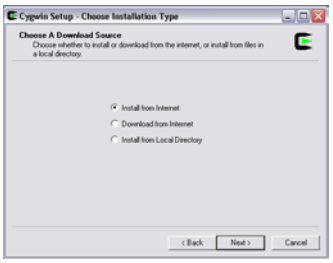


- Once you download the installer double click on it to begin the installation

X Windows vs. Microsoft Windows

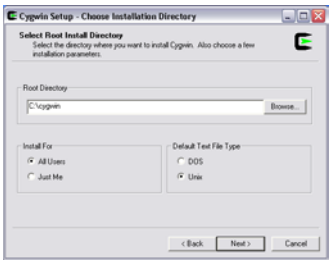
- Windows and X do not play nice
  - Windows has no clue how to go about interpreting the language that X uses
  - The infamous: “Error: Can't open display”
- Solution is a X server for Windows
  - Interprets the X server language, translates the commands into the Windows language, and acts upon them

Cygwin/X Installation



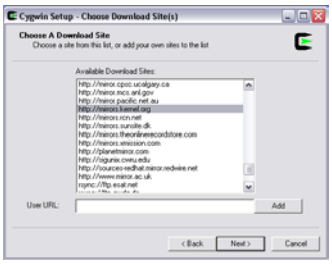
- You want to install from the net, unless you have already downloaded the packages offline

Cygwin/X Installation



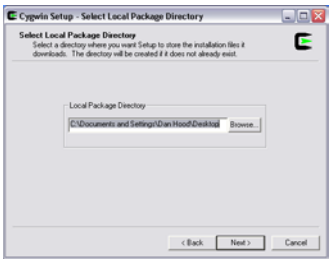
- Defaults are fine

Cygwin/X Installation



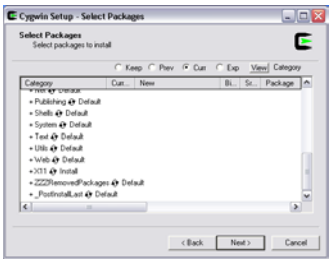
- Pick a mirror to actually download from

Cygwin/X Installation



- This is just asking where the installer should temporarily save the downloaded packages to before installation – defaults are fine

Cygwin/X Installation

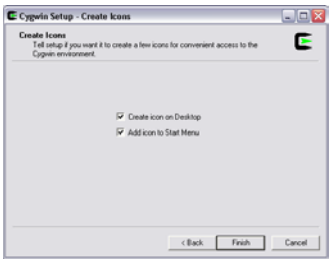


- Chose which packages to install
- **To use X windows, I strongly suggest installing the entire X11 package**

Cygwin/X Installation

- Typically the defaults are fine here, might need to change if you have some funky Internet configuration (i.e. behind a proxy, etc…)

Cygwin/X Installation



- After a while of downloading and installing, the installer will ask the normal stuff – defaults fine

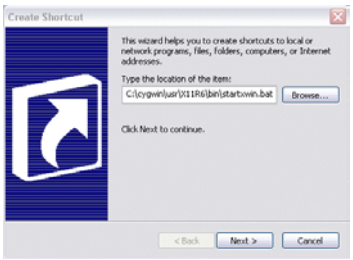
Cygwin/X Installation

- After the installation has completed, you should notice a Cygwin shortcut on your desktop – we'll talk about this later
- Basically all that is left is to fire up the X server

Cygwin/X Installation

- Once you have the shortcut setup, go ahead and click on it
- You should notice 2 things…
  - A local xterm should appear
  - There should be an "X" in the system tray
- Once they appear, you should be able to SSH to a UNIX host (need to forward X connections) and start an X based application, such as XEmacs

Cygwin/X Installation

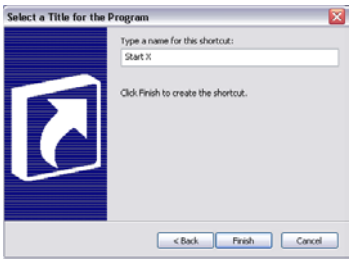


- I recommend making a shortcut to do this

X Forwarding/Tunneling

- We also need to inform the remote machine to explicitly forward these X commands (from the remote machine) to our X server (local machine)
- Most SSH clients have some form of forwarding or tunneling these connections
  - Typically something like or involving "-X"

Cygwin/X Installation

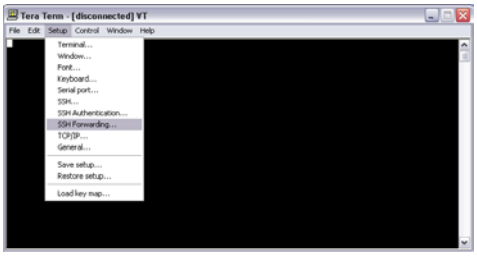


- Give it some meaningful name

PuTTY X Forwarding

- Or via the command line:
  - "C:\Program Files\PuTTY\putty.exe" -ssh -X -l username linux.gl.umbc.edu

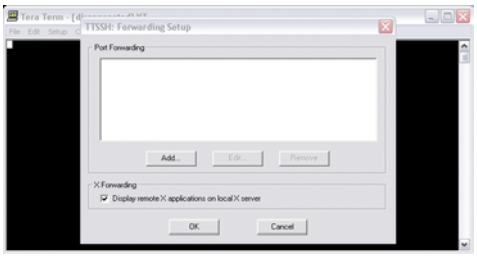
Tera Term SSH X Forwarding



AFS Overview

- What is AFS?
  - AFS is short for the Andrew File System
  - Basically AFS is distributed network file system
- Files are stored on remote servers and clients access the files using an AFS client

Tera Term SSH X Forwarding

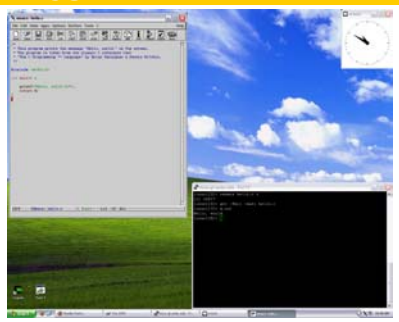


- Or via the command line:
  - "C:\Program Files\TeraTermSSH\ttssh.exe" linux.gl.umbc.edu:22 /ssh-X

AFS Clients

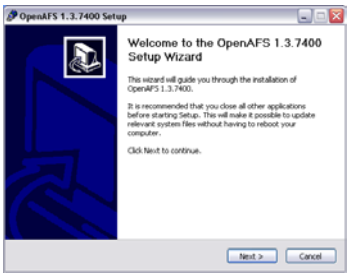
- There are AFS clients available for many operating systems
  - Windows, MacOS, Linux, Solaris, IRIX, etc…
- Motivation for using AFS
  - SCPing files all the time is a pain
  - Opens the door to multiple out-of-sync copies
  - Inconvenient compared to accessing a local drive
- There are several AFS clients, though I would recommend OpenAFS
  - It is what is used here in the labs to map your UNIX home directory to the Windows S:\ drive

Cygwin/X Installation



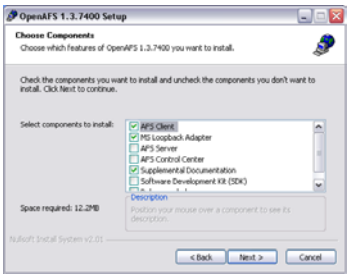
- Final product – X applications on my Windows Desktop

OpenAFS Installation



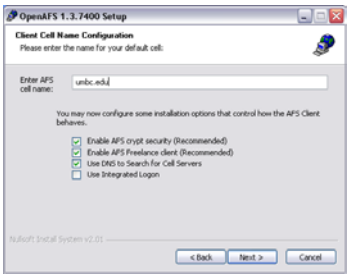
- Once you download the installer double click on it to kick off the install process

OpenAFS Installation



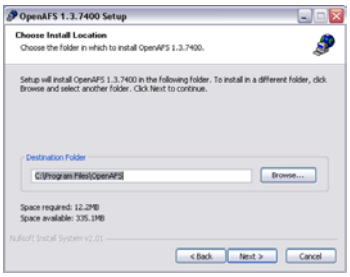
- Defaults are fine

OpenAFS Installation



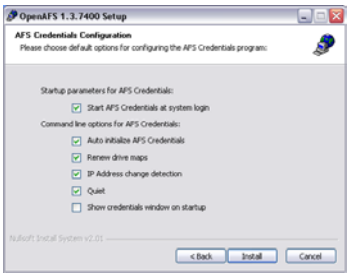
- Be sure to enter “umbc.edu” as the AFS cell

OpenAFS Installation



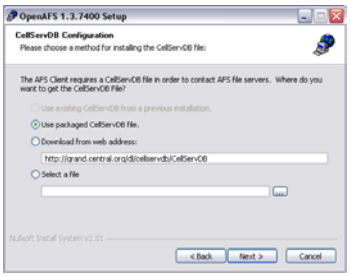
- Again, defaults are fine unless you want to put it elsewhere

OpenAFS Installation



- Defaults are fine

OpenAFS Installation

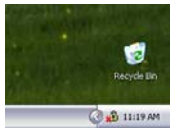


- Defaults are fine – use packaged DB file

OpenAFS Installation

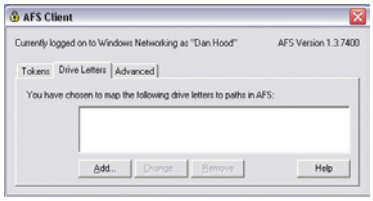
- The mandatory restart

OpenAFS Installation



- When Windows comes back up, you should see 2 things…
  - A dialog asking if you want to obtain new AFS tokens
  - A lock in the system tray

OpenAFS Installation



- Click on the Drive Letters tab, then click Add

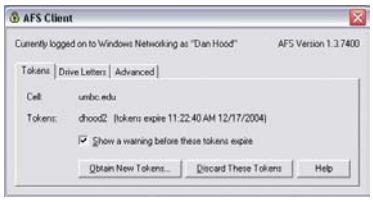
OpenAFS Installation

- Go ahead and fill in your myUMBC username and password

OpenAFS Installation

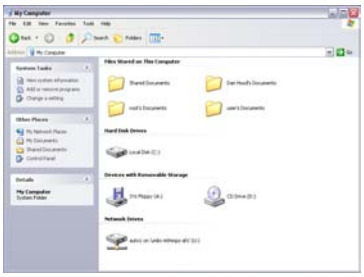
- Pick a drive letter to assign your UMBC home directory to, and enter the path of your home directory

OpenAFS Installation



- You should then be able to double click on the lock in the system tray and see a dialog box like so

OpenAFS Installation



- Once you have mapped the drive, you should see a new networked drive

OpenAFS Installation

- The contents of which are the contents of your home directory
- Any changes you make will happen in your account at UMBC

XEmacs Installation

- You want to install from the net, unless you have already downloaded the packages offline

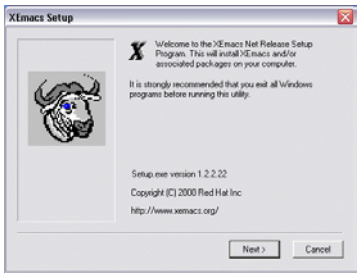
XEmacs

- XEmacs is not solely for UNIX
- Official ports are available for:
  - Windows – both native and Cygwin
  - MacOS – there was a port for MacOS although it is out of date, less of an issue now with OSX which is essentially BSD
- Can install stand-alone native version (i.e. compiled for Windows) of XEmacs to edit local files

XEmacs Installation

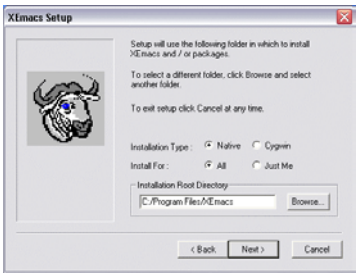
- This is just asking where the installer should temporarily save the downloaded packages to before installation – defaults are fine

XEmacs Installation



- Once you download the installer double click on it to begin the install process

XEmacs Installation

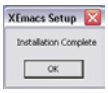


- If doing a stand-alone installation in Windows be sure to choose native

XEmacs Installation

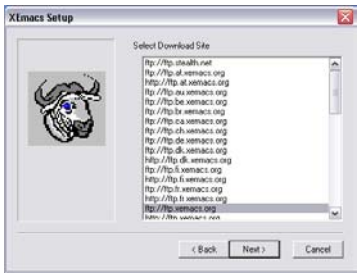
- Typically the defaults are fine here, might need to change if you have some funky Internet configuration (i.e. behind a proxy, etc…)

XEmacs Installation



- Once all packages are downloaded and installed the installation will wrap up
- Choose what MIME types (if any) you want to associate with XEmacs

XEmacs Installation

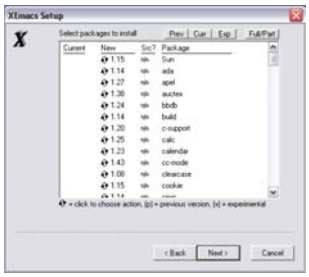


- Pick a mirror to actually download from

XEmacs Installation

- You should then be able to fire up XEmacs

XEmacs Installation



- Choose which packages to install – again defaults are fine

~/.xemacs/init.el & ~/.xemacs/custom.el

- Starting in XEmacs 21.4, the preferred location for the init file is "~/.xemacs/init.el"
- In previous versions, it was "~/.emacs"
- init.el should contain initialization related stuff (i.e. variable declarations, package requirements)
- custom.el should contain customizations (such as custom variables and faces)

TRAMP

- What is TRAMP?
  - Stands for "Transparent Remote (file) Access, Multiple Protocol"
  - A remote file editing package for XEmacs
- Allows us edit remote files as if they were local
  - Capable of using SSH/SCP to actually do the dirty work

TRAMP Windows Configuration

- Directions will assume that you grabbed the "Windows-style installer" that installs PuTTY plus some small supporting applications (as compared to the stand alone executable)
- Assumes the default installation path for PuTTY:
  - C:\Program Files\PuTTY\
- Assumes that you are using the "new" XEmacs configuration files
  - ~\.xemacs\custom.el

```
;; Snippet from custom.el

;; Allow XEmacs to be able to see PuTTY (specifically plink.exe)
(setq exec-path (append exec-path '("C:\\Progra~1\\PuTTY\\")))

;; make sure we have TRAMP
(require 'tramp)
;; PuTTY uses the plink, a normal Linux install would most likely be ssh
(setq tramp-default-method "plink")
;; Setup end of line sequence for Windows - carriage return + newline
(setq tramp-password-end-of-line "\r\n")
;; IMPORTANT: this is a regular expression that should match your prompt.  If you have not
;; changed your shell or prompt then you can just copy this, otherwise see the manual.
(setq shell-prompt-pattern "^.*%")
```

Obtaining TRAMP

- Any recent installation of XEmacs will most likely either come with TRAMP or will allow you to select the package at installation
- To see TRAMP is installed you can issue the following commands in XEmacs
  - M-x list-packages
  - Just search the list, and see if it is listed and installed
- If not installed, can be in 1 of 2 ways
  - Use the integrated installed when listing the packages
  - Download and install the package outside of XEmacs

Opening a Remote File Using TRAMP

- To open a remote file you will use the normal Xemacs command to open a file: C-x C-f
- You specify the user, remote computer, and file in the following format
  - "/[username@host]path/to/file/fileName"

TRAMP Windows Configuration

- If on a UNIX or Cygwin installation there typically is not a lot of setup
- There are some challenges to doing this in a Windows environment
  - XEmacs has no clue what SSH/SCP clients are installed and where to look for them
  - So we need to tell XEmacs where to look
- I've had the best results getting this working configuring XEmacs to use PuTTY

Opening a Remote File Using TRAMP

- After pressing enter, you will see some cryptic stuff go across the minibuffer – not to worry – it's just connecting
- Shortly thereafter it will prompt you for your myUMBC password

Opening a Remote File Using TRAMP

- After some more cryptic happenings in the minibuffer, your file will be opened for editing
- When you save the file, it is written back to the remote computer
- FYI: once connected other features such as auto completion and directory listings will also be available

Cygwin Motivations/Cautions

- Cygwin allows you to develop in an environment completely detached form UMBC
  - All work is being done on local host
  - SCP work over when done
- Use UNIX utilities (ls, grep, etc…) under Windows
- Can write applications that run on Windows (you are now generating a.exe's instead of a.out's)
- **Words of Caution**
  - **Almost all instructors require your project to run on linux.gl.umbc.edu**
  - **There may be some subtle differences between Cygwin and the Linux servers – such as random number generation**
  - **ALWAYS check your progress periodically against linux.gl.umbc.edu, to be sure your program works as expected on GL**
  - **Make sure you backup your work (SCP to UMBC periodically), this way you do not lose your work if your computer breaks down**

Cygwin Overview

- Cygwin is a Linux-like environment for Windows
- Consists of 2 parts:
  - A DLL (cygwin1.dll) which acts as a Linux API emulation layer providing substantial Linux API functionality
  - A collection of tools, which provide Linux look and feel

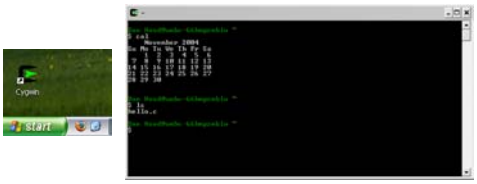
Cygwin Installation

- The Cygwin installation uses the same installer as Cygwin/X
- The only thing you'll want to change is to snoop around the packages and choose more stuff to install
- Packages of interest include
  - Development
  - Editors
  - Shells
  - X if you want a local X server

Cygwin Applications

- Many UNIX applications are bundled with Cygwin – listed is a *very small subset* of these applications
  - Development
    - ddd, cvs, gcc/g++, gdb, indent, make, nasm, rcs, subversion
  - Editors
    - emacs, xemacs, vi, nano
  - Interpreters
    - python , perl, ruby, clisp
  - Shells
    - bash, tcsh
  - Others
    - man, xterm, xorg X server, ssh, diff, grep, tar, gzip, scp, ssh

Cygwin at Work



- Once the installation has completed, you will notice the a Cygwin shortcut, this is your local shell
- Commands for packages that you have installed should be available

Cygwin Directory Structure

- When you open a Cygwin shell, you be put in your Cygwin home directory:
  - /home/username/
- This is actually mapped to some directory in the Windows file system where Cygwin stores your files
- You have still have access to all of you drives under the Cygwin path:
  - /cygdrive/c/Documents\ and\ Settings/
  - "c:\Documents and Settings\"

Conclusion

- Can combine multiple techniques together
  - SSH + Cygwin/X
  - OpenAFS + XEmacs for Windows
- No "right" solution each has its advantages and disadvantages
- However there are some dumb things that could be done:
  - Don't add complexity to something that you get for free
  - For example: setting up an Xserver, SSHing to another host and tunneling X connections just to open up an xterm, when an xterm is essentially the same thing you would get by just SSHing

Bootable Linux Overview

- What is a bootable Linux distribution?
  - A version of Linux that you can put in your CDROM drive and boot your computer into Linux from
  - Does not install anything what-so-ever
  - All of the software is loaded from the CD and stored in main memory - so when you reboot, everything is as it was before booting from the CD
  - Uses the hardware in your computer, with the exception of the hard drives, which are left untouched
  - Makes for a nice way to experiment with Linux – no risks, just reboot

Links

- SSH Clients
  - UMBC's Tera Term
    - http://www.umbc.edu/oit/sans/desktopsupport/downloads/
  - PuTTY
    - http://www.chiark.greenend.org.uk/~sgtatham/putty/
  - SSH.com
    - http://www.ssh.com/support/downloads/secureshellwks/non-commercial.html
  - OpenSSH
    - http://www.openssh.com/

Bootable Linux Distributions

- There are many bootable distributions available from bare-bones to fully featured
- Some of the more commonly known ones are
  - Knoppix
  - Gnoppix
  - SUSE Live

Links

- SCP Clients
  - WinSCP
    - http://winscp.sourceforge.net/
  - Cute FTP
    - http://www.cuteftp.com/cuteftppro/
  - SSH.com
    - http://www.openssh.com/

Links

- X Servers
  - Cygwin/X
    - http://x.cygwin.com/
  - Exceed
    - http://www.hummingbird.com/products/nc/exceed/
  - X-Deep/32
    - http://www.pexus.com/
  - X-Win32/64
    - http://www.starnet.com/

Links

- Open AFS
  - http://www.openafs.org/
- Xemacs
  - http://www.xemacs.org/
- TRAMP
  - http://savannah.gnu.org/projects/tramp/
- Cygwin
  - http://www.cygwin.com/

Links

- Bootable Linux Distributions
  - Knoppix
    - http://www.knoppix.com/
  - Gnoppix
    - http://www.gnoppix.org/
  - Suse Live
    - http://www.suse.com/us/private/download/suse_linux/