

# Mastering EOS

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## Manipulating the PATH

When you execute a command, the shell searches for the executable using the PATH environment variable. PATH should be set to a colon-delimited list of directories containing executables. To view your PATH, type:

```
echo $PATH
```

For instance, to add a local scripts directory (conventionally ~/bin) to your PATH, run:

```
export PATH=~/bin:$PATH
```

Note that this causes the shell to find your scripts before system executables of the same name; however, this effect is usually desired. To make this setting persist, consider adding it to your ~/.bash\_profile.

## Multiple terminals

An alternative to opening multiple terminals running SSH or multiple PuTTY windows is to use a terminal multiplexer such as Screen or tmux. tmux is recommended. Type tmux once SSH'd to start it.

**Default tmux bindings:**  
**C-b c** means **Control + b**, then **c**.

New window	C-b c	Kill window	C-b &
Last window	C-b l	Jump to window 4	C-b 4
Next window	C-b n	Previous window	C-b p
Enter copy mode	C-b [	Paste buffer	C-b ]

**Warning:** Detached sessions will be killed periodically. Please do not leave important jobs running.

## Directory navigation

pushd <i>dir</i>	Switch to <i>dir</i> and add the current directory to the directory stack
popd	Remove the top directory on the directory stack and switch to it
dirs	Show contents of the directory stack

## Version control systems

Version control systems are used to track changes to a set of files. Their use is considered professional software development practice.

- Distributed Version Control Systems (recommended)
  - Git (git) <git-scm.com>
  - Mercurial (hg) <mercurial.selenic.com>
- Centralized Version Control Systems
  - Subversion (svn) <subversion.apache.org>
  - Concurrent Versions System (cvs) <cvs.nongnu.org>

## Downloading files

Both commands listed download a copy of the IRS W4 form. Wget is a general-purpose file downloader while curl is great at crafting custom requests. aria2 is another option but is not typically included with a base system (you must install it yourself).

```
wget 'http://www.irs.gov/pub/irs-pdf/fw4.pdf'
curl 'http://www.irs.gov/pub/irs-pdf/fw4.pdf' > fw4.pdf
```

## Installing software to your EOS account

Installs version 1.17.0 of aria2, a download utility similar to Wget but with more features. This install is typical of many programs using the GNU build system. The option of note is the --prefix option to ./configure. You may install to any directory you like, but ~/.local is a common convention.

```
mkdir -p ~/.local/src # Create directory for source code
cd ~/.local/src
wget 'http://downloads.sourceforge.net/'\
    'project/aria2/stable/'\
    'aria2-1.17.0/aria2-1.17.0.tar.gz' # Download aria2 source code
tar -xf aria2-1.17.0.tar.gz # Unarchive source code
cd aria2-1.17.0
./configure --prefix ~/.local # Set up build configuration
make # Build the program
make install # Install program to ~/.local/bin
export PATH=~/local/bin:$PATH # Consider adding to ~/.bash_profile
aria2c 'http://www.irs.gov/'\
    'pub/irs-pdf/fw4.pdf' # Download the W4
```

## Software build systems

A build system offers an alternative to repetitively typing compiler commands and is considered professional practice.

- C/C++
  - CMake <cmake.org>
  - Autotools <gnu.org/s/automake>
  - SCons <scons.org>
  - GNU Make <gnu.org/s/make>
- Java
  - Buildr <buildr.apache.org>
  - Maven <maven.apache.org>
  - Ant <ant.apache.org>

## Run Make faster by using all processors

Software which takes longer to compile can be compiled faster by running Make in parallel. This command utilizes all processors of the current machine.

```
make --jobs="$(grep '^processor' /proc/cpuinfo | wc --lines)"
```

## Inter-EOS password-less SSH

Secure Shell is a protocol that is used to remotely control machines. Under normal circumstances, you must type a password to log in. However, by setting up trust, no password is necessary to SSH between EOS machines.

```
# Generate SSH key
ssh-keygen # Press Enter at each prompt
# Add new SSH key to authorized_keys
cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys
_trust_host() {
    ssh -o StrictHostKeyChecking=no -o ConnectTimeout=2 "$1" exit
}
# Trust all EOS machines
for i in {1..24}; do _trust_host "eos$(printf '%02d' $i)"; done
# Trust all Arch machines
for i in {1..10}; do _trust_host "arch$(printf '%02d' $i)"; done
ssh eos15 # Automatic login
```

For more security, use a passphrase and ssh-agent.

## Using the clipboard

When you copy or paste in a desktop environment, you use the X11 clipboard. The contents of the X11 clipboard can be accessed and modified through the terminal using a utility called xclip.

```
alias copy='xclip -selection clipboard -in'
alias paste='xclip -selection clipboard -out'
echo 'EOS Rocks' | copy # Set clipboard to 'EOS Rocks'
copy < eos.txt # Set clipboard to contents of eos.txt
paste > eos.txt # Write clipboard contents to eos.txt
```

## Interacting with other users

w	Show system uptime, who is logged in, and what they are doing
last	Show login history
write	Write a message to another user's terminal
mesg [yn]	Enable or disable write access to your terminal

## Getting help on commands

To get help on the dd command...

- Brief help: man dd, available for most commands
- Detailed help: info dd, available for some commands

## Miscellaneous

- If a user is already logged on to a machine, press Ctrl-Alt-Backspace to kill the X server and log them out.
- Change your password with passwd.
- Check your quota with quota --human-readable or quota -s.

..... for more interesting tips, please see the accompanying manual at <http://seanfisk.github.io/mastering-eos/>.