

Assignment 2-BDA
LINUX LAB DOCUMENT
NAMRA AZIZ

Built Ubuntu image and ran the container:

```
root@b482ca62efdf:/  
Microsoft Windows [Version 10.0.19042.1526]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\Users\Ahson Aziz>docker images  
REPOSITORY          TAG      IMAGE ID      CREATED       SIZE  
ubuntu              20.04   54c9d81cbb44  2 weeks ago   72.8MB  
nginx               latest   c316d5a335a5  3 weeks ago   142MB  
docker/getting-started  latest   26d80cd96d69  2 months ago  28.5MB  
alpine/git          latest   c6b70534b534  2 months ago  27.4MB  
docker/whalesay     latest   6b362a9f73eb  6 years ago   247MB  
  
C:\Users\Ahson Aziz>docker run ubuntu  
Unable to find image 'ubuntu:latest' locally  
latest: Pulling from library/ubuntu  
Digest: sha256:669e010b58baf5beb2836b253c1fd5768333f0d1dbc834f7c07a4dc93f474be  
Status: Downloaded newer image for ubuntu:latest  
  
C:\Users\Ahson Aziz>docker run --name MyContainer -it ubuntu bash  
root@b482ca62efdf:/#
```

Topic: Grep and file comparisons:

Created a file names fruits:

```
root@b482ca62efdf:/# cat>fruits  
Apple  
Apricot  
Avocado  
Banana  
Blackberry  
Blueberry  
Cherry  
Coconut  
Cucumber  
Durian  
Dragonfruit  
Fig  
Gooseberry  
Grape  
Guava  
Jackfruit  
Plum  
Kiwifruit  
Kumquat  
Lemon  
Lime
```

Used 'Grep' utility to find a certain character:

```
root@b482ca62efdf:/# grep "s" fruits
Gooseberry
Passionfruit
Persimmon
Raspberry
Soursop
root@b482ca62efdf:/#
```

Used basic elements with grep to locate c[vowels]t:

```
c
root@b482ca62efdf:/# grep "c[aeiou]t" fruits
Apricot
root@b482ca62efdf:/#
```

Located character d:

```
root@b482ca62efdf:/# grep "[0-9]" fruits
root@b482ca62efdf:/# grep "\d" fruits
Avocado
Tamarind
root@b482ca62efdf:/#
```

Used ‘egrep’ utility with negated form of character classes:

```
root@b482ca62efdf:/# egrep "\w" fruits
Apple
Apricot
Avocado
Banana
Blackberry
Blueberry
Cherry
Coconut
Cucumber
Durian
Dragonfruit
Fig
Gooseberry
Grape
Guava
Jackfruit
Plum
Kiwi
Kumquat
Lemon
Lime
Mango
Watermelon
Mulberry
Orange
Papaya
Passionfruit
```

Used “egrep” to locate s:

```
Yuzu
root@b482ca62efdf:/# egrep "\s" fruits
Star fruit
root@b482ca62efdf:/# egrep "^\s" fruits
root@b482ca62efdf:/# egrep "^\S" fruits
Soursop
Star fruit
Strawberry
root@b482ca62efdf:/#
```

Used \$ sign to locate ‘h’ at the end of a string:

```
root@b482ca62efdf:/# egrep "h$" fruits
Peach
root@b482ca62efdf:/#
```

Created a file for numbers and searched phone number pattern using sample regex:

The pattern provided helped in filtering out valid phone numbers.

```
root@b482ca62efdf:/# cat>phonebook
223-435-4354
245-345-2335
234-565-6789
546-786-5677
435-676-5467
345-687-4566
358-57-7
567-678-76
5678-879
566-897-786
657-898-4566^C
root@b482ca62efdf:/# egrep "^[0-9]{3}-[0-9]{3}-[0-9]{4}$" phonebook
223-435-4354
245-345-2335
234-565-6789
546-786-5677
435-676-5467
345-687-4566
```

Created 2 files for comparing:

```
root@b482ca62efdf:/# cat>file1
abc
bac
cad
def
eac
^C
root@b482ca62efdf:/# cat>file2
bac
cello
dell
eana
^C
```

Applied “cmm” command to select common characters of both files. Here 1st column shows characters that are in file1 but not in 2. 2nd column shows the characters that are only in file 2, and 3rd column shows characters that are common in both files:

```
root@b482ca62efdf:/# comm file1 file2
abc
              bac
cad
              cello
def
              dell
eac
              eana
```

We can use switches as well to suppress the column we don't want to be displayed:

Here, “-1” will suppress the 1st column, “-2” will suppress the 2nd column, and “-3” will suppress 3rd column. Moreover, switches can be used in combination. “-12” will suppress column 1 and 2:

```
root@b482ca62efdf:/# comm -1 file1 file2
      bac
cello
dell
eana
root@b482ca62efdf:/# comm -2 file1 file2
abc
      bac
cad
def
eac
root@b482ca62efdf:/# comm -12 file1 file2
bac
```

Created two files with strings and compared them. “cmp” will tell us after how many bytes has the whole character string differed. Here, byte7 means that at 7th index(space inclusive), the character differed:

```
root@b482ca62efdf:/# cat>filex
hello how are you
^C
root@b482ca62efdf:/# cat>filey
hello I am fine
^C
root@b482ca62efdf:/# cmp filex filey
filex filey differ: char 7, line 1
```

Created 2 files with 3 lines of strings. Used ‘diff’ command which tells us how to make one file identical to the other one. Here, we get 1,2c1,2 which means line 1 and 2 of 1st file should be changed to line 1 and 2 of 2nd file in order to make both files identical:

```
root@b482ca62efdf:/# cat>filez
hello
what
yes
^C
root@b482ca62efdf:/# cat>filea
Hi
why
yes
^C
root@b482ca62efdf:/# diff filez filea
1,2c1,2
< hello
< what
---
> Hi
> why
root@b482ca62efdf:/# cat>filea
```

Created a file for employees record. Two records are duplicated of which one is written in consecutive order. “uniq” command will duplicate entry that is consecutive(only):

```
root@b482ca62efdf:/# cat>emp
E001 Shagufta c001 MKT
E002 Shika c002 MKT
E003 Anurag c003 Prod
E003 Anurag c003 Prod
E004 Madhu c004 Sales
^C
root@b482ca62efdf:/# uniq emp
E001 Shagufta c001 MKT
E002 Shika c002 MKT
E003 Anurag c003 Prod
E004 Madhu c004 Sales
root@b482ca62efdf:/# uniq -u emp
E001 Shagufta c001 MKT
E002 Shika c002 MKT
E004 Madhu c004 Sales
```

Used ‘-u’ for displaying unique records. Again, it will only delete the consecutive record that duplicated. In this case, it is E003 that gets deleted:

```
root@b482ca62efdf:/# uniq -u emp
E001 Shagufta c001 MKT
E002 Shika c002 MKT
E004 Madhu c004 Sales
```

'-d' will display the duplicate entry that is consecutive. Here again, only E003 is displayed since it is right after its duplicate.

```
root@b482ca62efdf:/# uniq -d emp  
E003 Anurag c003 Prod
```

'-c' will show the count of how many times the repeated + consecutive entry appeared. For E003, count is 2, and 1 for everyone else:

```
E004 Madhu c004 Sales  
root@b482ca62efdf:/# uniq -d emp  
E003 Anurag c003 Prod  
root@b482ca62efdf:/# uniq -c emp  
 1 E001 Shagufta c001 MKT  
 1 E002 Shika c002 MKT  
 2 E003 Anurag c003 Prod  
 1 E004 Madhu c004 Sales
```

TOPIC: PIPE OPERATOR:

Used 'fruits' file and '**|**' pipe operator to run two commands. One to display content and filter it to the other command. Next command is grep. '**-i**' will filter all upper and lower case 'a' and match:

```
Yuzuroot@b482ca62efdf:/# cat fruits | grep -i a  
Apple  
Apricot  
Avocado  
Banana  
Blackberry  
Durian  
Dragonfruit  
Grape  
Guava  
Jackfruit  
Kumquat  
Mango  
Watermelon  
Orange  
Papaya  
Passionfruit  
Peach  
Pear  
Pineapple  
Raspberry  
Star fruit  
Strawberry  
Tamarind  
root@b482ca62efdf:/#
```

Sort command is used to sort contents in alphabetical order:

```
root@b482ca62efdf:/# sort fruits
Apple
Apricot
Avocado
Banana
Blackberry
Blueberry
Cherry
Coconut
Cucumber
Dragonfruit
Durian
Fig
Gooseberry
Grape
Guava
Jackfruit
Kiwifruit
Kumquat
Lemon
Lime
Mango
Mulberry
```

Sort -r is used to sort in reverse of alphabetical order:

```
root@b482ca62efdf:/# sort -r fruits
Yuzu
Watermelon
Tamarind
Strawberry
Star fruit
Soursop
Raspberry
Quince
Plum
Pineberry
Pineapple
Persimmon
Pear
Peach
Passionfruit
Papaya
Orange
Mulberry
Mango
Lime
Lemon
Kumquat
Kiwifruit
```

Pipe operator is sending fruits content to grep command, which is using '-v' to not show characters that have 'a' (lowercase) in it:

```
root@b482ca62efdf:/# cat fruits | grep -v a
Apple
Apricot
Blueberry
Cherry
Coconut
Cucumber
Fig
Gooseberry
Plum
Kiwifruit
Lemon
Lime
Mulberry
Persimmon
Pineberry
Quince
Soursop
Yuzu
```

Used pipe twice to run 3 commands. 1st is to filter all contents, second to not show strings containing letter a, and 3rd to sort the filtered result in revers order:

```
root@b482ca62efdf:/# cat fruits | grep -v a | sort -r
Yuzu
Soursop
Quince
Plum
Pineberry
Persimmon
Mulberry
Lime
Lemon
Kiwifruit
Gooseberry
Fig
Cucumber
Coconut
Cherry
Blueberry
Apricot
Apple
```

TOPIC: CURL AND WGET UTILITIES:

Used 'apt-get update' to update all packages and then installed curl:

```
E: Unable to locate package curl
root@b482ca62efdf:/# apt-get install curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
E: Unable to locate package curl
root@b482ca62efdf:/# apt-get update
Get:1 http://archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Get:2 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:3 http://security.ubuntu.com/ubuntu focal-security/universe amd64 Packages [840 kB]
Get:4 http://archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:5 http://archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:6 http://archive.ubuntu.com/ubuntu focal/multiverse amd64 Packages [177 kB]
Get:7 http://archive.ubuntu.com/ubuntu focal/universe amd64 Packages [11.3 MB]
Get:8 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 Packages [25.8 kB]
Get:9 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages [961 kB]
Get:10 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [1547 kB]
Get:11 http://archive.ubuntu.com/ubuntu focal/restricted amd64 Packages [33.4 kB]
Get:12 http://archive.ubuntu.com/ubuntu focal/main amd64 Packages [1275 kB]
Get:13 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1973 kB]
Get:14 http://archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [1030 kB]
Get:15 http://archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [29.4 kB]
Get:16 http://archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1134 kB]
Get:17 http://archive.ubuntu.com/ubuntu focal-backports/universe amd64 Packages [24.8 kB]
Get:18 http://archive.ubuntu.com/ubuntu focal-backports/main amd64 Packages [50.8 kB]
Fetched 21.0 MB in 50s (418 kB/s)
Reading package lists... Done
root@b482ca62efdf:/#
```

```
root@b482ca62efdf:/#
Get:10 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [1547 kB]
Get:11 http://archive.ubuntu.com/ubuntu focal/restricted amd64 Packages [33.4 kB]
Get:12 http://archive.ubuntu.com/ubuntu focal/main amd64 Packages [1275 kB]
Get:13 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1973 kB]
Get:14 http://archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [1030 kB]
Get:15 http://archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [29.4 kB]
Get:16 http://archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1134 kB]
Get:17 http://archive.ubuntu.com/ubuntu focal-backports/universe amd64 Packages [24.8 kB]
Get:18 http://archive.ubuntu.com/ubuntu focal-backports/main amd64 Packages [50.8 kB]
Fetched 21.0 MB in 50s (418 kB/s)
Reading package lists... Done
root@b482ca62efdf:/# apt-get -y install curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  ca-certificates krb5-locales libasn1-8-heimdal libbrotlii libcurl4 libgssapi-krb5-2 libgssapi3-heimdal
  libgcrypt04-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhx509-5-heimdal libk5crypto3 libkeyutils1
  libkrb5-26-heimdal libkrb5-3 libkrb5support0 libldap-2.4-2 libldap-common libnghttp2-14 libpsl5 libroken18-heimdal
  librmp1 libssasl2-2 libssasl2-modules-db libsqlite3-0 libssh-4 libssl1.1 libwind0-heimdal openssl
  publicsuffix
Suggested packages:
  krb5-doc krb5-user libssasl2-modules-gssapi-mit libssasl2-modules-gssapi-heimdal libssasl2-modules-ldap
  libssasl2-modules-otp libssasl2-modules-sql
The following NEW packages will be installed:
  ca-certificates curl krb5-locales libasn1-8-heimdal libbrotlii libcurl4 libgssapi-krb5-2 libgssapi3-heimdal
  libgcrypt04-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhx509-5-heimdal libk5crypto3 libkeyutils1
  libkrb5-26-heimdal libkrb5-3 libkrb5support0 libldap-2.4-2 libldap-common libnghttp2-14 libpsl5 libroken18-heimdal
  librmp1 libssasl2-2 libssasl2-modules-db libsqlite3-0 libssh-4 libssl1.1 libwind0-heimdal openssl
  publicsuffix
0 upgraded, 32 newly installed, 0 to remove and 9 not upgraded.
Need to get 5447 kB of archives.
After this operation, 16.7 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libssl1.1 amd64 1.1.1f-1ubuntu2.10 [1322 kB]
Get:2 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 openssl amd64 1.1.1f-1ubuntu2.10 [626 kB]
Get:3 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 ca-certificates all 20210119-20.04.2 [145 kB]
Get:4 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libsqlite3-0 amd64 3.31.1-4ubuntu0.2 [549 kB]
Get:5 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 krb5-locales all 1.17-6ubuntu4.1 [11.4 kB]
Get:6 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libkrb5support0 amd64 1.17-6ubuntu4.1 [30.9 kB]
Get:7 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libk5crypto3 amd64 1.17-6ubuntu4.1 [79.9 kB]
Get:8 http://archive.ubuntu.com/ubuntu focal/main amd64 libkeyutils1 amd64 1.0-1ubuntu1 [10.2 kB]
Get:9 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libkrb5-3 amd64 1.17-6ubuntu4.1 [330 kB]
Get:10 http://archive.ubuntu.com/ubuntu focal/main amd64 libgssapi-krb5-2 amd64 1.17-6ubuntu4.1 [121 kB]
Get:11 http://archive.ubuntu.com/ubuntu focal/main amd64 libpsl5 amd64 0.21.0-1ubuntu1 [51.5 kB]
```

Curl <URL> command will fetch content from webpage of the indicated URL. Here we used google.com:

```
Setting up libheimntlm0-heimdal:amd64 (7.7.0+dfsg-1ubuntu1) ...
Setting up libgssapi3-heimdal:amd64 (7.7.0+dfsg-1ubuntu1) ...
Setting up libldap-2.4-2:amd64 (2.4.49+dfsg-2ubuntu1.8) ...
Setting up libcurl4:amd64 (7.68.0-1ubuntu2.7) ...
Setting up curl (7.68.0-1ubuntu2.7) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for ca-certificates (20210119~20.04.2) ...
Updating certificates in /etc/ssl/certs...
0 added, 0 removed; done.
Running hooks in /etc/ca-certificates/update.d...
done.
root@b482ca62efdf:/# curl google.com
<HTML><HEAD><meta http-equiv="content-type" content="text/html; charset=utf-8"
<TITLE>301 Moved</TITLE></HEAD><BODY>
<H1>301 Moved</H1>
The document has moved
<A HREF="http://www.google.com/">here</A>.
</BODY></HTML>
```

In order to fetch output into a file, we use stdout operator (>). Sending data from a webpage to that file. Here we are sending data from google.com to google.html file:

```
root@b482ca62efdf:/# curl www.google.com>google.html
  % Total    % Received % Xferd  Average Speed   Time     Time     Time  Current
               Dload  Upload Total   Spent   Left  Speed
100 14993     0 14993      0    20454      0 --:--:-- --:--:-- --:--:-- 20426
root@b482ca62efdf:/#
```

Display content of google.html to see the content:

```
root@b482ca62efdf:/# cat google.html
<!doctype html><html itemscope="" itemtype="http://schema.org/WebPage" lang="en-PK"><head><meta content="text/html; charset=UTF-8" http-equiv="Content-Type"><meta content="/images/branding/googleg/1x/googleg_standard_color_128dp.png" itemprop="image"><title>Google</title><script nonce="oeqKpNuCtavkpvBQWw8R7A==">(function(){window.google={kEI:'PUQNYrzsHL2R4-EPjYCBYAc',kEXPI:'01302530,56879,1710,4348,207,4804,2316,383,246,5,1354,4013,1238,1122515,1197775,647,380068,16115,28684,17572,4859,1361,9290,3021,2823,14765,4020,978,13228,3847,4192,6430,22741,5081,1593,1279,2742,149,1103,840,2196,4101,109,3405,606,2023,1777,520,14670,3227,2845,7,17450,7540,8780,908,2,940,2615,13142,3,576,1014,1,5445,148,11323,966,1686,4,1528,2304,7039,20309,4764,2658,3757,30,901,12727,2305,2132,16786,5800,2557,4097,4049,3,3541,1,14261,2546,38,25309,2,15953,784,2554,4550,744,5852,9326,1137,1160,6700,2380,2718,18233,46,2,6,1,7736,2123,2444,2578,10,3671,6717,5297,2,11402,830,422,4570,2,6,1,1256,14968,1550,2782,4677,340,1014,59,58,1336,445,2,2,1,5656,739,4395,167,348,1193,9936,1349,845,1557,10,1,436,285,761,7109,113,2147,991,2,1,1912,5,466,945,930,56,2,793,1,2,9561,16,330,2769,1019,38,217,1944,178,1248,1948,1768,12,2,53,12,2,80,48,1802,285,903,2,6,1,299,592,317,630,57,2025,660,3,463,61,116,197,657,720,1063,125,7,499,67,42,1,133,268,94,246,6,465,1002,2421,5476208,2031,930,269,8796812,882,444,1,2,80,1,1796,1,2562,1,748,141,795,563,1,4265,1,1,2,1,1331,4142,2609,155,17,13,72,139,4,2,20,2,169,13,19,46,5,39,96,548,29,2,2,1,2,2,7,4,1,2,2,2,2,2,353,513,186,1,1,158,3,2,2,2,2,4,2,3,3,2,69,1601,141,97,295,184,62,64,13,1,175,1,23952089,4041689,3,450,1964,1491,9,1435,159,1358,4726,3,925,320,20,908,489,1803,1056,476,194,1698',kBL:'2E7f'});google.kHL='en-PK';})(());(function(){
var f=this||self;var h,k=[],function l(a){for(var b;a&&(!a.getAttribute('eid')));)a=a.parentNode;return b||h}function m(a){for(var b=null;a&&(!a.getAttribute()||(b=a.getAttribute("leid")));)a=a.parentNode;return b}
function n(a,b,c,d,g){var e="";c|-1==b.search("&ei=")||((e='&ei=')+l(d),-1==b.search("&lei=")&&(d=m(d))&&(e+="&lei="+d));
d="";!c&&f._cshid&&-1==b.search("&cshid=")&&"slh"!=a&&(d="&cshid="+f._cshid);c||"/"+(g||"gen_204")+"?atyp=i&ct="+a+
&cad="+b+++"&zx="+Date.now()++d;"/http://i.test(c)&&"https":==window.location.protocol&&(google.ml&google.ml(Error("a"),!1,{src:c,gLmm:1}),c="");return c};h=google.kEI;google.getEI=l;google.getLEI=m;google.ml=function(){return null};google.lo
g=function(a,b,c,d,g){if(c=n(a,b,c,d,g)){a=new Image;var e=k.length;k[e]=a;a.onerror=a.onload=a.onabort=function(){delete k[e];a.src=c};google.logUrl=n});call(this);}(function(){
google.y={};google.sy=[];google.x=function(a,b){if(a){var c=a.id;else{do c=Math.random();while(google.y[c])}google.y[c]=[a,b];return!1};google.sx=function(a){google.sy.push(a)};google.lm=[];google.plm=function(a){google.lm.push.apply(google.lm,[a]);};google.lq=[];google.load=function(a,b){google.lq.push([a,b])};google.loadAll=function(a,b){google.lq.push([a,b])};google.bx=!1;google.lx=function(){};call(this);google.f={};(function(){
```

Installed wget using apt-get install wget: Wget is used to download any file from internet.

```
bash: wget: command not found
root@b482ca62efdf:/# apt-get install wget
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  wget
0 upgraded, 1 newly installed, 0 to remove and 9 not upgraded.
Need to get 348 kB of archives.
After this operation, 1012 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 wget amd64 1.20.3-1ubuntu2 [348 kB]
Fetched 348 kB in 2s (222 kB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package wget.
(Reading database ... 4660 files and directories currently installed.)
Preparing to unpack .../wget_1.20.3-1ubuntu2_amd64.deb ...
Unpacking wget (1.20.3-1ubuntu2) ...
Setting up wget (1.20.3-1ubuntu2) ...
root@b482ca62efdf:/#
```

Now, I inspected google.com webpage, copied Google image source to URL and then used it with wget to download that image to computer using ‘wget <URL>’ command:

```
root@b482ca62efdf:/# wget www.google.com/images/branding/googlelogo/1x/googlelogo_color_272x92dp.png
--2022-02-16 18:42:36--  http://www.google.com/images/branding/googlelogo/1x/googlelogo_color_272x92dp.png
Resolving www.google.com (www.google.com)... 216.58.207.4, 2a00:1450:4019:809::2004
Connecting to www.google.com (www.google.com)|216.58.207.4|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 5969 (5.8K) [image/png]
Saving to: 'googlelogo_color_272x92dp.png'

googlelogo_color_272x92dp.png  100%[=====]  5.83K  ---KB/s   in 0.007s
2022-02-16 18:42:36 (832 KB/s) - 'googlelogo_color_272x92dp.png' saved [5969/5969]
```