Software Tools and Technologies Lab II

In-Class Assignment - Container Communication

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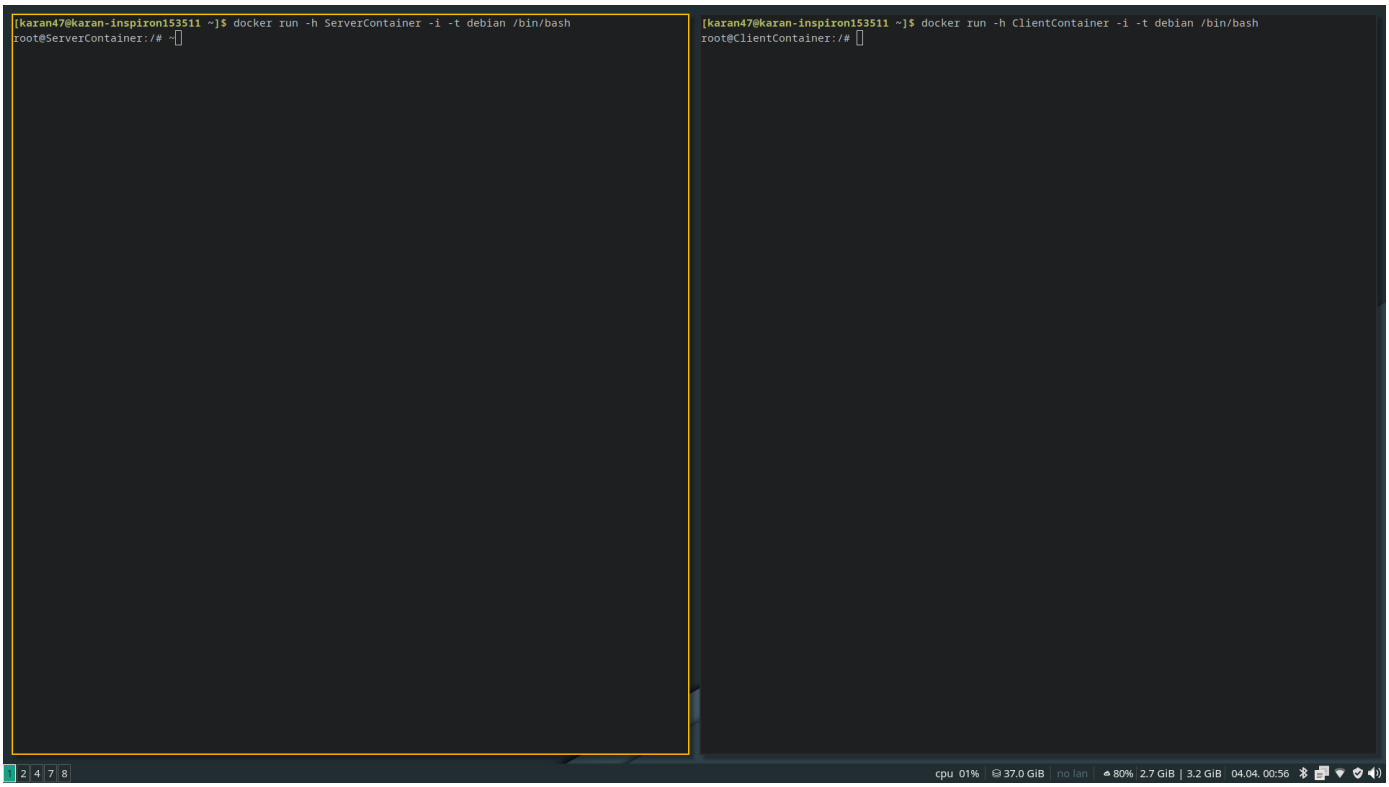
Question Number 1
Find another way to demonstrate communication between containers using docker networks

Ans:

1] Creating Server container and Client container



2] Installing pip in server container

```
root@ServerContainer:/# apt-get update && apt-get install -y python3-pip
Get:1 http://deb.debian.org/debian bullseye InRelease [116 kB]
Get:2 http://deb.debian.org/debian-security bullseye-security InRelease [48.4 kB]
Get:3 http://deb.debian.org/debian bullseye-updates InRelease [44.1 kB]
Get:4 http://deb.debian.org/debian bullseye/main amd64 Packages [8183 kB]
Get:5 http://deb.debian.org/debian-security bullseye-security/main amd64 Packages [236 kB]
Get:6 http://deb.debian.org/debian bullseye-updates/main amd64 Packages [14.6 kB]
Fetched 8642 kB in 3s (3210 kB/s)
Reading package lists... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu build-essential bzip2 ca-certificates cpp cpp-10
  dirmngr dpkg-dev fakeroot fontconfig-config fonts-dejavu-core g++ g++-10 gcc gcc-10 gnupg gnupg-l10n
  gnupg-utils gpg gpg-agent gpg-wks-client gpg-wks-server gpgconf gpgsm javascript-common
  libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan6 libassuan0
  libatomic1 libbinutils libbrotli1 libbsd0 libc-dev-bin libc-devtools libc6-dev libcc1-0 libcrypt-dev
  libctf-nobfd0 libctf0 libdeflate0 libdpkg-perl libexpat1 libexpat1-dev libfakeroot
  libfile-fcntllock-perl libfontconfig1 libfreetype6 libgcc-10-dev libgd3 libgdbm-compat4 libgdbm6
  libgomp1 libgpm2 libisl23 libitm1 libjbig0 libjpeg62-turbo libjs-jquery libjs-sphinxdoc
  libjs-underscore libksba8 libldap-2.4-2 libldap-common liblocale-gettext-perl liblsan0 libmd0
  libmpc3 libmpdec3 libmpfr6 libncursesw6 libnpth0 libnsl-dev libperl5.32 libpng16-16 libpython3-dev
  libpython3-stdlib libpython3.9 libpython3.9-dev libpython3.9-minimal libpython3.9-stdlib
  libquadmath0 libreadline8 libsasl2-2 libsasl2-modules libsasl2-modules-db libsqlite3-0
  libstdc++-10-dev libtiff5 libtirpc-dev libtsan0 libubsan1 libwebp6 libx11-6 libx11-data libxau6
  libxcb1 libxdmcp6 libxpm4 linux-libc-dev make manpages manpages-dev media-types netbase openssl
  patch perl perl-modules-5.32 pinentry-curses python-pip-whl python3 python3-dev python3-distutils
  python3-lib2to3 python3-minimal python3-pkg-resources python3-setuptools python3-wheel python3.9
  python3.9-dev python3.9-minimal readline-common sensible-utils ucf xz-utils zlib1g-dev
Suggested packages:
  binutils-doc bzip2-doc cpp-doc gcc-10-locales dbus-user-session libpam-systemd pinentry-gnome3 tor
  debian-keyring g++-multilib g++-10-multilib gcc-10-doc gcc-multilib autoconf automake libtool flex
  bison gdb gcc-doc gcc-10-multilib parcimonie xloadimage scdaemon apache2 | lighttpd | httpd
  glibc-doc git bzr libgd-tools gdbm-l10n gpm libsasl2-modules-gssapi-mit
  | libsasl2-modules-gssapi-heimdal libsasl2-modules-ldap libsasl2-modules-otp libsasl2-modules-sql
  libstdc++-10-doc make-doc man-browser ed diffutils-doc perl-doc libterm-readline-gnu-perl
  | libterm-readline-perl-perl libtap-harness-archive-perl pinentry-doc python3-doc python3-tk
  python3-venv python-setuptools-doc python3.9-venv python3.9-doc binfmt-support readline-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu build-essential bzip2 ca-certificates cpp cpp-10
  dirmngr dpkg-dev fakeroot fontconfig-config fonts-dejavu-core g++ g++-10 gcc gcc-10 gnupg gnupg-l10n
  gnupg-utils gpg gpg-agent gpg-wks-client gpg-wks-server gpgconf gpgsm javascript-common
  libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan6 libassuan0
  libatomic1 libbinutils libbrotli1 libbsd0 libc-dev-bin libc-devtools libc6-dev libcc1-0 libcrypt-dev
  libctf-nobfd0 libctf0 libdeflate0 libdpkg-perl libexpat1 libexpat1-dev libfakeroot
  libfile-fcntllock-perl libfontconfig1 libfreetype6 libgcc-10-dev libgd3 libgdbm-compat4 libgdbm6
  libgomp1 libgpm2 libisl23 libitm1 libjbig0 libjpeg62-turbo libjs-jquery libjs-sphinxdoc
```

3] Installing flask module (using flask as server)

```
root@ServerContainer:/# pip3 install Flask
Collecting Flask
  Downloading Flask-2.2.3-py3-none-any.whl (101 kB)
     |████████████████████████████████| 101 kB 257 kB/s
Collecting itsdangerous>=2.0
  Downloading itsdangerous-2.1.2-py3-none-any.whl (15 kB)
Collecting Jinja2>=3.0
  Downloading Jinja2-3.1.2-py3-none-any.whl (133 kB)
     |████████████████████████████████| 133 kB 742 kB/s
Collecting click>=8.0
  Downloading click-8.1.3-py3-none-any.whl (96 kB)
     |████████████████████████████████| 96 kB 423 kB/s
Collecting importlib-metadata>=3.6.0
  Downloading importlib_metadata-6.1.0-py3-none-any.whl (21 kB)
Collecting Werkzeug>=2.2.2
  Downloading Werkzeug-2.2.3-py3-none-any.whl (233 kB)
     |████████████████████████████████| 233 kB 1.1 MB/s
Collecting zipp>=0.5
  Downloading zipp-3.15.0-py3-none-any.whl (6.8 kB)
Collecting MarkupSafe>=2.0
  Downloading MarkupSafe-2.1.2-cp39-cp39-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (25 kB)
Installing collected packages: zipp, MarkupSafe, Werkzeug, Jinja2, itsdangerous, importlib-metadata, cli
ck, Flask
^[[21~Successfully installed Flask-2.2.3 Jinja2-3.1.2 MarkupSafe-2.1.2 Werkzeug-2.2.3 click-8.1.3 import
lib-metadata-6.1.0 itsdangerous-2.1.2 zipp-3.15.0
root@ServerContainer:/# ^
```

4] Installing curl in client server

```
root@ClientContainer:/# apt-get update && apt-get install -y curl
Get:1 http://deb.debian.org/debian bullseye InRelease [116 kB]
Get:2 http://deb.debian.org/debian-security bullseye-security InRelease [48.4 kB]
Get:3 http://deb.debian.org/debian bullseye-updates InRelease [44.1 kB]
Get:4 http://deb.debian.org/debian bullseye/main amd64 Packages [8183 kB]
Get:5 http://deb.debian.org/debian-security bullseye-security/main amd64 Packages [236 kB]
Get:6 http://deb.debian.org/debian bullseye-updates/main amd64 Packages [14.6 kB]
Fetched 8642 kB in 3s (3030 kB/s)
Reading package lists... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ca-certificates libbrotli1 libcurl4 libldap-2.4-2 libldap-common libnghttp2-14 libpsl5 librtmp1
  libsasl2-2 libsasl2-modules libsasl2-modules-db libssh2-1 openssl publicsuffix
Suggested packages:
  libsasl2-modules-gssapi-mit | libsasl2-modules-gssapi-heimdal libsasl2-modules-ldap
  libsasl2-modules-otp libsasl2-modules-sql
The following NEW packages will be installed:
  ca-certificates curl libbrotli1 libcurl4 libldap-2.4-2 libldap-common libnghttp2-14 libpsl5 librtmp1
  libsasl2-2 libsasl2-modules libsasl2-modules-db libssh2-1 openssl publicsuffix
0 upgraded, 15 newly installed, 0 to remove and 1 not upgraded.
Need to get 2992 kB of archives.
After this operation, 6256 kB of additional disk space will be used.
Get:1 http://deb.debian.org/debian-security bullseye-security/main amd64 openssl amd64 1.1.1n-0+deb11u4
[853 kB]
Get:2 http://deb.debian.org/debian bullseye/main amd64 ca-certificates all 20210119 [158 kB]
Get:3 http://deb.debian.org/debian bullseye/main amd64 libbrotli1 amd64 1.0.9-2+b2 [279 kB]
Get:4 http://deb.debian.org/debian bullseye/main amd64 libsasl2-modules-db amd64 2.1.27+dfsg-2.1+deb11u1
 [69.1 kB]
Get:5 http://deb.debian.org/debian bullseye/main amd64 libsasl2-2 amd64 2.1.27+dfsg-2.1+deb11u1 [106 kB]
Get:6 http://deb.debian.org/debian bullseye/main amd64 libldap-2.4-2 amd64 2.4.57+dfsg-3+deb11u1 [232 kB
]
Get:7 http://deb.debian.org/debian bullseye/main amd64 libnghttp2-14 amd64 1.43.0-1 [77.1 kB]
Get:8 http://deb.debian.org/debian bullseye/main amd64 libpsl5 amd64 0.21.0-1.2 [57.3 kB]
Get:9 http://deb.debian.org/debian bullseye/main amd64 librtmp1 amd64 2.4+20151223.gitfa8646d.1-2+b2 [60
.8 kB]
Get:10 http://deb.debian.org/debian bullseye/main amd64 libssh2-1 amd64 1.9.0-2 [156 kB]
Get:11 http://deb.debian.org/debian-security bullseye-security/main amd64 libcurl4 amd64 7.74.0-1.3+deb1
1u7 [346 kB]
Get:12 http://deb.debian.org/debian-security bullseye-security/main amd64 curl amd64 7.74.0-1.3+deb11u7
[270 kB]
Get:13 http://deb.debian.org/debian bullseye/main amd64 libldap-common all 2.4.57+dfsg-3+deb11u1 [95.8 k
B]
Get:14 http://deb.debian.org/debian bullseye/main amd64 libsasl2-modules amd64 2.1.27+dfsg-2.1+deb11u1 [
104 kB]
Get:15 http://deb.debian.org/debian bullseye/main amd64 publicsuffix all 20220811.1734-0+deb11u1 [127 kB
]
```

5] Using vim creating app.py

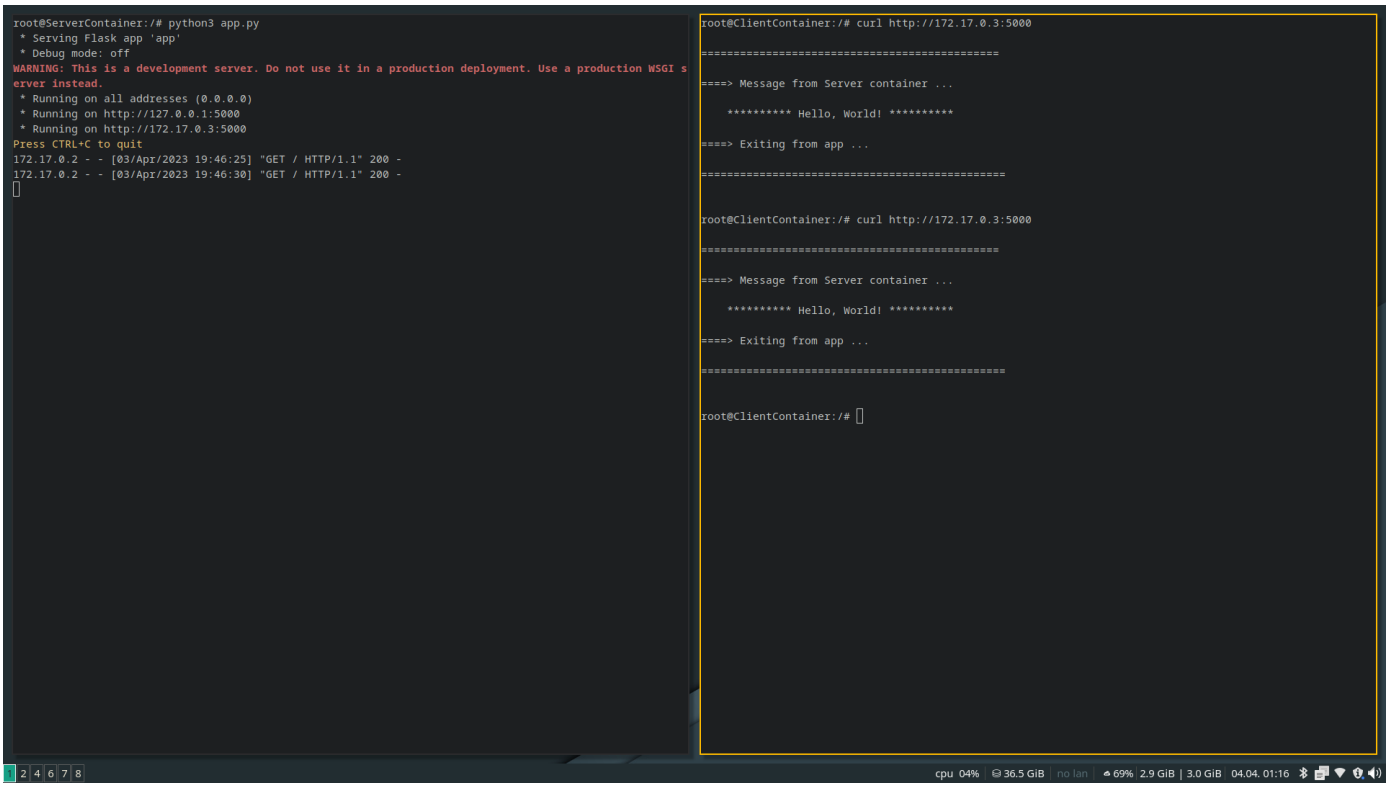
```
root@ServerContainer:/# apt-get install vim
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  vim-common vim-runtime xxd
Suggested packages:
  ctags vim-doc vim-scripts
The following NEW packages will be installed:
  vim vim-common vim-runtime xxd
0 upgraded, 4 newly installed, 0 to remove and 1 not upgraded.
Need to get 8138 kB of archives.
After this operation, 36.9 MB of additional disk space will be used.
Do you want to continue? [Y/n]
Get:1 http://deb.debian.org/debian bullseye/main amd64 xxd amd64 2:8.2.2434-3+deb11u1 [192 kB]
Get:2 http://deb.debian.org/debian bullseye/main amd64 vim-common all 2:8.2.2434-3+deb11u1 [226 kB]
Get:3 http://deb.debian.org/debian bullseye/main amd64 vim-runtime all 2:8.2.2434-3+deb11u1 [6226 kB]
Get:4 http://deb.debian.org/debian bullseye/main amd64 vim amd64 2:8.2.2434-3+deb11u1 [1494 kB]
Fetched 8138 kB in 1s (6496 kB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package xxd.
(Reading database ... 17861 files and directories currently installed.)
Preparing to unpack .../xxd_2%3a8.2.2434-3+deb11u1_amd64.deb ...
Unpacking xxd (2:8.2.2434-3+deb11u1) ...
Selecting previously unselected package vim-common.
Preparing to unpack .../vim-common_2%3a8.2.2434-3+deb11u1_all.deb ...
Unpacking vim-common (2:8.2.2434-3+deb11u1) ...
Selecting previously unselected package vim-runtime.
Preparing to unpack .../vim-runtime_2%3a8.2.2434-3+deb11u1_all.deb ...
Adding 'diversion of /usr/share/vim/vim82/doc/help.txt to /usr/share/vim/vim82/doc/help.txt.vim-tiny by
vim-runtime'
Adding 'diversion of /usr/share/vim/vim82/doc/tags to /usr/share/vim/vim82/doc/tags.vim-tiny by vim-runt
ime'
Unpacking vim-runtime (2:8.2.2434-3+deb11u1) ...
Selecting previously unselected package vim.
Preparing to unpack .../vim_2%3a8.2.2434-3+deb11u1_amd64.deb ...
Unpacking vim (2:8.2.2434-3+deb11u1) ...
Setting up xxd (2:8.2.2434-3+deb11u1) ...
Setting up vim-common (2:8.2.2434-3+deb11u1) ...
Setting up vim-runtime (2:8.2.2434-3+deb11u1) ...
Setting up vim (2:8.2.2434-3+deb11u1) ...
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vim (vim) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vimdiff (vimdiff) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/rvim (rvim) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/rview (rview) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vi (vi) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/view (view) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/ex (ex) in auto mode
```

6] app.py

```
from flask import Flask

app = Flask(__name__)

@app.route('/')
def hello_world():
    return '''\n==============================================\n
====> Message from Server container ...\n
    ********** Hello, World! **********\n
====> Exiting from app ...\n
===============================================
\n\n'''

if __name__ == '__main__':
    app.run(host='0.0.0.0', port=5000)
```

```
"app.py" 15L, 384B                                                15,38         All
```

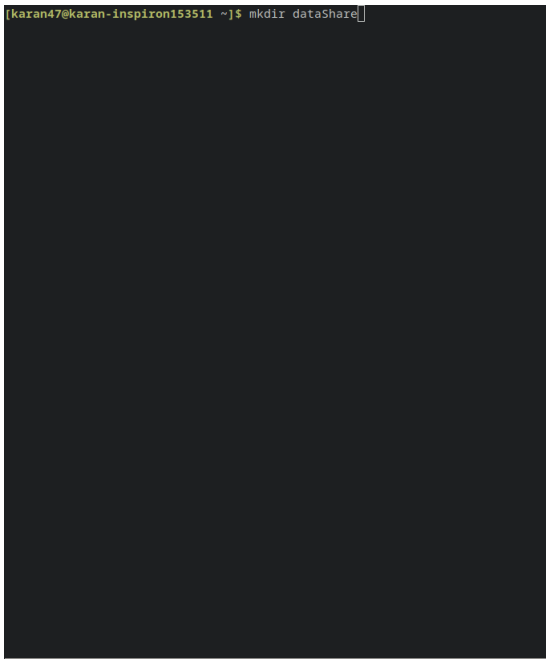
7] fetching server in client container using curl



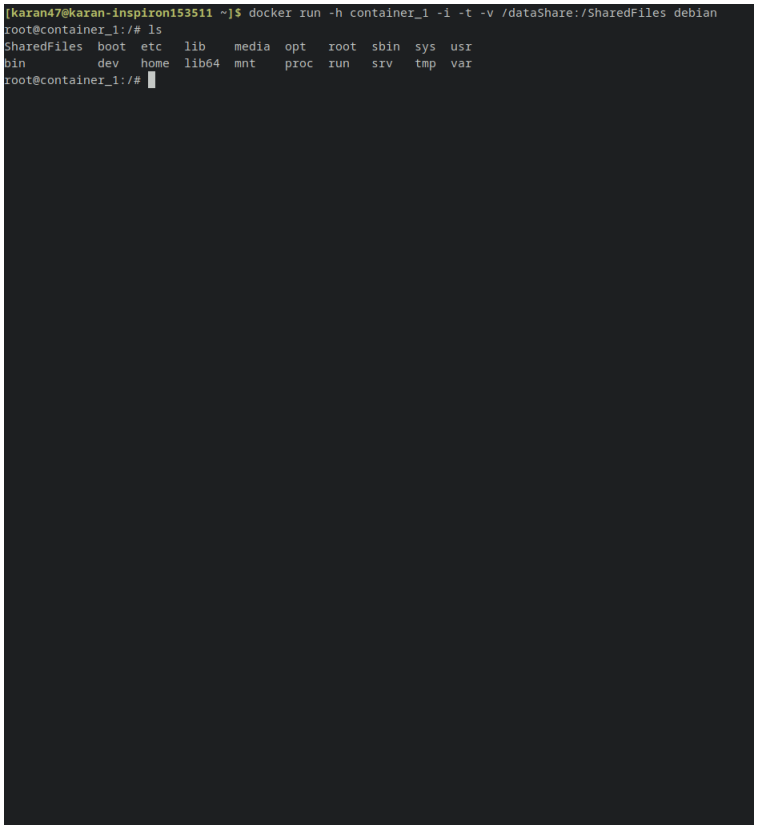
Question Number 2
Demonstrate how containers can communicate via shared folders

Ans:

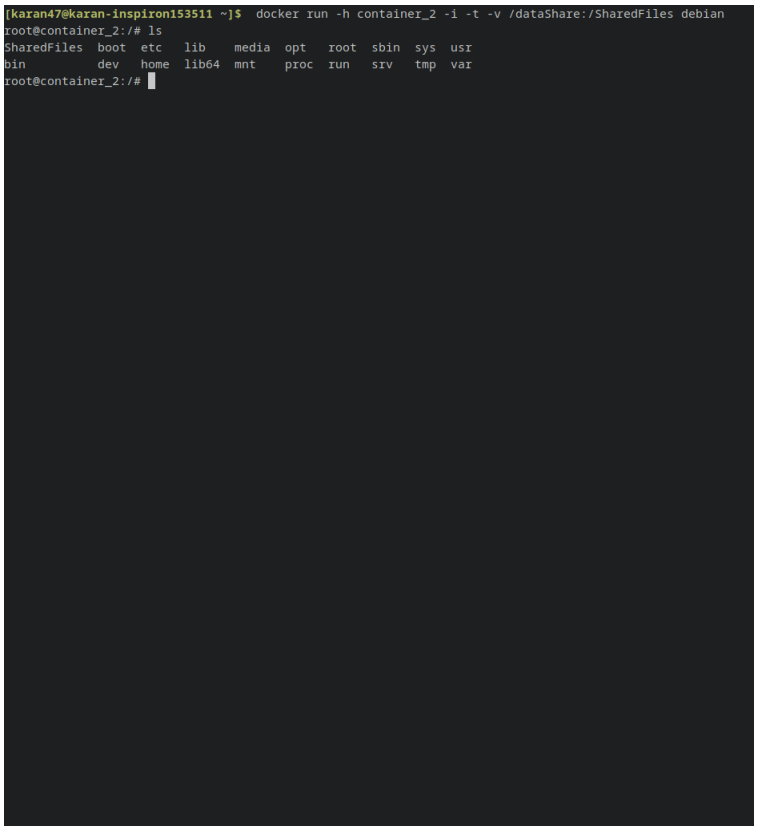
1] creating common directory dataShare



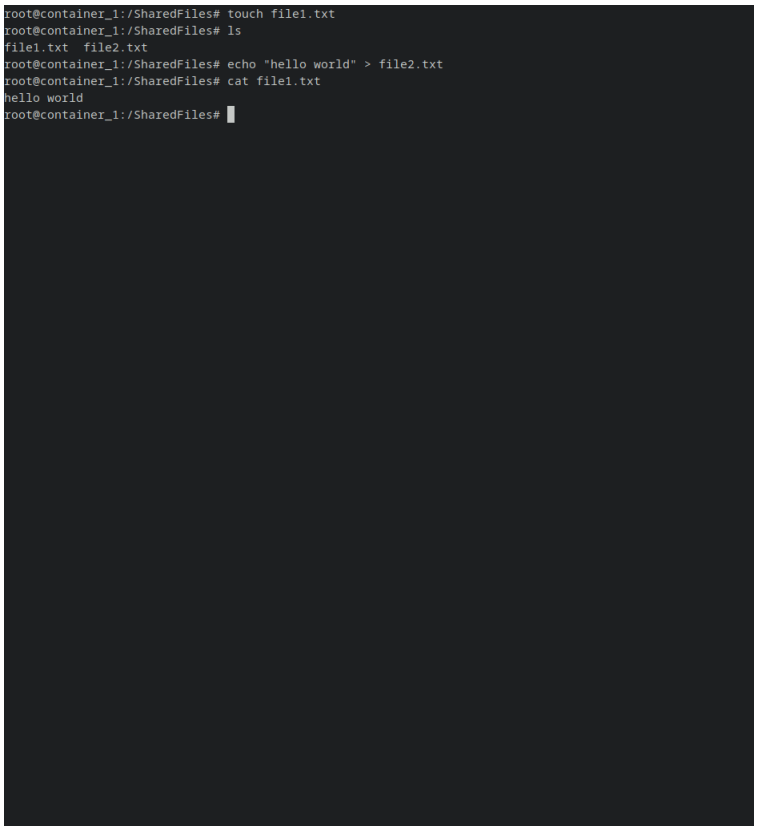
2] creating container 1 with sharing directory called SharedFiles



3] creating container 2 with sharing directory called SharedFiles



4] Editing files in container 1



4] Editing files in container 2