

**Lab #12: System Backup**  
**CSC432: System Information and Security**  
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**17 April 2017**

## **Abstract**

The main goal of this lab is to learn how to do a backup on my network. The software that I will be using for that procedure is called Rsync, or Remote Synchronization. Rsync will first be used according to the manual to see how it works, along with a small demonstration with four flags of my choosing. We will also create a script where we will copy a directory from the web server and move it over to my Kali virtual machine. A 'cron' service will also be configured so that my web server will automatically backup certain documents to my Kali every night.

## **Introduction**

At this point, my own network is fully secure with a variety of software monitoring it from various technical aspects. All there left to do now is to have a method for making backups for certain files in my web server. To demonstrate this, I will be backing up files from the web server to my Kali Linux virtual machine through the Rsync service. Rsync, which is short for Remote Synchronization, will be configured to send the files over to my Kali Linux via SSH. Because manual backups is a lot less efficient than automatic backups, I will work on setting that up as well.

## **Processes & Screenshots**

```
QEMU (CSC432-fsnuth-Web) - noVNC - Mozilla Firefox
https://vle.cs.utica.edu:8006/?console=kvm&novnc=1&vmid=432050&vmname=CSC432-fsnuth-Web&node=atris
rsync(1) rsync(1)

NAME
rsync - a fast, versatile, remote (and local) file-copying tool

SYNOPSIS
Local:  rsync [OPTION...] SRC... [DEST]

Access via remote shell:
Pull:   rsync [OPTION...] [USER@]HOST:SRC... [DEST]
Push:   rsync [OPTION...] SRC... [USER@]HOST:DEST

Access via rsync daemon:
Pull:   rsync [OPTION...] [USER@]HOST::SRC... [DEST]
        rsync [OPTION...] rsync://[USER@]HOST[:PORT]/SRC... [DEST]
Push:   rsync [OPTION...] SRC... [USER@]HOST:DEST
        rsync [OPTION...] SRC... rsync://[USER@]HOST[:PORT]/DEST

Usages with just one SRC arg and no DEST arg will list the source files instead of copying.

DESCRIPTION
Rsync is a fast and extraordinarily versatile file copying tool. It can copy locally, to/from another host over any remote shell, or to/from a remote rsync daemon. It offers a large number of options that control every aspect of its behavior and permit very flexible specification of the set of files to be copied. It is famous for its delta-transfer algorithm, which reduces the amount of data sent over the network by sending only the differences between the source files and the existing files in the destination. Rsync is widely used for backups and mirroring and as an improved copy command for everyday use.

Rsync finds files that need to be transferred using a "quick check" algorithm (by default) that looks for files that have changed in size or in last-modified time. Any changes in the other preserved attributes (as requested by options) are made on the destination file directly when the quick check indicates that the file's data does not need to be updated.

Some of the additional features of rsync are:

o support for copying links, devices, owners, groups, and permissions
o exclude and exclude-from options similar to GNU tar
o a CVS exclude mode for ignoring the same files that CVS would ignore
o can use any transparent remote shell, including ssh or rsh
o does not require super-user privileges
o pipelining of file transfers to minimize latency costs

Manual page rsync(1) line 1 (press h for help or q to quit)
```

*(In order to effectively use the Rsync service, I should read up the documentation on how to use it. Thankfully, Rsync comes with a manual coded into it. I can open up this manual by typing in 'man rsync'. Everything regarding Rsync from background information to syntax is displayed.)*

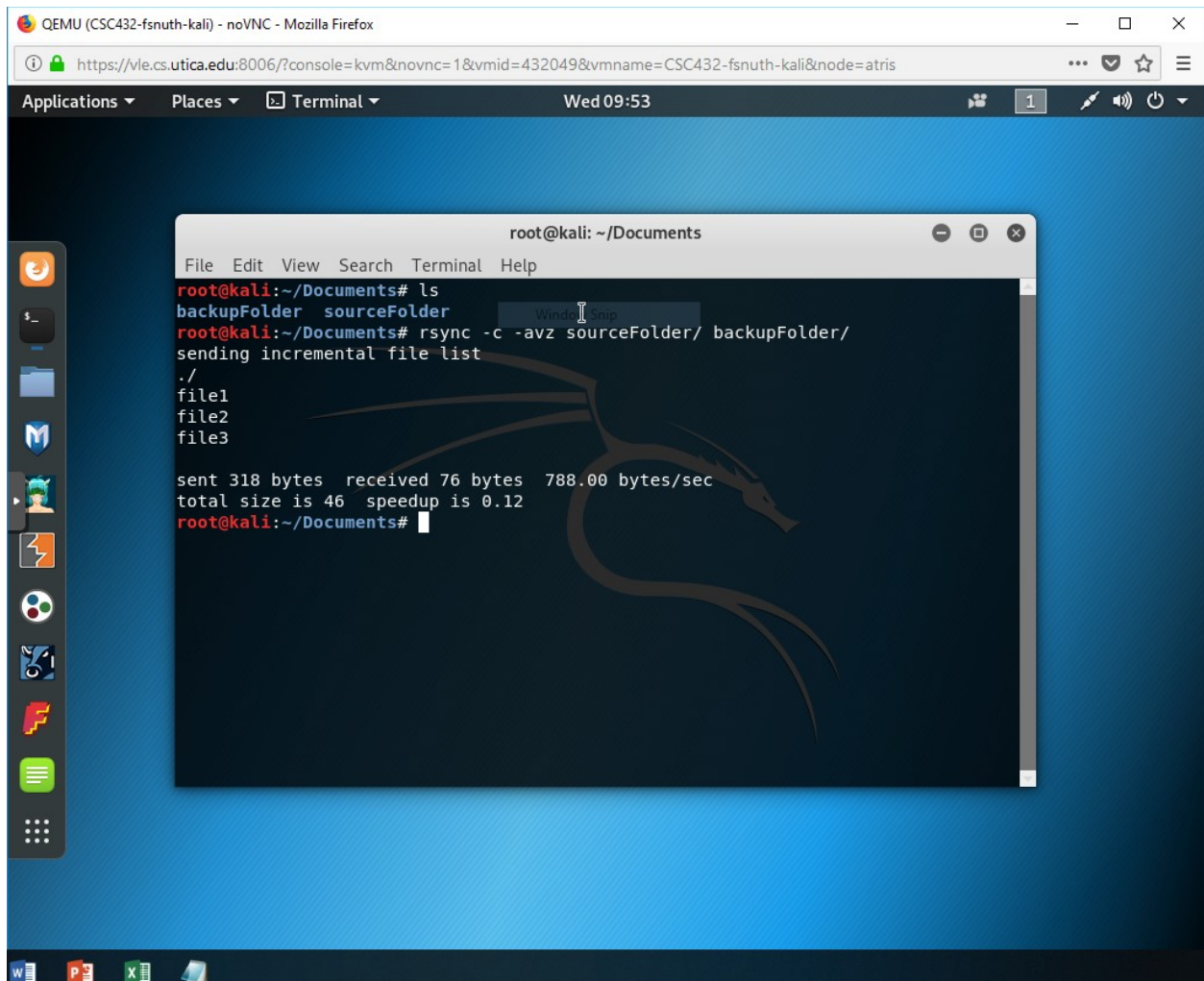
```
QEMU (CSC432-fsnuth-Web) - noVNC - Mozilla Firefox
https://vle.cs.utica.edu:8006/?console=kvm&novnc=1&vmid=432050&vmname=CSC432-fsnuth-Web&node=atris

OPTIONS SUMMARY
Here is a short summary of the options available in rsync. Please refer to the detailed description below for a complete description.

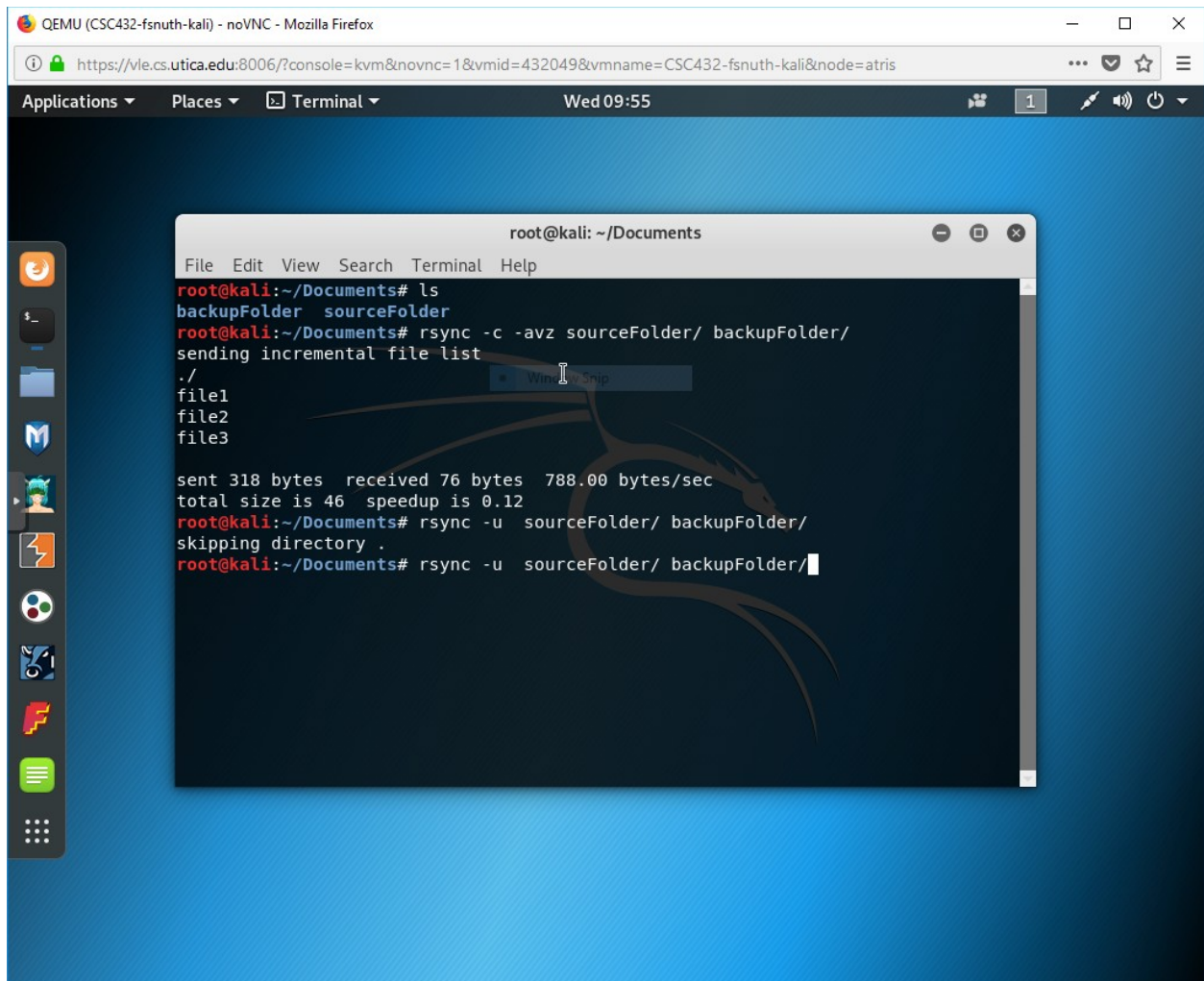
-v, --verbose           increase verbosity
--info=FLAGS           fine-grained informational verbosity
--debug=FLAGS          fine-grained debug verbosity
--msgs2stderr           special output handling for debugging
-q, --quiet            suppress non-error messages
--no-motd              suppress daemon-mode MOTD (see caveat)
-c, --checksum         skip based on checksum, not mod-time & size
-a, --archive          archive mode; equals -rlptgoD (no -H,-A,-X)
--no-OPTION            turn off an implied OPTION (e.g. --no-D)
-r, --recursive        recurse into directories
-R, --relative         use relative path names
--no-implied-dirs     don't send implied dirs with --relative
-b, --backup           make backups (see --suffix & --backup-dir)
--backup-dir=DIR       make backups into hierarchy based in DIR
--suffix=SUFFIX        backup suffix (default ~ w/o --backup-dir)
-u, --update           skip files that are newer on the receiver
--inplace             update destination files in-place
--append              append data onto shorter files
--append-verify        --append w/out data in file checksum
-d, --dirs            transfer directories without recursing
-l, --links            copy symlinks as symlinks
-L, --copy-links       transform symlink into referent file/dir
--copy-unsafe-links    only "unsafe" symlinks are transformed
--safe-links          ignore symlinks that point outside the tree
--munge-links         munge symlinks to make them safer
-k, --copy-dirlinks    transform symlink to dir into referent dir
-K, --keep-dirlinks    treat symlinked dir on receiver as dir
-H, --hard-links       preserve hard links
-p, --perms           preserve permissions
-E, --executability    preserve executability
--chmod=CHMOD         affect file and/or directory permissions
-A, --acls            preserve ACLs (implies -p)
-X, --xattrs          preserve extended attributes
-o, --owner           preserve owner (super-user only)
-g, --group           preserve group
--devices            preserve device files (super-user only)
--copy-devices        copy device contents as regular file
--specials           preserve special files
-D,                  same as --devices --specials
-t, --times           preserve modification times
-O, --omit-dir-times   omit directories from --times
-J, --omit-link-times  omit symlinks from --times

Manual page rsync(1) line 288 (press h for help or q to quit)
```

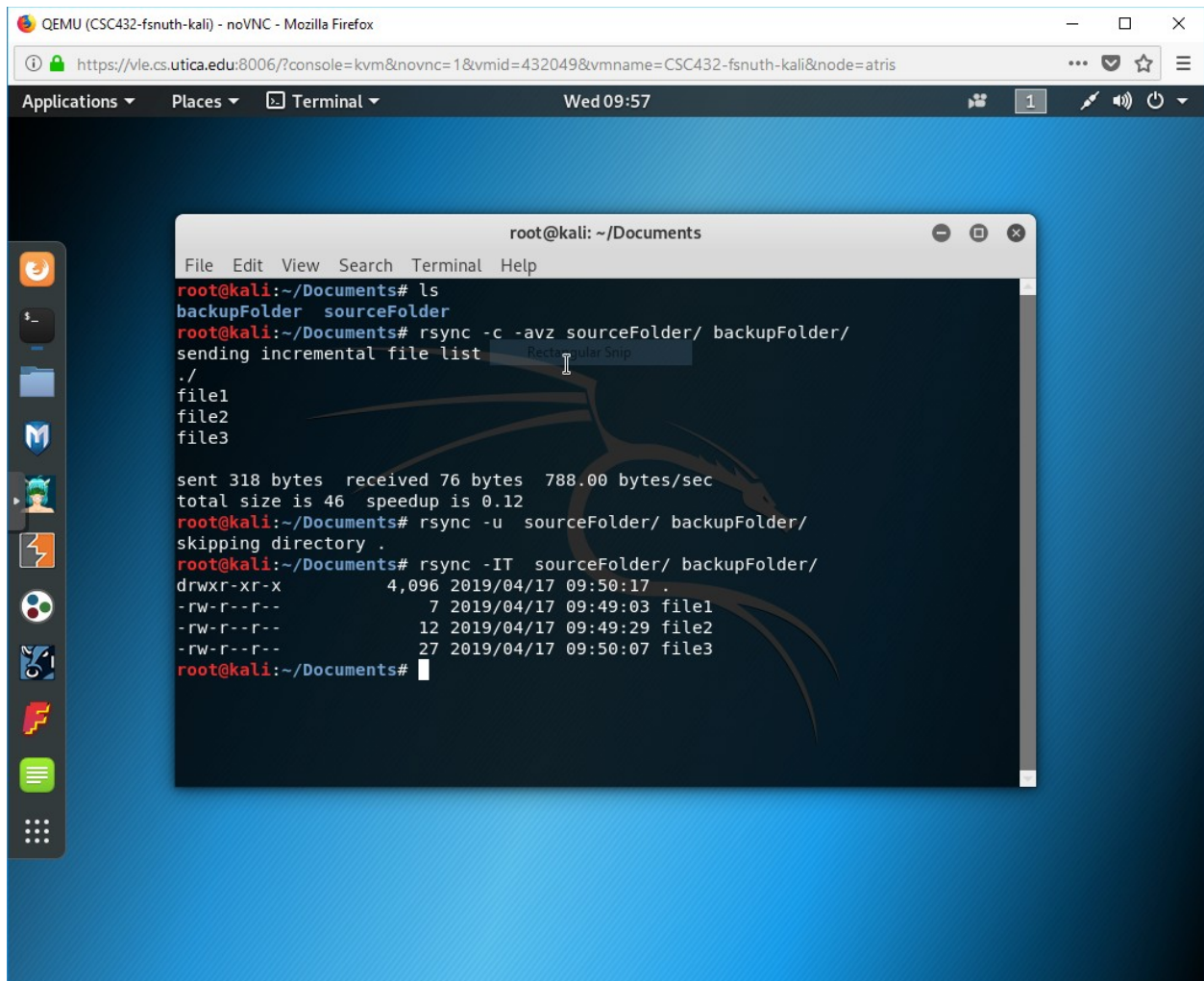
*(The flags can be found when scrolling down into the section called ‘Options Summary’. A long list of flags that can be used in the syntax for using Rsync. Each flag has their own capabilities, and most of them can be mixed up with each other for various functions.)*



*(We then go over to my Kali Linux machine and install the Rsync service with 'sudo apt-get install rsync'. In the Documents folder, we created two directories called 'backupFolder', and 'sourceFolder'. These are the directories that will be used for the backup procedure. This is part one of the four times where I will use different flags in Rsync for different purposes. The flag '-cavz' allows skips based on check-sums, activates archive mode, increase verbosity, and compress the data during transfer.)*



*(The flag '-u' allows Rsync to skip over files in the destination folder that already exist.)*

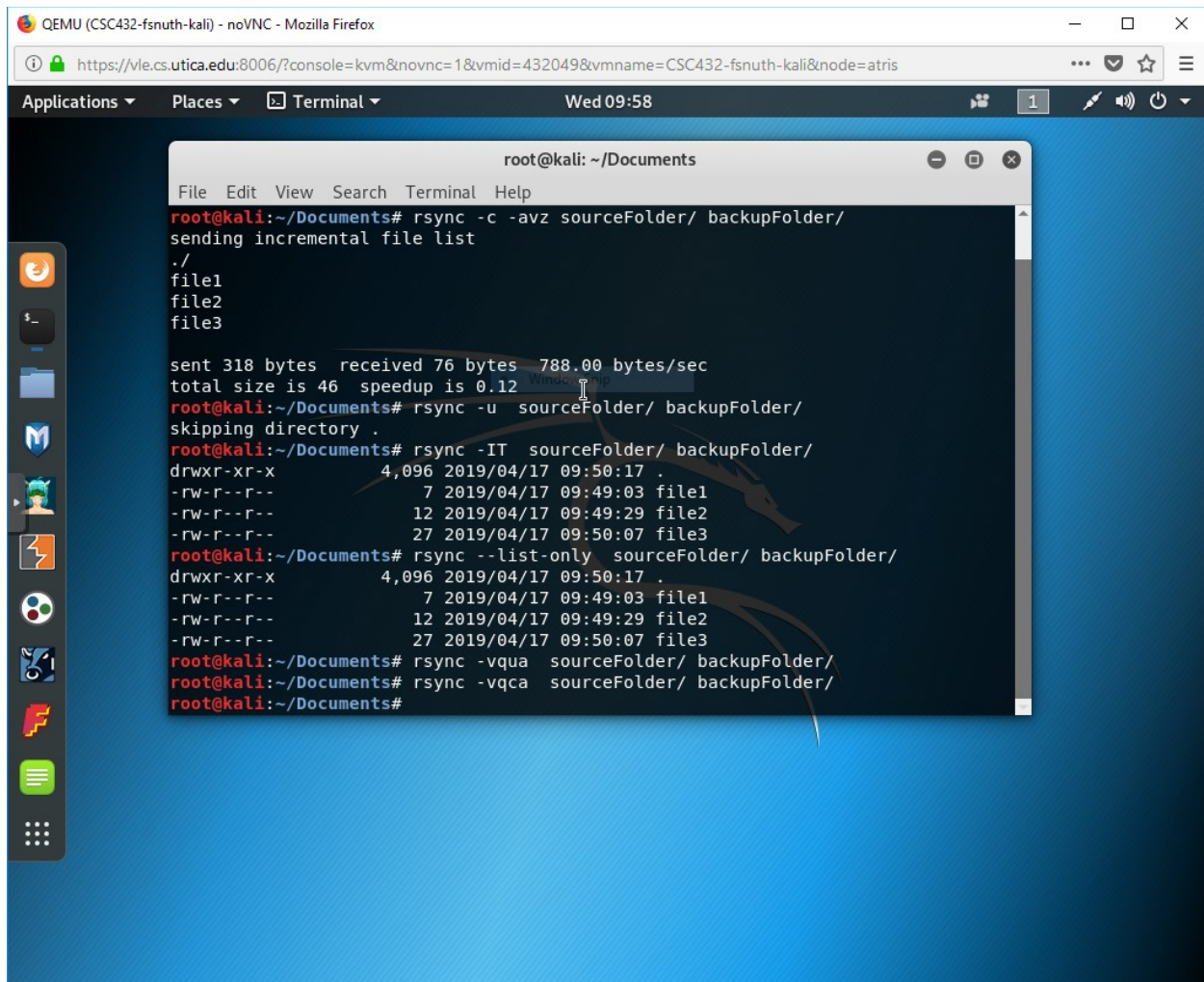


```
root@kali: ~/Documents
File Edit View Search Terminal Help
root@kali:~/Documents# ls
backupFolder  sourceFolder
root@kali:~/Documents# rsync -c -avz sourceFolder/ backupFolder/
sending incremental file list
./
file1
file2
file3

sent 318 bytes  received 76 bytes  788.00 bytes/sec
total size is 46  speedup is 0.12
root@kali:~/Documents# rsync -u sourceFolder/ backupFolder/
skipping directory .
root@kali:~/Documents# rsync -IT sourceFolder/ backupFolder/
drwxr-xr-x  4,096 2019/04/17 09:50:17 .
-rw-r--r--    7 2019/04/17 09:49:03 file1
-rw-r--r--   12 2019/04/17 09:49:29 file2
-rw-r--r--   27 2019/04/17 09:50:07 file3
root@kali:~/Documents#
```

*(The flag '-IT' allows files to be overridden regardless of timestamps and create a temporary directory in the destination folder.)*



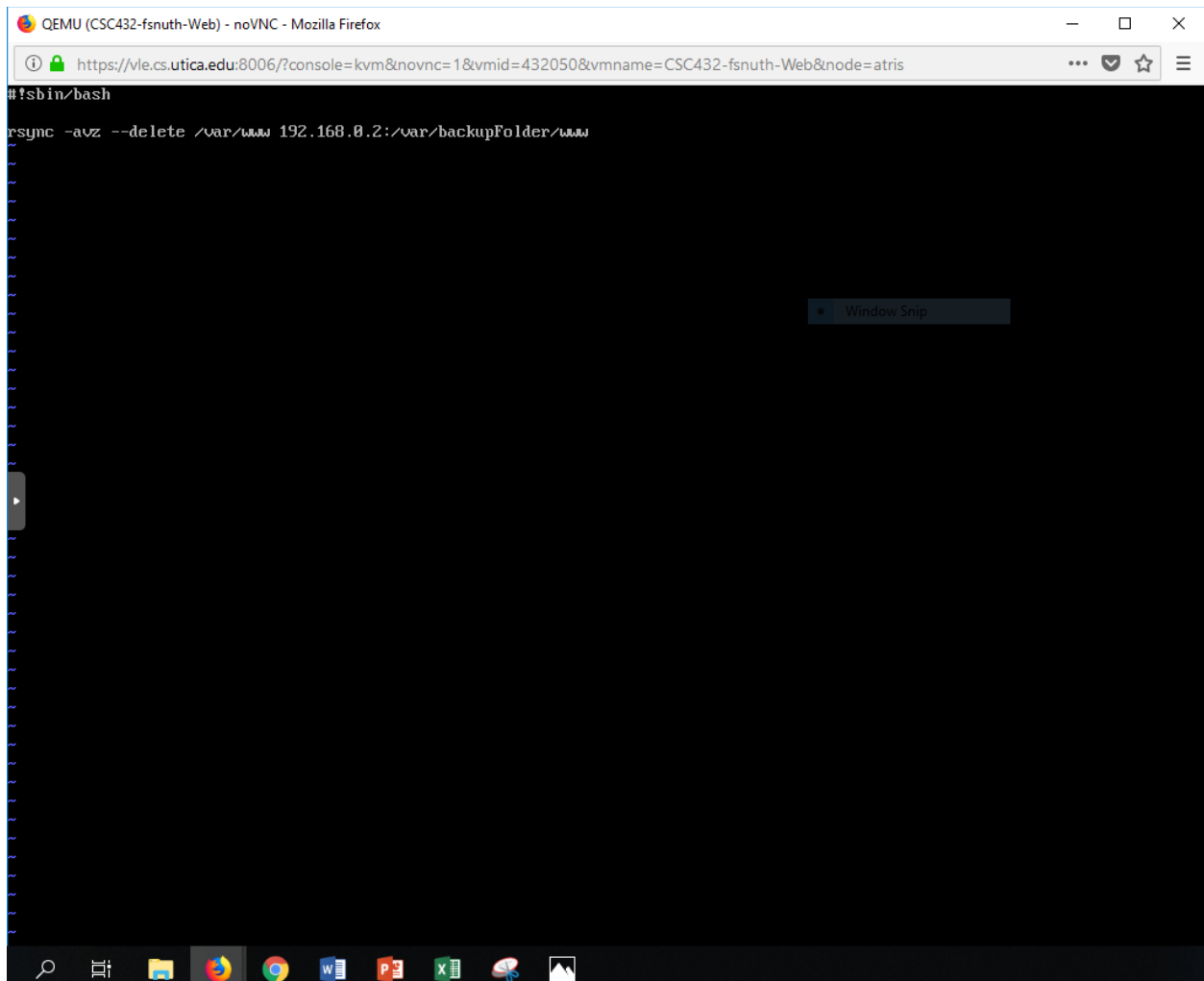


```
root@kali: ~/Documents
File Edit View Search Terminal Help
root@kali:~/Documents# rsync -c -avz sourceFolder/ backupFolder/
sending incremental file list
./
file1
file2
file3

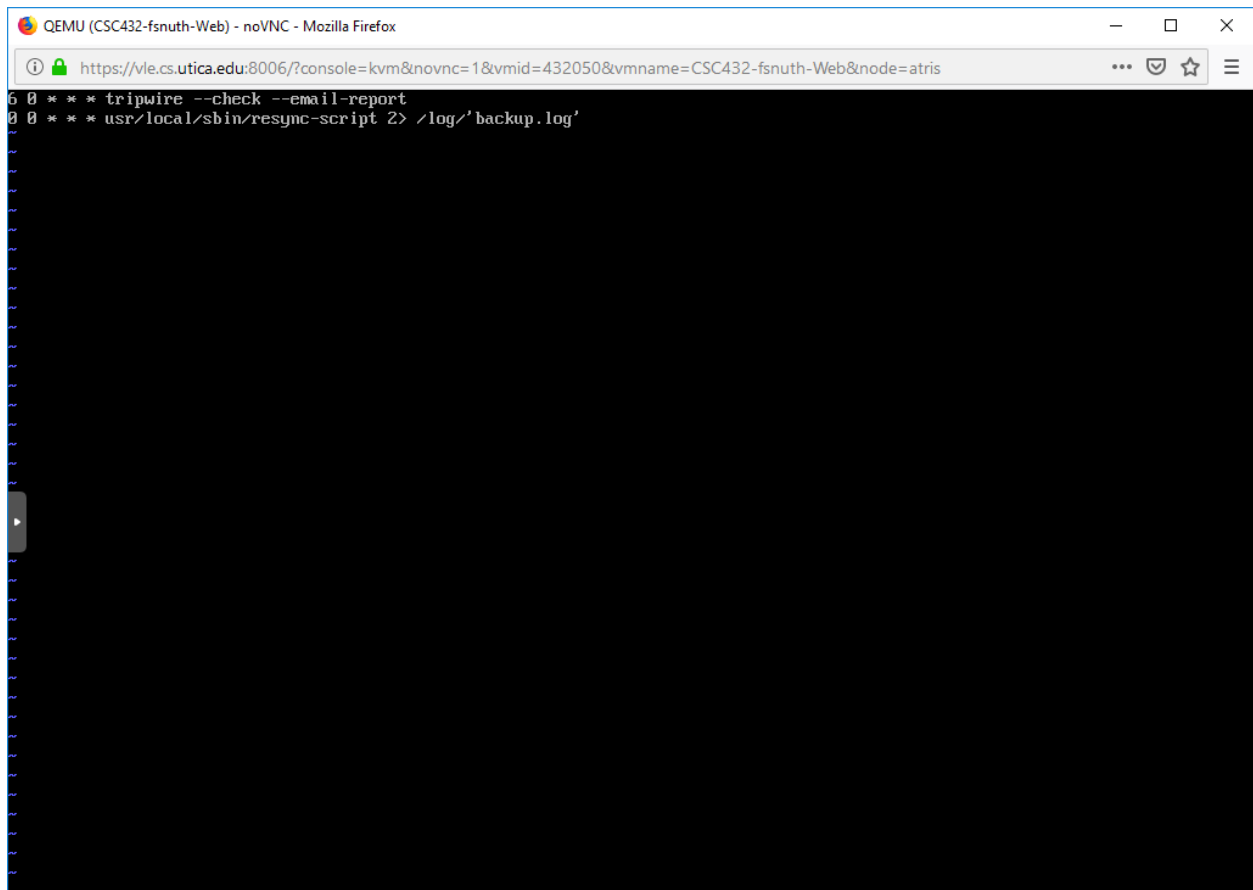
sent 318 bytes  received 76 bytes  788.00 bytes/sec
total size is 46  speedup is 0.12
root@kali:~/Documents# rsync -u sourceFolder/ backupFolder/
skipping directory .
root@kali:~/Documents# rsync -IT sourceFolder/ backupFolder/
drwxr-xr-x  4,096 2019/04/17 09:50:17 .
-rw-r--r--   7 2019/04/17 09:49:03 file1
-rw-r--r--  12 2019/04/17 09:49:29 file2
-rw-r--r--  27 2019/04/17 09:50:07 file3
root@kali:~/Documents# rsync --list-only sourceFolder/ backupFolder/
drwxr-xr-x  4,096 2019/04/17 09:50:17 .
-rw-r--r--   7 2019/04/17 09:49:03 file1
-rw-r--r--  12 2019/04/17 09:49:29 file2
-rw-r--r--  27 2019/04/17 09:50:07 file3
root@kali:~/Documents# rsync -vqua sourceFolder/ backupFolder/
root@kali:~/Documents# rsync -vqca sourceFolder/ backupFolder/
root@kali:~/Documents#
```

*(The flags '-vqca' increases verbosity, does not display any message that indicates success, skip files based on check-sums, and activate archive mode.)*



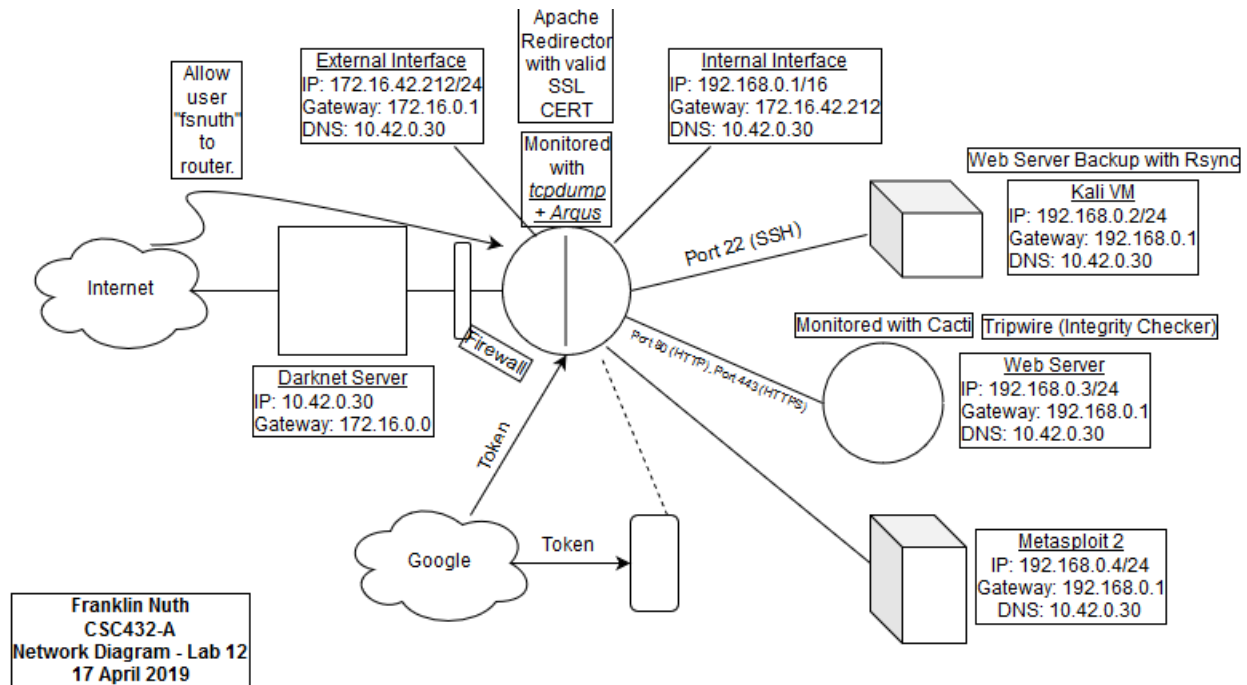
A screenshot of a web browser window displaying a QEMU console. The browser's address bar shows the URL: https://vle.cs.utica.edu:8006/?console=kvm&novnc=1&vmid=432050&vmname=CSC432-fsnuth-Web&node=atris. The console window has a title bar that reads "QEMU (CSC432-fsnuth-Web) - noVNC - Mozilla Firefox". Inside the console, the prompt is "#!sbin/bash" and the command "rsync -avz --delete /var/www 192.168.0.2:/var/backupFolder/www" has been entered. The rest of the console is filled with tilde (~) characters, indicating a large output or a scrollable buffer. A "Window Snip" button is visible on the right side of the console area. At the bottom of the browser window, a taskbar is visible with icons for various applications including a search bar, file manager, Firefox, Chrome, Word, PowerPoint, Excel, and a terminal icon.

*(This image shows the bash script needed to back up the contents in my web server's 'www' directory to the 'www' directory in my Kali Linux. Going through the 'var/www' directory, we go to a directory called 'usr/local/sbin'. We create a file called 'rsync-script' which will be used to backup files from the web server to the Kali. The image above shows the code I used. The flags here will be used to copy everything in the '/var/www' directory to the 'var/backupFolder/www' directory in my Kali Linux (its IP address is 192.168.0.2).)*



```
QEMU (CSC432-fsnuth-Web) - noVNC - Mozilla Firefox
https://vle.cs.utica.edu:8006/?console=kvm&novnc=1&vmid=432050&vmname=CSC432-fsnuth-Web&node=atris
6 0 * * * tripwire --check --email-report
0 0 * * * usr/local/sbin/resync-script Z> /log/' backup.log'
```

*(Editing the crontab file that we can access with 'crontab -e'. Here we get a message in the 'backup.log' file after every backup file is sent to the Kali machine.)*



(The recently upgraded version of my network topology. My Kali and Web Server are now equipped with Rsync. I now have the ability to backup files in case anything goes wrong.)

## Issues & Resolutions

The one issues I had upon doing this lab is that I had the wrong syntax for the bash script. The syntax in the bash script was that I had to specify what flags I wanted to use along with the ‘--delete’ flag, type in a directory of my web server, and then type a directory of my Kali machine following the IP address of said machine. I typed in the IP for my web server instead, and went back to correct it as soon as I discovered the issue.

## Conclusion

In this lab, I have learned how to perform backups on my network with the Rsync service. I now know how to operate the Rsync service with its flags and syntax for copying files. I have made a bash script in which the web server can upload to my Kali, and set up a crontab for the web server to perform backups automatically. Despite the ever-growing power of the modern

computer, it is not immune to the probability of sudden disasters that pervades many machine today. With knowledge on Rsync and its many functions, I am not worried about the unexpected destroying my files anymore.

### References

Bhartiya, Swapnil. 2015, June 24. *How to Backup Files in Linux With Rsync on the Command Line*. Retrieved from: <https://www.linux.com/learn/how-backup-files-linux-rsync-command-line>

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Peppas, Noti. 2018, November 23. *Install Rsync and Lsync on CentOS, Fedora or Red Hat*. Retrieved from: <https://www.liquidweb.com/kb/install-rsync-and-lsync-on-centos-fedora-or-red-hat/>

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Shrivastava, Tarunika. 2013, September 17. *Rsync (Remote Sync): 10 Practical Examples of Rsync Command in Linux*. Retrieved from: <https://www.tecmint.com/rsync-local-remote-file-synchronization-commands/>

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