Advanced Command Line

Advanced Embedded Linux Development

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Learning objectives:

Editing from command line

Using the shell

Searching from command line

Wildcards, pipes, redirection

Permissions

Remote access to the command line

Editing - vi

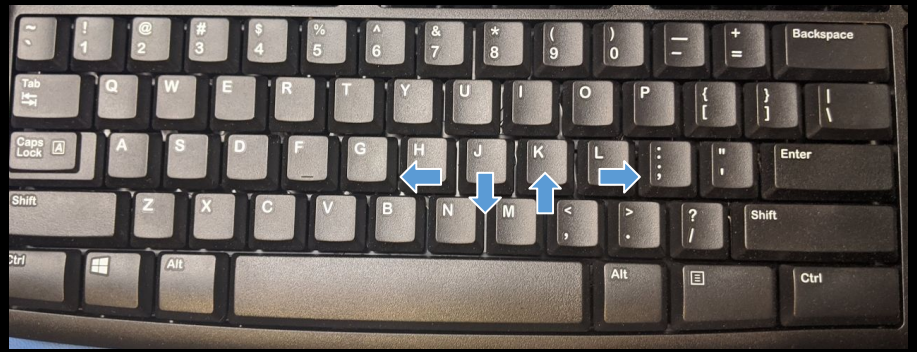
- Linux has lots of text editors to choose from.
- “vi” is one classic utility
  - Short reference for the “visual” mode of an early text editor utility on UNIX
  - Written in 1976
  - Often replaced by “vim” “VI improved”
- I suggest getting at least some familiarity with “vi”
  - Why? - It’s everywhere. In my experience it’s the only editor you can always count on being available.

http://ex-vi.sourceforge.net/
https://www.vim.org/

Editing - vi

- Basic commands:
  - vi <name> (or vim <name>)
- Entering “normal mode” for commands - use Esc key
  - write - Esc -> :w Esc -> :q - quit
  - Insert: i, Delete d
  - Navigation keys

Move	Key
Left	h
Down	j
Up	k
Right	l



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Shell Interpreter Options

- A shell interpreter handles commands from the terminal (or from a script file).
- Several have been developed, many have similar command support.
- Bourne shell (sh) was one of the originals, released in 1979
- Bash shell (Bourne Again SHell) was created as a replacement for Bourne with features from ksh and csh.

https://www.gnu.org/software/bash/

Searching for Files

- Locate files/directories with find
  - Find files/directories below the current directory “.” with name a_directory

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ find . -name a_directory
./a_copy_target/a_directory
./a_directory
```

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Searching for Content

- Searching for content with grep

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat textfile.txt
AESD_IS_AWESOME!
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat textfile2.txt
CU_IS_AWESOME!
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ grep -r "IS_AWESOME" *
textfile.txt:AESD_IS_AWESOME!
textfile2.txt:CU_IS_AWESOME!
```

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Wildcards

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat textfile.txt
AESD_IS_AWESOME!
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat textfile2.txt
CU_IS_AWESOME!
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ grep -r "IS_AWESOME" *
textfile.txt:AESD_IS_AWESOME!
textfile2.txt:CU_IS_AWESOME!
```

- * in means files with any character in the name
- textfile*txt would have meant any file starting with textfile and ending with txt
- expanded by the shell to
  - grep -r “IS_AWESOME” textfile.txt textfile1.txt textfie2.txt textfile3.txt textfile4.txt

https://ryanstutorials.net/linuxtutorial/wildcards.php

Pipes

- The Pipe Character ‘|’ sends the output of one command to the input of another command
  - Chain commands together based on standard input/output streams.

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat textfile.txt  | grep "IS_AWESOME"
AESD_IS_AWESOME!
```

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Redirection

- Send the output of a command to a new file using >

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ grep -r "IS_AWESOME" * > searchresult.txt
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat searchresult.txt
textfile.txt:AESD_IS_AWESOME!
textfile2.txt:CU_IS_AWESOME!
```

- Append the output of a command into an existing file using >>

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ echo "hello" >> searchresult.txt
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat searchresult.txt
textfile.txt:AESD_IS_AWESOME!
textfile2.txt:CU_IS_AWESOME!
hello
```

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File Permissions

- Control how a file may be used and by whom
- 3 levels of permission - User, Group and World (or everyone

  Use ls -l to show permission info

User (owner)			Group			Others (everyone)		
Read (r)	Write (w)	Execute (x)	Read (r)	Write (w)	Execute (x)	Read (r)	Write (w)	Execute (x)

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ ls -l
total 20
drwxr-xr-x 3 dan dan 4096 Jun 21 15:28 a_copy_target
drwxr-xr-x 3 dan dan 4096 Jun 21 15:28 a_directory
-rw-r--r-- 1 dan dan   65 Jun 21 15:35 searchresult.txt
-rw-r--r-- 1 dan dan   17 Jun 21 15:31 textfile.txt
-rw-r--r-- 1 dan dan   15 Jun 21 15:31 textfile2.txt
```

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File Permissions

- Execute permissions typically not granted by default

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ cat helloworld.sh
#!/bin/bash
echo "hello world!"
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ ls -l helloworld.sh
-rw-r--r-- 1 dan dan 32 Jun 21 15:38 helloworld.sh
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ ./helloworld.sh
-bash: ./helloworld.sh: Permission denied
```

- Use chmod to change permissions

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ chmod u+x helloworld.sh
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ ls -l helloworld.sh
-rwxr--r-- 1 dan dan 32 Jun 21 15:38 helloworld.sh
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ ./helloworld.sh
hello world!
```

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File Permissions

- Permissions can be specified by octal digits in numeric mode.
  - 4 = read
  - 2 = write
  - 1 = execute

```
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ ls -l helloworld.sh
-rwxr--r-- 1 dan dan 32 Jun 21 15:38 helloworld.sh
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ chmod 766 helloworld.sh
dan@DESKTOP-BQMVP69:~/CU/aesd-lectures/lecture2$ ls -l helloworld.sh
-rwxrw-rw- 1 dan dan 32 Jun 21 15:38 helloworld.sh
```

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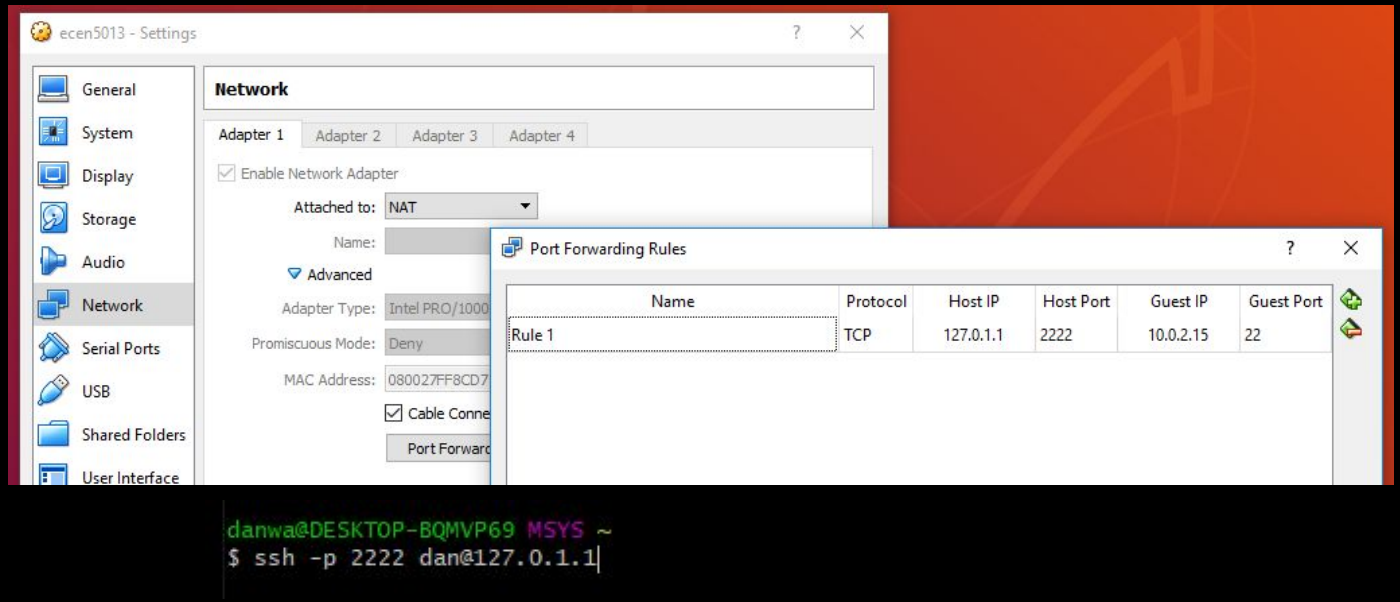
Remote Access

- You can use Secure Shell (ssh) for remote access to machines (including your VM)



https://nomanualentry.org/post/174407221318/ssh-into-your-virtualbox-guest

Remote Access

- Use a unix environment WSL or msys2 on Windows
  - https://docs.microsoft.com/en-us/windows/wsl/install-win10
  - https://www.msys2.org/
- Use scp for file transfer into/out of your VM

Transfer from windows to your virtual machine home directory

```
danwa@DESKTOP-BQMVP69 MSYS ~
$ scp -P 2222 /c/Users/danwa/Downloads/somefile.txt dan@127.0.1.1:~
```

SSH into your virtual machine

```
danwa@DESKTOP-BQMVP69 MSYS ~
$ ssh -p 2222 dan@127.0.1.1
```

Verify your virtual machine contains somefile.txt

```
dan@DESKTOP-BQMVP69:~$ ls -la | grep somefile
-rw-r--r--   1 dan  dan      0 Jun 21 15:45 somefile.txt
```

Transfer from virtual machine into your Windows system

```
danwa@DESKTOP-BQMVP69 MSYS ~
$ scp -P 2222 dan@127.0.1.1:~/somefile.txt /c/Users/danwa/Downloads/from_vm.txt
```

https://linuxize.com/post/how-to-use-scp-command-to-securely-transfer-files/