# CSE 5306-004: Team 14

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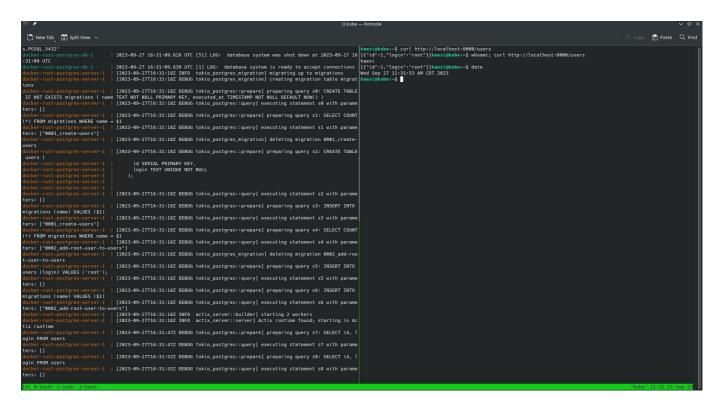
## Q1: Docker Intro

Kaesi:

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  - compose.yaml

Let's get started!

? What application platform does your project use? Rust
? What version of Rust do you want to use? 1.70.0
? What port does your server listen on? 8000

CREATED: .dockerignore
CREATED: Dockerfile
CREATED: compose.yaml

✔ Your Docker files are ready!

Take a moment to review them and tailor them to your application.

When you're ready, start your application by running: docker compose up --build

Your application will be available at http://localhost:8000
kaesi@kube:~/docker-rust-hello$ whoami; docker build --tag docker-rust-image .
kaesi
[+] Building 186.2s (14/14) FINISHED                                                docker:default
 => [internal] load build definition from Dockerfile                                          0.0s
 => => transferring dockerfile: 2.70kB                                                        0.0s
 => [internal] load .dockerignore                                                             0.0s
 => => transferring context: 655B                                                             0.0s
 => resolve image config for docker.io/docker/dockerfile:1                                    0.4s
 => CACHED docker-image://docker.io/docker/dockerfile:1@sha256:ac85f380a63b13dfcefa89046420e1781752bab202122f  0.0s
 => [internal] load metadata for docker.io/library/debian:bullseye-slim                       0.4s
 => [internal] load metadata for docker.io/library/rust:1.70.0-slim-bullseye                  0.4s
 => [build 1/3] FROM docker.io/library/rust:1.70.0-slim-bullseye@sha256:d1f62de1372e7103b9973848c3f873abfb73  23.1s
 => => resolve docker.io/library/rust:1.70.0-slim-bullseye@sha256:d1f62de1372e7103b9973848c3f873abfb73a6668ce  0.0s
 => => sha256:a1f78581ec471026659e0f2c6c386ded66847c1c8c7465b8149865dccafe6f82 4.85kB / 4.85kB  0.0s
 => => sha256:9d21b12d5fab9ab82969054d72411ce627c209257df64b6057016c981e163c30 31.42MB / 31.42MB  2.3s
 => => sha256:3d32f2bb54c4b0263c632cc36fefdc8b536380d3d8f0a7445ba644fc60bd775c 251.51MB / 251.51MB  16.7s
 => => sha256:d1f62de1372e7103b9973848c3f873abfb73a6668ce4b0af2fe57fd9e32178b8 984B / 984B    0.0s
 => => sha256:f2ab36c92f2a4a52b1728752cde99dc207acf1567c03a5a015671eb33dcc9052 742B / 742B    0.0s
 => => extracting sha256:9d21b12d5fab9ab82969054d72411ce627c209257df64b6057016c981e163c30     1.5s
 => => extracting sha256:3d32f2bb54c4b0263c632cc36fefdc8b536380d3d8f0a7445ba644fc60bd775c     6.3s
 => [final 1/3] FROM docker.io/library/debian:bullseye-slim@sha256:c618be84fc82aa8ba203abbb07218410b0f5b3c7cb  0.0s
 => CACHED [final 2/3] RUN adduser     --disabled-password     --gecos ""     --home "/nonexistent"     --she  0.0s
 => [internal] load build context                                                             0.0s
 => => transferring context: 35.39kB                                                          0.0s
 => [build 2/3] WORKDIR /app                                                                  0.9s
 => [build 3/3] RUN --mount=type=bind,source=src,target=src     --mount=type=bind,source=Cargo.toml,target=  141.1s
 => [final 3/3] COPY --from=build /bin/server /bin/                                           6.4s
 => exporting to image                                                                        6.3s
 => => exporting layers                                                                       5.2s
 => => writing image sha256:c2032c852e092515ff51c301bfa9bc23b59ff54a18b05cb447a8328f63e004b0  0.3s
 => => naming to docker.io/library/docker-rust-image                                          0.7s
kaesi@kube:~/docker-rust-hello$ whoami; docker images;date
kaesi
REPOSITORY          TAG       IMAGE ID       CREATED          SIZE
docker-rust-image   latest    c2032c852e09   About a minute ago   93.3MB
Tue Sep 26 05:25:40 PM CDT 2023
kaesi@kube:~/docker-rust-hello$
[0] 0:bash* 1:sudo-                                                      "kube" 17:25 26-Sep-23
```

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kaesi@kube:~/docker-rust-hello$ curl http://localhost:8000
curl: (7) Failed to connect to localhost port 8000 after 0 ms: Couldn't connect to server
kaesi@kube:~/docker-rust-hello$ whoami; docker ps
kaesi
CONTAINER ID   IMAGE               COMMAND        CREATED          STATUS          PORTS       NAMES
4353f8a27382   docker-rust-image   "/bin/server"  20 seconds ago   Up 20 seconds   8000/tcp    wizardly_sinoussi
kaesi@kube:~/docker-rust-hello$ whoami; docker rm -f wizardly_sinoussi
kaesi
wizardly_sinoussi
kaesi@kube:~/docker-rust-hello$ whoami; docker run --publish 3001:8000 -dt docker-rust-image
kaesi
82d54f8c2b1fa15137aa008c2fde74dc6805ad9b5776084652357bdc23e5e823
kaesi@kube:~/docker-rust-hello$ whoami; curl http://localhost:3001
kaesi
Hello, Docker!kaesi@kube:~/docker-rust-hello$ whoami; docker ps
kaesi
CONTAINER ID   IMAGE               COMMAND        CREATED          STATUS          PORTS
         NAMES
82d54f8c2b1f   docker-rust-image   "/bin/server"  20 seconds ago   Up 19 seconds   0.0.0.0:3001->8000/tcp, :::3001-
```

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```
>8000/tcp    relaxed_saha
kaesi@kube:~/docker-rust-hello$ whoami; docker stop relaxed_saha
kaesi
relaxed_saha
kaesi@kube:~/docker-rust-hello$ docker ps -a
CONTAINER ID    IMAGE             COMMAND         CREATED        STATUS                    PORTS        NAMES
82d54f8c2b1f    docker-rust-image   "/bin/server"   49 seconds ago   Exited (0) 4 seconds ago            relaxed_sah
a
kaesi@kube:~/docker-rust-hello$ whoami ; docker restart relaxed_saha
kaesi
relaxed_saha
kaesi@kube:~/docker-rust-hello$ whoami ; docker ps --all
kaesi
CONTAINER ID    IMAGE             COMMAND         CREATED          STATUS         PORTS
              NAMES
82d54f8c2b1f    docker-rust-image   "/bin/server"   About a minute ago   Up 7 seconds   0.0.0.0:3001->8000/tcp, :::30
01->8000/tcp    relaxed_saha
kaesi@kube:~/docker-rust-hello$ whoami; docker stop relaxed_saha
kaesi
relaxed_saha
kaesi@kube:~/docker-rust-hello$ whoami; docker rm relaxed_saha
kaesi
relaxed_saha
kaesi@kube:~/docker-rust-hello$ whoami; docker run -d -p 3001:8000 --name docker-rust-container docker-rust-image
kaesi
1a8e4322ce5790b84a46a23285afb7ea38b1716b171dacc1731b58eef670d49d
kaesi@kube:~/docker-rust-hello$ whoami; docker ps
kaesi
CONTAINER ID    IMAGE             COMMAND         CREATED        STATUS         PORTS
              NAMES
1a8e4322ce57    docker-rust-image   "/bin/server"   4 seconds ago    Up 3 seconds   0.0.0.0:3001->8000/tcp, :::3001->8
000/tcp    docker-rust-container
kaesi@kube:~/docker-rust-hello$ whoami; curl http://localhost:3001
kaesi
Hello, Docker!kaesi@kube:~/docker-rust-hello$ date
Tue Sep 26 05:30:11 PM CDT 2023
kaesi@kube:~/docker-rust-hello$
[0] 0:bash* 1:sudo-                                                      "kube" 17:30 26-Sep-23
```

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s.PGSQL.5432"                                                              kaesi@kube:~$ curl http://localhost:8000/users
docker-rust-postgres-db-1      | 2023-09-27 16:31:09.626 UTC [51] LOG:  database system was shut down at 2023-09-27 16 [{"id":1,"login":"root"}]kaesi@kube:~$ whoami; curl http://localhost:8000/users
:31:09 UTC                                                                kaesi
docker-rust-postgres-db-1      | 2023-09-27 16:31:09.639 UTC [1] LOG:  database system is ready to accept connections [{"id":1,"login":"root"}]kaesi@kube:~$ date
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z INFO  tokio_postgres_migration] migrating up to migrations     Wed Sep 27 11:31:53 AM CDT 2023
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres_migration] creating migration table migrat kaesi@kube:~$ ▮
ions
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::prepare] preparing query s0: CREATE TABLE
 IF NOT EXISTS migrations ( name TEXT NOT NULL PRIMARY KEY, executed_at TIMESTAMP NOT NULL DEFAULT NOW() )
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::query] executing statement s0 with parame
ters: []
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::prepare] preparing query s1: SELECT COUNT
(*) FROM migrations WHERE name = $1
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::query] executing statement s1 with parame
ters: ["0001_create-users"]
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres_migration] deleting migration 0001_create-
users
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::prepare] preparing query s2: CREATE TABLE
 users (
docker-rust-postgres-server-1  |        id SERIAL PRIMARY KEY,
docker-rust-postgres-server-1  |        login TEXT UNIQUE NOT NULL
docker-rust-postgres-server-1  |    );
docker-rust-postgres-server-1  |
docker-rust-postgres-server-1  |
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::query] executing statement s2 with parame
ters: []
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::prepare] preparing query s3: INSERT INTO
migrations (name) VALUES ($1)
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::query] executing statement s3 with parame
ters: ["0001_create-users"]
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::prepare] preparing query s4: SELECT COUNT
(*) FROM migrations WHERE name = $1
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::query] executing statement s4 with parame
ters: ["0002_add-root-user-to-users"]
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres_migration] deleting migration 0002_add-roo
t-user-to-users
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::prepare] preparing query s5: INSERT INTO
users (login) VALUES ('root');
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::query] executing statement s5 with parame
ters: []
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::prepare] preparing query s6: INSERT INTO
migrations (name) VALUES ($1)
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z DEBUG tokio_postgres::query] executing statement s6 with parame
ters: ["0002_add-root-user-to-users"]
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z INFO  actix_server::builder] starting 2 workers
docker-rust-postgres-server-1  | [2023-09-27T16:31:18Z INFO  actix_server::server] Actix runtime found; starting in Ac
tix runtime
docker-rust-postgres-server-1  | [2023-09-27T16:31:47Z DEBUG tokio_postgres::prepare] preparing query s7: SELECT id, l
ogin FROM users
docker-rust-postgres-server-1  | [2023-09-27T16:31:47Z DEBUG tokio_postgres::query] executing statement s7 with parame
ters: []
docker-rust-postgres-server-1  | [2023-09-27T16:31:52Z DEBUG tokio_postgres::prepare] preparing query s8: SELECT id, l
ogin FROM users
docker-rust-postgres-server-1  | [2023-09-27T16:31:52Z DEBUG tokio_postgres::query] executing statement s8 with parame
ters: []
[0] 0:bash* 1:sudo  2:bash-                                                        "kube" 11:32 27-Sep-23
```

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```
kaesi@kube:~/docker-rust-hello$ cat kube-rust-hello.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: hello-deployment
  labels:
    app: rust
spec:
  replicas: 1
  selector:
    matchLabels:
      app: rust
  template:
    metadata:
      labels:
        app: rust
    spec:
      containers:
      - name: rust
        image: kcpu/docker-rust-image-demo
        ports:
        - containerPort: 8000
kaesi@kube:~/docker-rust-hello$ vi kube-rust-hello.yaml^C
kaesi@kube:~/docker-rust-hello$ cat kube-rust-svc.yaml
apiVersion: v1
kind: Service
metadata:
  name: hello-service
spec:
  type: NodePort
  selector:
    app: rust
  ports:
    - protocol: TCP
      port: 8000
      targetPort: 8000
      nodePort: 30100
kaesi@kube:~/docker-rust-hello$ kubectl apply -f kube-rust-hello.yaml
deployment.apps/hello-deployment created
kaesi@kube:~/docker-rust-hello$ whoami;  kubectl apply -f kube-rust-svc.yaml
kaesi
service/hello-service created
kaesi@kube:~/docker-rust-hello$ whoami; kubectl get pods
kaesi
NAME                                READY    STATUS     RESTARTS    AGE
hello-deployment-584495c949-bn7ks   1/1      Running    0           18s
kaesi@kube:~/docker-rust-hello$ whoami; kubectl get services
kaesi
NAME            TYPE        CLUSTER-IP      EXTERNAL-IP    PORT(S)          AGE
hello-service   NodePort    10.98.133.164   <none>         8000:30100/TCP   10s
kubernetes      ClusterIP   10.96.0.1       <none>         443/TCP          29m
kaesi@kube:~/docker-rust-hello$ whoami; minikube service hello-service --url
kaesi
http://192.168.49.2:30100
kaesi@kube:~/docker-rust-hello$ curl http://192.168.49.2:30100
Hello, Docker!kaesi@kube:~/docker-rust-hello$
[0] 0:bash* 1:sudo  2:docker-
```

Syed:

# Q2: gRPC Quickstart

Kaesi:

```
kaesi@kube:~/grpc/examples/cpp/helloworld$ whoami; pushd cmake/build
kaesi
~/grpc/examples/cpp/helloworld/cmake/build ~/grpc/examples/cpp/helloworld
kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$ whoami; cmake -DCMAKE_PREFIX_PATH=$MY_INSTALL_DIR ../..
kaesi
-- The C compiler identification is GNU 12.2.0
-- The CXX compiler identification is GNU 12.2.0
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Check for working C compiler: /usr/bin/cc - skipped
-- Detecting C compile features
-- Detecting C compile features - done
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Check for working CXX compiler: /usr/bin/c++ - skipped
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Performing Test CMAKE_HAVE_LIBC_PTHREAD
-- Performing Test CMAKE_HAVE_LIBC_PTHREAD - Success
-- Found Threads: TRUE
-- Using protobuf 23.4.0
-- Using gRPC 1.58.0
-- Configuring done
-- Generating done
-- Build files have been written to: /home/kaesi/grpc/examples/cpp/helloworld/cmake/build
kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$ whoami; make -j2
kaesi
[  5%] Generating helloworld.pb.cc, helloworld.pb.h, helloworld.grpc.pb.cc, helloworld.grpc.pb.h
[ 16%] Building CXX object CMakeFiles/hw_grpc_proto.dir/helloworld.grpc.pb.cc.o
[ 16%] Building CXX object CMakeFiles/hw_grpc_proto.dir/helloworld.pb.cc.o
[ 22%] Linking CXX static library libhw_grpc_proto.a
[ 22%] Built target hw_grpc_proto
[ 33%] Building CXX object CMakeFiles/greeter_server.dir/greeter_server.cc.o
[ 33%] Building CXX object CMakeFiles/greeter_client.dir/greeter_client.cc.o
[ 38%] Linking CXX executable greeter_client
[ 44%] Linking CXX executable greeter_server
[ 44%] Built target greeter_server
[ 44%] Built target greeter_client
[ 55%] Building CXX object CMakeFiles/greeter_callback_server.dir/greeter_callback_server.cc.o
[ 55%] Building CXX object CMakeFiles/greeter_callback_client.dir/greeter_callback_client.cc.o
[ 61%] Linking CXX executable greeter_callback_client
[ 66%] Linking CXX executable greeter_callback_server
[ 66%] Built target greeter_callback_client
[ 72%] Building CXX object CMakeFiles/greeter_async_client.dir/greeter_async_client.cc.o
[ 72%] Built target greeter_callback_server
[ 77%] Building CXX object CMakeFiles/greeter_async_client2.dir/greeter_async_client2.cc.o
[ 83%] Linking CXX executable greeter_async_client
[ 88%] Linking CXX executable greeter_async_client2
[ 88%] Built target greeter_async_client
[ 94%] Building CXX object CMakeFiles/greeter_async_server.dir/greeter_async_server.cc.o
[ 94%] Built target greeter_async_client2
[100%] Linking CXX executable greeter_async_server
[100%] Built target greeter_async_server
kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$
[0] 0:make*                                                                          "kube" 11:57 01-Oct-23
```

```
kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$ whoami; make -j2          ./CMakeFiles/3.25.1/CompilerIdC/a.out
kaesi                                                                              ./CMakeFiles/3.25.1/CompilerIdC/CMakeCCompilerId.c
[  5%] Generating helloworld.pb.cc, helloworld.pb.h, helloworld.grpc.pb.cc, helloworld.grpc.pb.h   ./CMakeFiles/3.25.1/CompilerIdC/tmp
[ 16%] Building CXX object CMakeFiles/hw_grpc_proto.dir/helloworld.grpc.pb.cc.o   ./CMakeFiles/3.25.1/CMakeSystem.cmake
[ 16%] Building CXX object CMakeFiles/hw_grpc_proto.dir/helloworld.pb.cc.o        ./CMakeFiles/3.25.1/CMakeCXXCompiler.cmake
[ 22%] Linking CXX static library libhw_grpc_proto.a                              ./CMakeFiles/3.25.1/CMakeDetermineCompilerABI_C.bin
[ 22%] Built target hw_grpc_proto                                                 ./CMakeFiles/3.25.1/CMakeDetermineCompilerABI_CXX.bin
[ 33%] Building CXX object CMakeFiles/greeter_server.dir/greeter_server.cc.o      ./CMakeFiles/3.25.1/CMakeCCompiler.cmake
[ 33%] Building CXX object CMakeFiles/greeter_client.dir/greeter_client.cc.o      ./CMakeFiles/3.25.1/CompilerIdCXX
[ 38%] Linking CXX executable greeter_client                                      ./CMakeFiles/3.25.1/CompilerIdCXX/a.out
[ 44%] Linking CXX executable greeter_server                                      ./CMakeFiles/3.25.1/CompilerIdCXX/tmp
[ 44%] Built target greeter_server                                                ./CMakeFiles/3.25.1/CompilerIdCXX/CMakeCXXCompilerId.cpp
[ 44%] Built target greeter_client                                                ./CMakeFiles/Makefile.cmake
[ 55%] Building CXX object CMakeFiles/greeter_callback_server.dir/greeter_callback_server.cc.o   ./CMakeFiles/hw_grpc_proto.dir
[ 55%] Building CXX object CMakeFiles/greeter_callback_client.dir/greeter_callback_client.cc.o   ./CMakeFiles/hw_grpc_proto.dir/progress.make
[ 61%] Linking CXX executable greeter_callback_client                             ./CMakeFiles/hw_grpc_proto.dir/link.txt
[ 66%] Linking CXX executable greeter_callback_server                             ./CMakeFiles/hw_grpc_proto.dir/helloworld.pb.cc.o
[ 66%] Built target greeter_callback_client                                       ./CMakeFiles/hw_grpc_proto.dir/flags.make
[ 72%] Building CXX object CMakeFiles/greeter_async_client.dir/greeter_async_client.cc.o   ./CMakeFiles/hw_grpc_proto.dir/helloworld.pb.cc.d
[ 72%] Built target greeter_callback_server                                       ./CMakeFiles/hw_grpc_proto.dir/DependInfo.cmake
[ 77%] Building CXX object CMakeFiles/greeter_async_client2.dir/greeter_async_client2.cc.o   ./CMakeFiles/hw_grpc_proto.dir/compiler_depend.ts
[ 83%] Linking CXX executable greeter_async_client                                ./CMakeFiles/hw_grpc_proto.dir/compiler_depend.make
[ 88%] Linking CXX executable greeter_async_client2                               ./CMakeFiles/hw_grpc_proto.dir/helloworld.grpc.pb.cc.d
[ 88%] Built target greeter_async_client                                          ./CMakeFiles/hw_grpc_proto.dir/depend.make
[ 94%] Building CXX object CMakeFiles/greeter_async_server.dir/greeter_async_server.cc.o   ./CMakeFiles/hw_grpc_proto.dir/helloworld.grpc.pb.cc.o
[ 94%] Built target greeter_async_client2                                         ./CMakeFiles/hw_grpc_proto.dir/cmake_clean_target.cmake
[100%] Linking CXX executable greeter_async_server                                ./CMakeFiles/hw_grpc_proto.dir/build.make
[100%] Built target greeter_async_server                                          ./CMakeFiles/hw_grpc_proto.dir/cmake_clean.cmake
kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$ ./greeter_server          ./CMakeFiles/CMakeScratch
Server listening on 0.0.0.0:50051                                                 ./CMakeFiles/CMakeDirectoryInformation.cmake
^C                                                                                kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$ ls^C
kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$ whoami; ./greeter_server   kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$ whoami; ./greeter_client
kaesi                                                                             kaesi
Server listening on 0.0.0.0:50051                                                 Greeter received: Hello world
                                                                                  kaesi@kube:~/grpc/examples/cpp/helloworld/cmake/build$
[0] 0:bash*                                                                                           "kube" 11:59 01-Oct-23
```

Syed: