CS 5450 - Fall 2017

Networked and Distributed Systems

Back to Lab 1

Github | Ask on Piazza

Home
Lecture Schedule
Assignments
Materials

Remote development using containers

This article would help people who used IDEs a lot and got used to Remote development, autocomplete and other features. However, Remote deployment and debugging for C is not an easy way to setup, therefore we have prepared some scripts and suggestions to setup your dev environment.

Disclaimer 1 The code might contain bugs and the offered solution might have unknown issues in your environment, please use provided ideas at your own risk, as it might slow down your progress.

Disclaimer 2 Even though it should work the same on Windows, none of us have tested it on this platform. Please discuss issues on Piazza.

Note If you like to develop in CLI, containers might be an easy way to go.

Install steps

1. Install Docker on your OS
2. Install CLion IDE https://www.jetbrains.com/clion/download/ and get a student license: https://www.jetbrains.com/student/.
3. Create a Docker image. You can just download an image from Dockerhub: `docker pull ebagdasa/cs5450_p1` or create it from this Dockerfile:

```
FROM ubuntu:16.04
```

```
RUN apt-get update && apt-get install -y openssh-s
RUN apt-get install vim python tcpdump telnet -y
RUN apt-get install byacc flex -y
RUN apt-get install iproute2 gdbserver less bison

RUN mkdir /var/run/sshd
RUN echo 'root:root' | chpasswd
RUN sed -i 's/PermitRootLogin prohibit-password/Pe

# SSH login fix. Otherwise user is kicked off afte
RUN sed 's@session\s*required\s*pam_loginuid.so@se

ENV NOTVISIBLE "in users profile"
RUN echo "export VISIBLE=now" >> /etc/profile

EXPOSE 22 9999 7777
CMD ["/usr/sbin/sshd", "-D"]
```

We expose 3 ports: 22, 9999 and 7777.

- Port 22 will be used to SSH into the container,
- Port 9999 can be used to connect to the program from outside
- Port 7777 is used to run `gdbserver` program that allows to debug the program remotely.

4. Start the container:

```
docker run -d -p 3022:22 -p 7777:7777 -p 9999:9999
  --security-opt seccomp:unconfined  \
  --name server ebagdasa/cs5450_p1:latest
```

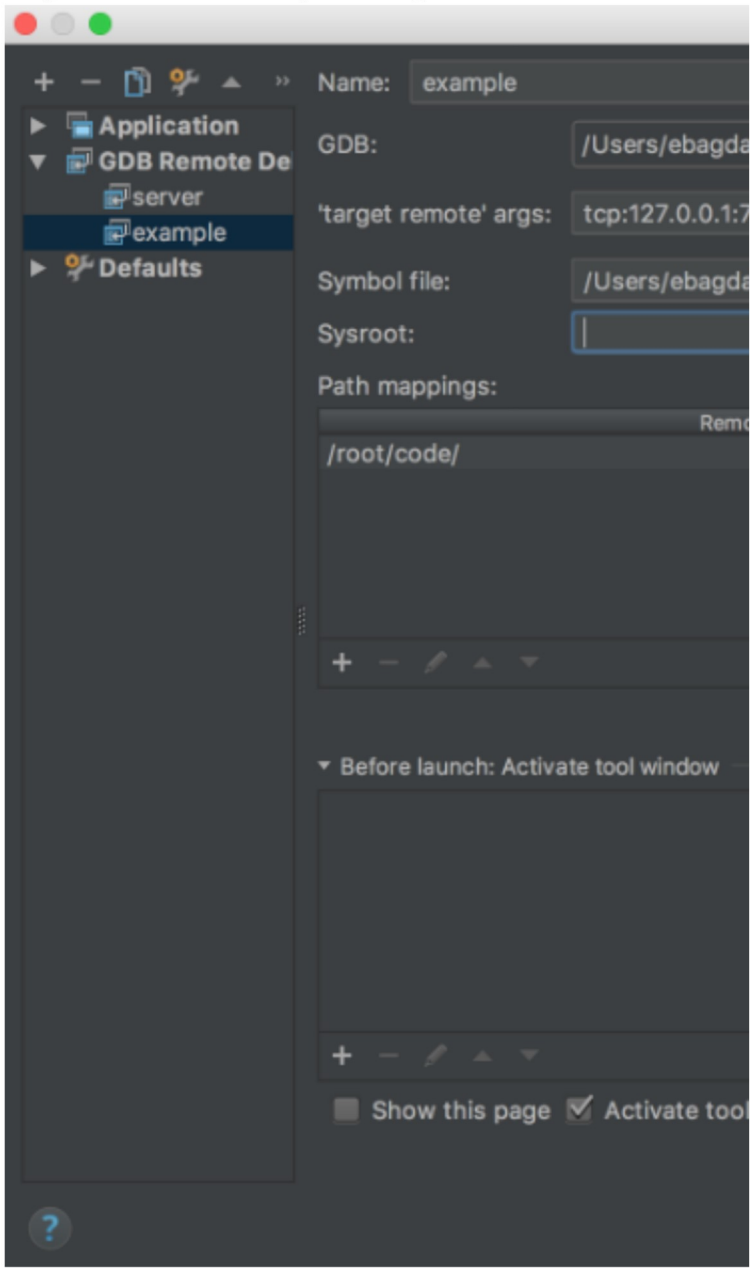
This option `--security-opt seccomp:unconfined` is required to allow remote debugger to run.

If you want to run sever and client containers you can start them both and then communicate through Docker network (`172.17.0.0/16`), but in this project it is redundant.

5. Try to SSH into your container `ssh -p 3022 root@127.0.0.1`. The password is `root`. You can copy your SSH public key from your machine.
6. Copy your code to the server. You can setup Remote

Deployment in CLion to automatically upload code. Here is the link to configuration

7. Please refer to this link and this link to setup CLion Remote Debugging. Note, for MacOS you would have to configure your local GDB with x86 linux target. This is the sample config on MacOS:



8. Obtain symbol file. Symbol file is essentially a compiled program with debug information: `gcc -g -o example example.c`. You need to compile it in your container, then copy to your machine and specify in CLion Run Configuration.

9. To automate this process you can use the script.sh inside your container:

```
#!/usr/bin/env bash

OUTPUT="$(ps -ef | grep gdbserver | awk '/echo_ser
echo "gdbserver PID: $OUTPUT"
kill -9 "$OUTPUT"
OUTPUT="$(ps -aux | awk '/echo_server/' | awk 'NR=
echo "the running program $OUTPUT"
kill -9 "$OUTPUT"
sleep 5
make clean
make
gcc -g -o server echo_server.c
gdbserver 127.0.0.1:7777 ./echo_server &
```

10. After the script run server file back to laptop `scp -P 3022 root@127.0.0.1:/root/code/server /$YOUR_LOCATION/starter_code/`
11. Set breakpoints in CLion and run the Remote Debugger.

Troubleshooting

1. Always check that ports are open:

```
docker ps -a
CONTAINER ID        ***  PORTS
a89893c7c0d9        ***  0.0.0.0:7777->7777/tcp,
                         0.0.0.0:9999->9999/tcp,
                         0.0.0.0:3022->22/tcp
```

2. Don’t forget to copy symbol file
3. Don’t forget to put breakpoints in the reachable code.

If you have problems to get it working, please ask them on Piazza.